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THE ENCYCLOPÆDIA BRITANNICA

A DICTIONARY OF ARTS, SCIENCES, LITERATURE AND GENERAL INFORMATION

ELEVENTH EDITION

VOLUME XI SLICE IV

G to Gaskell Elizabeth

Articles in This Slice

G The form of this letter which is familiar to us is an invention of the Romans, who had previously converted the third symbol of the alphabet into a representative of a *k*-sound (see C). Throughout the whole of Roman history C remained as the symbol for G in the abbreviations C and Cn. for the proper names Gaius and Gnaeus. According to Plutarch (*Roman Questions*, 54, 59) the symbol for G was invented by Spurius Carvilius Ruga about 293 B.C. This probably means that he was the first person to spell his cognomen RVGA instead of RVCA. G came to occupy the seventh place in the Roman alphabet which had earlier been taken by Z, because between 450 B.C. and 350 B.C. the z-sounds of Latin passed into *r*, names like *Papisius* and *Fusius* in that period becoming Papirius and Furius (see Z), so that the letter z had become superfluous. According to the late writer Martianus Capella *z* was removed from the alphabet by the censor Appius Claudius Caecus in 312 B.C. To Claudius the insertion of G into the alphabet is also sometimes ascribed.

In the earliest form the difference from C is very slight, the lower lip of the crescent merely rising up in a straight line  , but  and  are found also in republican times. In the earliest Roman inscription which was found in the Forum in 1899 the form is  written from right to left, but the hollow at the bottom lip of the crescent is an accidental pit in the stone and not a diacritical mark. The unvoiced sound in this inscription is represented by K. The use of the new form was not firmly established till after the middle of the 3rd century B.C.

In the Latin alphabet the sound was always the voiced stop (as in *gig*) in classical times. Later, before *e*, *g* passed into a sound like the English *y*, so that words begin indifferently with *g* or *j*; hence from the Lat. *generum* (accusative) and *Ianuarium* we have in Ital. *genero* and *Gennajo*, Fr. *gendre* and *janvier*. In the ancient Umbrian dialect *g* had made this change between vowels before the Christian era, the inhabitant of *Iguvium* (the modern Gubbio) being in the later form of his native speech *Iuvins*, Lat. *Iguvinus*. In most cases in Mid. Eng. also *g* passed into a *y* sound; hence the old prefix *ge* of the past participle appears only as *y* in *yclept* and the like. But *ng* and *gg* took a different course, the *g* becoming an affricate dẓ (*dzh*), as in *singe*, *ridge*, *sedge*, which in English before 1500 were *senge*, *rigge*, *segge*, and in Scotch are still pronounced *sing*, *rig*, *seg*. The affricate in words like *gaol* is of French origin (*geôle*), from a Late Lat. *gabiola*, out of *caveola*, a diminutive of the Lat. *cavea*.

The composite origin of English makes it impossible to lay down rules for the pronunciation of English *g*; thus there are in the language five words *Gill*, three of which have the *g* hard, while two have it soft: viz. (1) *gill* of a fish, (2) *gill*, a ravine, both of which are Norse, and (3) *Gill*, the surname, which is mostly Gaelic = White; and (4) *gill* a liquid measure, from O. Fr. *gelle*, Late Lat. *gella* in the same sense, and (5) *Gill*, a girl's name,

shortened from *Gillian*, *Juliana* (see Skeat's *Etymological Dictionary*). No one of these words is of native origin; otherwise the initial *g* would have changed to *y*, as in Eng. *yell* from the O. Eng. *gellan*, *giellan*.

(P. Gi.)

GABBRO, in petrology, a group of plutonic basic rocks, holocrystalline and usually rather coarse-grained, consisting essentially of a basic plagioclase felspar and one or more ferromagnesian minerals (such as augite, hornblende, hypersthene and olivine). The name was given originally in north Italy to certain coarsely crystalline dark green rocks, some of which are true gabbros, while others are serpentines. The gabbros are the plutonic or deep-seated representatives of the dolerites, basalts and diabases (also of some varieties of andesite) with which they agree closely in mineral composition, but not in minute structure. Of their minerals felspar Is usually the most abundant, and is principally labradorite and bytownite, though anorthite occurs in some, while oligoclase and orthoclase have been found in others. The felspar is sometimes very clear and fresh, its crystals being for the most part short and broad, with rather irregular or rounded outlines. Albite twinning is very frequent, but in these rocks it is often accompanied by pericline twinning by which the broad or narrow albite plates are cut transversely by many thin, bright and dark bars as seen in polarized light. Equally characteristic of the gabbros is the alteration of the felspars to cloudy, semi-opaque masses of saussurite. These are compact, tough, devoid of cleavage, and have a waxy lustre and usually a greenish-white colour. When this substance can be resolved by the microscope it proves to consist usually of zoisite or epidote, with garnet and albite, but mixed with it are also chlorite, amphibole, serpentine, prehnite, sericite and other minerals. The augite is usually brown, but greenish, violet and colourless varieties may occur. Hypersthene, when present, is often strikingly pleochroic in colours varying from pink to bright green. It weathers readily to platy-pseudomorphs of bastite which are soft and yield low polarization colours. The olivine is colourless in itself, but in most cases is altered to green or yellow serpentine, often with bands of dark magnetite granules along its cleavages and cracks. Hornblende when primary is often brown, and may surround augite or be perthitically intergrown with it; original green hornblende probably occurs also, though it is more frequently secondary. Dark-brown biotite, although by no means an important constituent of these rocks, occurs in many of them. Quartz is rare, but is occasionally seen intergrown with felspar as micropegmatite. Among the accessory minerals may be mentioned apatite, magnetite, ilmenite, picotite and garnet.

A peculiar feature, repeated so constantly in many of the minerals of these rocks as to be almost typical of them, is the occurrence of small black or dark brown enclosures often regularly arranged parallel to certain crystallographic planes. Reflection of light from the surfaces of these minute enclosures produces a shimmering or *Schiller*. In augite or hypersthene the effect is that the surface of the mineral has a bronzy sub-metallic appearance, and polished plates seen at a definite angle yield a bright coppery-red reflection, but polished sections of the felspars may exhibit a brilliant play of colours, as is well seen in the Labrador spar, which is used as an ornamental or semi-precious stone. In olivine the black enclosures are not thin laminae, but branching growths resembling pieces of moss. The phenomenon is known as "schillerization"; its origin has been much discussed, some holding that it is secondary, while others regard these enclosures as original.

In many gabbros there is a tendency to a centric arrangement of the minerals, the first crystallized forming nuclei around which the others grow. Thus magnetite, apatite and picotite, with olivine, may be enclosed in augite, hornblende, and hypersthene, sometimes with a later growth of biotite, while the felspars occupy the interspaces between the clusters of ferromagnesian minerals. In some cases there are borders around olivine consisting of fibrous hornblende or tremolite and rhombic pyroxene (kelyphitic or ocellar structures); spinels and garnet may occur in this zone, and as it is developed most frequently where olivine is in contact with felspar it may be due to a chemical resorption at a late stage in the solidification of the rock. In some gabbros and norites reaction rims of fibrous hornblende are found around both hypersthene and diallage where these are in contact with felspar. Typical orbicular structure such as characterizes some granites and diorites is rare in the gabbros, though it has been observed in a few instances in Norway, California, &c.

In a very large number of the rocks of this group the plagioclase felspar has crystallized in

large measure before the pyroxene, and is enveloped by it in ophitic manner exactly as occurs in the diabases. When these rocks become fine-grained they pass gradually into ophitic diabase and dolerite; only very rarely does olivine enclose felspar in this way. A fluxion structure or flow banding also can be observed in some of the rocks of this series, and is characterized by the occurrence of parallel sinuous bands of dark colour, rich in ferromagnesian minerals, and of lighter shades in which felspars predominate.

These basic holocrystalline rocks form a large and numerous class which can be subdivided into many groups according to their mineral composition; if we take it that typical gabbro consists of plagioclase and augites or diallage, norite of plagioclase and hypersthene, and troctolite of plagioclase and olivine, we must add to these olivine-gabbro and olivine-norite in which that mineral occurs in addition to those enumerated above. Hornblende-gabbros are distinctly rare, except when the hornblende has been developed from pyroxene by pressure and shearing, but many rocks may be described as hornblende- or biotite-bearing gabbro and norite, when they contain these ingredients in addition to the normal minerals plagioclase, augite and hypersthene. We may recognize also quartz-gabbro and quartz-norite (containing primary quartz or micropegmatite) and orthoclase-gabbro (with a little orthoclase). The name eucrite has been given to gabbros in which the felspar is mainly anorthite; many of them also contain hypersthene or enstatite and olivine, while allivalites are anorthite-olivine rocks in which the two minerals occur in nearly equal proportions; harrisites have preponderating olivine, anorthite felspar and a little pyroxene. In areas of gabbro there are often masses consisting nearly entirely of a single mineral, for example, felspar rocks (anorthosites), augite or hornblende rocks (pyroxenites and hornblendites) and olivine rocks (dunites or peridotites). Segregations of iron ores, such as ilmenite, usually with pyroxene or olivine, occur in association with some gabbro and anorthosite masses.

Some gabbros are exceedingly coarse-grained and consist of individual crystals several inches in length; such a type often form dikes or veins in serpentine or gabbro, and may be called gabbro-pegmatite. Very fine-grained gabbros, on the other hand, have been distinguished as beerbachites. Still more common is the occurrence of sheared, foliated or schistose forms of gabbro. In these the minerals have a parallel arrangement, the felspars are often broken down by pressure into a mosaic of irregular grains, while greenish fibrous or bladed amphibole takes the place of pyroxene and olivine. The diallage may be present as rounded or oval crystals around which the crushed felspar has flowed (augen-gabbro); or the whole rock may have a well-foliated structure (hornblende-schists and amphibolites). Very often a mass of normal gabbro with typical igneous character passes at its margins or along localized zones into foliated rocks of this kind, and every transition can be found between the different types. Some authors believe that the development of saussurite from felspar is also dependent on pressure rather than on weathering, and an analogous change may affect the olivine, replacing it by talc, chlorite, actinolite and garnet. Rocks showing changes of the latter type have been described from Switzerland under the name allalinites.

Rocks of the gabbro group, though perhaps not so common nor occurring in so great masses as granites, are exceedingly widespread. In Great Britain, for example, there are areas of gabbro in Shetland, Aberdeenshire, and other parts of the Highlands, Ayrshire, the Lizard (Cornwall), Carrock Fell (Cumberland) and St David’s (Wales). Most of these occur along with troctolites, norites, serpentine and peridotite. In Skye an interesting group of fresh olivine-gabbros is found in the Cuillin Hills; here also peridotites occur and there are sills and dikes of olivine-dolerite, while a great series of basaltic lavas and ash beds marks the site of volcanic outbursts in early Tertiary time. In this case it is clearly seen that the gabbros are the deep-seated and slowly crystallized representatives of the basalts which were poured out at the surfaces, and the dolerites which consolidated in fissures. The older gabbros of Britain, such as those of the Lizard, Aberdeenshire and Ayrshire, are often more or less foliated and show a tendency to pass into hornblende-schists and amphibolites. In Germany gabbros are well known in the Harz Mountains, Saxony, the Odenwald and the Black Forest. Many outcrops of similar rocks have been traced in the northern zones of the Alps, often with serpentine and hornblende-schist. They occupy considerable tracts of country in Norway and Sweden, as for instance in the vicinity of Bergen. The Pyrenees, Ligurian Alps, Dauphiné and Tuscany are other European localities for gabbro. In Canada great portions of the eastern portion of the Dominion are formed of gabbros, norite, anorthosite and allied rock types. In the United States gabbros and norites occur near Baltimore and near Peekskill on the Hudson river. As a rule each of these occurrences contains a diversity of petrographical types, which appear also in certain of the others; but there is often a well-marked individuality about the rocks of the various districts in which gabbros are found.

From an economic standpoint gabbros are not of great importance. They are used locally for building and for road-metal, but are too dark in colour, too tough and difficult to dress, to

be popular as building stones, and, though occasionally polished, are not to be compared for beauty with the serpentines and the granites. Segregations of iron ores are found in connexion with many of them (Norway and Sweden) and are sometimes mined as sources of the metal.

Chemically the gabbros are typical rocks of the basic subdivision and show the characters of that group in the clearest way. They have low silica, much iron and magnesia, and the abundance of lime distinguishes them in a marked fashion from both the granites and the peridotites. A few analyses of well-known gabbros are cited here.

	SiO_2	TiO_2	Ab_2O_3	FeO	Fe_2O_3	MgO	CaO	Na_2O	K_2O	H_2O
I.	49.63	1.75	16.18	12.03	1.92	5.38	9.33	1.89	0.81	0.55
II.	49.90	..	16.04	..	7.81	10.08	14.48	1.69	0.55	1.46
III.	45.73	..	22.10	3.51	0.71	11.16	9.26	2.54	0.34	4.38
IV.	46.24	..	29.85	2.12	1.30	2.41	16.24	1.98	0.18	..

I. Gabbro, Radanthal, Harzburg; II. Gabbro, Penig, Saxony; III. Troctolite, Coverack, Cornwall; IV. Anorthosite, mouth of the Seine river, Bad Vermilion lake, Ontario, Canada.

(J. S. F.)

GABEL, KRISTOFFER (1617-1673), Danish statesman, was born at Glückstadt, on the 6th of January 1617. His father, Wulbern, originally a landscape painter and subsequently recorder of Glückstadt, was killed at the siege of that fortress by the Imperialists in 1628. Kristoffer is first heard of in 1639, as overseer and accountant at the court of Duke Frederick. When the duke ascended the Danish throne as Frederick III., Gabel followed him to Copenhagen as his private secretary and man of business. Gabel, who veiled under a mysterious reticence considerable financial ability and uncommon shrewdness, had great influence over the irresolute king. During the brief interval between King Charles X.'s first and second attack upon Denmark, Gabel was employed in several secret missions to Sweden; and he took a part in the intrigues which resulted in the autocratic revolution of 1660 (see Denmark: *History*). His services on this occasion have certainly been exaggerated; but if not the originator of the revolution, he was certainly the chief intermediary between Frederick III. and the conjoined Estates in the mysterious conspiracy which established absolutism in Denmark. His activity on this occasion won the king's lifelong gratitude. He was enriched, ennobled, and in 1664 made governor of Copenhagen. From this year must be dated his open and official influence and power, and from 1660 to 1670 he was the most considerable personage at court, and very largely employed in financial and diplomatic affairs. When Frederick III. died, in February 1670, Gabel's power was at an end. The new ruler, Christian V., hated him, and accusations against him poured in from every quarter. When, on the 18th of April 1670, he was dismissed, nobody sympathized with the man who had grown wealthy at a time when other people found it hard to live. He died on the 13th of October 1673.

See Carl Frederik Bricka, *Dansk. Biograf. Lex.* art "Gabel" (Copenhagen, 1887, &c.); *Danmarks Riges Historie* (Copenhagen, 1897-19051905), vol. v.

GABELENTZ, HANS CONON VON DER (1807-1874), German linguist and ethnologist, born at Altenburg on the 13th of October 1807, was the only son of Hans Karl Leopold von der Gabelentz, chancellor and privy-councillor of the duchy of Altenburg. From 1821 to 1825 he attended the gymnasium of his native town, where he had Matthiae (the eminent Greek scholar) for teacher, and Hermann Brockhaus and Julius Löbe for schoolfellows. Here, in addition to ordinary school-work, he carried on the private study of Arabic and Chinese; and the latter language continued especially to engage his attention during his undergraduate course, from 1825 to 1828, at the universities of Leipzig and Göttingen. In 1830 he entered the public service of the duchy of Altenburg, where he attained to the rank of privy-

councillor in 1843. Four years later he was chosen to fill the post of *Landmarschall* in the grand-duchy of Weimar, and in 1848 he attended the Frankfort parliament, and represented the Saxon duchies on the commission for drafting an imperial constitution for Germany. In November of the same year he became president of the Altenburg ministry, but he resigned office in the following August. From 1851 to 1868 he was president of the second chamber of the duchy of Altenburg; but in the latter year he withdrew entirely from public life, that he might give undivided attention to his learned researches. He died on his estate of Lemnitz, in Saxe-Weimar, on the 3rd of September 1874.

In the course of his life he is said to have learned no fewer than eighty languages, thirty of which he spoke with fluency and elegance. But he was less remarkable for his power of acquisition than for the higher talent which enabled him to turn his knowledge to the genuine advancement of linguistic science. Immediately after quitting the university, he followed up his Chinese researches by a study of the Finno-Ugrian languages, which resulted in the publication of his *Éléments de la grammaire mandchoue* in 1832. In 1837 he became one of the promoters, and a joint-editor, of the *Zeitschrift für die Kunde des Morgenlandes*, and through this medium he gave to the world his *Versuch einer mordwinischen Grammatik* and other valuable contributions. His *Grundzüge der syrjänischen Grammatik* appeared in 1841. In conjunction with his old school friend, Julius Löbe, he brought out a complete edition, with translation, glossary and grammar, of Ulfilas's Gothic version of the Bible (1843-1846); and from 1847 he began to contribute to the *Zeitschrift der deutschen morgenländischen Gesellschaft* the fruits of his researches into the languages of the Swahilis, the Samoyedes, the Hazaras, the Aimaks, the Formosans and other widely-separated tribes. The *Beiträge zur Sprachenkunde* (1852) contain Dyak, Dakota, and Kiriri grammars; to these were added in 1857 a *Grammatik u. Wörterbuch der Kassiasprache*, and in 1860 a treatise in universal grammar (*Über das Passivum*). In 1864 he edited the Manchu translations of the Chinese Sse-shu, Shu-king and Shi-king, along with a dictionary; and in 1873 he completed the work which constitutes his most important contribution to philology, *Die melanesischen Sprachen nach ihrem grammatischen Bau und ihrer Verwandschaft unter sich und mit den malaiisch-polynesischen Sprachen untersucht* (1860-1873). It treats of the language of the Fiji Islands, New Hebrides, Loyalty Islands, New Caledonia, &c., and shows their radical affinity with the Polynesian class. He also contributed most of the linguistic articles in Pierer's *Conversations-Lexicon*.

GABELLE (French, from the Med. Lat. *gabulum*, *gablum*, a tax, for the origin of which see Gavelkind), a term which, in France, was originally applied to taxes on all commodities, but was gradually limited to the tax on salt. In process of time it became one of the most hated and most grossly unequal taxes in the country, but, though condemned by all supporters of reform, it was not abolished until 1790. First imposed in 1286, in the reign of Philip IV., as a temporary expedient, it was made a permanent tax by Charles V. Repressive as a state monopoly, it was made doubly so from the fact that the government obliged every individual above the age of eight years to purchase weekly a minimum amount of salt at a fixed price. When first instituted, it was levied uniformly on all the provinces in France, but for the greater part of its history the price varied in different provinces. There were five distinct groups of provinces, classified as follows: (*a*) the *Pays de grandes gabelles*, in which the tax was heaviest; (*b*) the *Pays de petites gabelles*, which paid a tax of about half the rate of the former; (*c*) the *Pays de salines*, in which the tax was levied on the salt extracted from the salt marshes; (*d*) the *Pays rédimés*, which had purchased redemption in 1549; and (*e*) the *Pays exempts*, which had stipulated for exemption on entering into union with the kingdom of France. *Greniers à sel* (dating from 1342) were established in each province, and to these all salt had to be taken by the producer on penalty of confiscation. The *grenier* fixed the price which it paid for the salt and then sold it to retail dealers at a higher rate.

See J.J. Clamagéran, *Histoire de l'impôt en France* (1876); A. Gasquet, *Précis des institutions politiques de l'ancienne France* (1885); Necker, *Compte rendu* (1781).

GABERDINE, or GABARDINE, any long, loose over-garment, reaching to the feet and girt round the waist. It was, when made of coarse material, commonly worn in the middle ages by pilgrims, beggars and almsmen. The Jews, conservatively attached to the loose and flowing garments of the East, continued to wear the long upper garment to which the name "gaberdine" could be applied, long after it had ceased to be a common form as worn by non-Jews, and to this day in some parts of Europe, *e.g.* in Poland, it is still worn, while the tendency to wear the frock-coat very long and loose is a marked characteristic of the race. The fact that in the middle ages the Jews were forbidden to engage in handicrafts also, no doubt, tended to stereotype a form of dress unfitted for manual labour. The idea of the "gaberdine" being enforced by law upon the Jews as a distinctive garment is probably due to Shakespeare's use in the *Merchant of Venice*, I. iii. 113. The mark that the Jews were obliged to wear generally on the outer garment was the badge. This was first enforced by the fourth Lateran Council of 1215. The "badge" (Lat. *rota*; Fr. *rouelle*, wheel) took generally the shape of a circle of cloth worn on the breast. It varied in colour at different times. In France it was of yellow, later of red and white; in England it took the form of two bands or stripes, first of white, then of yellow. In Edward I.'s reign it was made in the shape of the Tables of the Law (see the *Jewish Encyclopedia*, s.v. "Costume" and "Badge"). The derivation of the word is obscure. It apparently occurs first in O. Fr. in the forms *gauverdine*, *galvardine*, and thence into Ital. as *gavardina*, and Span. *gabardina*, a form which has influenced the English word. The *New English Dictionary* suggests a connexion with the O.H. Ger. *wallevart*, pilgrimage. Skeat (*Etym. Dict.*, 1898) refers it to Span. *gaban*, coat, cloak; *cabaña*, hut, cabin.

GABES, a town of Tunisia, at the head of the gulf of the same name, and 70 m. by sea S.W. of Sfax. It occupies the site of the Tacape of the Romans and consists of an open port and European quarter and several small Arab towns built in an oasis of date palms. This oasis is copiously watered by a stream called the Wad Gabes. The European quarter is situated on the right bank of the Wad near its mouth, and adjacent are the Arab towns of Jara and Menzel. The houses of the native towns are built largely of dressed stones and broken columns from the ruins of Tacape. Gabes is the military headquarters for southern Tunisia. The population of the oasis is about 20,000, including some 1500 Europeans. There is a considerable export trade in dates.

Gabes lies at the head of the shat country of Tunisia and is intimately connected with the scheme of Commandant Roudaire to create a Saharan sea by making a channel from the Mediterranean to these shats (large salt lakes below the level of the sea). Roudaire proposed to cut a canal through the belt of high ground between Gabes and the shats, and fixed on Wad Melah, a spot 10 m. N. of Gabes, for the sea end of the channel (see SAHARA). The company formed to execute his project became simply an agricultural concern and by the sinking of artesian wells created an oasis of olive and palm trees.

The Gulf of Gabes, the *Syrtis Minor* of the ancients, is a semi-circular shallow indentation of the Mediterranean, about 50 m. across from the Kerkenna Islands, opposite Sfax on its northern shore, to Jerba Island, which lies at its southern end. The waters of the gulf abound in fish and sponge.

GABII, an ancient city of Latium, between 12 and 13 m. E. of Rome, on the Via Praenestina, which was in early times known as the Via Gabina. The part played by it in the story of the expulsion of the Tarquins is well known; but its importance in the earliest history of Rome rests upon other evidence—the continuance of certain ancient usages which imply a period of hostility between the two cities, such as the adoption of the *cinctus Gabinus* by the consul when war was to be declared. We hear of a treaty of alliance with Rome in the time of Tarquinius Superbus, the original text of which, written on a bullock's skin, was said by Dionysius of Halicarnassus to be still extant in his day. Its subsequent history is obscure, and we only hear of it again in the 1st century B.C. as a small and

insignificant place, though its desolation is no doubt exaggerated by the poets. From inscriptions we learn that from the time of Augustus or Tiberius onwards it enjoyed a municipal organization. Its baths were well known, and Hadrian, who was responsible for much of the renewed prosperity of the small towns of Latium, appears to have been a very liberal patron, building a senate-house (*Curia Aelia Augusta*) and an aqueduct. After the 3rd century Gabii practically disappears from history, though its bishops continue to be mentioned in ecclesiastical documents till the close of the 9th. The primitive city occupied the eastern bank of the lake, the citadel being now marked by the ruins of the medieval fortress of Castiglione, while the Roman town extended farther to the south. The most conspicuous relic of the latter is a ruined temple, generally attributed to Juno, which had six columns in the front and six on each side. The plan is interesting, but the style of architecture was apparently mixed. To the east of the temple lay the Forum, where excavations were made by Gavin Hamilton in 1792. All the objects found were placed in the Villa Borghese, but many of them were carried off to Paris by Napoleon, and still remain in the Louvre. The statues and busts are especially numerous and interesting; besides the deities Venus, Diana, Nemesis, &c., they comprise Agrippa, Tiberius, Germanicus, Caligula, Claudius, Nero, Trajan and Plotina, Hadrian and Sabina, M. Aurelius, Septimius Severus, Geta, Gordianus Pius and others. The inscriptions relate mainly to local and municipal matters.

See E.Q. Visconti, *Monumenti Gabini della Villa Pinciana* (Rome, 1797, and Milan, 1835); T. Ashby in *Papers of the British School at Rome*, i. 180 seq.; G. Pinza in *Bull. Com.* (1903), 321 seq.

(T. As.)

GABINIUS, AULUS, Roman statesman and general, and supporter of Pompey, a prominent figure in the later days of the Roman republic. In 67 B.C., when tribune of the people, he brought forward the famous law (*Lex Gabinia*) conferring upon Pompey the command in the war against the Mediterranean pirates, with extensive powers which gave him absolute control over that sea and the coasts for 50 m. inland. By two other measures of Gabinius loans of money to foreign ambassadors in Rome were made non-actionable (as a check on the corruption of the senate) and the senate was ordered to give audience to foreign envoys on certain fixed days (1st of Feb.-1st of March). In 61 Gabinius, then praetor, endeavoured to win the public favour by providing games on a scale of unusual splendour, and in 58 managed to secure the consulship, not without suspicion of bribery. During his term of office he aided Publius Clodius in bringing about the exile of Cicero. In 57 Gabinius went as proconsul to Syria. On his arrival he reinstated Hyrcanus in the high-priesthood at Jerusalem, suppressed revolts, introduced important changes in the government of Judaea, and rebuilt several towns. During his absence in Egypt, whither he had been sent by Pompey, without the consent of the senate, to restore Ptolemy Auletes to his kingdom, Syria had been devastated by robbers, and Alexander, son of Aristobulus, had again taken up arms with the object of depriving Hyrcanus of the high-priesthood. With some difficulty Gabinius restored order, and in 54 handed over the province to his successor, M. Licinius Crassus. The knights, who as farmers of the taxes had suffered heavy losses during the disturbances in Syria, were greatly embittered against Gabinius, and, when he appeared in the senate to give an account of his governorship, he was brought to trial on three counts, all involving a capital offence. On the charge of *majestas* (high treason) incurred by having left his province for Egypt without the consent of the senate and in defiance of the Sibylline books, he was acquitted; it is said that the judges were bribed, and even Cicero, who had recently attacked Gabinius with the utmost virulence, was persuaded by Pompey to say as little as he could in his evidence to damage his former enemy. On the second charge, that of *repetundae* (extortion during the administration of his province), with especial reference to the 10,000 talents paid by Ptolemy for his restoration, he was found guilty, in spite of evidence offered on his behalf by Pompey and witnesses from Alexandria and the eloquence of Cicero, who had been induced to plead his cause. Nothing but Cicero’s wish to do a favour to Pompey could have induced him to take up what must have been a distasteful task; indeed, it is hinted that the half-heartedness of the defence materially contributed to Gabinius’s condemnation. The third charge, that of *ambitus* (illegalities committed during his canvass for the consulship), was consequently dropped; Gabinius went into exile, and his property was confiscated. After the outbreak of the civil war, he was recalled by Caesar in 49, and

entered his service, but took no active part against his old patron Pompey. After the battle of Pharsalus, he was commissioned to transport some recently levied troops to Illyricum. On his way thither by land, he was attacked by the Dalmatians and with difficulty made his way to Salonae (Dalmatia). Here he bravely defended himself against the attacks of the Pompeian commander, Marcus Octavius, but in a few months died of illness (48 or the beginning of 47).

See Dio Cassius xxxvi. 23-36, xxxviii. 13. 30, xxxix. 55-63; Plutarch, *Pompey*, 25. 48; Josephus, *Antiq*. xiv. 4-6; Appian, *Illyrica*, 12, *Bell. Civ.* ii. 24. 59; Cicero, *ad Att.* vi. 2, *ad Q. Fratrem*, ii. 13, *Post reditum in senatu*, 4-8, *Pro lege Manilia*, 17, 18, 19; exhaustive article by Bähr in Ersch and Gruber's *Allgemeine Encyclopädie*; and monograph by G. Stocchi, *Aulo Gabinio e i suoi processi* (1892).

GABION (a French word derived through Ital. *gabbione*, *gabbia*, from Lat. *cavea*, a cage), a cylindrical basket without top or bottom, used in revetting fortifications and for numerous other purposes of military engineering. The gabion is filled with earth when in position. The ordinary brushwood gabion in the British service has a diameter of 2 ft. and a height of 2 ft. 9 in. There are several forms of gabion in use, the best known being the Willesden paper band gabion and the Jones iron or steel band gabion.

GABLE, in architecture, the upper portion of a wall from the level of the eaves or gutter to the ridge of the roof. The word is a southern English form of the Scottish *gāvel*, or of an O. Fr. word *gable* or *jable*, both ultimately derived from O. Norwegian *gafl*. In other Teutonic languages, similar words, such as Ger. *Gabel* and Dutch *gaffel*, mean "fork," cf. Lat. *gabalus*, gallows, which is Teutonic in origin; "gable" is represented by such forms as Ger. *Giebel* and Dutch *gevel*. According to the *New English Dictionary* the primary meaning of all these words is probably "top" or "head," cf. Gr. κεφαλή, and refers to the forking timbers at the end of a roof. The gable corresponds to the pediment in classic buildings where the roof was of low pitch. If the roof is carried across on the top of the wall so that the purlins project beyond its face, they are masked or hidden by a "barge board," but as a rule the roof butts up against the back of the wall which is raised so as to form a parapet. In the middle ages the gable end was invariably parallel to the roof and was crowned by coping stones properly weathered on both sides to throw off the rain. In the 16th century in England variety was given to the outline of the gable by a series of alternating semi-circular and ogee curves. In Holland, Belgium and Scotland a succession of steps was employed, which in the latter country are known as crow gables or corbie steps. In Germany and the Netherlands in the 17th and 18th centuries the step gables assume very elaborate forms of an extremely rococo character, and they are sometimes of immense size, with windows in two or three storeys. Designs of a similar rococo character are found in England, but only in crestings such as those which surmount the towers of Wollaton and the gatehouse of Hardwick Hall.

Gabled Towers, in architecture, are those towers which are finished with gables instead of parapets, as at Sompting, Sussex. Many of the German Romanesque towers are gabled.

GABLER, GEORG ANDREAS (1786-1853), German Hegelian philosopher, son of J.P. Gabler (below), was born on the 30th of July 1786, at Altdorf in Bavaria. In 1804 he accompanied his father to Jena, where he completed his studies in philosophy and law, and became an enthusiastic disciple of Hegel. After holding various educational appointments, he was in 1821 appointed rector of the Bayreuth gymnasium, and in 1830 general superintendent of schools. In 1835 he succeeded Hegel in the Berlin chair. He died at

Teplitz on the 13th of September 1853. His works include *Lehrbuch d. philos. Propädeutik* (1st vol., Erlangen, 1827), a popular exposition of the Hegelian system; *De verae philosophiae erga religionem Christianam pietate* (Berlin, 1836), and *Die Hegel'sche Philosophie* (*ib.*, 1843), a defence of the Hegelian philosophy against Trendelenburg.

GABLER, JOHANN PHILIPP (1753-1826), German Protestant theologian of the school of J.J. Griesbach and J.G. Eichhorn, was born at Frankfort-on-Main on the 4th of June 1753. In 1772 he entered the university of Jena as a theological student. In 1776 he was on the point of abandoning theological pursuits, when the arrival of Griesbach inspired him with new ardour. After having been successively *Repetent* in Göttingen and teacher in the public schools of Dortmund (Westphalia) and Altdorf (Bavaria), he was, in 1785, appointed second professor of theology in the university of Altdorf, whence he was translated to a chair in Jena in 1804, where he succeeded Griesbach in 1812. Here he died on the 17th of February 1826. At Altdorf Gabler published (1791-1793) a new edition, with introduction and notes, of Eichhorn's *Urgeschichte*; this was followed, two years afterwards, by a supplement entitled *Neuer Versuch über die mosaische Schöpfungsgeschichte*. He was also the author of many essays which were characterized by much critical acumen, and which had considerable influence on the course of German thought on theological and Biblical questions. From 1798 to 1800 he was editor of the *Neuestes theologisches Journal*, first conjointly with H.K.A. Hänlein (1762-1829), C.F. von Ammon (1766-1850) and H.E.G. Paulus, and afterwards unassisted; from 1801 to 1804 of the *Journal für theologische Litteratur*; and from 1805 to 1811 of the *Journal für auserlesene theologische Litteratur*.

Some of his essays were published by his sons (2 vols., 1831); and a memoir appeared in 1827 by W. Schröter.

GABLETS (diminutive of "gable"), in architecture, triangular terminations to buttresses, much in use in the Early English and Decorated periods, after which the buttresses generally terminated in pinnacles. The Early English gablets are generally plain, and very sharp in pitch. In the Decorated period they are often enriched with panelling and crockets. They are sometimes finished with small crosses, but of oftener with finials.

GABLONZ (Czech, *Jablonec*), a town of Bohemia, Austria, 94 m. N.E. of Prague by rail. Pop. (1900) 21,086, mostly German. It is the chief seat of the glass pearl and imitation jewelry manufacture, and has also an important textile industry, and produces large quantities of hardware, papier mâché and other paper goods.

GABORIAU, ÉMILE (1833-1873), French novelist, was born at Saujon (Charente Inférieure) on the 9th of November 1833. He became secretary to Paul Féval, and, after publishing some novels and miscellaneous writings, found his real gift in *L'Affaire Lerouge* (1866), a detective novel which was published in the *Pays* and at once made his reputation. The story was produced on the stage in 1872. A long series of novels dealing with the annals of the police court followed, and proved very popular. Among them are: *Le Crime d'Orcival* (1867), *Monsieur Lecoq* (1869), *La Vie infernale* (1870), *Les Esclaves de Paris* (1869), *L'Argent des autres* (1874). Gaboriau died in Paris on the 28th of September 1873.

GABRIEL (Heb. גבריאל, man of God), in the Bible, the heavenly messenger (see ANGEL) sent to Daniel to explain the vision of the ram and the he-goat, and to communicate the prediction of the Seventy Weeks (Dan. viii. 16, ix. 21). He was also employed to announce the birth of John the Baptist to Zacharias, and that of the Messiah to the Virgin Mary (Luke i. 19, 26). Because he stood in the divine presence (see Luke i. 19; Rev. viii. 2; and cf. Tobit xii. 15), both Jewish and Christian writers generally speak of him as an archangel. In the *Book of Enoch* "the four great archangels" are Michael, Uriel, Suriel or Raphael, and Gabriel, who is set over "all the powers" and shares the work of intercession. His name frequently occurs in the Jewish literature of the later post-Biblical period. Thus, according to the Targum Pseudo-Jonathan, he was the man who showed the way to Joseph (Gen. xxxvii. 15); and in Deut. xxxiv. 6 it is affirmed that he, along with Michael, Uriel, Jophiel, Jephephiah and the Metatron, buried the body of Moses. In the Targum on 2 Chron. xxxii. 21 he is named as the angel who destroyed the host of Sennacherib; and in similar writings of a still later period he is spoken of as the spirit who presides over fire, thunder, the ripening of the fruits of the earth and similar processes. In the Koran great prominence is given to his function as the medium of divine revelation, and, according to the Mahommedan interpreters, he it is who is referred to by the appellations "Holy Spirit" and "Spirit of Truth." He is specially commemorated in the calendars of the Greek, Coptic and Armenian churches.

GABRIEL HOUNDS, a spectral pack supposed in the North of England to foretell death by their yelping at night. The legend is that they are the souls of unbaptized children wandering through the air till the day of judgment. They are also sometimes called Gabriel or Gabble Ratchet. A very prosaic explanation of this nocturnal noise is given by J.C. Atkinson in his *Cleveland Glossary* (1868). "This," he writes, "is the name for a yelping sound heard at night, more or less resembling the cry of hounds or yelping of dogs, probably due to large flocks of wild geese which chance to be flying by night."

See further Joseph Lucas, *Studies in Nidderdale* (1882), pp. 156-157.

GABRIELI, GIOVANNI (1557-1612?), Italian musical composer, was born at Venice in 1557, and was a pupil of his uncle Andrea, a distinguished musician of the contrapuntal school and organist of St Mark's. He succeeded Claudio Merulo as first organist of the same church in 1585, and died at Venice either in 1612 or 1613. He was remarkable for his compositions for several choirs, writing frequently for 12 or 16 voices, and is important as an early experimenter in chromatic harmony. It was probably for this reason that he made a special point of combining voices with instruments, being thus one of the founders of choral and orchestral composition. Among his pupils was Heinrich Schütz; and the church of St Mark, from the time of the Gabrielis onwards down to that of Lotti, became one of the most important musical schools in Europe.

See also Winterfeld, *Johann Gabrieli und seine Zeit* (1834).

GABUN, a district on the west coast of Africa, one of the colonies forming French Congo (*q.v.*). It derives its designation from the settlements on the Gabun river or Rio de Gabão.

The Gabun, in reality an estuary of the sea, lies immediately north of the equator. At the entrance, between Cape Joinville or Santa Clara on the N. and Cape Pangara or Sandy Point on the S., it has a width of about 10 m. It maintains a breadth of some 7 m. for a distance of 40 m. inland, when it contracts into what is known as the Rio Olambo, which is not more than 2 or 3 m. from bank to bank. Several rivers, of which the Komo is the chief, discharge their waters into the estuary. The Gabun was discovered by Portuguese navigators towards the close of the 15th century, and was named from its fanciful resemblance to a *gabão* or cabin. On the small island of Koniké, which lies about the centre of the estuary, scanty remains of a Portuguese fort have been discovered. The three principal tribes in the Gabun are the Mpongwe, the Fang and the Bakalai.

GACE BRULÉ (d. *c.* 1220), French *trouvère*, was a native of Champagne. It has generally been asserted that he taught Thibaut of Champagne the art of verse, an assumption which is based on a statement in the *Chroniques de Saint-Denis*: “Si fist entre lui [Thibaut] et Gace Brulé les plus belles chançons et les plus délitables et melodieuses qui onque fussent oïes.” This has been taken as evidence of collaboration between the two poets. The passage will bear the interpretation that with those of Gace the songs of Thibaut were the best hitherto known. Paulin Paris, in the *Histoire littéraire de la France* (vol. xxiii.), quotes a number of facts that fix an earlier date for Gace’s songs. Gace is the author of the earliest known *jeu parti*. The interlocutors are Gace and a count of Brittany who is identified with Geoffrey of Brittany, son of Henry II. of England. Gace appears to have been banished from Champagne and to have found refuge in Brittany. A deed dated 1212 attests a contract between Gatho Bruslé (Gace Brulé) and the Templars for a piece of land in Dreux. It seems most probable that Gace died before 1220, at the latest in 1225.

See Gédéon Busken Huet, *Chansons de Gace Brulé*, edited for the Société des anciens textes français (1902), with an exhaustive introduction. Dante quotes a song by Gace, *Ire d’amor qui en mon cuer repaire*, which he attributes erroneously to Thibaut of Navarre (*De vulgari eloquentia*, p. 151, ed. P. Rajna, Florence, 1895).

GACHARD, LOUIS PROSPER (1800-1885), Belgian man of letters, was born in Paris on the 12th of March 1800. He entered the administration of the royal archives in 1826, and was appointed director-general, a post which he held for fifty-five years. During this long period he reorganized the service, added to the records by copies taken in other European collections, travelled for purposes of study, and carried on a wide correspondence with other keepers of records, and with historical scholars. He also edited and published many valuable collections of state papers; a full list of his various publications was printed in the *Annuaire de l’académie royale de Belgique* by Ch. Piot in 1888, pp. 220-236. It includes 246 entries. He was the author of several historical writings, of which the best known are *Don Carlos et Philippe II* (1867), *Études et notices historiques concernant l’histoire des Pays-Bas* (1863), *Histoire de la Belgique au commencement du XVIII*^{e} *siècle* (1880), *Histoire politique et diplomatique de P.P. Rubens* (1877), all published at Brussels. His chief editorial works are the *Actes des états généraux des Pays-Bas 1576-1585* (Brussels, 1861-1866), *Collection de documents inédits concernant l’histoire de la Belgique* (Brussels, 1833-1835), and the *Relations des ambassadeurs Vénitiens sur Charles V et Philippe II* (Brussels, 1855). Gachard died in Brussels on the 24th of December 1885.

GAD, in the Bible. 1. A prophet or rather a “seer” (cp. 1 Sam. ix. 9), who was a companion of David from his early days. He is first mentioned in 1 Sam. xxii. 5 as having warned David to take refuge in Judah, and appears again in 2 Sam. xxiv. 11 seq. to make known Yahweh’s

displeasure at the numbering of the people. Together with Nathan he is represented in post-exilic tradition as assisting to organize the musical service of the temple (2 Chron. xxix. 25), and like Nathan and Samuel he is said to have written an account of David's deeds (1 Chron. xxix. 29); a history of David in accordance with later tradition and upon the lines of later prophetic ideas is far from improbable.

2. Son of Jacob, by Zilpah, Leah's maid; a tribe of Israel (Gen. xxx. 11). The name is that of the god of "luck" or fortune, mentioned in Isa. lxv. 11 (R.V. mg.), and in several names of places, *e.g.* Baal-Gad (Josh. xi. 17, xii. 7), and possibly also in Dibon-Gad, Migdol-Gad and Nahal-Gad.[1] There is another etymology in Gen. xlix. 19, where the name is played on: "Gad, a plundering troop (*gĕdûd*) shall plunder him (*yegudennu*), but he shall plunder at their heels." There are no traditions of the personal history of Gad. One of the earliest references to the name is the statement on the inscription of Mesha, king of Moab (about 850 B.C.), that the "men of Gad" had occupied Ataroth (E. of Dead Sea) from of old, and that the king of Israel had fortified the city. This is in the district ascribed to Reuben, with which tribe the fortunes of Gad were very closely connected. In Numbers xxxii. 34 sqq., the cities of Gad appear to lie chiefly to the south of Heshbon; in Joshua xiii. 24-28 they lie almost wholly to the north; while other texts present discrepancies which are not easily reconciled with either passage. Possibly some cities were common to both Reuben and Gad, and perhaps others more than once changed hands. That Gad, at one time at least, held territory as far south as Pisgah and Nebo would follow from Deut. xxxiii. 21, if the rendering of the Targums be accepted, "and he looked out the first part for himself, because there was the portion of the buried law-giver." It is certain, however, that, at a late period, this tribe was localized chiefly in Gilead, in the district which now goes by the name of Jebel Jil'ād. The traditions encircling this district point, it would seem, to the tribe having been of Aramaean origin (see the story of Jacob); at all events its position was extremely exposed, and its population at the best must have been a mixed one. Its richness and fertility made it a prey to the marauding nomads of the desert; but the allusion in the Blessing of Jacob gives the tribe a character for bravery, and David's men of Gad (1 Chron. xii. 8) were famous in tradition. Although rarely mentioned by name (the geographical term Gilead is usual), the history of Gad enters into the lives of Jephthah and Saul, and in the wars of Ammon and Moab it must have played some part. It followed Jeroboam in the great revolt against the house of David, and its later fortunes until 734 B.C. (1 Chron. v. 26) would be those of the northern kingdom.

See, for a critical discussion of the data, H.W. Hogg, *Ency. Bib.* cols. 1579 sqq.; also GILEAD; MANASSEH; REUBEN.

1 See G.B. Gray, *Heb. Proper Names*, pp. 134 seq., 145.

GADAG, or GARAG, a town of British India, in the Dharwar district of Bombay, 43 m. E. of Dharwar town. Pop. (1901) 30,652. It is an important railway junction on the Southern Mahratta system, with a growing trade in raw cotton, and also in the weaving of cotton and silk. There are factories for ginning and pressing cotton, and a spinning mill. The town contains remains of a number of temples, some of which exhibit fine carving, while inscriptions in them indicate the existence of Gadag as early as the 10th century.

GADARA, an ancient town of the Syrian Decapolis, the capital of Peraea, and the political centre of the small district of Gadaris. It was a Greek city, probably entirely non-Syrian in origin. The earliest recorded event in its history is its capture by Antiochus III. of Syria in 218 B.C.; how long it may have existed before this date is unknown. About twenty years later it was besieged for ten months by Alexander Jannaeus. It was restored by Pompey, and in 30 B.C. was presented by Augustus to Herod the Great; on Herod's death it was reunited to Syria. The coins of the place bear Greek legends, and such inscriptions as have been found on its site are Greek. Its governing and wealthy classes were probably Greek, the common people being Hellenized and Judaized Aramaeans. The community was Hellenistically

organized, and though dependent on Syria and acknowledging the supremacy of Rome it was governed by a democratic senate and managed its own internal affairs. In the Jewish war it surrendered to Vespasian, but in the Byzantine period it again flourished and was the seat of a bishop. It was renowned for its hot sulphur baths; the springs still exist and show the remains of bath-houses. The temperature of the springs is 110° F. This town was the birthplace of Meleager the anthologist. There is a confusion in the narrative of the healing of the demoniac between the very similar names *Gadara*, *Gerasa* and *Gergesa*; but the probabilities, both textual and geographical, are in favour of the reading of Mark (*Gerasenes*, ch. v. 1, revised version); and that the miracle has nothing to do with Gadara, but took place at *Kersa*, on the eastern shore of the Sea of Galilee.

Gadara is now represented by *Umm Kais*, a group of ruins about 6 m. S.E. of the Sea of Galilee, and 1194 ft. above the sea-level. There are very fine tombs with carved sarcophagi in the neighbourhood. There are the remains of two theatres and (probably) a temple, and many heaps of carved stones, representing ancient buildings of various kinds. The walls are, or were, traceable for a circuit of 2 m., and there are also the remains of a street of columns. The natives are rapidly destroying the ruins by quarrying building material out of them.

(R. A. S. M.)

GADDI. Four painters of the early Florentine school—father, son and two grandsons—bore this name.

1. Gaddo Gaddi was, according to Vasari, an intimate friend of Cimabue, and afterwards of Giotto. The dates of birth and death have been given as 1239 and about 1312; these are probably too early; he may have been born towards 1260, and may have died in or about 1333. He was a painter and mosaicist, is said to have executed the great mosaic inside the portal of the cathedral of Florence, representing the coronation of the Virgin, and may with more certainty be credited with the mosaics inside the portico of the basilica of S. Maria Maggiore, Rome, relating to the legend of the foundation of that church; their date is probably 1308. In the original cathedral of St Peter in Rome he also executed the mosaics of the choir, and those of the front representing on a colossal scale God the Father, with many other figures; likewise an altarpiece in the church of S. Maria Novella, Florence; these works no longer exist. It is ordinarily held that no picture (as distinct from mosaics) by Gaddo Gaddi is now extant. Messrs Crowe & Cavalcaselle, however, consider that the mosaics of S. Maria Maggiore bear so strong a resemblance in style to four of the frescoes in the upper church of Assisi, representing incidents in the life of St Francis (frescoes 2, 3, 4 and especially 5, which shows Francis stripping himself, and protected by the bishop), that those frescoes likewise may, with considerable confidence, be ascribed to Gaddi. Some other extant mosaics are attributed to him, but without full authentication. This artist laid the foundation of a very large fortune, which continued increasing, and placed his progeny in a highly distinguished worldly position.

2. Taddeo Gaddi (about 1300-1366, or later), son of Gaddo, was born in Florence, and is usually said to have been one of Giotto’s most industrious assistants for a period of 24 years. This can hardly be other than an exaggeration; it is probable that he began painting on his own account towards 1330, when Giotto went to Naples. Taddeo also traded as a merchant, and had a branch establishment in Venice. He was a painter, mosaicist and architect. He executed in fresco, in the Baroncelli (now Giugni) chapel, in the Florentine church of S. Croce, the “Virgin and Child between Four Prophets,” on the funeral monument at the entrance, and on the walls various incidents in the legend of the Virgin, from the expulsion of Joachim from the Temple up to the Nativity. In the subject of the “Presentation of the Virgin in the Temple” are the two heads traditionally accepted as portraits of Gaddo Gaddi and Andrea Tafi; they, at any rate, are not likely to be portraits of those artists from the life. On the ceiling of the same chapel are the “Eight Virtues.” In the museum of Berlin is an altarpiece by Taddeo, the “Virgin and Child,” and some other subjects, dated 1334; in the Naples gallery, a triptych, dated 1336, of the “Virgin enthroned along with Four Saints,” the “Baptism of Jesus,” and his “Deposition from the Cross”; in the sacristy of S. Pietro a Megognano, near Poggibonsi, an altarpiece dated 1355, the “Virgin and Child enthroned amid Angels.” A series of paintings, partly from the life of St Francis, which Taddeo executed for the presses in S. Croce, are now divided between the Florentine Academy and the Berlin Museum; the compositions are taken from or founded on Giotto, to whom, indeed,

the Berlin authorities have ascribed their examples. Taddeo also painted some frescoes still extant in Pisa, besides many in S. Croce and other Florentine buildings, which have perished. He deservedly ranks as one of the most eminent successors of Giotto; it may be said that he continued working up the material furnished by that great painter, with comparatively feeble inspiration of his own. His figures are vehement in action, long and slender in form; his execution rapid and somewhat conventional. To Taddeo are generally ascribed the celebrated frescoes—those of the ceiling and left or western wall—in the Cappella degli Spagnuoli, in the church of S. Maria Novella, Florence; this is, however, open to considerable doubt, although it may perhaps be conceded that the designs for the ceiling were furnished by Taddeo. Dubious also are the three pictures ascribed to him in the National Gallery, London. In mosaic he has left some work in the baptistery of Florence. As an architect he supplied in 1336 the plans for the present Ponte Vecchio, and those for the original (not the present) Ponte S. Trinita; in 1337 he was engaged on the church of Or San Michele; and he carried on after Giotto's death the work of the unrivalled Campanile.

3. Agnolo Gaddi, born in Florence, was the son of Taddeo; the date of his birth has been given as 1326, but possibly 1350 is nearer the mark. He was a painter and mosaicist, trained by his father, and a merchant as well; in middle age he settled down to commercial life in Venice, and he added greatly to the family wealth. He died in Florence in October 1396. His paintings show much early promise, hardly sustained as he advanced in life. One of the earliest, at S. Jacopo tra' Fossi, Florence, represents the "Resurrection of Lazarus." Another probably youthful performance is the series of frescoes of the Pieve di Prato—legends of the Virgin and of her Sacred Girdle, bestowed upon St Thomas, and brought to Prato in the 11th century by Michele dei Dagomari; the "Marriage of Mary" is one of the best of this series, the later compositions in which have suffered much by renewals. In S. Croce he painted, in eight frescoes, the legend of the Cross, beginning with the archangel Michael giving Seth a branch from the tree of knowledge, and ending with the emperor Heraclius carrying the Cross as he enters Jerusalem; in this picture is a portrait of the painter himself. Agnolo composed his subjects better than Taddeo; he had more dignity and individuality in the figures, and was a clear and bold colourist; the general effect is laudably decorative, but the drawing is poor, and the works show best from a distance. Various other productions of this master exist, and many have perished. Cennino Cennini, the author of the celebrated treatise on painting, was one of his pupils.

4. Giovanni Gaddi, brother of Agnolo, was also a painter of promise. He died young in 1383.

Vasari, and Crowe and Cavelcaselle can be consulted as to the Gaddi. Other notices appear here and there—such as *La Cappella de' Rinuccini in S. Croce di Firenze*, by G. Ajazzi (1845).

(W. M. R.)

GADE, NIELS WILHELM (1817-1890), Danish composer, was born at Copenhagen, on the 22nd of February 1817, his father being a musical instrument maker. He was intended for his father's trade, but his passion for a musician's career, made evident by the ease and skill with which he learnt to play upon a number of instruments, was not to be denied. Though he became proficient on the violin under Wexschall, and in the elements of theory under Weyse and Berggreen, he was to a great extent self-taught. His opportunities of hearing and playing in the great masterpieces were many, since he was a member of the court band. In 1840 his *Aladdin* and his overture of *Ossian* attracted attention, and in 1841 his *Nachklänge aus Ossian* overture gained the local musical society's prize, the judges being Spohr and Schneider. This work also attracted the notice of the king, who gave the composer a stipend which enabled him to go to Leipzig and Italy. In 1844 Gade conducted the Gewandhaus concerts in Leipzig during Mendelssohn's absence, and on the latter's death became chief conductor. In 1848, on the outbreak of the Holstein War, he returned to Copenhagen, where he was appointed organist and conductor of the Musik-Verein. In 1852 he married a daughter of the composer J.P.E. Hartmann. He became court conductor in 1861, and was pensioned by the government in 1876—the year in which he visited Birmingham to conduct his *Crusaders*. This work, and the *Frühlingsfantasie*, the *Erlkönigs Tochter*, *Frühlingsbotschaft* and *Psyche* (written for Birmingham in 1882) have enjoyed a wide popularity. Indeed, they represent the strength and the weakness of Gade's musical ability quite as well as any of his eight symphonies (the best of which are the first and

fourth, while the fifth has an obbligato pianoforte part). Gade was distinctly a romanticist, but his music is highly polished and beautifully finished, lyrical rather than dramatic and effective. Much of the pianoforte music, *Aquarellen*, *Spring Flowers*, for instance, enjoyed a considerable vogue, as did the *Novelletten* trio; but Gade's opera *Mariotta* has not been heard outside the Copenhagen opera house. He died at Copenhagen on the 21st of December 1890.

GADOLINIUM (symbol Gd., atomic weight 157.3), one of the rare earth metals (see ERBIUM). The element was discovered in 1880 in the mineral samarskite by C. Marignac (*Comptes rendus*, 1880, 90, p. 899; *Ann. chim. phys.*, 1880 [5] 20, p. 535). G. Urbain (*Comptes rendus*, 1905, 140, p. 583) separates the metal by crystallizing the double nitrate of nickel and gadolinium. The salts show absorption bands in the ultra-violet. The oxide Gd_2O_3 is colourless (Lecoq de Boisbaudran).

GADSDEN, CHRISTOPHER (1724-1805), American patriot, was born in Charleston, South Carolina, in 1724. His father, Thomas Gadsden, was for a time the king's collector for the port of Charleston. Christopher went to school near Bristol, in England, returned to America in 1741, was afterwards employed in a counting house in Philadelphia, and became a merchant and planter at Charleston. In 1759 he was captain of an artillery company in an expedition against the Cherokees. He was a member of the South Carolina legislature almost continuously from 1760 to 1780, and represented his province in the Stamp Act Congress of 1765 and in the Continental Congress in 1774-1776. In February 1776 he was placed in command of all the military forces of South Carolina, and in October of the same year was commissioned a brigadier-general and was taken into the Continental service; but on account of a dispute arising out of a conflict between state and Federal authority resigned his command in 1777. He was lieutenant-governor of his state in 1780, when Charleston was surrendered to the British. For about three months following this event he was held as a prisoner on parole within the limits of Charleston; then, because of his influence in deterring others from exchanging their paroles for the privileges of British subjects, he was seized, taken to St Augustine, Florida, and there, because he would not give another parole to those who had violated the former agreement affecting him, he was confined for forty-two weeks in a dungeon. In 1782 Gadsden was again elected a member of his state legislature; he was also elected governor, but declined to serve on the ground that he was too old and infirm; in 1788 he was a member of the convention which ratified for South Carolina the Federal constitution; and in 1790 he was a member of the convention which framed the new state constitution. He died in Charleston on the 28th of August 1805. From the time that Governor Thomas Boone, in 1762, pronounced his election to the legislature improper, and dissolved the House in consequence, Gadsden was hostile to the British administration. He was an ardent leader of the opposition to the Stamp Act, advocating even then a separation of the colonies from the mother country; and in the Continental Congress of 1774 he discussed the situation on the basis of inalienable rights and liberties, and urged an immediate attack on General Thomas Gage, that he might be defeated before receiving reinforcements.

GADSDEN, JAMES (1788-1858), American soldier and diplomat, was born at Charleston, S.C., on the 15th of May 1788, the grandson of Christopher Gadsden. He graduated at Yale in 1806, became a merchant in his native city, and in the war of 1812 served in the regular U.S. Army as a lieutenant of engineers. In 1818 he served against the Seminoles, with the rank of captain, as aide on the staff of Gen. Andrew Jackson. In October 1820 he became

inspector-general of the Southern Division, with the rank of colonel, and as such assisted in the occupation and the establishment of posts in Florida after its acquisition. From August 1821 to March 1822 he was adjutant-general, but, his appointment not being confirmed by the Senate, he left the army and became a planter in Florida. He served in the Territorial legislature, and as Federal commissioner superintended in 1823 the removal of the Seminole Indians to South Florida. In 1832 he negotiated with the Seminoles a treaty which provided for their removal within three years to lands in what is now the state of Oklahoma; but the Seminoles refused to move, hostilities again broke out, and in the second Seminole War Gadsden was quartermaster-general of the Florida Volunteers from February to April 1836. Returning to South Carolina he became a rice planter, and was president of the South Carolina railway. In 1853 President Franklin Pierce appointed him minister to Mexico, with which country he negotiated the so-called "Gadsden treaty" (signed the 30th of December 1853), which gave to the United States freedom of transit for mails, merchandise and troops across the Isthmus of Tehuantepec, and provided for a readjustment of the boundary established by the treaty of Guadalupe Hidalgo, the United States acquiring 45,535 sq. m. of land, since known as the "Gadsden Purchase," in what is now New Mexico and Arizona. In addition, Article XI. of the treaty of Guadalupe Hidalgo, which bound the United States to prevent incursions of Indians from the United States into Mexico, and to restore Mexican prisoners captured by such Indians, was abrogated, and for these considerations the United States paid to Mexico the sum of $10,000,000. Ratifications of the treaty, slightly modified by the Senate, were exchanged on the 30th of June 1854; before this, however, Gadsden had retired from his post. The boundary line between Mexico and the "Gadsden Purchase" was marked by joint commissions appointed in 1855 and 1891, the second commission publishing its report in 1899. Gadsden died at Charleston, South Carolina, on the 25th of December 1858.

An elder brother, Christopher Edwards Gadsden (1785-1852), was Protestant Episcopal bishop of South Carolina in 1839-1852.

GADWALL, a word of obscure origin,[1] the common English name of the duck, called by Linnaeus *Anas strepera*, but considered by many modern ornithologists to require removal from the genus *Anas* to that of *Chaulelasmus* or *Ctenorhynchus*, of either of which it is almost the sole species. Its geographical distribution is almost identical with that of the common wild duck or mallard (see Duck), since it is found over the greater part of the northern hemisphere; but, save in India, where it is one of the most abundant species of duck during the cold weather, it is hardly anywhere so numerous, and both in the eastern parts of the United States and in the British Islands it is rather rare than otherwise. Its habits also, so far as they have been observed, greatly resemble those of the wild duck; but its appearance on the water is very different, its small head, flat back, elongated form and elevated stern rendering it recognizable by the fowler even at such a distance as hinders him from seeing its very distinct plumage. In coloration the two sexes appear almost equally sombre; but on closer inspection the drake exhibits a pencilled grey coloration and upper wing-coverts of a deep chestnut, which are almost wanting in his soberly clad partner. She closely resembles the female of the mallard in colour, but has, like her own male, some of the secondary quills of a pure white, presenting a patch of that colour which forms one of the most readily perceived distinctive characters of the species. The gadwall is a bird of some interest in England, since it is one of the few that have been induced, by the protection afforded them in certain localities, to resume the indigenous position they once filled, but had, through the draining and reclaiming of marshy lands, long since abandoned. In regard to the present species, this fact was due to the efforts of Andrew Fountaine, on whose property, in West Norfolk and its immediate neighbourhood, the gadwall, from 1850, annually bred in increasing numbers. It has been always esteemed one of the best of wild fowl for the table.

(A. N.)

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1 The *New English Dictionary* has nothing to say. Webster gives the etymology *gad well* = go about well. Dr R.G. Latham suggested that it was taken from the syllables *quedul*, of the Lat. *querquedula*, a teal. The spelling "gadwall" seems to be first found in Willughby in 1676, and has been generally adopted by later writers; but Merrett, in 1667, has "gaddel" (*Pinax rerum naturalium Britannicarum*, p. 180), saying that it was so called by bird-dealers. The synonym

"gray," given by Willughby and Ray, is doubtless derived from the general colour of the species, and has its analogue in the Icelandic *Gráönd*, applied almost indifferently, or with some distinguishing epithet, to the female of any of the freshwater ducks, and especially to both sexes of the present, in which, as stated in the text, there is comparatively little conspicuous difference of plumage in drake and duck.

GAEKWAR, or GUICOWAR, the family name of the Mahratta rulers of Baroda (*q.v.*) in western India, which has been converted by the English into a dynastic title. It is derived from the vernacular word for the cow, but it is a mistake to suppose that the family are of the cowherd caste; they belong to the upper class of Mahrattas proper, sometimes claiming a Rajput origin. The dynasty was founded by a succession of three warriors, Damaji I., Pilaji and Damaji II., who established Mahratta supremacy throughout Gujarat during the first half of the 18th century. The present style of the ruler is Maharaja Gaekwar of Baroda.

GAETA (anc. *Caietae Portus*), a seaport and episcopal see of Campania, Italy, in the province of Caserta, from which it is 53 m. W.N.W. by rail via Sparanise. Pop. (1901) 5528. It occupies a lower projecting point of the promontory which forms the S.W. extremity of the Bay of Gaeta. The tomb of Munatius Plancus, on the summit of the promontory (see CAIETAE PORTUS), is now a naval signal station, and lies in the centre of the extensive earthworks of the modern fortifications. The harbour is well sheltered except on the E., but has little commercial importance, being mainly a naval station. To the N.W. is the suburb of Elena (formerly Borgo di Gaeta). Pop. (1901) 10,369. Above the town is a castle erected by the Angevin kings, and strengthened at various periods. The cathedral of St Erasmus (S. Elmo), consecrated in 1106, has a fine campanile begun in 860 and completed in 1279, and a nave and four aisles; the interior has, however, been modernized. Opposite the door of the cathedral is a candelabrum with interesting sculptures of the end of the 13th century, consisting of 48 panels in bas-relief, with 24 representations from the life of Christ, and 24 of the life of St Erasmus (A. Venturi, *Storia dell' arte Italiana*, iii. Milan, 1904, 642 seq.). The cathedral possesses three fine *Exultet* rolls, with miniatures dating from the 11th to the beginning of the 13th century. Behind the high altar is the banner sent by Pope Pius V. to Don John of Austria, the victor of Lepanto. The constable of Bourbon, who fell in the sack of Rome of 1527, is buried here. The other churches are of minor interest; close to that of La Trinità is the Montagna Spaccata, where a vertical fissure from 6 to 15 ft. wide runs right down to the sea-level. Over the chasm is a chapel *del Crocefisso*, the mountain having split, it is said, at the death of Christ.

During the break-up of the Roman empire, Gaeta, like Amalfi and Naples, would seem to have established itself as a practically independent port and to have carried on a thriving trade with the Levant. Its history, however, is obscure until, in 823, it appears as a lordship ruled by hereditary *hypati* or consuls. In 844 the town fell into the hands of the Arabs, but four years later they were driven out with help supplied by Pope Leo IV. In 875 the town was in the hands of Pope John VIII., who gave it to the count of Capua as a fief of the Holy See, which had long claimed jurisdiction over it. In 877, however, the *hypatus* John (Ioannes) II. succeeded in recovering the lordship, which he established as a duchy under the suzerainty of the East Roman emperors. In the 11th century the duchy fell into the hands of the Norman counts of Aversa, afterwards princes of Capua, and in 1135 it was definitively annexed to his kingdom by Roger of Sicily. The town, however, had its own coinage as late as 1229.

In military history the town has played a conspicuous part. Its fortifications were strengthened in the 15th century. On the 30th of September 1707 it was stormed, after a three months' siege, by the Austrians under Daun; and on the 6th of August 1734 it was taken, after a siege of four months, by French, Spanish and Sardinian troops under the future King Charles of Naples. The fortifications were again strengthened; and in 1799 it was temporarily occupied by the French. On the 18th of July 1806 it was captured, after an heroic defence, by the French under Masséna; and on the 18th of July 1815 it capitulated,

after a three months' siege, to the Austrians. In November 1848 Pope Pius IX., after his flight in disguise from Rome, found a refuge at Gaeta, where he remained till the 4th of September 1849. Finally, in 1860, it was the scene of the last stand of Francis II. of Naples against the forces of United Italy. Shut up in the fortress with 12,000 men, after Garibaldi's occupation of Naples, the king, inspired by the heroic example of Queen Maria, offered a stubborn resistance, and it was not till the 13th of February 1861 that, the withdrawal of the French fleet having made bombardment from the sea possible, he was forced to capitulate.

See G.B. Federici, *Degli antichi duchi, consoli o ipati della città di Gaeta* (Naples, 1791); Onorato Gaetani d' Aragona, *Mem. stor. della città di Gaeta* (Milan, 1879); C. Ravizza, *Il Golfo di Gaeta* (Novara, 1876).

(T. As.)

GAETANI, or CAETANI, the name of the oldest of the Roman princely families which played a great part in the history of the city and of the papacy. The Gaetani are of Longobard origin, and the founder of the house is said to be one Dominus Constantinus Cagetanus, who flourished in the 10th century, but the family had no great importance until the election of Benedetto Gaetani to the papacy as Boniface VIII. in 1294, when they at once became the most notable in the city. The pope conferred on them the fiefs of Sermoneta, Bassiano, Ninfa and San Donato (1297-1300), and the marquisate of Ancona in 1300, while Charles II. of Anjou created the pope's brother count of Caserta. Giordano Loffredo Gaetani by his marriage with Giovanna dell' Aquila, heiress of the counts of Fondi and Traetto, in 1297 added the name of Aquila to his own, and his grandson Giacomo acquired the lordships of Piedimonte and Gioia. The Gaetani proved brave warriors and formed a bodyguard to protect Boniface VIII. from his many foes. During the 14th and 15th centuries their feuds with the Colonna caused frequent disturbances in Rome and the Campagna, sometimes amounting to civil war. They also played an important rôle as Neapolitan nobles. In 1500 Alexander VI., in his attempt to crush the great Roman feudal nobility, confiscated the Gaetani fiefs and gave them to his daughter Lucrezia Borgia (*q.v.*); but they afterwards regained them.

At present there are two lines of Gaetani: (1) Gaetani, princes of Teano and dukes of Sermoneta, founded by Giacobello Gaetani, whose grandson, Guglielmo Gaetani, was granted the duchy of Sermoneta by Pius III. in 1503, the marquisate of Cisterna being conferred on the family by Sixtus V. in 1585. In 1642, Francesco, the 7th duke of Sermoneta, acquired by marriage the county of Caserta, which was exchanged for the principality of Teano in 1750. The present head of the house, Onorato Gaetani, 14th duke of Sermoneta, 4th prince of Teano, duke of San Marco, marquis of Cisterna, &c., is a senator of the kingdom of Italy, and was minister for foreign affairs for a short time. (2) Gaetani dell' Aquila d'Aragona, princes of Piedimonte, and dukes of Laurenzana, founded by Onorato Gaetani dell' Aquila, count of Fondi, Traetto, Alife and Morcone, lord of Piedimonte and Gioia, in 1454. The additional surname of Aragona was assumed after the marriage of Onorato Gaetani, duke of Traetto (d. 1529), with Lucrezia of Aragon, natural daughter of King Ferdinand I. of Naples. The duchy of Laurenzana, in the kingdom of Naples, was acquired by Alfonso Gaetani by his marriage in 1606 with Giulia di Ruggiero, duchess of Laurenzana. The lordship of Piedimonte was raised to a principality in 1715. The present (1908) head of the house is Nicola Gaetani dell' Aquila d'Aragona (b. 1857), 7th prince of Piedimonte and 12th duke of Laurenzana.

See A. von Reumont, *Geschichte der Stadt Rom* (Berlin, 1868); F. Gregorovius, *Geschichte der Stadt Rom* (Stuttgart, 1872); *Almanach de Gotha* (1907 and 1908).

GAETULIA, an ancient district in northern Africa, which in the usage of Roman writers comprised the wandering tribes of the southern slopes of Mount Aures and the Atlas, as far as the Atlantic, and the oases in the northern part of the Sahara. They were always distinguished from the Negro people to the south, and beyond doubt belonged to the same

Berber race which formed the basis of the population of Numidia and Mauretania (*q.v.*). The tribes to be found there at the present day are probably of the same race, and retain the same wandering habits; and it is possible that they still bear in certain places the name of their Gaetulian ancestors (see Vivien St Martin, *Le Nord de l'Afrique*, 1863). A few only seem to have mingled with the Negroes of the Sahara, if we may thus interpret Ptolemy's allusion to Melano-Gaetuli (4. 6. 5.). They were noted for the rearing of horses, and according to Strabo had 100,000 foals in a single year. They were clad in skins, lived on flesh and milk, and the only manufacture connected with their name is that of the purple dye which became famous from the time of Augustus onwards, and was made from the purple fish found on the coast, apparently both in the Syrtes and on the Atlantic.

We first hear of this people in the Jugurthine War (111-106 B.C.), when, as Sallust tells us, they did not even know the name of Rome. They took part with Jugurtha against Rome; but when we next hear of them they are in alliance with Caesar against Juba I. (*Bell. Afr.* 32). In 25 B.C. Augustus seems to have given a part of Gaetulia to Juba II., together with his kingdom of Mauretania, doubtless with the object of controlling the turbulent tribes; but the Gaetulians rose and massacred the Roman residents, and it was not till a severe defeat had been inflicted on them by Lentulus Cossus (who thus acquired the surname Gaetulicus) in A.D. 6 that they submitted to the king. After Mauretania became a Roman province in A.D. 40, the Roman governors made frequent expeditions into the Gaetulian territory to the south, and the official view seems to be expressed by Pliny (v. 4. 30) when he says that all Gaetulia as far as the Niger and the Ethiopian frontier was reckoned as subject to the Empire. How far this represents the fact is not clear; but inscriptions prove that Gaetulians served in the auxiliary troops of the empire, and it may be assumed that the country passed within the sphere of Roman influence, though hardly within the pale of Roman civilization.

For bibliography see AFRICA, ROMAN.

GAGE, LYMAN JUDSON (1836-), American financier, was born at De Ruyter, Madison county, New York, on the 28th of June 1836. He was educated at an academy at Rome, New York, where at the age of seventeen he became a bank clerk. In 1855 he removed to Chicago, served for three years as book-keeper in a planing-mill, and in 1858 entered the banking house of the Merchant's Loan and Trust Company, of which he was cashier in 1861-1868. Afterwards he became successively assistant cashier (1868), vice-president (1882), and president (1891) of the First National Bank of Chicago, one of the strongest financial institutions in the middle west. He was chosen in 1892 president of the board of directors of the World's Columbian Exposition, the successful financing of which was due more to him than to any other man. In politics he was originally a Republican, and was a delegate to the national convention of the party in 1880, and chairman of its finance committee. In 1884, however, he supported Grover Cleveland for the presidency, and came to be looked upon as a Democrat. In 1892 President Cleveland, after his second election, offered Gage the post of secretary of the treasury, but the offer was declined. In the "free-silver" campaign of 1896 Gage laboured effectively for the election of William McKinley, and from March 1897 until January 1902 he was secretary of the treasury in the cabinets successively of Presidents McKinley and Roosevelt. From April 1902 until 1906 he was president of the United States Trust Company in New York City. His administration of the treasury department, through a more than ordinarily trying period, was marked by a conservative policy, looking toward the strengthening of the gold standard, the securing of greater flexibility in the currency, and a more perfect adjustment of the relations between the government and the National banks.

GAGE, THOMAS (1721-1787), British general and governor of Massachusetts, second son of the first Viscount Gage, was born in 1721. He entered the army in 1741 and saw service in Flanders and in the campaign of Culloden, becoming lieutenant-colonel in the 44th foot in March 1751. In 1754 he served in America, and he took part in the following year in General

Braddock's disastrous expedition. In 1758 he became colonel of a new regiment, and served in Amherst's operations against Montreal. He was made governor of Montreal, and promoted major-general in 1761, and in 1763 succeeded Amherst in the command of the British forces in America; in 1770 he was made a lieutenant-general. In 1774 he was appointed governor of Massachusetts, and in that capacity was entrusted with carrying into effect the Boston Port Act. The difficulties which surrounded him in the execution of his office at this time of the gravest unrest culminated in 1775, and the action of the 19th of April at Lexington initiated the American War of Independence. After the battle of Bunker Hill, Gage was superseded by General (Sir William) Howe, and returned to England. He became general in 1782, and died on the 2nd of April 1787.

GAGE, a pledge, something deposited as security for the performance of an agreement, and liable to be forfeited on failure to carry it out. The word also appears in "engage," and is taken from the O. Fr., as are "wage," payment for services, and "wager," bet, stake, from the collateral O. Fr. *waige*. These two words are from the Low Lat. *wadiare*, *vadiare*, to pledge, *vadium*, classical Lat. *vas*, *vadis*, but may be from the old Teutonic cognate base seen in Gothic *wadi*, a pledge (cf. Ger. *wetten*, to wager); this Teutonic base is seen in Eng. "wed," to marry, *i.e.* to engage by a pledge (cf. Goth, *gawadjon*, to betrothe). A particular form of giving a "gage" or pledge was that of throwing down a glove or gauntlet as a challenge to a judicial combat, the glove being the "pledge" that the parties would appear on the field; hence the common phrase "to throw down the gage of defiance" for any challenge (see GLOVE and WAGER).

GAGERN, HANS CHRISTOPH ERNST, BARON VON (1766-1852), German statesman and political writer, was born at Kleinniedesheim, near Worms, on the 25th of January 1766. After studying law at the universities of Leipzig and Göttingen, he entered the service of the prince of Nassau-Weilburg, whom in 1791 he represented at the imperial diet. He was afterwards appointed the prince's envoy at Paris, where he remained till the decree of Napoleon, forbidding all persons born on the left side of the Rhine to serve any other state than France, compelled him to resign his office (1811). He then retired to Vienna, and in 1812 he took part in the attempt to excite a second insurrection against Napoleon in Tirol. On the failure of this attempt he left Austria and joined the headquarters of the Prussian army (1813), and became a member of the board of administration for north Germany. In 1814 he was appointed administrator of the Orange principalities; and, when the prince of Orange became king of the Netherlands, Baron Gagern became his prime minister. In 1815 he represented him at the congress of Vienna, and succeeded in obtaining for the Netherlands a considerable augmentation of territory. From 1816 to 1818 he was Luxemburg envoy at the German diet, but was recalled, at the instance of Metternich, owing to his too independent advocacy of state constitutions. In 1820 he retired with a pension to his estate at Hornau, near Höchst, in Hesse-Darmstadt; but as a member of the first chamber of the states of the grand-duchy he continued to take an active share in the promotion of measures for the welfare of his country. He retired from public life in 1848, and died at Hornau on the 22nd of October 1852. Baron von Gagern wrote a history of the German nation (Vienna, 1813; 2nd ed., 2 vols., Frankfort, 1825-1826), and several other books on subjects connected with history and social and political science. Of most permanent value, however, is his autobiography, *Mein Anteil an der Politik*, 5 vols. (Stuttgart and Leipzig, 1823-1845).

Of Hans Christoph von Gagern's sons three attained considerable eminence:—

FRIEDRICH BALDUIN, Freiherr von Gagern (1794-1848), the eldest, was born at Weilburg on the 24th of October 1794. He entered the university of Göttingen, but soon left, and, taking service in the Austrian army, took part in the Russian campaign of 1812, and fought in the following year at Dresden, Kulm and Leipzig. He then entered the Dutch service, took part in the campaigns of 1815, and, after studying another year at Heidelberg, was member for

Luxemburg of the military commission of the German federal diet (1824, 1825). In 1830 and 1831 he took part in the Dutch campaign in Belgium, and in 1844, after being promoted to the rank of general, was sent on an important mission to the Dutch East Indies to inquire into the state of their military defences. In 1847 he was appointed governor at the Hague, and commandant in South Holland. In the spring of 1848 he was in Germany, and on the outbreak of the revolutionary troubles he accepted the invitation of the government of Baden to take the command against the insurgent "free companies" (*Freischaaren*). At Kandern, on the 20th of April, he made a vain effort to persuade the leaders to submit, and was about to order his troops to attack when he was mortally wounded by the bullets of the insurgents. His *Life*, in 3 vols. (Heidelberg and Leipzig, 1856-1857), was written by his brother Heinrich von Gagern.

HEINRICH WILHELM AUGUST, Freiherr von Gagern (1799-1880), the third son, was born at Bayreuth on the 20th of August 1799, educated at the military academy at Munich, and, as an officer in the service of the duke of Nassau, fought at Waterloo. Leaving the service after the war, he studied jurisprudence at Heidelberg, Göttingen and Jena, and in 1819 went for a while to Geneva to complete his studies. In 1821 he began his official career as a lawyer in the grand-duchy of Hesse, and in 1832 was elected to the second chamber. Already at the universities he had proclaimed his Liberal sympathies as a member of the *Burschenschaft*, and he now threw himself into open opposition to the unconstitutional spirit of the Hessian government, an attitude which led to his dismissal from the state service in 1833. Henceforth he lived in comparative retirement, cultivating a farm rented by his father at Monsheim, and occasionally publishing criticisms of public affairs, until the February revolution of 1848 and its echoes in Germany recalled him to active political life. For a short while he was at the head of the new Hessian administration; but his ambition was to share in the creation of a united Germany. At the Heidelberg meeting and the preliminary convention (*Vorparlament*) of Frankfort he deeply impressed the assemblies with the breadth and moderation of his views; with the result that when the German national parliament met (May 18), he was elected its first president. His influence was at first paramount, both with the Unionist party and with the more moderate elements of the Left, and it was he who was mainly instrumental in imposing the principle of a united empire with a common parliament, and in carrying the election of the Archduke John as regent. With the growing split between the Great Germans (*Grossdeutschen*), who wished the new empire to include the Austrian provinces, and the Little Germans (*Kleindeutschen*), who realized that German unity could only be attained by excluding them, his position was shaken. On the 15th of December, when Schmerling and the Austrian members had left the cabinet, Gagern became head of the imperial ministry, and on the 18th he introduced a programme (known as the *Gagernsche Programm*) according to which Austria was to be excluded from the new federal state, but bound to it by a treaty of union. After a severe struggle this proposal was accepted; but the academic discussion on the constitution continued for weary months, and on the 20th of May, realizing the hopelessness of coming to terms with the ultra-democrats, Gagern and his friends resigned. Later on he attempted to influence the Prussian Northern Union in the direction of the national policy, and he took part in the sessions of the Erfurt parliament; but, soon realizing the hopelessness of any good results from the vacillating policy of Prussia, he retired from the contest, and, as a major in the service of the Schleswig-Holstein government, took part in the Danish War of 1850. After the war he retired into private life at Heidelberg. In 1862, misled by the constitutional tendency of Austrian politics, he publicly declared in favour of the Great German party. In 1864 he went as Hessian envoy to Vienna, retiring in 1872 when the post was abolished. He died at Darmstadt on the 22nd of May 1880.

MAXIMILIAN, Freiherr von Gagern (1810-1889), the youngest son, was born at Weilburg on the 26th of March 1810. Up to 1848 he was a government official in Nassau; in that year he became a member of the German national parliament and under-secretary of state for foreign affairs. Throughout the revolutionary years he supported his brother's policy, became a member of the Erfurt parliament, and, after the collapse of the national movement, returned to the service of the duchy of Nassau. In 1855 he turned Roman Catholic and entered the Austrian service as court and ministerial councillor in the department of foreign affairs. In 1871 he retired, and in 1881 was nominated a life member of the Upper Chamber (*Herrenhaus*). He died at Vienna on the 17th of October 1889.

See *Allgemeine deutsche Biographie*, Band viii. p. 301, &c. (1878) and Band xlix. p. 654 (1904).

GAHANBAR, festivals of the ancient Avesta calendar celebrated by the Parsees at six seasons of the year which correspond with the six periods of creation: (1) *Maidhyozaremaya* (mid spring), (2) *Maidhyoshema* (midsummer), (3) *Paitishahya* (season of corn), (4) *Ayathrema* (season of flocks), (5) *Maidhyarya* (winter solstice), (6) *Hamaspathmaedha* (festival of sacrifices).

GAIGNIÈRES, FRANÇOIS ROGER DE (1642-1715), French genealogist, antiquary and collector, was the son of Aimé de Gaignières, secretary to the governor of Burgundy, and was born on the 30th of December 1642. He became écuyer (esquire) to Louis Joseph, duke of Guise, and afterwards to Louis Joseph's aunt, Marie of Guise, by whom in 1679 he was appointed governor of her principality of Joinville. At an early age he began to make a collection of original materials for history generally, and, in particular, for that of the French church and court. He brought together a large collection of original letters and other documents, together with portraits and prints, and had copies made of a great number of the most curious antiquarian objects, such as seals, tombstones, stained glass, miniatures and tapestry. In 1711 he presented the whole of his collections to the king. The bulk of them is preserved in the Bibliothèque Nationale at Paris, and a certain number in the Bodleian library at Oxford.

See G. Duplessis, *Roger de Gaignières* (Paris, 1870); L. Delisle, *Cabinet des manuscrits*, t. i. pp. 335-356; H. Bouchot, *Les Portraits aux crayon des XVI^e^ et XVII^e^ siècles* (Paris, 1884); Ch. de Grandmaison, *Gaignières, ses correspondants et ses collections de portraits* (Niort, 1892).

GAIL, JEAN BAPTISTE (1755-1829), French hellenist, was born in Paris on the 4th of July 1755. In 1791 he was appointed deputy, and in 1792 titular professor at the Collège de France. During the Revolution he quietly performed his professional duties, taking no part in politics, although he possessed the faculty of ingratiating himself with those in authority. In 1815 he was appointed by the king keeper of Greek MSS. in the royal library over the heads of the candidates proposed by the other conservators, an appointment which made him many enemies. Gail imagined that there was an organized conspiracy to belittle his learning and professional success, and there was a standing quarrel between him and his literary opponents, the most distinguished of whom was P.L. Courier. He died on the 5th of February 1829. Without being a great Greek scholar, Gail was a man of unwearied industry, whose whole life was devoted to his favourite studies, and he deserves every credit for having rescued Greek from the neglect into which it had fallen during the troublous times in which he lived. The list of Gail's published works filled 500 quarto pages of the introduction to his edition of Xenophon. The best of these is his edition of Theocritus (1828). He also wrote a number of elementary educational works, based on the principles of the school of Port Royal. His communications to the Académie des Inscriptions being coldly received and seldom accorded the honour of print, he inserted them in a vast compilation in 24 volumes, which he called *Le Philologue*, containing a mass of ill-digested notes on Greek grammar, geography, archaeology, and various authors.

See "Notice historique sur la vie et les ouvrages de J. B. G.," in *Mém. de l'Acad. des Inscriptions*, ix.; the articles in *Biographie universelle* (by A. Pillon) and Ersch and Gruber's *Allgemeine Encyclopädie* (by C.F. Bähr); a list of his works will be found in J.M. Quérard, *La France littéraire* (1829), including the contents of the volumes of *Le Philologue*.

GAILLAC, a town of south-western France, capital of an arrondissement in the

department of Tarn, on the right bank of the Tarn, 15 m. W. of Albi on the railway from that city to Toulouse. Pop. (1906) town, 5388; commune, 7535. The churches of St Michel and St Pierre, both dating from the 13th and 14th centuries, have little architectural importance. There are some interesting houses, one of which, the Maison Yversen, of the Renaissance, is remarkable for the rich carving of its doors. The public institutions include the sub-prefecture, a tribunal of first instance, and a communal college. Its industries include the manufacture of lime and wooden shoes, while dyeing, wood-sawing and flour-milling are also carried on; it has a considerable trade in grain, flour, vegetables, dried plums, anise, coriander, &c., and in wine, the white and red wines of the arrondissement having a high reputation. Gaillac grew up round the Benedictine abbey of St Michel, founded in the 10th century.

GAILLARD, GABRIEL HENRI (1726-1806), French historian, was born at Ostel, Picardy, in 1726. He was educated for the bar, but after finishing his studies adopted a literary career, ultimately devoting his chief attention to history. He was already a member of the Academy of Inscriptions and Belles-lettres (1760), when, after the publication of the three first volumes of his *Histoire de la rivalité de la France et d'Angleterre*, he was elected to the French Academy (1771); and when Napoleon created the Institute he was admitted into its third class (*Académie française*) in 1803. For forty years he was the intimate friend of Malesherbes, whose life (1805) he wrote. He died at St Firmin, near Chantilly, on the 13th of February 1806. Gaillard is painstaking and impartial in his statement of facts, and his style is correct and elegant, but the unity of his narrative is somewhat destroyed by digressions, and by his method of treating war, politics, civil administration, and ecclesiastical affairs under separate heads. His most important work is his *Histoire de la rivalité de la France et de l'Angleterre* (in 11 vols., 1771-1777); and among his other works may be mentioned *Essai de rhétorique française, à l'usage des jeunes demoiselles* (1745), often reprinted, and in 1822 with a life of the author; *Histoire de Marie de Bourgogne* (1757); *Histoire de François I^{er}* (7 vols., 1776-1779); *Histoire des grandes querelles entre Charles V. et François I^{er}* (2 vols., 1777); *Histoire de Charlemagne* (2 vols., 1782); *Histoire de la rivalité de la France et de l'Espagne* (8 vols., 1801); *Dictionnaire historique* (6 vols., 1789-1804), making part of the *Encyclopédie méthodique*; and *Mélanges littéraires*, containing *éloges* on Charles V., Henry IV., Descartes, Corneille, La Fontaine, Malesherbes and others.

GAINESVILLE, a city and the county-seat of Alachua county, Florida, U.S.A., about 70 m. S.W. of Jacksonville. Pop. (1890) 2790; (1900) 3633, of whom 1803 were negroes; (1905) 5413; (1910) 6183. Gainesville is served by the Atlantic Coast Line, the Seaboard Air Line, and the Tampa & Jacksonville railways, and is an important railway junction. It is the seat of the University of the State of Florida, established at Lake City in 1905 and removed to Gainesville in 1906. The university includes a school of language and literature, a general scientific school, a school of agriculture, a technological school, a school of pedagogy, a normal school, and an agricultural experiment station. In 1908 the university had 15 instructors and 103 students. The Florida Winter Bible Conference and Chautauqua is held here. Gainesville is well known as a winter resort, and its climate is especially beneficial to persons affected by pulmonary troubles. In the neighbourhood are the Alachua Sink, Payne's Prairie, Newman's Lake, the Devil's Mill Hopper and other objects of interest. The surrounding country produces Sea Island cotton, melons, citrus and other fruits, vegetables and naval stores. About 15 m. W. of the city there is a rich phosphate mining district. The city has bottling works, and manufactures fertilizers, lumber, coffins, ice, &c. The municipality owns and operates the water-works; the water-supply comes from a spring 2 m. from the city, and the water closely resembles that of the Poland Springs in Maine. Gainesville is in the midst of the famous Seminole country. The first settlement was made here about 1850; and Gainesville, named in honour of General E.P. Gaines, was incorporated as a town in 1869, and was chartered as a city in 1907.

GAINESVILLE, a city and the county-seat of Cooke county, Texas, U.S.A., about 6 m. S. of the Red river, and about 60 m. N. of Fort Worth. Pop. (1890) 6594; (1900) 7874 (1201 negroes and 269 foreign-born); (1910) 7624. The city is served by the Gulf, Colorado & Santa Fé, and the Missouri, Kansas & Texas railways, and by an interurban electric railway. Gainesville is a trading centre and market for the surrounding country, in which cotton, grains, garden truck, fruit and alfalfa are grown and live-stock is raised; and a wholesale distributing point for the neighbouring region in Texas and Oklahoma. The city has cotton-compresses and cotton-gins, and among its manufactures are cotton-seed oil, flour, cement blocks, pressed bricks, canned goods, foundry products, waggon-beds and creamery products. Gainesville was settled about 1851, was incorporated in 1873, and was chartered as a city in 1879; it was named in honour of General Edmund Pendleton Gaines (1777-1849), who served with distinction in the War of 1812, becoming a brigadier-general in March 1814 and receiving the brevet of major-general and the thanks of Congress for his defence of Fort Erie in August 1814. Gaines took a prominent part in the operations against the Seminoles in Florida in 1817 (when he was in command of the Southern Military District) and in 1836 and during the Mexican War commanded the department of the South-West, with headquarters at New Orleans.

GAINSBOROUGH, THOMAS (1727-1788), English painter, one of the greatest masters of the English school in portraiture, and only less so in landscape, was born at Sudbury, Suffolk, in the spring of 1727. His father, who carried on the business of a woollen crape-maker in that town, was of a respectable character and family, and was noted for his skill in fencing; his mother excelled in flower-painting, and encouraged her son in the use of the pencil. There were nine children of the marriage, two of the painter’s brothers being of a very ingenious turn.

At ten years old, Gainsborough “had sketched every fine tree and picturesque cottage near Sudbury,” and at fourteen, having filled his task-books with caricatures of his schoolmaster, and sketched the portrait of a man whom he had detected on the watch for robbing his father’s orchard, he was allowed to follow the bent of his genius in London, with some instruction in etching from Gravelot, and under such advantages as Hayman, the historical painter, and the academy in St Martin’s Lane could afford. Three years of study in the metropolis, where he did some modelling and a few landscapes, were succeeded by two years in the country. Here he fell in love with Margaret Burr, a young lady of many charms, including an annuity of £200, married her after painting her portrait, and a short courtship, and, at the age of twenty, became a householder in Ipswich, his rent being £6 a year. The annuity was reported to come from Margaret’s real (not her putative) father, who was one of the exiled Stuart princes or else the duke of Bedford. She was sister of a young man employed by Gainsborough’s father as a traveller. At Ipswich, Gainsborough tells us, he was “chiefly in the face-way”; his sitters were not so numerous as to prevent him from often rambling with his friend Joshua Kirby (president of the Society of Artists) on the banks of the Orwell, from painting many landscapes with an attention to details which his later works never exhibited, or from joining a musical club and entertaining himself and his fellow-townsmen by giving concerts. As he advanced in years he became ambitious of advancing in reputation. Bath was then the general resort of wealth and fashion, and to that city, towards the close of the year 1759, he removed with his wife and two daughters, the only issue of their marriage. His studio in the circus was soon thronged with visitors; he gradually raised his price for a half-length portrait from 5 to 40 guineas, and for a whole-length from 8 to 100 guineas; and he rapidly developed beyond the comparatively plain and humdrum quality of his Ipswich paintings. Among his sitters at this period were the authors Sterne and Richardson, and the actors Quin, Henderson and Garrick. Meanwhile he contributed both portraits and landscapes to the annual exhibitions in London. He indulged his taste for music by learning to play the viol-di-gamba, the harp, the hautboy, the violoncello. His house harboured Italian, German, French and English musicians. He haunted the green-room of Palmer’s theatre, and painted gratuitously the portraits of many of the actors: he constantly

gave away his sketches and landscapes. In the summer of 1774, having already attained a position of great prosperity, he took his departure for London, and fixed his residence at Schomberg House, Pall Mall, a noble mansion still standing, for a part of which the artist paid £300 a year.

Gainsborough had not been many months in London ere he received a summons to the palace, and to the end of his career he divided with West the favour of the court, and with Reynolds the favour of the town. Sheridan, Burke, Johnson, Franklin, Canning, Lady Mary Wortley Montagu, Mrs Siddons, Clive, Blackstone, Hurd, were among the number of those who sat to him. But in London as in Bath his landscapes were exhibited, were commended, and were year after year returned to him, “till they stood,” says Sir William Beechey, “ranged in long lines from his hall to his painting-room.” Gainsborough was a member of the Royal Academy, one of the original 36 elected in 1768; but in 1784, being dissatisfied with the position assigned on the exhibition walls to his portrait of the three princesses, he withdrew that and his other pictures, and he never afterwards exhibited there. Even before this he had taken no part in the business of the Institution. After seceding he got up an exhibition in his own house, not successfully. In February 1788, while witnessing the trial of Warren Hastings, he felt an extraordinary chill at the back of his neck; this was the beginning of a cancer (or, as some say, a malignant wen) which proved fatal on the 2nd of August of the same year. He lies buried at Kew.

Gainsborough was tall, fair and handsome, generous, impulsive to the point of capriciousness, easily irritated, not of bookish likings, a lively talker, good at repartee. He was a most thorough embodiment of the artistic temperament; delighting in nature and “the look of things,” insatiable in working, fond of music and the theatre hardly less than of painting—a warm, rich personality, to whom severe principle was perhaps as foreign as deliberate wrong-doing. The property which he left at his death was not large. One of his daughters, Mary, had married the musician Fischer contrary to his wishes, and was subject to fits of mental aberration. The other daughter, Margaret, died unmarried. Mrs Gainsborough, an extremely sweet-tempered woman, survived her husband ten years. There is a pretty anecdote that Gainsborough, if he ever had a tiff with her, would write a pacifying note, confiding it to his dog Fox, who delivered it to the lady’s pet spaniel Tristram. The note was worded as in the person of Fox to Tristram, and Mrs Gainsborough replied in the best of humours, as from Tristram to Fox.

Gainsborough and Reynolds rank side by side as the greatest portrait-painters of the English school. They were at variance; but Gainsborough on his death-bed sought and obtained a reconciliation. It is difficult to say which stands the higher of the two, although Reynolds may claim to have worked with a nearer approach to even and demonstrable excellence. In grace, spirit, and lightness of insight and of touch, Gainsborough is peculiarly eminent. His handling was slight for the most part, and somewhat arbitrary, but in a high degree masterly; and his landscapes and rustic compositions are not less gifted than his portraits. Among his finest works are portraits of “Lady Ligonier,” “Georgiana, duchess of Devonshire,” “Master Buttall (the Blue Boy),” now in Grosvenor House, “Mrs Sheridan and Mrs Tickell,” “Orpin, the parish clerk” (National Gallery), “the Hon. Mrs Graham” (Scottish National Gallery), his own portrait (Royal Academy), “Mrs Siddons” (National Gallery); also “the Cottage Door,” “the Market Cart,” “the Return from Harvest,” “the Woodman and his Dog in a Storm” (destroyed by fire), and “Waggon and Horses passing a Brook” (National Gallery—this was a favourite with its painter). He made a vast number of drawings and sketches.

A few observations may be added: (1) as to individual works by Gainsborough, and (2) as to his general characteristics as a painter.

Two of his first portraits, executed when he was settled at Ipswich, were separate likenesses of Mr and Mrs Hingeston. His first great hit was made at Bath with a portrait of Lord Nugent. With a likeness of Mr Poyntz, 1762, we find a decided advance in artistic type, and his style became fixed towards 1768. The date of the “Blue Boy” is somewhat uncertain: most accounts name 1779, but perhaps 1770 is nearer the mark. This point is not without interest for dilettanti; because it is said that Gainsborough painted the picture with a view to confuting a dictum of Reynolds, to the effect that blue was a colour unsuitable for the main light of a work. But, if the picture was produced before 1778, the date of Reynolds’s dictum, this long-cherished and often-repeated tradition must be given up. A full-length of the duke of Norfolk was perhaps the latest work to which Gainsborough set his hand. His portrait of Elizabeth, duchess of Devonshire, famous for its long disappearance, has aroused much controversy; whether this painting, produced not long after Gainsborough had settled in London, and termed “the Duchess of Devonshire,” does really represent that lady, is by no

means certain. It was mysteriously stolen in 1876 in London immediately after it had been purchased by Messrs Agnew at the Wynn Ellis sale at a huge price, and a long time elapsed before it was retraced. The picture was taken to New York, and eventually to Chicago; and in April 1901, through the agency of a man named Pat Sheedy, it was given up to the American detectives working for Messrs Agnew; it was then sold to Mr Pierpont Morgan.

Gainsborough's total output of paintings exceeded 300, including 220 portraits: he also etched at least 18 plates, and 3 in aquatint. At the date of his death 56 paintings remained on hand: these, along with 148 drawings, were then exhibited. In his earlier days he made a practice of copying works by Vandyck (the object of his more special admiration), Titian, Rubens, Teniers, Hobbema, Claude and some others, but not in a spirit of servile reproduction.

Gainsborough was pre-eminent in that very essential element of portraiture—truthful likeness. In process of time he advanced in the rendering of immediate expression, while he somewhat receded in general character. He always made his sitters look pleasant, and, after a while, distinguished. Unity of impression is one of the most marked qualities in his work; he seems to have seen his subject as an integer, and he wrought at the various parts of it together, every touch (and very wilful some of his touches look) tending towards the foreseen result. He painted with arrowy speed, more especially in his later years. For portraits he used at times brushes upon sticks 6 ft. long; there was but little light in his painting-room, and he often worked in the evenings. He kept his landscape work distinct from his portraiture, not ever adding to the latter a fully realized landscape background; his views he never signed or dated—his likenesses only once or twice. His skies are constantly cloudy, the country represented is rough and broken; the scenes are of a pastoral kind, with an effect generally of coming rain, or else of calm sun-setting. The prevalent feeling of his landscapes is somewhat sad, and to children, whether in subject-groups or in portraits, he mostly lent an expression rather plaintive than mirthful. It should be acknowledged that, whether in portraiture or in landscape, the painter's mannerisms of execution increased in process of time—patchings of the brush, tufty foliage, &c.; some of his portraits are hurried and flimsy, with a minimum of solid content, though not other than artistic in feeling. Here are a few of his axioms:—"What makes the difference between man and man is real performance, and not genius or conception." "I don't think it would be more ridiculous for a person to put his nose close to the canvas and say the colours smelt offensive than to say how rough the paint lies, for one is just as material as the other with regard to hurting the effect and drawing of a picture." "The eye is the only perspective-master needed by a landscape-painter."

AUTHORITIES.—In 1788 Philip Thicknesse, Lieutenant-Governor of Landguard Fort, Ipswich, who had been active in promoting the artist's fortunes at starting, published A *Sketch of the Life and Paintings of Thomas Gainsborough*. He had quarrelled with the painter at Bath, partly because the latter had undertaken to do a portrait of him as a gift, and then neglected the work, and finally, in a huff, bundled it off only half done. The crucial question here is whether or not Gainsborough was reasonably pledged to perform any such gratuitous work, and this point has been contested. Thicknesse's book is in part adverse to Gainsborough, and more particularly so to his wife. Reynolds's "Lecture" on Gainsborough, replete with critical insight, should never be lost sight of as a leading document. In 1856 a heedfully compiled *Life of Thomas Gainsborough* was brought out by T.W. Fulcher. This was the first substantial work about him subsequent to Allan Cunningham's lively account (1829) in his *Lives of the Painters*. Of late years a great deal has been written, mainly but not by any means exclusively from the critical or technical point of view:—Sir Walter Armstrong (two works, 1896 and 1898); Mrs Arthur Bell (1902); Sir W.M. Conway, *Artistic Development of Reynolds and Gainsborough* (1886); Lord Ronald Sutherland Gower (1903); G.M. Brock-Arnold (1881). G. Pauli has brought out an illustrated work in Germany (1904) under the title *Gainsborough*.

(W. M. R.)

GAINSBOROUGH, a market town in the W. Lindsey or Gainsborough parliamentary division of Lincolnshire, England; on the right (E.) bank of the Trent. Pop. of urban district (1901) 17,660. It is served by the Lincoln-Doncaster joint line of the Great Northern and Great Eastern railways, by which it is 16 m. N.W. of Lincoln, and by the Great Central railway. The parish church of All Saints is classic of the 18th century, excepting the

Perpendicular tower. The two other parish churches are modern. The Old Hall, of the 15th century, enlarged in the 16th, is a picturesque building, forming three sides of a quadrangle, partially timber-framed, but having a beautiful oriel window and other parts of stone. There is also a Tudor tower of brick. A literary and scientific institute occupy part of the building. Gainsborough possesses a grammar school (founded in 1589 by a charter of Queen Elizabeth) and other schools, town-hall, county court-house, Albert Hall and Church of England Institute. There is a large carrying trade by water on the Trent and neighbouring canals. Shipbuilding and iron-founding are carried on, and there are manufactures of linseed cake, and agricultural and other machinery.

Gainsborough (*Gegnesburh*) was probably inhabited by the Saxons on account of the fishing in the Trent. The *Saxon Chronicle* states that in 1013 the Danish king Sweyn landed here and subjugated the inhabitants. Gainsborough, though not a chartered borough, was probably one by prescription, for mention is made of burghal tenure in 1280. The privilege of the return of writs was conferred on the lord of the manor, Aymer de Valence, earl of Pembroke, in 1323, and confirmed to Ralph de Percy in 1383. Mention is made in 1204 of a Wednesday market, but there is no extant grant before 1258, when Henry III. granted a Tuesday market to William de Valence, earl of Pembroke, who also obtained from Edward I. in 1291 licence for an annual fair on All Saints' Day, and the seven preceding and eight following days. In 1243 Henry III. granted to John Talbot licence for a yearly fair on the eve, day and morrow of St James the Apostle. Queen Elizabeth in 1592 granted to Thomas Lord Burgh two fairs, to begin on Easter Monday and on the 9th of October, each lasting three days. Charles I. in 1635-1636 extended the duration of each to nine days. The Tuesday market is still held, and the fair days are Tuesday and Wednesday in Easter-week, and the Tuesday and Wednesday after the 20th of October.

See Adam Stark, *History and Antiquities of Gainsburgh* (London, 1843).

GAIRDNER, JAMES (1828-), English historian, son of John Gairdner, M.D., was born in Edinburgh on the 22nd of March 1828. Educated in his native city, he entered the Public Record Office in London in 1846, becoming assistant keeper of the public records (1859-1893). Gairdner's valuable and painstaking contributions to English history relate chiefly to the reigns of Richard III., Henry VII. and Henry VIII. For the "Rolls Series" he edited *Letters and Papers illustrative of the Reigns of Richard III. and Henry VII.* (London, 1861-1863), and *Memorials of Henry VII.* (London, 1858); and he succeeded J.S. Brewer in editing the *Letters and Papers*, foreign and domestic, of the reign of Henry VIII. (London, 1862-1905). He brought out the best edition of the *Paston Letters* (London, 1872-1875, and again 1896), for which he wrote a valuable introduction; and for the Camden Society he edited the *Historical collections of a Citizen of London* (London, 1876), and *Three 15th-century Chronicles* (London, 1880). His other works include excellent monographs on *Richard III.* (London, 1878, new and enlarged edition, Cambridge, 1898), and on *Henry VII.* (London, 1889, and subsequently); *The Houses of Lancaster and York* (London, 1874, and other editions); *The English Church in the 16th century* (London, 1902); *Lollardy and the Reformation in England* (1908); and contributions to the *Encyclopaedia Britannica*, the *Dictionary of National Biography*, the *Cambridge Modern History*, and the *English Historical Review*. Gairdner received the honorary degree of LL.D. from the university of Edinburgh in 1897, and was made a C.B. in 1900.

GAIRLOCH (Gaelic *geàrr*, short), a sea loch, village and parish in the west of the county of Ross and Cromarty, Scotland. Pop. of parish (1901) 3797. The parish covers a large district on the coast, and stretches inland beyond the farther banks of Loch Maree, the whole of which lies within its bounds. It also includes the islands of Dry and Horisdale in the loch, and Ewe in Loch Ewe, and occupies a total area of 200,646 acres. The place and loch must not be confounded with Gareloch in Dumbartonshire. Formerly an appanage of the earldom of Ross, Gairloch has belonged to the Mackenzies since the end of the 15th century.

Flowerdale, an 18th-century house in the pretty little glen of the same name, lying close to the village, is the chief seat of the Gairloch branch of the clan Mackenzie. William Ross (1762-1790), the Gaelic poet, who was schoolmaster of Gairloch, of which his mother was a native, was buried in the old kirkyard, where a monument commemorates him.

GAISERIC, or GENSERIC (*c.* 390-477), king of the Vandals, was a son of King Godegisel (d. 406), and was born about 390. Though lame and only of moderate stature, he won renown as a warrior, and became king on the death of his brother Gonderic in 428. In 428 or 429 he led a great host of Vandals from Spain into Roman Africa, and took possession of Mauretania. This step is said to have been taken at the instigation of Boniface, the Roman general in Africa; if true, Boniface soon repented of his action, and was found resisting the Vandals and defending Hippo Regius against them. At the end of fourteen months Gaiseric raised the siege of Hippo; but Boniface was forced to fly to Italy, and the city afterwards fell into the hands of the Vandals. Having pillaged and conquered almost the whole of Roman Africa, the Vandal king concluded a treaty with the emperor Valentinian III. in 435, by which he was allowed to retain his conquests; this peace, however, did not last long, and in October 439 he captured Carthage, which he made the capital of his kingdom. According to some authorities Gaiseric at this time first actually assumed the title of king. In religious matters he was an Arian, and persecuted the members of the orthodox church in Africa, although his religious policy varied with his relations to the Roman empire. Turning his attention in another direction he built a fleet, and the ravages of the Vandals soon made them known and feared along the shores of the Mediterranean. “Let us make,” said Gaiseric, “for the dwellings of the men with whom God is angry,” and he left the conduct of his marauding ships to wind and wave. In 455, however, he led an expedition to Rome, stormed the city, which for fourteen days his troops were permitted to plunder, and then returned to Africa laden with spoil. He also carried with him many captives, including the empress Eudoxia, who is said to have invited the Vandals into Italy. The Romans made two attempts to avenge themselves, one by the Western emperor, Majorianus, in 460, and the other by the Eastern emperor, Leo I., eight years later; but both enterprises failed, owing principally to the genius of Gaiseric. Continuing his course on the sea the king brought Sicily, Sardinia, Corsica and the Balearic Islands under his rule, and even extended his conquests into Thrace, Egypt and Asia Minor. Having made peace with the eastern emperor Zeno in 476, he died on the 25th of January 477. Gaiseric was a cruel and cunning man, possessing great military talents and superior mental gifts. Though the effect of his victories was afterwards neutralized by the successes of Belisarius, his name long remained the glory of the Vandals. The name Gaiseric is said to be derived from *gais*, a javelin, and *reiks*, a king.

See VANDALS; also T. Hodgkin, *Italy and her Invaders*, vol. ii. (London, 1892); E. Gibbon, *Decline and Fall of the Roman Empire* (ed. J.B. Bury, 1896-1900); L. Schmidt, *Geschichte der Vandalen* (Leipzig, 1901); and F. Martroye, *Genseric; La Conquête vandale en Afrique* (Paris, 1907).

GAISFORD, THOMAS (1779-1855), English classical scholar, was born at Iford, Wiltshire, on the 22nd of December 1779. Proceeding to Oxford in 1797, he became successively student and tutor of Christ Church, and was in 1811 appointed regius professor of Greek in the university. Taking orders, he held (1815-1847) the college living of Westwell, in Oxfordshire, and other ecclesiastical preferments simultaneously with his professorship. From 1831 until his death on the 2nd of June 1855, he was dean of Christ Church. As curator of the Bodleian and principal delegate of the University Press he was instrumental in securing the co-operation of distinguished European scholars as collators, notably Bekker and Dindorf. Among his numerous contributions to Greek literature may be mentioned, Hephaestion’s *Encheiridion* (1810); *Poëtae Graeci minores* (1814-1820); Stobaeus’ *Florilegium* (1822); *Herodotus*, with variorum notes (1824); Suidas’ *Lexicon* (1834); *Etymologicon magnum* (1848); Eusebius’s *Praeparatio* (1843) and *Demonstratio evangelica* (1852). In 1856 the Gaisford prizes, for Greek composition, were founded at Oxford to

perpetuate his memory.

GAIUS, a celebrated Roman jurist. Of his personal history very little is known. It is impossible to discover even his full name, Gaius or Caius being merely the personal name (praenomen) so common in Rome. From internal evidence in his works it may be gathered that he flourished in the reigns of the emperors Hadrian, Antoninus Pius, Marcus Aurelius and Commodus. His works were thus composed between the years 130 and 180, at the time when the Roman empire was most prosperous, and its government the best. Most probably Gaius lived in some provincial town, and hence we find no contemporary notices of his life or works. After his death, however, his writings were recognized as of great authority, and the emperor Valentinian named him, along with Papinian, Ulpian, Modestinus and Paulus, as one of the five jurists whose opinions were to be followed by judicial officers in deciding cases. The works of these jurists accordingly became most important sources of Roman law.

Besides the *Institutes*, which are a complete exposition of the elements of Roman law, Gaius was the author of a treatise on the *Edicts of the Magistrates*, of *Commentaries on the Twelve Tables*, and on the important *Lex Papia Poppaea*, and several other works. His interest in the antiquities of Roman law is apparent, and for this reason his work is most valuable to the historian of early institutions. In the disputes between the two schools of Roman jurists he generally attached himself to that of the Sabinians, who were said to be followers of Ateius Capito, of whose life we have some account in the *Annals* of Tacitus, and to advocate a strict adherence as far as possible to ancient rules, and to resist innovation. Many quotations from the works of Gaius occur in the *Digest* of Justinian, and so acquired a permanent place in the system of Roman law; while a comparison of the *Institutes* of Justinian with those of Gaius shows that the whole method and arrangement of the later work were copied from that of the earlier, and very numerous passages are word for word the same. Probably, for the greater part of the period of three centuries which elapsed between Gaius and Justinian, the *Institutes* of the former had been the familiar textbook of all students of Roman law.

Unfortunately the work was lost to modern scholars, until, in 1816, a manuscript was discovered by B.G. Niebuhr in the chapter library of Verona, in which certain of the works of St Jerome were written over some earlier writings, which proved to be the lost work of Gaius. The greater part of the palimpsest has, however, been deciphered and the text is now fairly complete. This discovery has thrown a flood of light on portions of the history of Roman law which had previously been most obscure. Much of the historical information given by Gaius is wanting in the compilations of Justinian, and, in particular, the account of the ancient forms of procedure in actions. In these forms can be traced “survivals” from the most primitive times, which provide the science of comparative law with valuable illustrations, which may explain the strange forms of legal procedure found in other early systems. Another circumstance which renders the work of Gaius more interesting to the historical student than that of Justinian, is that Gaius lived at a time when actions were tried by the system of formulae, or formal directions given by the praetor before whom the case first came, to the judex to whom he referred it. Without a knowledge of the terms of these formulae it is impossible to solve the most interesting question in the history of Roman law, and show how the rigid rules peculiar to the ancient law of Rome were modified by what has been called the equitable jurisdiction of the praetors, and made applicable to new conditions, and brought into harmony with the notions and the needs of a more developed society. It is clear from evidence of Gaius that this result was obtained, not by an independent set of courts administering, as in England previous to the Judicature Acts, a system different from that of the ordinary courts, but by the manipulation of the formulae. In the time of Justinian the work was complete, and the formulary system had disappeared.

The *Institutes* of Gaius are divided into four books—the first treating of persons and the differences of the status they may occupy in the eye of the law; the second of things, and the modes in which rights over them may be acquired, including the law relating to wills; the third of intestate succession and of obligations; the fourth of actions and their forms.

There are several carefully prepared editions of the *Institutes*, starting from that of Göschen (1820), down to that of Studemund and Krüger (1900). The most complete English edition is that of E. Poste, which includes beside the text an English translation and copious

commentary (1885). A comparison of the early forms of actions mentioned by Gaius with those used by other primitive societies will be found in Sir H. Maine's *Early Institutions*, cap. 9. For further information see M. Glasson, *Étude sur Gaius et sur le jus respondendi*; also ROMAN LAW.

GAIUS CAESAR (A.D. 12-41), surnamed CALIGULA, Roman emperor from 37-41, youngest son of Germanicus and Agrippina the elder, was born on the 31st of August A.D. 12. He was brought up in his father's camp on the Rhine among the soldiers, and received the name Caligula from the *caligae*, or foot-soldiers' boots, which he used to wear. He also accompanied his father to Syria, and after his death returned to Rome. In 32 he was summoned by Tiberius to Capreae, and by skilful flattery managed to escape the fate of his relatives. After the murder of Tiberius by Naevius Sertorius Macro, the prefect of the praetorian guards, which was probably due to his instigation, Caligula ascended the throne amidst the rejoicings of the people. The senate conferred the imperial power upon him alone, although Tiberius Gemellus, the grandson of the preceding emperor, had been designated as his co-heir. He entered on his first consulship in July 37. For the first eight months of his reign he did not disappoint the popular expectation; but after his recovery from a severe illness his true character showed itself. His extravagance, cruelty and profligacy can hardly be explained except on the assumption that he was out of his mind. According to Pelham, much of his conduct was due to the atmosphere in which he was brought up, and the ideas of sovereignty instilled into him, which led him to pose as a monarch of the Graeco-oriental type. To fill his exhausted treasury he put to death his wealthy subjects and confiscated their property; even the poor fell victims to his thirst for blood. He bestowed the priesthood and a consulship upon his horse Incitatus, and demanded that sacrifice should be offered to himself. He openly declared that he wished the whole Roman people had only one head, that he might cut it off at a single stroke. In 39 he set out with an army to Gaul, nominally to punish the Germans for having invaded Roman territory, but in reality to get money by plunder and confiscation. Before leaving, he led his troops to the coast opposite Britain, and ordered them to pick up shells on the seashore, to be dedicated to the gods at Rome as the spoils of ocean. On his return he entered Rome with an ovation (a minor form of triumph), temples were built, statues erected in his honour, and a special priesthood instituted to attend to his worship. The people were ground down by new forms of taxation and every kind of extortion, but on the whole Rome was free from internal disturbances during his reign; some insignificant conspiracies were discovered and rendered abortive. A personal insult to Cassius Chaerea, tribune of a praetorian cohort, led to Caligula's assassination on the 24th of January 41.

See Suetonius, *Caligula*; Tacitus, *Annals*, vi. 20 ff.; Dio Cassius lix.; see also S. Baring Gould, *The Tragedy of the Caesars* (3rd ed., 1892); H.F. Pelham in *Quarterly Review* (April, 1905); H. Willrich, *Beiträge zur alten Geschichte* (1903); H. Schiller, *Geschichte der römischen Kaiserzeit*, i. pt. 1; J.B. Bury, *Student's Hist. of the Roman Empire* (1893); Merivale, *History of the Romans under the Empire*, ch. 48; H. Furneaux's *Annals* of Tacitus, ii. (introduction). Mention may also be made of the famous pamphlet by L. Quidde, *Caligula. Eine Studie über römischen Cäsarenwahnsinn* and an anonymous supplement, *1st Caligula mit unserer Zeit vergleichbar?* (both 1894); and a reply, *Fin-de-Siècle-Geschichtsschreibung*, by G. Sommerfeldt (1895).

GALAGO, the Senegal name of the long-tailed African representatives of the lemur-like Primates, which has been adopted as their technical designation. Till recently the galagos have been included in the family *Lemuridae*; but this is restricted to the lemurs of Madagascar, and they are now classed with the lorises and pottos in the family *Nycticebidae*, of which they form the section *Galaginae*, characterized by the great elongation of the upper portion of the feet (tarsus) and the power of folding the large ears. Throughout the greater part of Africa south of the Sahara galagos are widely distributed in the wooded districts, from Senegambia in the west to Abyssinia in the east, and as far south

as Natal. They pass the day in sleep, but are very active at night, feeding on fruits, insects and small birds. When they descend to the ground they sit upright, and move about by jumping with their hind-legs like jerboas. They are pretty little animals, varying from the size of a small cat to less than that of a rat, with large eyes and ears, soft woolly fur and long tails. There are several species, of which *G. crassicaudatus* from Mozambique is the largest; together with *G. garnetti* of Natal, *G. agisymbanus* of Zanzibar, and *G. monteiroi* of Angola, this represents the subgenus *Otolemur*. The typical group includes *G. senegalensis* (or *galago*) of Senegal, *G. alleni* of West and Central Africa, and *G. moholi* of South Africa; while *G. demidoffi* of West and Central Africa and *G. anomurus* of French Congoland represent the subgenus *Hemigalago*.

(R. L.*)

GALANGAL, formerly written “galingale,” and sometimes “garingal,” *rhizoma galangae* (Arab. *Kholínjan*;[1] Ger. *Galgantwurzel*; Fr. *Racine de Galanga*), a drug, now obsolete, with an aromatic taste like that of mingled ginger and pepper. Lesser galangal root, *radix galangae minoris*, the ordinary galangal of commerce, is the dried rhizome of *Alpinia officinarum*, a plant of the natural order Zingiberaceae, growing in the Chinese island of Hainan, where it is cultivated, and probably also in the woods of the southern provinces of China. The plant is closely allied to *Alpinia calcarata*, the rhizome of which is sold in the bazaars of some parts of India as a sort of galangal. Its stems attain a length of about 4 ft., and its leaves are slender, lanceolate and light-green, and have a hot taste; the flowers are white with red veins, and in simple racemes; the roots form dense masses, sometimes more than a foot in diameter; and the rhizomes grow horizontally, and are ¾ in. or less in thickness. Galangal seems to have been unknown to the ancient Greeks and Romans, and to have been first introduced into Europe by Arabian physicians. It is mentioned in the writings of Ibn Khurdádbah, an Arabian geographer who flourished in the latter half of the 9th century, and “gallengar” (gallingale or galangal) is one of the ingredients in an Anglo-Saxon receipt for a “wen salve” (see O. Cockayne, *Saxon Leechdoms*, vol. iii. p. 13). In the middle ages, as at present in Livonia, Esthonia and central Russia, galangal was in esteem in Europe both as a medicine and a spice, and in China it is still employed as a therapeutic agent. Its chief consumption is in Russia, where it is used as a cattle-medicine, and as a flavouring for liqueurs.

1 Apparently derived from the Chinese *Kau-liang-Kiang*, *i.e.* Kau-liang ginger, the term applied by the Chinese to galangal, after the prefecture Kau-chau fu in Canton province, formerly called Kau-liang (see F. Porter Smith, *Contrib. to the Materia Medica ... of China*, p. 9, 1871).

GALAPAGOS ISLANDS, an archipelago of five larger and ten smaller islands in the Pacific Ocean, exactly under the equator. The nearest island to the South American coast lies 580 m. W. of Ecuador, to which country they belong. The name is derived from *galápago*, a tortoise, on account of the giant species, the characteristic feature of the fauna. The islands were discovered early in the 16th century by Spaniards, who gave them their present name. They were then uninhabited. The English names of the individual islands were probably given by buccaneers, for whom the group formed a convenient retreat.

The larger members of the group, several of which attain an elevation of 2000 to 2500 ft., are Albemarle or Isabela (100 m. long, 28 m. in extreme breadth, with an area of 1650 sq. m. and an extreme elevation of 5000 ft.), Narborough or Fernandina, Indefatigable or Santa Cruz, Chatham or San Cristobal, James or San Salvador, and Charles or Santa Maria. The total land area is estimated at about 2870 sq. m. (about that of the West Riding of Yorkshire). The extraordinary number of craters, a few of which are reported still to be active, gives evidence that the archipelago is the result of volcanic action. The number of main craters may be about twenty-five, but there are very many small eruptive cones on the flanks of the old volcanoes. There is a convict settlement on Chatham with some 300 inhabitants living in low thatched or iron-roofed huts, under the supervision of a police

commissioner and other officials of Ecuador, by which country the group was annexed in 1832, when General Villamil founded Floreana on Charles Island, naming it in honour of Juan José Flores, president of Ecuador. A governor has been appointed since 1885, some importance being foreseen for the islands in connexion with the cutting of the Panama canal, as the group lies on the route to Australia opened up by that scheme. Charles Island, the most valuable of the group, is cultivated by a small colony. On many of the islets numerous tropical fruits are found growing wild, but they are no doubt escapes from cultivation, just as the large herds of wild cattle, horses, donkeys, pigs, goats and dogs—the last large and fierce—which occur abundantly on most of the islands have escaped from domestication.

The shores of the larger islands are fringed in some parts with a dense barrier of mangroves, backed by an often impenetrable thicket of tropical undergrowth, which, as the ridges are ascended, give place to taller trees and deep green bushes which are covered with orchids and trailing moss (*orchilla*), and from which creepers hang down interlacing the vegetation. But generally the low grounds are parched and rocky, presenting only a few thickets of Peruvian cactus and stunted shrubs, and a most uninviting shore. The contrast between this low zone and the upper zone of rich vegetation (above about 800 ft.) is curiously marked. From July to November the clouds hang low on the mountains, and give moisture to the upper zone, while the climate of the lower is dry. Rain in the lower zone is scanty, and from May to January does not occur. The porous soil absorbs the moisture, and fresh water is scarce. Though the islands are under the equator, the climate is not intensely hot, as it is tempered by cold currents from the Antarctic sea, which, having followed the coast of Peru as far as Cape Blanco, bear off to the N.W. towards and through the Galapagos. The mean temperature of the lower zone is about 71° F., that of the upper from 66° to 62°.

The Galapagos Islands are of some commercial importance to Ecuador, on account of the guano and the orchilla moss found on them and exported to Europe. Except on Charles Island, where settlement has existed longest, little or no influence of the presence of man is evident in the group; still, the running wild of dogs and cats, and, as regards the vegetation, especially goats, must in a comparatively short period greatly modify the biological conditions of the islands.

The origin and development of these conditions, in islands so distinctly oceanic as the Galapagos, have given its chief importance to this archipelago since it was visited by Darwin in the “Beagle.” The Galapagos archipelago possesses a rare advantage from its isolated situation, and from the fact that its history has never been interfered with by any aborigines of the human race. Of the seven species of giant tortoises known to science (although at the discovery of the islands there were probably fifteen) all are indigenous, and each is confined to its own islet. There also occurs a peculiar genus of lizards with two species, the one marine, the other terrestrial. The majority of the birds are of endemic species peculiar to different islets, while more than half belong to peculiar genera. More than half of the flora is unknown elsewhere.

Since 1860 several visits have been paid to the group by scientific investigators—by Dr Habel in 1868; Messrs Baur and Adams, and the naturalists of the “Albatross,” between 1888 and 1891; and in 1897-1898 by Mr Charles Harris, whose journey was specially undertaken at the instance of the Hon. Walter Rothschild. Very complete collections have therefore, as a result of these expeditions, been brought together; but their examination does not materially change the facts upon which the conclusions arrived at by Darwin, from the evidence of the birds and plants, were based; though he “no doubt would have paid more attention to [the evidence afforded by Land-tortoises], if he had been in possession of facts with which we are acquainted now” (Günther). His conclusions were that the group “has never been nearer the mainland than it is now, nor have its members been at any time closer together”; and that the character of the flora and fauna is the result of species straggling over from America, at long intervals of time, to the different islets, where in their isolation they have gradually varied in different degrees and ways from their ancestors. Equally indecisive is the further exploration as to evidence for the opinion held by other naturalists that the endemic species of the different islands have resulted from subsidences, through volcanic action, which have reduced one large island mass into a number of islets, wherein the separated species became differentiated during their isolation. The presence of these giant reptiles on the group is the chief fact on which a former land connexion with the continent of America may be sustained. “Nearly all authorities agree that it is not probable that they have crossed the wide sea between the Galapagos Islands and the American continent, although, while they are helpless, and quite unable to swim, they can float on the water. If their ancestors had been carried out to sea once or twice by a flood and safely drifted as far as the Galapagos Islands” (Wallace), “they must have been numerous on the

continent" (Rothschild and Hartert). No remains, and of course no living species, of these tortoises are known to exist or have existed on the mainland. Rothschild and Hartert think "it is more natural to assume the disappearance of a great stock of animals, the remains of which have survived, ... than to assume the disappearance in comparatively recent times (*i.e.* in the Eocene period or later) of enormous land masses." Past elevations of land, however (and doubtless equally great subsidences) have taken place in South America since the Eocene, and the conclusion that extensive areas of land have subsided in the Indian Ocean has long been based on a somewhat similar distribution of giant tortoises in the Mascarene region.

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GALASHIELS, a municipal and police burgh of Selkirkshire, Scotland. Pop. (1891) 17,367; (1901) 13,615. It is situated on Gala Water, within a short distance of its junction with the Tweed, 33½ m. S.S.E. of Edinburgh by the North British railway. The town stretches for more than 2 m. along both banks of the river, the mills and factories occupying the valley by the stream, the villas and better-class houses the high-lying ground on either side. The principal structures include the municipal buildings, corn exchange, library, public hall, and the market cross. The town is under the control of a provost, bailies and council, and, along with Hawick and Selkirk, forms the Hawick (or Border) group of parliamentary burghs. The woollen manufactures, dating from the close of the 16th century, are the most important in Scotland, though now mainly confined to the weaving of tweeds. Other leading industries are hosiery, tanning (with the largest yards in Scotland), dyeing, iron and brass founding, engineering and boot-making. Originally a village built for the accommodation of pilgrims to Melrose Abbey (4 m. E. by S.), it became, early in the 15th century, an occasional residence of the Douglases, who were then keepers of Ettrick Forest, and whose peel-tower was not demolished till 1814. Galashiels was created into a burgh of barony in 1599. The Catrail or Picts' Work begins near the town and passes immediately to the west. Clovenfords, 3½ m. W., is noted for the Tweed vineries, which are heated by 5 m. of water-pipes, and supply the London market throughout the winter. Two miles farther W. by S. is Ashestiel, where Sir Walter Scott resided from 1804 to 1812, where he wrote his most famous poems and began *Waverley*, and which he left for Abbotsford.

GALATIA. I. In the strict sense (Galatia Proper, Roman *Gallograecia*) this is the name applied by Greek-speaking peoples to a large inland district of Asia Minor since its occupation by Gaulish tribes in the 3rd century B.C. Bounded on the N. by Bithynia and Paphlagonia, W. by Phrygia, S. by Lycaonia and Cappadocia, E. by Pontus, it included the greater part of the modern vilayet of Angora, stretching from Pessinus eastwards to Tavium and from the Paphlagonian hills N. of Ancyra southwards to the N. end of the salt lake Tatta (but probably including the plains W. of the lake during the greater part of its history),—a rough oblong about 200 m. long and 100 (to 130) broad.

Galatia is part of the great central plateau of Asia Minor, here ranging from 2000 to 3000

ft. above sea-level, and falls geographically into two parts separated by the Halys (Kizil Irmak),—a small eastern district lying chiefly in the basin of the Delije Irmak, the principal affluent of the Halys, and a large western region drained almost entirely by the Sangarius (Sakaria) and its tributaries. On the N. side Galatia consists of a series of plains with fairly fertile soil, lying between bare hills. But the greater part is a dreary stretch of barren, undulating uplands, intersected by tiny streams and passing gradually into the vast level waste of treeless (anc. *Axylon*) plain that runs S. to Lycaonia; these uplands are little cultivated and only afford extensive pasturage for large flocks of sheep and goats. Cities are few and far apart, and the climate is one of extremes of heat and cold. The general condition and aspect of the country was much the same in ancient as in modern times.

The Gaulish invaders appeared in Asia Minor in 278-277 B.C. They numbered 20,000, of which only one-half were fighting men, the rest being doubtless women and children; and not long after their arrival we find them divided into three tribes, Trocmi, Tolistobogii and Tectosages, each of which claimed a separate sphere of operations. They had split off from the army which invaded Greece under Brennus in 279 B.C., and, marching into Thrace under Leonnorius and Lutarius, crossed over to Asia at the invitation of Nicomedes I. of Bithynia, who required help in his struggle against his brother. For about 46 years they were the scourge of the western half of Asia Minor, ravaging the country, as allies of one or other of the warring princes, without any serious check, until Attalus I., king of Pergamum (241-197), inflicted several severe defeats upon them, and about 232 B.C. forced them to settle permanently in the region to which they gave their name. Probably they already occupied parts of Galatia, but definite limits were now fixed and their right to the district was formally recognized. The tribes were settled where they afterwards remained, the Tectosages round Ancyra, the Tolistobogii round Pessinus, and the Trocmi round Tavium. The constitution of the Galatian state is described by Strabo: conformably to Gaulish custom, each tribe was divided into four cantons (Gr. τετραρχίαι), each governed by a chief (“tetrarch”) of its own with a judge under him, whose powers were unlimited except in cases of murder, which were tried before a council of 300 drawn from the twelve cantons and meeting at a holy place called Drynemeton. But the power of the Gauls was not yet broken. They proved a formidable foe to the Romans in their wars with Antiochus, and after Attalus’ death their raids into W. Asia Minor forced Rome in 189 B.C. to send an expedition against them under Cn. Manlius Vulso, who taught them a severe lesson. Henceforward their military power declined and they fell at times under Pontic ascendancy, from which they were finally freed by the Mithradatic wars, in which they heartily supported Rome. In the settlement of 64 B.C. Galatia became a client-state of the empire, the old constitution disappeared, and three chiefs (wrongly styled “tetrarchs”) were appointed, one for each tribe. But this arrangement soon gave way before the ambition of one of these tetrarchs, Deiotarus, the contemporary of Cicero and Caesar, who made himself master of the other two tetrarchies and was finally recognized by the Romans as king of Galatia. On the death of the third king Amyntas in 25 B.C., Galatia was incorporated by Augustus in the Roman empire, and few of the provinces were more enthusiastically loyal.

The population of Galatia was not entirely Gallic. Before the arrival of the Gauls, western Galatia up to the Halys was inhabited by Phrygians, and eastern Galatia by Cappadocians and other native races. This native population remained, and constituted the majority of the inhabitants of the rural parts and almost the sole inhabitants of the towns. They were left in possession of two-thirds of the land (cf. Caesar, *B.G.* i. 31) on condition of paying part of the produce to their new lords, who took the other third, and agriculture and commerce with all the arts and crafts of peaceful life remained entirely in their hands. They were henceforth ranked as “Galatians” by the outside world equally with their overlords, and it was from their numbers that the “Galatian” slaves who figure in the markets of the ancient world were drawn. The conquerors, who were few in number, formed a small military aristocracy, living not in the towns, but in fortified villages, where the chiefs in their castles kept up a barbaric state, surrounded by their tribesmen. With the decline of their warlike vigour they began gradually to mix with the natives and to adopt at least their religion: the amalgamation was accelerated under Roman influence and ultimately became as complete as that of the Normans with the Saxons in England, but they gave to the mixed race a distinctive tone and spirit, and long retained their national characteristics and social customs, as well as their language (which continued in use, side by side with Greek, in the 4th century after Christ). In the 1st century, when St Paul made his missionary journeys, even the towns Ancyra, Pessinus and Tavium (where Gauls were few) were not Hellenized, though Greek, the language of government and trade, was spoken there; while the rural population was unaffected by Greek civilization. Hellenic ways and modes of thought begin to appear in the towns only in the later 2nd century. In the rustic parts a knowledge of

Greek begins to spread in the 3rd century; but only in the 4th and 5th centuries, after the transference of the centre of government first to Nicomedia and then to Constantinople placed Galatia on the highway of imperial communication, was Hellenism in its Christian form gradually diffused over the country. (See also Ancyra; Pessinus; Gordium.)

II. The Roman province of Galatia, constituted 25 B.C., included the greater part of the country ruled by Amyntas, viz. Galatia Proper, part of Phrygia towards Pisidia (Apollonia, Antioch and Iconium), Pisidia, part of Lycaonia (including Lystra and Derbe) and Isauria. For nearly 100 years it was the frontier province, and the changes in its boundaries are an epitome of the stages of Roman advance to the Euphrates, one client-state after another being annexed: Paphlagonia in 6-5 B.C.; Sebastopolis, 3-2 B.C.; Amasia, A.D. 1-2; Comana, A.D. 34-35,—together forming Pontus Galaticus,—the Pontic kingdom of Polemon, A.D. 64, under the name Pontus Polemoniacus. In A.D. 70 Cappadocia (a procuratorial province since A.D. 17) with Armenia Minor became the centre of the forward movement and Galatia lost its importance, being merged with Cappadocia in a vast double governorship until A.D. 114 (probably), when Trajan separated the two parts, making Galatia an inferior province of diminished size, while Cappadocia with Armenia Minor and Pontus became a great consular military province, charged with the defence of the frontier. Under Diocletian's reorganization Galatia was divided, about 295, into two parts and the name retained for the northern (now nearly identical with the Galatia of Deiotarus); and about 390 this province, amplified by the addition of a few towns in the west, was divided into Galatia Prima and Secunda or Salutaris, the division indicating the renewed importance of Galatia in the Byzantine empire. After suffering from Persian and Arabic raids, Galatia was conquered by the Seljuk Turks in the 11th century and passed to the Ottoman Turks in the middle of the 14th.

The question whether the "Churches of Galatia," to which St Paul addressed his Epistle, were situated in the northern or southern part of the province has been much discussed, and in England Prof. Sir W.M. Ramsay has been the principal advocate of the adoption of the South-Galatian theory, which maintains that they were the churches planted in Derbe, Lystra, Iconium and Antioch (see Galatians). In the present writer's opinion this is supported by the study of the historical and geographical facts.[1]

Authorities.—Van Gelder, *De Gallis in Graecia et Asia* (1888); Staehelin, *Gesch. d. kleinasiat. Galater* (1897); Perrot, *De Galatia prov. Rom.* (1867); Sir W.M. Ramsay, *Histor. Geogr.* (1890), *St Paul* (1898), and Introd. to *Histor. Commentary on Galatians* (1899). For antiquities generally, Perrot, *Explor. archéol. de la Galatie* (1862); K. Humann and O. Puchstein, *Reisen in Kleinasien* (1890); Koerte, *Athen. Mitteilungen* (1897); Anderson and Crowfoot, *Journ. of Hellenic Studies* (1899); and Anderson, *Map of Asia Minor* (London, Murray, 1903).

(J. G. C. A.)

1 In the unsettled state of this controversy, weight naturally attaches to the opinion of experts on either side; and the above statement, while opposed to the view taken in the following article on the epistle, must be taken on its merits.—Ed. *E.B.*

GALATIANS, EPISTLE TO THE, one of the books of the New Testament. This early Christian scripture is one of the books militant in the world's literature. Its usefulness to Luther in his propaganda was no accident in its history; it originated in a controversy, and the varying views of the momentous struggle depicted in Gal. ii. and Acts xv. have naturally determined, from time to time, the conception of the epistle's aim and date. Details of the long critical discussion of this problem cannot be given here. (See Paul.) It must suffice to say that to the present writer the identification of Gal. ii. 1-10 with Acts xi. 28 f. and not with Acts xv. appears quite untenable, while a fair exegesis of Acts xvi. 1-6 implies a distinction between such towns as Lystra, Derbe and Iconium on the one hand and the Galatian χώρα with Phrygia upon the other.[1] A further visit to the latter country is mentioned, upon this view, in Acts xviii. 23. The Christians to whom the epistle was addressed were thus inhabitants, for the most part (iv. 8) of pagan birth, belonging to the northern section of the province, perhaps mainly in its south-western district adjoining Bithynia and the province of Asia. The scanty allusions to this mission in Acts cannot be taken as any objection to the theory. Nor is there any valid geographical difficulty. The country was quite accessible from

Antioch. Least of all does the historical evidence at our disposal justify the inference that the civilization of north Galatia, during the 1st century A.D., was Romano-Gallic rather than Hellenic; for, as the coins and inscriptions indicate, the Anatolian culture which predominated throughout the province did not exclude the infusion either of Greek religious conceptions or of the Greek language. The degree of elementary Greek culture needful for the understanding of Galatians cannot be shown to have been foreign to the inhabitants of north Galatia. So far as any trustworthy evidence is available, such Hellenic notions as are presupposed in this epistle might well have been intelligible to the Galatians of the northern provinces. Still less does the acquaintance with Roman jurisprudence in iii. 15-iv. 2 imply, as Halmel contends (*Über röm. Recht im Galaterbrief*, 1895), not merely that Paul must have acquired such knowledge in Italy but that he wrote the epistle there. A popular acquaintance with the outstanding features of Roman law was widely diffused by this time in Asia Minor.

The epistle can hardly have been written therefore until after the period described in Acts xviii. 22, but the *terminus ad quem* is more difficult to fix.[2] The composition may be placed (cf. the present writer's *Historical New Testament*, pp. 124 f. for details) either during the earlier part of Paul's residence at Ephesus (Acts xix. 1, 10, so most editors and scholars), or on his way from Ephesus to Corinth, or at Corinth itself (so Lightfoot, Bleek, Salmon).

The epistle was not written until Paul had visited Thessalonica, but the Galatian churches 395
owed their origin to a mission of Paul undertaken some time before he crossed from Asia to Europe. When he composed this letter, he had visited the churches twice. On the former of these visits (iv. 13 τὸ πρότερον), though broken down by illness (2 Cor. xii. 7-9?) he had been enthusiastically welcomed, and the immediate result of his mission was an outburst of religious fervour (iii. 1-5, iv. 14 f.). The local Christians made a most promising start (v. 7). But they failed to maintain their ardour. On his second visit (iv. 13, i. 7, v. 21) the apostle found in many of them a disheartening slackness, due to discord and incipient legalism. His plain-speaking gave offence in some quarters (iv. 16), though it was not wholly ineffective. Otherwise, this second visit is left in the shadow.[3] So far as it was accompanied by warnings, these were evidently general rather than elicited by any definite and imminent peril to the churches. Not long afterwards, however, some judaizing opponents of the apostle (note the contemptuous anonymity of the τινες in i. 7, as in Col. ii. 4 f.), headed by one prominent and influential individual (v. 10), made their appearance among the Galatians, promulgating a "gospel" which meant fidelity to, not freedom from, the Law (i. 6-10). Arguing from the Old Testament, they represented Paul's gospel as an imperfect creed which required to be supplemented by legal exactitude,[4] including ritual observance (iv. 10) and even circumcision,[5] while at the same time they sought to undermine his authority[6] by pointing out that it was derived from the apostles at Jerusalem and therefore that his teaching must be open to the checks and tests of that orthodox primitive standard which they themselves claimed to embody. The sole valid charter to Messianic privileges was observance of the Mosaic law, which remained obligatory upon pagan converts (iii. 6-9, 16).

When the news of this relapse reached Paul, matters had evidently not yet gone too far. Only a few had been circumcised. It was not too late to arrest the Galatians on their downward plane, and the apostle, unable or unwilling to re-visit them, despatched this epistle. How or when the information came to him, we do not know. But the gravity of the situation renders it unlikely that he would delay for any length of time in writing to counteract the intrigues of his opponents; to judge from allusions like those in i. 6 (ταχέως and μετατίθεσθε—the lapse still in progress), we may conclude that the interval between the reception of the news and the composition of the letter must have been comparatively brief.

After a short introduction[7] (i. 1-5), instead of giving his usual word of commendation, he plunges into a personal and historical vindication[8] of his apostolic independence, which, developed negatively and positively, forms the first of the three main sections in the epistle (i. 6-ii. 21). In the closing passage he drifts over from an account of this interview with Peter into a sort of monologue upon the incompatibility of the Mosaic law with the Christian gospel (ii. 15-21),[9] and this starts him afresh upon a trenchant expostulation and appeal (iii. 1-v. 12) regarding the alternatives of law and spirit. Faith dominates this section; faith in its historical career and as the vantage-ground of Christianity. The much-vaunted law is shown to be merely a provisional episode[10] culminating in the gospel (iii. 7-28) as a message of filial confidence and freedom (iii. 29-iv. 11). The genuine "sons of Abraham" are not legalistic Jewish Christians but those who simply possess faith in Jesus Christ. A passionate outburst then follows (iv. 12 f.), and, harping still on Abraham, the apostle essays, with fresh rabbinic dialectic, to establish Christianity over legalism as the free and final religion for men, applying this to the moral situation of the Galatians themselves (v. 1-12). This conception of freedom then leads him to define the moral responsibilities of the faith (v. 13-

vi. 10), in order to prevent misconception and to enforce the claims of the gospel upon the individual and social life of the Galatians. The epilogue (vi. 11-21) reiterates, in a handful of abrupt, emphatic sentences, the main points of the epistle.

The allusion in vi. 11 (ἴδετε πηλίκοις ὑμῖν γράμμασιν ἔγραψα τῇ ἐμῇ χειρί) is to the large bold size[11] of the letters in Paul's handwriting, but the object and scope of the reference are matters of dispute. It is "a sensational heading" (Findlay), but it may either refer[12] to the whole epistle (so Augustine, Chrysostom, &c., followed by Zahn) or, as most hold (with Jerome) to the postscript (vi. 11-18). Paul commonly dictated his letters. His use of the autograph here may have been to prevent any suspicion of a forgery or to mark the personal emphasis of his message. In any case it is assumed that the Galatians knew his handwriting. It is unlikely that he inserted this postscript from a feeling of ironical playfulness, to make the Galatians realize that, after the sternness of the early chapters, he was now treating them like children, "playfully hinting that surely the large letters will touch their hearts" (so Deissmann, *Bible-Studies* (1901), 346 f.).

The earliest allusion to the epistle[13] is the notice of its inclusion in Marcion's canon, but almost verbal echoes of iii. 10-13 are to be heard in Justin Martyr's *Dial.* xciv.-xcv.; it was certainly known to Polycarp, and as the 2nd century advances the evidence of its popularity multiplies on all sides, from Ptolemaeus and the Ophites to Irenaeus and the Muratorian canon (cf. Gregory's *Canon and Text of N.T.*, 1907, pp. 201-203). It is no longer necessary for serious criticism to refute the objections to its authenticity raised during the 19th century in certain quarters;[14] as Macaulay said of the authenticity of Caesar's commentaries, "to doubt on that subject is the mere rage of scepticism." Even the problems 396
of its integrity are quite secondary. Marcion (cf. Tert. *Adv. Marc.* 2-4) removed what he judged to be some interpolations, but van Manen's attempt to prove that Marcion's text is more original than the canonical (*Theolog. Tijdschrift*, 1887, 400 f. 451 f.) has won no support (cf. C. Clemen's refutation in *Die Einheitlichkeit der paulin. Briefe*, 1894, pp. 100 f. and Zahn's *Geschichte d. N. T. lichen Kanons*, ii. 409 f.), and little or no weight attaches to the attempts made (*e.g.* by J.A. Cramer) to disentangle a Pauline nucleus from later accretions. Even D. Völter, who applies this method to the other Pauline epistles, admits that Galatians, whether authentic or not, is substantially a literary unity (*Paulus und seine Briefe*, 1905, pp. 229-285). The frequent roughnesses of the traditional text suggest, however, that here and there marginal glosses may have crept in. Thus iv. 25a (τὸ γὰρ Σινᾶ ὄρος ἐστὶν ἐν τῇ Ἀραβίᾳ) probably represents the explanatory and prosaic gloss of a later editor, as many scholars have seen from Bentley (*Opuscula philologica*, 1781, pp. 533 f.) to H.A. Schott, J.A. Cramer, J.M.S. Baljon and C. Holsten. The general style of the epistle is vigorous and unpremeditated, "one continuous rush, a veritable torrent of genuine and inimitable Paulinism, like a mountain stream in full flood, such as may often have been seen by his Galatians" (J. Macgregor). But there is a certain rhythmical balance, especially in the first chapter (cf. J. Weiss, *Beiträge zur paulin. Rhetorik*, 1897, 8 f.); here as elsewhere the rush and flow of feeling carry with them some care for rhetorical form, in the shape of antitheses, such as a pupil of the schools might more or less unconsciously retain.[15] All through, the letter shows the breaks and pauses of a mind in direct contact with some personal crisis. Hurried, unconnected sentences, rather than sustained argument, are its most characteristic features.[16] The trenchant remonstrances and fiery outbursts make it indeed "read like a dithyramb from beginning to end."

Bibliography.—Of more modern editions in English, the most competent are those of C.J. Ellicott (4th ed., 1867, strong in linguistic and grammatical material), Prof. Eadie (Edinburgh, 1869), J.B. Lightfoot (11th ed., 1892), Dean Alford (3rd ed., 1862) and F. Rendall (*Expositor's Greek Testament*, 1903) on the Greek text; Dr Sanday (in Ellicott's *Commentary*, 1879), Dr Jas. Macgregor (Edinburgh, 1879), B. Jowett (3rd ed., 1894), Huxtable (*Pulpit Comment.*, 1885), Dr Agar Beet (London, 1885, &c.), Dr W.F. Adeney (*Century Bible*), Dr E.H. Perowne (*Cambridge Bible*, 1890) and Dr James Drummond (*Internat. Handbooks to N.T.*, 1899) also comment on the English text. The editions of Lightfoot and Jowett are especially valuable for their subsidiary essays, and Sir W.M. Ramsay's *Historical Commentary on Galatians* (1899) contains archaeological and historical material which is often illuminating. The French editions are few and minor, those by A. Sardinoux (Valence, 1837) and E. Reuss (1878) being adequate, however. In Germany the two most up-to-date editions are by F. Sieffert (in Meyer's *Comment.*, 1899) and Th. Zahn (2nd ed., 1907); these supersede most of the earlier works, but H.A. Schott (1834), A. Wieseler (Göttingen, 1859), G.B. Winer (4th ed., 1859), J.C.K. von Hofmann (2nd ed., 1872), Philippi (1884), R.A. Lipsius (2nd ed., *Hand.-Commentar*, 1892), and Zöckler (2nd ed., 1894) may still be consulted with advantage, while Hilgenfeld's commentary (1852) discusses acutely the historical problems of the epistle from the standpoint of Baur's criticism. The works of A. Schlatter (2nd ed.,

1894) and W. Bousset (*in Die Schriften des N.T.*, 2nd ed., 1907) are more popular in character. F. Windischmann (Mayence, 1843), F.X. Reithmayr (1865), A. Schäfer (Münster, 1890) and F. Cornely (1892, also in *Cursus scripturae sacrae*, 1907) are the most satisfactory modern editors, from the Roman Catholic church, but it should not be forgotten that the 16th century produced the *Literalis expositio* of Cajetan (Rome, 1529) and the similar work of Pierre Barahona (Salamanca, 1590), no less than the epoch-making edition of Luther (Latin, 1519, &c.; German, 1525 f.; English, 1575 f.). After Calvin and Grotius, H.E.G. Paulus (*Des Apostel P. Lehrbriefe an die Gal. u. Römer Christen*, 1831) was perhaps the most independent interpreter. For the patristic editions, see the introductory sections in Zahn and Lightfoot. The religious thought of the epistle is admirably expounded from different standpoints by C. Holsten (*Das Evangelium Paulus*, Teil I., i., 1880), A.B. Bruce (*St Paul's Conception of Christianity*, 1894, pp. 49-70) and Prof. G.G. Findlay (*Expositor's Bible*). On the historical aspects, Zimmer (*Galat. und Apostelgeschichte*, 1882) and M. Thomas (*Mélanges d'histoire et de litt. religieuse*, Paris, 1899, pp. 1-195) are excellent; E.H. Askwith's essay (*Epistle to the Galatians, its Destination and Date*, 1899) advocates ingeniously the south Galatian theory, and W.S. Wood (*Studies in St Paul's Epistle to the Galatians*, 1887) criticizes Lightfoot. General studies of the epistle will be found in all biographies of Paul and histories of the apostolic age, as well as in works like Sabatier's *The Apostle Paul* (pp. 187 f.), B.W. Bacon's *Story of St Paul* (pp. 116 f.), Dr R.D. Shaw's *The Pauline Epistles* (2nd ed., pp. 60 f.), R. Mariano, *Il Cristianesimo nei primi secoli* (1902), i. pp. 111 f., and Volkmar's *Paulus vom Damaskus bis zum Galaterbrief* (1887), to which may be added a series of papers by Haupt in *Deutsche Evang.-Blätter* (1904), 1-16, 89-108, 161-183, 238-259, and an earlier set by Hilgenfeld in the *Zeitschrift für wiss. Theologie* ("Zur Vorgeschichte des Gal." 1860, pp. 206 f., 1866, pp. 301 f., 1884, pp. 303 f.). Other monographs and essays have been noted in the course of this article. See further under PAUL.

(J. MT.)

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1 The historical and geographical facts concerning Galatia, which lead other writers to support the south Galatian theory, are stated in the preceding article on Galatia; and the question is still a matter of controversy, the division of opinion being to some extent dependent on whether it is approached from the point of view of the archaeologist or the Biblical critic. The ablest re-statements of the north Galatian theory, in the light of recent pleas for south Galatia as the destination of this epistle, may be found by the English reader in P.W. Schmiedel's exhaustive article in *Encycl. Biblica* (1592-1616) and Prof. G.H. Gilbert's *Student's Life of Paul* (1902), pp. 260-272. Schmiedel's arguments are mainly directed against Sir W.M. Ramsay, but a recent Roman Catholic scholar, Dr A. Steinmann, takes a wider survey in a pamphlet on the north Galatian side of the controversy (*Die Abfassungszeit des Galaterbriefes*, Münster, i. W., 1906), carrying forward the points already urged by Sieffert and Zöckler amongst others, and especially refuting his fellow-churchman, Prof. Valentine Weber.

2 The tendency among adherents of the south Galatian theory is to put the epistle as early as possible, making it contemporaneous with, if not prior to, 1 Thessalonians. So Douglass Round in *The Date of St Paul's Epistle to the Galatians* (1906).

3 It is not quite clear whether traces of the Judaistic agitation were already found by Paul on this visit (so especially Holsten, Lipsius, Sieffert, Pfleiderer, Weiss and Weizsäcker) or whether they are to be dated subsequent to his departure (so Philippi, Renan and Hofmann, among others). The tone of surprise which marks the opening of the epistle tells in favour of the latter theory. Paul seems to have been taken aback by the news of the Galatians' defection.

4 Apparently they were clever enough to keep the Galatians in ignorance that the entire law would require to be obeyed (v. 3).

5 The critical dubiety about οὐδέ in ii. 5 (cf. Zahn's excursus and Prof. Lake in *Expositor*, March 1906, p. 236 f.) throws a slight doubt on the interpretation of ii. 3, but it is clear that the agitators had quoted Paul's practice as an authoritative sanction of the rite.

6 This depreciation is voiced in their catch-word οἱ δοκοῦντες ("those of repute," ii. 6), while other echoes of their talk can be overheard in such phrases as "we are Abraham's seed" (iii. 16), "sinners of Gentiles" (ii. 15) and "Jerusalem which is our mother" (iv. 26), as well as in their charges against Paul of "seeking to please men" (i. 10) and "preaching circumcision" (v. 11).

7 Not only is the address "to the churches of Galatia" unusually bare, but Paul associates no one with himself, either because he was on a journey or because, as the attacked party, he desired to concentrate attention upon his personal commission. Yet the ἡμεῖς of i. 8 indicates colleagues like Silas and Timothy.

8 Cf. Hausrath's *History of the N.T. Times* (iii. pp. 181-199), with the fine remarks, on vi. 17, that "Paul stands before us like an ancient general who bares his breast before his mutinous legions, and shows them the scars of the wounds that proclaim him not unworthy to be called Imperator."

9 Cf. T.H. Green's *Works*, iii. 186 f. Verses 15-17 are the indirect abstract of the speech's argument, but in verses 18-21 the apostle, carried away by the thought and barrier of the

moment as he dictates to his amanuensis, forgets the original situation.

10 Thus Paul reverses the ordinary rabbinic doctrine which taught (cf. Kiddushim, 30, b) that the law was given as the divine remedy for the evil *yezer* of man. So far from being a remedy, he argues, it is an aggravation.

11 According to Plutarch, Cato the elder wrote histories for the use of his son, ἰδίᾳ χειρὶ καὶ μεγάλοις γράμμασιν (cf. Field's *Notes on Translation of the New Testament*, p. 191). If the point of Gal. vi. 11 lies in the size of the letters, Paul cannot have contemplated copies of the epistle being made. He must have assumed that the autograph would reach all the local churches (cf. 2 Thess. iii. 17, with E.A. Abbott, *Johannine Grammar*, pp. 530-532).

12 For ἔγραψα, the epistolary aorist, at the close of a letter, cf. Xen. *Anab.* i. 9. 25, Thuc. i. 129. 3, Ezra iv. 14 (LXX) and Lucian, *Dial. Meretr.* x.

13 Hermann Schulze's attempt to bring out the filiation of the later N.T. literature to Galatians (*Die Ursprünglichkeit des Galaterbriefes*, Leipzig, 1903) involves repeated exaggerations of the literary evidence.

14 Cf. especially J. Gloe's *Die jüngste Kritik des Galaterbriefes* (Leipzig, 1890) and Baljon's reply to Steck and Loman (*Exeg.-kritische verhandeling over den Brief van P. aan de Gal.*, 1889). The English reader may consult Schmiedel's article (already referred to) and Dr R.J. Knowling's *The Testimony of St Paul to Christ* (1905), 28 f.

15 Compare the minute analysis of the whole epistle in F. Blass, *Die Rhythmen der asianischen und römischen Kunstprosa* (1905), pp. 43-53, 204-216, where, however, this feature is exaggerated into unreality. The comic trimeter in Philipp. iii. 1 (ἐμοὶ μὲν ουκ ὀκνηρόν, ὑμῖν δ' ἀσφαλές) may well be, like that in 1 Cor. xv. 33, a reminiscence of Menander.

16 This affects even the vocabulary which has also "einen gewissen vulgären Zug" (Nägeli, *Der Wortschatz des Apostels Paulus*, 1905, pp. 78-79).

GALATINA, a town of Apulia, Italy, in the province of Lecce, from which it is 14 m. S. by rail, 233 ft. above sea-level. Pop. (1901) 12,917 (town); 14,086 (commune). It is chiefly remarkable for the fine Gothic church of St Caterina, built in 1390 by Raimondello del Balzo Orsini, count of Soleto, with a fine portal and rose-window. The interior contains frescoes by Francesco d' Arezzo (1435). The apse contains the fine mausoleum of the son of the founder (d. 1454), a canopy supported by four columns, with his statue beneath it.

GALATZ (*Galaţii*), a city of Rumania, capital of the department of Covurlui; on the left bank of the river Danube, 90 m. W. by N. of its mouth at Sulina. Pop. (1900) 62,678, including 12,000 Jews. The Danube is joined by the Sereth 3 m. S.W. of Galatz, and by the Pruth 10 m. E. Galatz is built on a slight eminence among the marshes which line the intervening shore and form, beside the western bank of the Pruth, the shallow mere called Lake Bratych (*Brateşul*), more than 50 sq. m. in extent. With the disappearance, towards the close of the 19th century, of most of its older quarters in which the crooked, ill-paved streets and insanitary houses were liable to be flooded every year, the city improved rapidly. Embankments and fine quays were constructed along the Danube; electric tramways were opened in the main streets, which were lighted by gas or electricity, and pure water was supplied. The higher, or north-western part of the city, which is the more open and comfortable, contains many of the chief buildings. These include the prefecture, consulate, prison, barracks, civil and military hospitals and the offices of the international commission for the control of the Danube (*q.v.*). The bishop of the lower Danube resides at Galatz. There are many Orthodox Greek, Roman Catholic and other churches; the most interesting being the cathedral, and St Mary's church, in which is the tomb of the famous Cossack chief, Mazeppa (1644-1709), said to have been rifled of its contents by the Russians. Galatz is a naval station, and the headquarters of the III. army corps, protected by a line of fortifications which extends for 45 m. E. to Focshani and is known as the Sereth line. But the main importance of the city is commercial. Galatz is the chief Moldavian port of entry, approached by three waterways, the Danube, Sereth and Pruth, down which there is a

continual volume of traffic, except in mid-winter; and by the railways which intersect all the richest portions of the country. Textiles, machinery, and coal make up the bulk of imports. Besides a large trade in petroleum and salt, Galatz ranks first among Rumanian cities in its export of timber, and second to Braila in its export of grain. It possesses many saw-mills, paste-mills, flour-mills, roperies, chemical works and petroleum refineries; manufacturing also metal ware, wire, nails, soap and candles. Vessels of 2500 tons can discharge at the quays, but cargoes consigned to Galatz are often transhipped into lighters at Sulina. The shipping trade is largely in foreign hands, the principal owners being British.

GALAXY, properly the MILKY WAY, from the Greek name ὁ γαλαξίας, sc. κύκλος, from γάλα, milk, cf. the Lat. *via lactea* (see STAR). The word is more generally employed in its figurative or transferred sense, to describe a gathering of brilliant or distinguished persons or objects. 397

GALBA, SERVIUS SULPICIUS, Roman general and orator. He served under Lucius Aemilius Paulus in the third Macedonian War. As praetor in 151 B.C. in farther Spain he made himself infamous by the treacherous murder of a number of Lusitanians, with their wives and children, after inducing them to surrender by the promise of grants of land. For this in 149 he was brought to trial, but secured an acquittal by bribery and by holding up his little children before the people to gain their sympathy. He was consul in 144, and must have been alive in 138. He was an eloquent speaker, noted for his violent gesticulations, and, in Cicero's opinion, was the first of the Roman orators. His speeches, however, were almost forgotten in Cicero's time.

Livy xlv. 35; Appian, *Hisp.* 58-60; Cicero, *De orat.* i. 53, iii. 7; Brutus 21.

GALBA, SERVIUS SULPICIUS, Roman emperor (June A.D. 68 to January 69), born near Terracina, on the 24th of December 5 B.C. He came of a noble family and was a man of great wealth, but unconnected either by birth or by adoption with the first six Caesars. In his early years he was regarded as a youth of remarkable abilities, and it is said that both Augustus and Tiberius prophesied his future eminence (Tacitus, *Annals*, vi. 20; Suetonius, *Galba*, 4). Praetor in 20, and consul in 33, he acquired a well-merited reputation in the provinces of Gaul, Germany, Africa and Spain by his military capability, strictness and impartiality. On the death of Caligula, he refused the invitation of his friends to make a bid for empire, and loyally served Claudius. For the first half of Nero's reign he lived in retirement, till, in 61, the emperor bestowed on him the province of Hispania Tarraconensis. In the spring of 68 Galba was informed of Nero's intention to put him to death, and of the insurrection of Julius Vindex in Gaul. He was at first inclined to follow the example of Vindex, but the defeat and suicide of the latter renewed his hesitation. The news that Nymphidius Sabinus, the praefect of the praetorians, had declared in his favour revived Galba's spirits. Hitherto, he had only dared to call himself the legate of the senate and Roman people; after the murder of Nero, he assumed the title of Caesar, and marched straight for Rome. At first he was welcomed by the senate and the party of order, but he was never popular with the soldiers or the people. He incurred the hatred of the praetorians by scornfully refusing to pay them the reward promised in his name, and disgusted the mob by his meanness and dislike of pomp and display. His advanced age had destroyed his energy, and he was entirely in the hands of favourites. An outbreak amongst the legions of Germany, who demanded that the senate should choose another emperor, first made him aware of his own unpopularity and the general discontent. In order to check the rising storm, he adopted as his coadjutor and successor L. Calpurnius Piso Frugi Licinianus, a man in every way worthy of the honour. His choice was wise and patriotic; but the populace regarded it as a sign of fear, and the

praetorians were indignant, because the usual donative was not forthcoming. M. Salvius Otho, formerly governor of Lusitania, and one of Galba's earliest supporters, disappointed at not being chosen instead of Piso, entered into communication with the discontented praetorians, and was adopted by them as their emperor. Galba, who at once set out to meet the rebels—he was so feeble that he had to be carried in a litter—was met by a troop of cavalry and butchered near the Lacus Curtius. During the later period of his provincial administration he was indolent and apathetic, but this was due either to a desire not to attract the notice of Nero or to the growing infirmities of age. Tacitus rightly says that all would have pronounced him worthy of empire if he had never been emperor ("omnium consensu capax imperii nisi imperasset").

See his life by Plutarch and Suetonius; Tacitus, *Histories*, i. 7-49; Dio Cassius lxiii. 23-lxiv. 6; B.W. Henderson, *Civil War and Rebellion in the Roman Empire, A.D. 69-70* (1908); W.A. Spooner, *On the Characters of Galba, Otho and Vitellius* in Introd. to his edition (1891) of the *Histories* of Tacitus.

GALBANUM (Heb. *Helbenāh*; Gr. χαλβάνη), a gum-resin, the product of *Ferula galbaniflua*, indigenous to Persia, and perhaps also of other umbelliferous plants. It occurs usually in hard or soft, irregular, more or less translucent and shining lumps, or occasionally in separate tears, of a light-brown, yellowish or greenish-yellow colour, and has a disagreeable, bitter taste, a peculiar, somewhat musky odour, and a specific gravity of 1.212. It contains about 8% of terpene; about 65% of a resin which contains sulphur; about 20% of gum; and a very small quantity of the colourless crystalline substance *umbelliferone*, $C_9H_6O_3$. Galbanum is one of the oldest of drugs. In Exodus xxx. 34 it is mentioned as a sweet spice, to be used in the making of a perfume for the tabernacle. Hippocrates employed it in medicine, and Pliny (*Nat. Hist.* xxiv. 13) ascribes to it extraordinary curative powers, concluding his account of it with the assertion that "the very touch of it mixed with oil of spondylium is sufficient to kill a serpent." The drug is occasionally given in modern medicine, in doses of from five to fifteen grains. It has the actions common to substances containing a resin and a volatile oil. Its use in medicine is, however, obsolescent.

GALCHAS, the name given to the highland tribes of Ferghana, Kohistan and Wakhan. These Aryans of the Pamir and Hindu Kush, kinsmen of the Tajiks, are identified with the *Calcienses populi* of the lay Jesuit Benedict Goes, who crossed the Pamir in 1603 and described them as "of light hair and beard like the Belgians." The word "Galcha," which has been explained as meaning "the hungry raven who has withdrawn to the mountains," in allusion to the retreat of this branch of the Tajik family to the mountains to escape the Tatar hordes, is probably simply the Persian *galcha*, "clown" or "rustic," in reference to their uncouth manners. The Galchas conform physically to what has been called the "Alpine or Celtic European race," so much so that French anthropologists have termed them "those belated Savoyards of Kohistan." D'Ujfalvy describes them as tall, brown or bronzed and even white, with ruddy cheeks, black, chestnut, sometimes red hair, brown, blue or grey eyes, never oblique, well-shaped, slightly curved nose, thin lips, oval face and round head. Thus it seems reasonable to hold that the Galchas represent the most eastern extension of the Alpine race through Armenia and the Bakhtiari uplands into central Asia. The Galchas for the most part profess Sunnite Mahommedanism.

See Robert Shaw, "On the Galtchah Languages," in *Journ. As. Soc. Bengal*, xlv. (1876), and xlvi. (1877); Major J. Biddulph, *Tribes of the Hindoo-Koosh* (Calcutta, 1880); Hon. Mountstuart Elphinstone, *An Account of the Kingdom of Caubul* (1815); *Bull. de la société d'anthropologie de Paris* (1887); Charles Eugene D'Ujfalvy de Mezoe-Koevesd, *Les Aryens* (1896), and in *Revue d'anthropologie* (1879), and *Bull. de la soc. de géogr.* (June 1878); W.Z. Ripley, *Races of Europe* (New York, 1899).

GALE, THEOPHILUS (1628-1678), English nonconformist divine, was born in 1628 at Kingsteignton, in Devonshire, where his father was vicar. In 1647 he was entered at Magdalen College, Oxford, where he took his B.A. degree in 1649, and M.A. in 1652. In 1650 he was made fellow and tutor of his college. He remained some years at Oxford, discharging actively the duties of tutor, and was in 1657 appointed as preacher in Winchester cathedral. In 1662 he refused to submit to the Act of Uniformity, and was ejected. He became tutor to the sons of Lord Wharton, whom he accompanied to the Protestant college of Caen, in Normandy, returning to England in 1665. The latter portion of his life he passed in London as assistant to John Rowe, an Independent minister who had charge of an important church in Holborn; Gale succeeded Rowe in 1677, and died in the following year. His principal work, *The Court of the Gentiles*, which appeared in parts in 1669, 1671 and 1676, is a strange storehouse of miscellaneous philosophical learning. It resembles the *Intellectual System* of Ralph Cudworth, though much inferior to that work both in general construction and in fundamental idea. Gale's endeavour (based on a hint of Grotius in *De veritate*, i. 16) is to prove that the whole philosophy of the Gentiles is a distorted or mangled reproduction of Biblical truths. Just as Cudworth referred the Democritean doctrine of atoms to Moses as the original author, so Gale tries to show that the various systems of Greek thought may be traced back to Biblical sources. Like so many of the learned works of the 17th century, the *Court of the Gentiles* is chaotic and unsystematic, while its erudition is rendered almost valueless by the complete absence of any critical discrimination.

His other writings are: *A True Idea of Jansenism* (1669); *Theophil, or a Discourse of the Saint's Amitie with God in Christ* (1671); *Anatomie of Infidelitie* (1672); *Idea theologiae* (1673); *Philosophia generalis* (1676).

GALE, THOMAS (?1636-1702), English classical scholar and antiquarian, was born at Scruton, Yorkshire. He was educated at Westminster school and Trinity College, Cambridge, of which he became a fellow. In 1666 he was appointed regius professor of Greek at Cambridge, in 1672 high master of St Paul's school, in 1676 prebendary of St Paul's, in 1677 a fellow of the Royal Society, and in 1697 dean of York. He died at York on the 7th (or 8th) of April 1702. He published a collection, *Opuscula mythologica, ethica, et physica*, and editions of several Greek and Latin authors, but his fame rests chiefly on his collection of old works bearing on Early English history, entitled *Historiae Anglicanae scriptores* and *Historiae Britannicae, Saxonicae, Anglo-Danicae scriptores XV*. He was the author of the inscription on the London Monument in which the Roman Catholics were accused of having originated the great fire.

See J.E.B. Mayor, *Cambridge in the Time of Queen Anne*, 448-450.

GALE. 1. (A word of obscure origin; possibly derived from Dan. *gal*, mad or furious, sometimes applied to wind, in the sense of boisterous) a wind of considerable power, considerably stronger than a breeze, but not severe enough to be called a storm. In nautical language it is usually combined with some qualifying word, as "half a gale," a "stiff gale." In poetical and figurative language "gale" is often used in a pleasant sense, as in "favouring gale"; in America, it is used in a slang sense for boisterous or excited behaviour.

2. The payment of rent, customs or duty at regular intervals; a "hanging gale" is an arrear of rent left over after each successive "gale" or rent day. The term survives in the Forest of Dean, for leases granted to the "free miners" of the forest, granted by the "gaveller" or agent of the crown, and the term is also applied to the royalty paid to the crown, and to the area mined. The word is a contracted form of the O. Eng. *gafol*, which survives in "gavel," in gavelkind (*q.v.*), and in the name of the office mentioned above. The root from which these words derive is that of "give." Through Latinized forms it appears in *gabelle* (*q.v.*).

3. The popular name of a plant, also known as the sweet gale or gaul, sweet willow, bog or Dutch myrtle. The Old English form of the word is *gagel*. It is a small, twiggy, resinous

fragrant shrub found on bogs and moors in the British Islands, and widely distributed in the north temperate zone. It has narrow, short-stalked leaves and inconspicuous, apetalous, unisexual flowers borne in short spikes. The small drupe-like fruit is attached to the persistent bracts. The leaves are used as tea and as a country medicine. John Gerard (*Herball*, p. 1228) describes it as sweet willow or gaule, and refers to its use in beer or ale. The genus *Myrica* is the type of a small, but widely distributed order, *Myricaceae*, which is placed among the apetalous families of Dicotyledons, and is perhaps most nearly allied to the willow family. *Myrica cerifera* is the candleberry, wax-myrtle or wax-tree (*q.v.*).

GALEN, CHRISTOPH BERNHARD, Freiherr von (1606-1678), prince bishop of Münster, belonged to a noble Westphalian family, and was born on the 12th of October 1606. Reduced to poverty through the loss of his paternal inheritance, he took holy orders; but this did not prevent him from fighting on the side of the emperor Ferdinand III. during the concluding stages of the Thirty Years' War. In 1650 he succeeded Ferdinand of Bavaria, archbishop of Cologne, as bishop of Münster. After restoring some degree of peace and prosperity in his principality, Galen had to contend with a formidable insurrection on the part of the citizens of Münster; but at length this was crushed, and the bellicose bishop, who maintained a strong army, became an important personage in Europe. In 1664 he was chosen one of the directors of the imperial army raised to fight the Turk; and after the peace which followed the Christian victory at St Gotthard in August 1664, he aided the English king Charles II. in his war with the Dutch, until the intervention of Louis XIV. and Frederick William I. of Brandenburg compelled him to make a disadvantageous peace in 1666. When Galen again attacked Holland six years later he was in alliance with Louis, but he soon deserted his new friend, and fought for the emperor Leopold I. against France. Afterwards in conjunction with Brandenburg and Denmark he attacked Charles XI. of Sweden, and conquered the duchy of Bremen. He died at Ahaus on the 19th of September 1678. Galen showed himself anxious to reform the church, but his chief energies were directed to increasing his power and prestige.

See K. Tücking, *Geschichte des Stifts Münster unter C.B. von Galen* (Münster, 1865); P. Corstiens, *Bernard van Galen, Vorst-Bisschop van Munster* (Rotterdam, 1872); A. Hüsing, *Fürstbischof C.B. von Galen* (Münster, 1887); and C. Brinkmann in the *English Historical Review*, vol. xxi. (1906). There is in the British Museum a poem printed in 1666, entitled *Letter to the bishop of Munster containing a Panegyrick of his heroick achievements in heroick verse*.

GALEN (or Galenus), **CLAUDIUS,** called Gallien by Chaucer and other writers of the middle ages, the most celebrated of ancient medical writers, was born at Pergamus, in Mysia, about a.d. 130. His father Nicon, from whom he received his early education, is described as remarkable both for excellence of natural disposition and for mental culture; his mother, on the other hand, appears to have been a second Xanthippe. In 146 Galen began the study of medicine, and in about his twentieth year he left Pergamus for Smyrna, in order to place himself under the instruction of the anatomist and physician Pelops, and of the peripatetic philosopher Albinus. He subsequently visited other cities, and in 158 returned from Alexandria to Pergamus. A few years later he went for the first time to Rome. There he healed Eudemus, a celebrated peripatetic philosopher, and other persons of distinction; and ere long, by his learning and unparalleled success as a physician, earned for himself the titles of "Paradoxologus," the wonder-speaker, and "Paradoxopoeus," the wonder-worker, thereby incurring the jealousy and envy of his fellow-practitioners. Leaving Rome in 168, he repaired to his native city, whence he was soon sent for to Aquileia, in Venetia, by the emperors Lucius Verus and Marcus Aurelius. In 170 he returned to Rome with the latter, who, on departing thence to conduct the war on the Danube, having with difficulty been persuaded to dispense with his personal attendance, appointed him medical guardian of his son Commodus. In Rome Galen remained for some years, greatly extending his reputation as a physician, and writing some of his most important treatises. It would

appear that he eventually betook himself to Pergamus, after spending some time at the island of Lemnos, where he learned the method of preparing a certain popular medicine, the "terra lemnia" or "sigillata." Whether he ever revisited Rome is uncertain, as also are the time and place of his death. According to Suidas, he died at the age of seventy, or in the year 200, in the reign of Septimius Severus. If, however, we are to trust the testimony of Abul-faraj, his decease took place in Sicily, when he was in his eightieth year. Galen was one of the most versatile and accomplished writers of his age. He composed, it is said, nearly 500 treatises on various subjects, including logic, ethics and grammar. Of the published works attributed to him, 83 are recognized as genuine, 19 are of doubtful authenticity, 45 are confessedly spurious, 19 are fragments, and 15 are notes on the writings of Hippocrates.

Galen, who in his youth was carefully trained in the Stoic philosophy, was an unusually prolific writer on logic. Of the numerous commentaries and original treatises, a catalogue of which is given in his work *De propriis libris*, one only has come down to us, the treatise on *Fallacies in dictione* (Περὶ τῶν κατὰ τήν λέξιν σοφισμάτων). Many points of logical theory, however, are discussed in his medical and scientific writings. His name is perhaps best known in the history of logic in connexion with the fourth syllogistic figure, the first distinct statement of which was ascribed to him by Averroes. There is no evidence from Galen's own works that he did make this addition to the doctrines of syllogism, and the remarkable passage quoted by Minoides Minas from a Greek commentator on the *Analytics*, referring the fourth figure to Galen, clearly shows that the addition did not, as generally supposed, rest on a new principle, but was merely an amplification or alteration of the indirect moods of the first figure already noted by Theophrastus and the earlier Peripatetics.

In 1844 Minas published a work, avowedly from a MS. with the superscription *Galenus*, entitled Γαληνοῦ εἰσαγωγὴ διαλεκτική. Of this work, which contains no direct intimation of a fourth figure, and which in general exhibits an astonishing mixture of the Aristotelian and Stoic logic, Prantl speaks with the bitterest contempt. He shows demonstratively that it cannot be regarded as a writing of Galen's, and ascribes it to some one or other of the later Greek logicians. A full summary of its contents will be found in the 1st vol. of the *Geschichte der Logik* (pp. 591-610), and a notice of the logical theories of the true Galen in the same work, pp. 559-577.

There have been numerous issues of the whole or parts of Galen's works, among the editors or illustrators of which may be mentioned Jo. Bapt. Opizo, N. Leonicenus, L. Fuchs, A. Lacuna, Ant. Musa Brassavolus, Aug. Gadaldinus, Conrad Gesner, Sylvius, Cornarius, Joannes Montanus, Joannes Caius, Thomas Linacre, Theodore Goulston, Caspar Hoffman, René Chartier, Haller and Kühn. Of Latin translations Choulant mentions one in the 15th and twenty-two in the following century. The Greek text was edited at Venice, in 1525, 5 vols. fol.; at Basel, in 1538, 5 vols. fol.; at Paris, with Latin version by René Chartier, in 1639, and in 1679, 13 vols. fol.; and at Leipzig, in 1821-1833, by C.G. Kühn, considered to be the best, 20 vols. 8vo. An epitome in English of the works of Hippocrates and Galen, by J.R. Coxe, was published at Philadelphia in 1846. A new edition of Galen's smaller works by J. Marquardt, Iwan Müller and G. Helmreich was published in three volumes at Leipzig in 1884-1909.

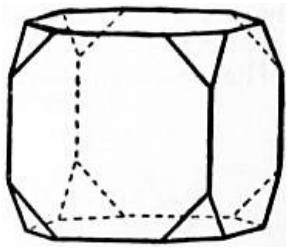
Further details as to the life and an account of the anatomical and medical knowledge of Galen will be found in the historical articles under the headings of Anatomy and Medicine. See also René Chartier's Life, in his edition of Galen's works; N.F.J. Eloy, *Dictionnaire historique de la médecine*, *s.v.* "Galien," tom. i. (1778); F. Adams's "Commentary" in his *Medical Works of Paulus Aegineta* (London and Aberdeen, 1834); J. Kidd, "A Cursory Analysis of the Works of Galen, so far as they relate to Anatomy and Physiology," *Trans. Provincial Med. and Surg. Assoc.* vi., 1837, pp. 299-336; C.V. Daremberg, *Exposition des connaissances de Galien sur l'anatomie, la physiologie et la pathologie du système nerveux* (Thèse pour le Doctorat en Médecine) (Paris, 1841); J.R. Gasquet, "The Practical Medicine of Galen and his Time," *The British and Foreign Medico-Chirurgical Rev.*, vol. xi., 1867, pp. 472-488; and Ilberg, "Die Schriften des Claudius Galenos," *Rheinisches Museum für Philologie*, 1889, 1892 and 1896.

GALENA, a city and the county-seat of Jo Daviess county, Illinois, U.S.A., in the N.W. part of the state, on the Galena (formerly the Fever) river, near its junction with the Mississippi, about 165 m. W.N.W. of Chicago. Pop. (1900) 5005, of whom 918 were foreign-born; (1910) 4835. It is served by the Chicago, Burlington & Quincy, the Chicago & North-Western and

the Illinois Central railways; the Galena river has been made navigable by government locks at the mouth of the river, but the river traffic is unimportant. The city is built on rocky limestone bluffs, which rise rather abruptly on each side of the river, and a number of the parallel streets, of different levels, are connected by flights of steps. In Grant Park there is a statue of General U.S. Grant, who was a resident of Galena at the outbreak of the Civil War. In the vicinity there are the most important deposits of zinc and lead in the state, and the city derives its name from the deposits of sulphide of lead (galena), which were the first worked about here; below the galena is a zone of zinc carbonate (or smithsonite) ores, which was the main zone worked between 1860 and 1890; still lower is a zone of blende, or zinc sulphide, now the principal source of the mineral wealth of the region. The production of zinc is increasing, but that of lead is unimportant. The principal manufactures are mining pumps and machinery, flour, woollen goods, lumber and furniture. Water power is afforded by the river. Galena was originally a trading post, called by the French “La Pointe” and by the English “Fever River,” the river having been named after le Fevre, a French trader who settled near its mouth. In 1826 Galena was laid out as a town and received its present name; it was incorporated in 1835 and was reincorporated in 1882. In 1838 a theatre was opened, one of whose proprietors was Joseph Jefferson, the father of the celebrated actor of that name.

GALENA, a city of Cherokee county, Kansas, U.S.A., in the extreme S.E. part of the state, on Short Creek and near Spring river. Pop. (1890) 2496; (1900) 10,155, of whom 580 were negroes and 251 were foreign-born; (1905) 6449; (1910) 6096. It is situated at the intersection of the Missouri, Kansas & Texas, and the Kansas City, Fort Scott & Memphis (“Frisco System”) railways, in the midst of a lead and zinc region, extremely valuable deposits of these metals having been discovered in 1877. Smelters and foundries are its principal manufacturing establishments. Water power in abundance is furnished by the Spring river. After the discovery of the ore deposits two rival companies founded Galena and Empire City (pop. in 1905, 982), the former S. of Short Creek and the latter N. of it. Galena was incorporated in 1877, and in 1907 Empire City was annexed to it.

GALENA, an important ore of lead, consisting of lead sulphide (PbS). The mineral was mentioned by Pliny under this name, and it is sometimes now known as lead-glance (Ger. *Bleiglanz*). It crystallizes in the cubic system, and well-developed crystals are of common occurrence; the usual form is the cube or the cubo-octahedron (fig.). An important character, and one by which the mineral may always be recognized, is the perfect cubical cleavage, on which the lustre is brilliant and metallic. The colour of the mineral and of its streak is lead-grey; it is opaque; the hardness is 2½ and the specific gravity 7.5. Twinned crystals are not common, but the presence of polysynthetic twinning is sometimes shown by fine striations running diagonally or obliquely across the cleavage surfaces. Large masses with a coarse or fine granular structure are of common occurrence; the fractured surfaces of such masses present a spangled appearance owing to the numerous bright cleavages.



The formula PbS corresponds with lead 86.6 and sulphur 13.4%. The mineral nearly always contains a small amount of silver, and sometimes antimony, arsenic, copper, gold, selenium, &c. Argentiferous galena is an important source of silver; this metal is present in amounts rarely exceeding 1%, and often less than 0.03% (equivalent to 10¾ ounces per ton). Since argentite (Ag_2S) is isomorphous with galena, it is probable that the silver isomorphously replaces lead, but it is to be noted that native silver has been detected as an enclosure in galena.

Galena is of wide distribution, and occurs usually in metalliferous veins traversing

crystalline rocks, clay-slates and limestones, and also as pockets in limestones. It is often associated with blende and pyrites, and with calcite, fluorspar, quartz, barytes, chalybite and pearlspar as gangue minerals; in the upper oxidized parts of the deposits, cerussite and anglesite occur as alteration products. The mineral has occasionally been observed as a recent formation replacing organic matter, such as wood; and it is sometimes found in beds of coal. As small concretionary nodules, it occurs disseminated through sandstone at Kommern in the Eifel. In the lead-mining districts of Derbyshire and the north of England the ore occurs as veins and flats in the Carboniferous Limestone series, whilst in Cornwall the veins traverse clay-slates. In the Upper Mississippi lead region of Missouri, Illinois, Iowa and Wisconsin the ore fills large cavities or chambers in limestone.

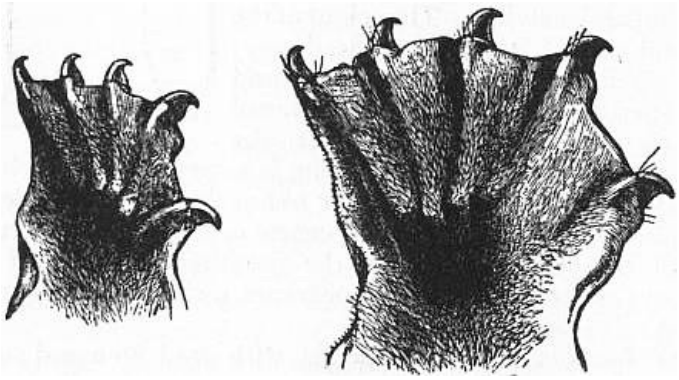
Galena is met with at all places where lead is mined; of localities which have yielded finely crystallized specimens the following may be selected for mention: Derbyshire, Alston in Cumberland, Laxey in the Isle of Man (where crystals measuring almost a foot across have been found), Neudorf in the Harz, Rossie in New York and Joplin in Missouri. Good crystals have also been obtained as a furnace product.

Coarsely grained galena is used for glazing pottery, and is then known as “potters’ ore” or alquifoux.

The galena group includes several other cubic minerals, such as argentite (*q.v.*). Mention may also be made here of clausthalite (lead selenide, PbSe) and altaite (lead telluride, PbTe), which, with their lead-grey colour and perfect cubic cleavage, closely resemble galena in appearance; these species are named after the localities at which they were originally found, namely, Klausthal in the Harz and the Altai mountains in Asiatic Russia. Altaite is of interest as being one of the tellurides found associated with gold.

(L. J. S.)

GALEOPITHECUS, the scientific designation of the Colugo (*q.v.*) or Cobego, commonly known as the flying-lemur, and alone representing the family *Galeopithecidae*. Much uncertainty has prevailed among naturalists as to the systematic position of this animal, or rather these animals (for there are two species); and while some have referred it to the lemurs, others have placed it with the bats, and others again among the *Insectivora*, as the representative of a special subordinal group, the *Dermoptera*. Dr H.C. Chapman, who has made a special study of the creature, writes, however, as follows: “It appears, at least in the judgment of the author, that *Galeopithecus* cannot be regarded as being either a lemur, or insectivore, or bat, but that it stands alone, the sole representative of an ancient group, *Galeopithecidae*, as *Hyrax* does of *Hyracoidea*. While *Galeopithecus* is but remotely related to the *Lemuroidea* and *Insectivora*, it is so closely related to *Chiroptera*, more particularly in regard to the structure of its patagium, brain, alimentary canal, genito-urinal apparatus, &c., that there can be but little doubt that the Chiroptera are the descendants of Galeopithecus, or, more probably, that both are the descendants of a Galeopithecus-like ancestor.” Without going quite so far as this, it may be definitely admitted that the colugo is entitled to represent an order by itself, the characters of which will be as follows: Herbivorous, climbing, unguiculate mammals, provided with a very extensive flying-membrane, and having the dental formula *i.* $\frac{2}{2}$, *c.* $\frac{0}{1}$, *p.* $\frac{3}{3}$, *m.* $\frac{3}{3}$, total 34. The lower incisors are directed forwards and have a comb-like structure of their crowns, while the outermost of these teeth and the canines are double-rooted, being in these respects, taken together, quite unlike those of all other mammals; the cheek-teeth have numerous sharp cusps; and there is the normal replacement of milk-molars by premolars. In the skull the orbit is surrounded by bone, and the tympanic has a bulla and an ossified external meatus. The ulna and fibula are to some extent inclined backwards; the carpus has a scapho-lunar; and the feet are five-toed. The hemispheres of the brain are short and but slightly convoluted; the stomach is simple; there is a large caecum; the testes are received into inguinal pouches; the uterus is two-horned; the placenta is discoidal; and there are two pairs of pectoral teats. A single offspring is produced at a birth.



Feet of Philippine Colugo, or Flying-Lemur (*Galeopithecus philippinensis*).

It will be obvious that if other representatives of the *Dermoptera* were discovered, some of these features might apply only to the family *Galeopithecidae*.

There are two species, *Galeopithecus volans*, ranging from Burma, Siam and the Malay Peninsula to Borneo, Sumatra and Java, and *G. philippinensis* of the Philippine group. The former, which is nearly 2 ft. in total length, is distinguished by its larger upper incisors, shorter ears and smaller skull. In both species not only are the long and slender limbs connected by a broad integumentary expansion extending outwards from the sides of the neck and body, but there is also a web between the fingers and toes as far as the base of the claws (fig.); and the hind-limbs are further connected by a similar expansion passing outwards along the back of the feet to the base of the claws, and, inwardly, involving the long tail to the tip, forming a true interfemoral membrane, as in bats. Besides differing from bats altogether in the form of the anterior limbs and of the double-rooted outer incisors and canines, *Galeopithecus* contrasts strongly with that order in the presence of a large sacculated caecum, and in the great length of the colon, which is so remarkably short in *Chiroptera*. From the lemurs, on the other hand, the form of the brain, the character of the teeth, the structure of the skull, and the deciduate discoidal placenta at once separate the group.

(R. L.*)

GALERIUS [Galerius Valerius Maximianus], Roman emperor from A.D. 305 to 311, was born near Sardica in Thrace. He originally followed his father’s occupation, that of a herdsman, whence his surname of *Armentarius* (Lat. *armentum*, herd). He served with distinction as a soldier under Aurelian and Probus, and in 293 was designated Caesar along with Constantius Chlorus, receiving in marriage Diocletian’s daughter Valeria, and at the same time being entrusted with the care of the Illyrian provinces. In 296, at the beginning of the Persian War, he was removed from the Danube to the Euphrates; his first campaign ended in a crushing defeat, near Callinicum, but in 297, advancing through the mountains of Armenia, he gained a decisive victory over Narses (*q.v.*) and compelled him to make peace. In 305, on the abdication of Diocletian and Maximianus, he at once assumed the title of Augustus, with Constantius his former colleague, and having procured the promotion to the rank of Caesar of Flavius Valerius Severus, a faithful servant, and Daia (Maximinus), his nephew, he hoped on the death of Constantius to become sole master of the Roman world. This scheme, however, was defeated by the sudden elevation of Constantine at Eboracum (York) on the death of his father, and by the action of Maximianus and Maxentius in Italy. After an unsuccessful invasion of Italy in 307 he elevated his friend Licinius to the rank of Augustus, and, moderating his ambition, devoted the few remaining years of his life “to the enjoyment of pleasure and to the execution of some works of public utility.” It was at the instance of Galerius that the first of the celebrated edicts of persecution against the Christians was published, on the 24th of February 303, and this policy of repression was maintained by him until the appearance of the general edict of toleration (311), issued in his own name and in those of Licinius and Constantine. He died in May 311 A.D.

See Zosimus ii. 8-11; Zonaras xii. 31-34; Eutropius ix. 24, x. 1.

GALESBURG, a city and the county-seat of Knox county, Illinois, U.S.A., in the N.W. part of the state, 163 m. S.W. of Chicago. Pop. (1890) 15,264; (1900) 18,607; of whom 3602 were foreign-born; (census, 1910) 22,089. It is served by the Atchison, Topeka & Santa Fé, and the Chicago, Burlington & Quincy railways. Knox College (non-sectarian and coeducational), which was chartered here in 1837 as the "Knox Manual Labor College" (the present name was adopted in 1857), was opened in 1841, and had in 1907-1908, 31 instructors and 628 students, of whom more than half were in the Conservatory of Music, a department of the college, and 79 were in the Academy. Lombard College (coeducational; Universalist), which was chartered as the "Illinois Liberal Institute" in 1851, was known as Lombard University (in honour of Benjamin Lombard, a benefactor) from 1855 to 1899; it includes a College of Liberal Arts, the Ryder Divinity School (1881), and departments of music and domestic science, and in 1907-1908 had 18 instructors and 117 students. Here also are Corpus Christi College (Roman Catholic), St Joseph's Academy (Roman Catholic) and Brown's Business College (1874). There is a public library, founded in 1874. The industries consist mainly of the construction and repairing of steam railway cars (in the shops of the Chicago, Burlington & Quincy railway) and the manufacture of foundry and machine-shop products, vitrified brick, agricultural implements and machinery. The total value of the factory product in 1905 was $2,217,772, being 52.9% more than in 1900. Galesburg was named in honour of the Rev. George Washington Gale (1789-1862), a prominent Presbyterian preacher, who in 1827-1834 had founded the Oneida Manual Labor Institute at Whitestown, Oneida county, New York. Desiring to establish a college in the Mississippi Valley to supply "an evangelical and able ministry" to "spread the Gospel throughout the world," and also wishing to counteract the influence of pro-slavery men in Illinois, he interested a number of people in the project, formed a society for colonization, and in 1836 led the first settlers to Galesburg, the "Mesopotamia in the West." Knox College was founded to fulfil his educational purpose. Galesburg was an important "station" of the Underground Railroad, one of the conditions of membership in the "Presbyterian Church of Galesburg" (the name of Mr Gale's society) being opposition to slavery; and in 1855 this caused the church to withdraw from the Presbytery. Galesburg was chartered as a city in 1857. On the 7th of October 1858 one of the famous Lincoln-Douglas debates was held in the grounds of Knox College.

GALGĀCUS, or perhaps rather CALGĀCUS, a Caledonian chief who led the tribes of North Britain against the invading Roman army under Cn. Julius Agricola about A.D. 85 and was defeated at the battle of Mons Graupius (Tac. *Agric.* 29). The name recurs much later, in Adamnan's *Life of Columba*, in the name of a wood near Londonderry, Daire-Calgaich or Roboretum Calgachi, "the wood of Calgacus": it may be Celtic and denote "the man with the sword."

GALIANI, FERDINANDO (1728-1787), Italian economist, was born at Chieti on the 2nd of December 1728. He was carefully educated by his uncle Monsignor C. Galiani at Naples and Rome with a view to entering the Church. Galiani gave early promise of distinction as an economist, and even more as a wit. At the age of twenty-two, after he had taken orders, he had produced two works by which his name became widely known far beyond the bounds of his own Naples. The one, his *Trattato della moneta*, in which he shows himself a strong supporter of the mercantile school, deals with many aspects of the question of exchange, but always with a special reference to the state of confusion then presented by the whole monetary system of the Neapolitan government. The other, *Raccolta in Morte del Boia*, established his fame as a humorist, and was highly popular in Italian literary circles at the end of the 18th century. In this volume Galiani parodied with exquisite felicity, in a series of discourses on the death of the public hangman, the styles of the most pompous and pedantic Neapolitan writers of the day. Galiani's political knowledge and social qualities now pointed him out to the discriminating eye of King Charles, afterwards Charles III. of Spain, and his liberal minister Tanucci, and he was appointed in 1759 secretary to the Neapolitan embassy at Paris. This post he held for ten years, when he returned to Naples and was made a

councillor of the tribunal of commerce, and in 1777, minister of the royal domains. His economic reputation was made by a book written in French and published in Paris, namely, his *Dialogues sur le commerce des blés*. This work, by its light and pleasing style, and the vivacious wit with which it abounded, delighted Voltaire, who spoke of it as a book in the production of which Plato and Molière might have been combined! The author, says Pecchio, treated his arid subject as Fontenelle did the vortices of Descartes, or Algarotti the Newtonian system of the world. The question at issue was that of the freedom of the corn trade, then much agitated, and, in particular, the policy of the royal edict of 1764, which permitted the exportation of grain so long as the price had not arrived at a certain height. The general principle he maintains is that the best system in regard to this trade is to have no system—countries differently circumstanced requiring, according to him, different modes of treatment. He fell, however, into some of the most serious errors of the mercantilists—holding, as indeed did also Voltaire and even Verri, that one country cannot gain without another losing, and in his earlier treatise going so far as to defend the action of governments in debasing the currency. Until his death at Naples on the 30th of October 1787, Galiani kept up with his old Parisian friends a correspondence, which was published in 1818.

See *L'Abate Galiani*, by Alberto Marghieri (1878), and his correspondence with Tanucci in Viesseux's *L'Archivio storico* (Florence, 1878).

GALICIA (Ger. *Galizien*; Pol. *Halicz*), a crownland of Austria, bounded E. and N. by Russia, S. by Bukovina and Hungary, and W. by Austrian and Prussian Silesia. It has an area of 30,299 sq. m., and is the largest Austrian province. It comprises the old kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand duchy of Cracow.

Galicia lies on the northern slopes of the Carpathians, which with their offshoots cover about a third of the whole area of the country. The surface gradually sinks down by undulating terraces to the valleys of the Vistula and Dniester. To the N. and E. of these rivers Galicia forms a continuation of the great plains of Russia, intersected only by a few hills, which descend from the plateaus of Poland and Podolia, and which attain in some places an altitude of 1300 to 1500 ft. The Carpathians, which, extending in the form of an arc, form the boundary between Galicia and Hungary, are divided into the West and the East Beskides, which are separated by the northern ramifications of the massif of the Tatra. The highest peaks are the Babia Góra (5650 ft.), the Wolowiec (6773 ft.) and the Cserna Góra (6505 ft.). The principal passes are those of Zdjar over the Tatra, and of Dukla, Vereczke Körösmezö or Delatyn in the East Beskides. The river Vistula, which becomes navigable at Cracow, and forms afterwards the north-western frontier of Galicia, receives the Sola, the Skawa, the Raba, the Dunajec with its affluents the Poprad and the Biala, the Wisloka, the San and the Bug. The Dniester, which rises in the Carpathians, within the territory of Galicia, becomes navigable at Sambor, and receives on the right the Stryj, the Swica, the Lomnica and the Bystrzyca, and on the left the Lipa, the Strypa, the Sereth and the Zbrucz, the boundary river towards Russia. The Pruth, which also rises in the Carpathians, within the territory of Galicia, traverses its south-eastern corner and receives the Czeremosz, the boundary river towards Bukovina. There are few lakes in the country except mountain tarns; but considerable morasses exist about the Upper Dneister, the Vistula and the San, while the ponds or dams in the Podolian valleys are estimated to cover an area of over 200 sq. m. The most frequented mineral springs are the alkaline springs at Szczawnica and Krynica, the sulphur springs at Krzesowice, Szklo and Lubian, and the iodine springs at Iwonicz.

Exposed to the cold northern and north-eastern winds, and shut out by the Carpathians from the warm southerly winds, Galicia has the severest climate in Austria. It has long winters, with an abundant snowfall, short and wet springs, hot summers and long and steady autumns. The mean annual temperature at Lemberg is 46.2° F., and at Tarnopol only 43° F.

Of the total area 48.45% is occupied by arable land, 11.16% by meadows, 9.19% by pastures, 1.39% by gardens and 25.76% by forests. The soil is generally fertile, but agriculture is still backward. The principal products are barley, oats, rye, wheat, maize and leguminous plants. Galicia has the largest area under potatoes and legumes in the whole of Austria, and hemp, flax, tobacco and hops are of considerable importance. The principal mineral products are salt, coal and petroleum. Salt is extracted at Wieliczka, Bochnia, Bolechow, Dolina, Kalusz and Kosow. Coals are found in the Cracow district at Jaworzno, at

Siersza near Trzebinia and at Dabrowa. Some of the richest petroleum fields in Europe are spread in the region of the Carpathians, and are worked at Boryslaw and Schodnica near Drohobycz, Bobrka and Potok near Krosno, Sloboda-Rungurska near Kolomea, &c. Great quantities of ozocerite are also extracted in the petroliferous region of the Carpathians. Other mineral products are zinc, extracted at Trzebionka and Wodna in the Cracow region, amounting to 40% of the total zinc production in Austria, iron ore, marble and various stones for construction. The sulphur mines of Swoszowice near Cracow, which had been worked since 1598, were abandoned in 1884.

The manufacturing industries of Galicia are not highly developed. The first place is occupied by the distilleries, whose output amounts to nearly 40% of the total production of spirits in Austria. Then follow the petroleum refineries and kindred industries, saw-mills and the fabrication of various wood articles, paper and milling. The sugar factory at Tlumacz and the tobacco factory at Winniki are amongst the largest establishments of their kind in Austria. Cloth manufacture is concentrated at Biala, while the weaving of linen and of woollens is pursued as a household industry, the former in the Carpathian region, the latter in eastern Galicia. The commerce, which is mainly in the hands of the Jews, is very active, and the transit trade to Russia and to the East is also of considerable importance.

Galicia had in 1900 a population of 7,295,538, which is equivalent to 241 inhabitants per sq. m. The two principal nationalities are the Poles (45%) and the Ruthenians (42%), the former predominating in the west and in the big towns, and the latter in the east. The Poles who inhabit the Carpathians are distinguished as Goralians (from *góry*, mountain), and those of the lower regions as Mazures and Cracoviaks. The Ruthenian highlanders bear the name of Huzulians. The Poles are mostly Roman Catholics, the Ruthenians are Greek Catholics, and there are over 770,000 Jews, and about 2500 Armenians, who are Catholics and stand under the jurisdiction of an Armenian archbishop at Lemberg.

The Roman Catholic Church has an archbishop, at Lemberg, and three bishops, at Cracow, at Przemysl and at Tarnow, and the Greek Catholic Church is represented by an archbishop, at Lemberg, and two bishops, at Przemysl and at Stanislau. At the head of the educational institutions stand the two universities of Lemberg and Cracow, and the Polish academy of science at Cracow.

The local Diet is composed of 151 members, including the 3 archbishops, the 5 bishops, and the 2 rectors of the universities, and Galicia sends 78 deputies to the Reichsrat at Vienna. For administrative purposes, the province is divided into 78 districts and 2 autonomous municipalities—Lemberg (pop. 159,618), the capital, and Cracow (91,310). Other principal towns are: Przemysl (46,439), Kolomea (34,188), Tarnów (31,548), Tarnopol (30,368), Stanislau (29,628), Stryj (23,673), Jaroslau (22,614), Drohobycz (19,146), Podgórze (18,142), Brody (17,360), Sambor (17,027), Neusandec (15,724), Rzeszów (14,714), Zloczow (12,209), Grodek (11,845), Horodenka (11,615), Buczacz (11,504), Sniatyn (11,498), Brzezany (11,244), Kuty (11,127), Boryslaw (10,671), Chrzanów (10,170), Jaworów (10,090), Bochnia (10,049) and Biala (8265).

Galicia (or Halicz) took its rise, along with the neighbouring principality of Lodomeria (or Vladimir), in the course of the 12th century—the seat of the ruling dynasty being Halicz or Halitch. Disputes between the Galician and Lodomerian houses led to the interference of the king of Hungary, Bela III., who in 1190 assumed the title of king, and appointed his son Andreas lieutenant of the kingdom. Polish assistance, however, enabled Vladimir, the former possessor, to expel Andreas, and in 1198 Roman, prince of Lodomeria, made himself master of Galicia also. On his death in 1205 the struggle between Poland and Hungary for supremacy in the country was resumed; but in 1215 it was arranged that Daniel (1205-1264), son of Roman, should be invested with Lodomeria, and Coloman, son of the Hungarian king, with Galicia. Coloman, however, was expelled by Mstislav of Novgorod; and in his turn Andreas, Mstislav’s nominee, was expelled by Daniel of Lodomeria, a powerful prince, who by a flexible policy succeeded in maintaining his position. Though in 1235 he had recognized the overlordship of Hungary, yet, when he found himself hard pressed by the Mongolian general Batu, he called in the assistance of Innocent IV., and accepted the crown of Galicia from the hands of a papal legate; and again, when Innocent disappointed his expectation, he returned to his former connexion with the Greek Church. On the extinction of his line in 1340 Casimir III. of Poland incorporated Galicia and Lemberg; on Casimir’s death in 1370 Louis the Great of Hungary, in accordance with previous treaties, became king of Poland, Galicia and Lodomeria; and in 1382, by the marriage of Louis’s daughter with Ladislaus II., Galicia, which he had regarded as part of his Hungarian rather than of his Polish possessions, became definitively assigned to Poland. On the first partition of Poland, in 1772, the kingdom of Galicia and Lodomeria came to Austria, and to this was added the

district of New or West Galicia in 1795; but at the peace of Vienna in 1809 West Galicia and Cracow were surrendered to the grand-duchy of Warsaw, and in 1810 part of East Galicia, including Tarnopol, was made over to Russia. This latter portion was recovered by Austria at the peace of Paris (1814), and the former came back on the suppression of the independent republic of Cracow in 1846. After the introduction of the constitution of February 1861, Galicia gained a larger degree of autonomy than any other province in the Austrian empire.

See *Die österreichisch-ungarische Monarchie in Wort und Bild*, vol. 19 (Wien, 1885-1902, 24 vols.); *Die Länder Österreich-Ungarns in Wort und Bild*, vol. 10 (Wien, 1881-1886, 15 vols.). Remarkable sketches of Galician life are to be found in the works of the German novelist Sacher-Masoch (1835-1895).

GALICIA (the ancient *Gallaecia* or *Callaecia*, Καλλαικία or Καλαικία), a captaincy-general, and formerly a kingdom, countship and province, in the north-western angle of Spain; bounded on the N. by the Bay of Biscay, E. by Leon and Asturias, S. by Portugal, and W. by the Atlantic Ocean. Pop. (1900) 1,980,515; area, 11,254 sq. m. In 1833 Galicia was divided for administrative purposes into the provinces of Corunna, Lugo, Orense and Pontevedra.

Galicia is traversed by mountain ranges, sometimes regarded as a continuation of the Cantabrian chain; and its surface is further broken in the east by the westernmost ridges of that system, which, running in a south-westerly direction, rise above the basin of the Miño. The high land north of the headwaters of the Miño forms the sole connecting link between the Cantabrians properly so-called and the mountains of central and western Galicia. The average elevation of the province is considerable, and the maximum height (6593 ft.) is reached in the Peña Trevinca on the eastern border of Orense.

The principal river is the Miño (Portuguese *Minho*; Lat. *Minius*; so named, it is said, from the *minium* or vermilion found in its bed). Rising near Mondoñedo, within 25 m. of the northern coast, the Miño enters the Atlantic near the port of Guardia, after a course of 170 m. S. and S.W. Its lower reaches are navigable by small vessels. Of its numerous affluents the most important is the Sil, which rises among the lofty mountains between Leon and Asturias. Among other rivers having a westerly direction may be mentioned the Tambre, the Ulla and the Lerez or Ler, which falls into the Atlantic by estuaries or *rias* called respectively Ria de Muros y Noya, Ria de Arosa and Ria de Pontevedra. The rivers of the northern versant, such as the Nera, are, like those of Asturias, for the most part short, rapid and subject to violent floods.

The coast-line of Galicia, extending to about 240 m., is everywhere bold and deeply indented, presenting a large number of secure harbours, and in this respect forming a marked contrast to the neighbouring province. The Eo, which bounds Galicia on the east, has a deep estuary, the Rivadeo or Ribadeo, which offers a safe and commodious anchorage. Vivero Bay and the Ria del Barquero y Váres are of a similar character; while the harbour of Ferrol ranks among the best in Europe, and is the chief naval station on the northern coast of Spain. On the opposite side of Betanzos Bay (the μέγας λιμήν or *Portus Magnus* of the ancients) is the great port of Corunna or Coruña. The principal port on the western coast is that formed by the deep and sheltered bay of Vigo, but there are also good roadsteads at Corcubion under Cape Finisterre, at Marin and at Carril.

The climate of the Galician coast is mild and equable, but the interior, owing to the great elevation (the town of Lugo is 1500 ft. above sea-level), has a wide range of temperature. The rainfall is exceptionally large, and snow lies on some of the loftier elevations for a considerable portion of the year. The soil is on the whole fertile, and the produce very varied. A considerable quantity of timber is grown on the high lands, and the rich valley pastures support large herds of cattle, while the abundance of oaks and chestnuts favours the rearing of swine. In the lowland districts good crops of maize, wheat, barley, oats and rye, as well as of turnips and potatoes, are obtained. The fruit also is of excellent quality and in great variety, although the culture of the vine is limited to some of the warmer valleys in the southern districts. The *dehesas* or moorlands abound in game, and fish are plentiful in all the streams. The mineral resources of the province, which are considerable, were known to some extent to the ancients. Strabo (*c.* 63 B.C.-A.D. 21) speaks of its gold and tin, and Pliny (A.D. 23-79) mentions the *gemma Gallaica*, a precious stone. Galicia is also remarkable for the number of its sulphur and other warm springs, the most important of which are those at

Lugo, and those from which Orense is said to take its name (*Aquae urentes*).

Ethnologically the Galicians (*Gallegos*) are allied to the Portuguese, whom they resemble in dialect, in appearance and in habits more than the other inhabitants of the peninsula. The men are well known all over Spain and Portugal as hardy, honest and industrious, but for the most part somewhat unskilled, labourers; indeed the word *Gallego* has come to be almost a synonym in Madrid for a "hewer of wood and drawer of water." It is also used as a term of abuse, meaning "boor." Agriculture engages the greater part of the resident population, both male and female; other industries, except the fisheries, are little developed. The largest town in Galicia is Corunna (pop. 1900, 43,971); Santiago de Compostela is the ancient capital and an archiepiscopal see; Lugo, Tuy, Mondoñedo and Orense are bishoprics.

Gallaecia, the country of the Galacci, *Callaici* or *Gallaici*, seems to have been very imperfectly known to the earlier geographers. According to Eratosthenes (276-196 B.C.) the entire population of the peninsula were at one time called *Galatae*. The region properly called by their name, bounded on the south by the Douro and on the east by the Navia, was first entered by the Roman legions under Decius Junius Brutus in 137-136 B.C. (Livy lv., lvi., *Epit.*); but the final subjugation cannot be placed earlier than the time of Augustus (31 B.C.-A.D. 14). On the partition of Spain, which followed the successful invasions of the Suevi, Alans and Vandals, Gallaecia fell to the lot of the first named (A.D. 411). After an independent subsistence of nearly 200 years, the Suevian kingdom was annexed to the Visigothic dominions under Leovigild in 585. In 734 it was occupied by the Moors, who in turn were driven out by Alphonso I. of Asturias, in 739. During the 9th and 10th centuries it was the subject of dispute between more than one count of Galicia and the suzerain, and its coasts were repeatedly ravaged by the Normans. When Ferdinand I. divided his kingdom among his sons in 1063, Galicia was the portion allotted to Garcia, the youngest of the three. In 1072 it was forcibly reannexed by Garcia's brother Alphonso VI. of Castile and thenceforward it remained an integral part of the kingdom of Castile or of Leon. The honorary title of count of Galicia has frequently been borne by younger sons of the Spanish sovereign.

See Annette B. Meakin, *Galicia, the Switzerland of Spain* (London, 1909).

GALIGNANI, GIOVANNI ANTONIO (1752-1821), newspaper publisher, was born at Brescia, Italy, in 1752. After living some time in London, he went to Paris, where he started in 1800 an English library, and in 1808 a monthly publication, the *Repertory of English Literature*. In 1814 he began to publish, in Paris, *Galignani's Messenger*, a daily paper printed in English. At his death in 1821 the paper was carried on by his two sons, Jean-Antoine (1796-1873) and Guillaume (1798-1882). Under their management it enjoyed a high reputation. Its policy was to promote good feeling between England and France. The brothers established and endowed hospitals at Corbeil and at Neuilly-sur-Seine. In recognition of their generosity the city of Corbeil erected a monument in their honour. In 1884 the Galignani family disposed of their interest in *Galignani's Messenger*, and from that date until 1904, when it was discontinued, the paper appeared under the title of the *Daily Messenger*.

GALILEE (Heb. גליל, "border" or "ring," Gr. Γαλιλαία), a Roman province of Palestine north of Samaria, bounded S. by Samaria and the Carmel range, E. by the Jordan, N. by the Leontes (Litāni), and W. by the Mediterranean and part of Phoenicia. Its maximum extent was about 60 m. north to south and 30 east to west. The name in the Hebrew Scriptures hardly had a definite territorial significance. It literally means a ring or circuit, and, like analogous words in English, could be applied to various districts. Thus Joshua (xiii. 2) and Joel (iii. 4) refer to the *Geliloth* ("borders, coast") of the Philistines or of Palestine; Joshua again (xxii. 10, 11) and Ezekiel (xlvii. 8) mention the Jordan valley plain as the "Geliloth of Jordan" in "the Eastern Gelilah." In its more restricted connotation, denoting the district to which it is usually applied or a part thereof, it is found in Joshua xx. 7, xxi. 32, 1 Chr. vi. 76, as the place where was situated the town of Kadesh; and in 1 Kings ix. 11, the district of

“worthless” cities given by Solomon to Hiram. In Isa. ix. 1 we find the full name of the district, Galil ha-Goyim, literally “the ring, circuit or border of the foreigners”—referring to the Phoenicians, Syrians and Aramaeans, by whose country the province was on three sides surrounded. In 1 Kings xv. 29 it is specified as one of the districts whose population was deported by Tiglath-Pileser. Throughout the Old Testament history, however, Galilee as a whole cannot be said to have a history; the unit of territorial subdivision was tribal rather than provincial, and though such important events as those associated with the names of Barak, Gideon, Gilboa, Armageddon, took place within its borders, yet these belong rather to the histories of Issachar, Zebulon, Asher or Naphtali, whose territories together almost correspond with Galilee, than to the province itself.

After the Jewish return from exile the population confined itself to Judaea, and Galilee was left in the possession of the mixed multitude of successors established there by the Assyrians. When it once more came into Israelite hands is uncertain; it is generally supposed that its reconquest was due to John Hyrcanus. Before very long it developed a nationalism and patriotism as intense as that of Judaea itself, notwithstanding the contempt with which the metropolitans of Jerusalem looked down upon the Galilean provincials. Stock proverbial sayings such as “Out of Galilee cometh no prophet” (though Deborah, Jonah, Elisha, and probably Hosea, were Galileans) were apparently common. Provincialism of speech (Matt. xxvi. 73) distinguished the Galileans; it appears that they confused the gutturals in pronunciation.

Under the Roman domination Galilee was made a tetrarchate governed by members of the Herod family. Herod the Great was tetrarch of Galilee in 47 B.C.; in 4 B.C. he was succeeded by his son Antipas. Galilee was the land of Christ’s boyhood and the chief centre of His active work, and in His various ministries here some of His chief discourses were uttered (as the Sermon on the Mount, Matt. v.) and some of His chief miracles performed.

After the destruction of Jerusalem the Judaean Rabbinic schools took refuge in the Galilee they had heretofore despised. No ancient remains of Jewish synagogues exist except those that have been identified in some of the ancient Galilean towns, such as Tell Ḥum (Talḥūm), Kerāzeh, Kefr Birʾīm, and elsewhere. One of the chief centres of Rabbinism was Ṣafed, still a sacred city of the Jews and largely inhabited by members of that faith. Near here is Meirūn, a place much revered by the Jews as containing the tombs of Hillel, Shammai and Simon ben Yohai; a yearly festival in honour of these rabbis is here celebrated. At Tiberias also are the tombs of distinguished Jewish teachers, including Maimonides.

The province was subdivided into two parts, Upper and Lower Galilee, the two being divided by a ridge running west to east, which prolonged would cut the Jordan about midway between Ḥūleh and the Sea of Galilee. Lower Galilee includes the plains of Buttauf and Esdraelon.

Lower Galilee.

The whole of Galilee presents country more or less disturbed by volcanic action. In the lower division the hills are all tilted up towards the east, and broad streams of lava have flowed over the plateau above the sea of Galilee. In this district the highest hills are only about 1800 ft. above the sea. The ridge of Nazareth rises north of the great plain of Esdraelon, and north of this again is the fertile basin of the Buttauf, separated from the sea-coast plains by low hills. East of the Buttauf extends the basaltic plateau called Sahel el Aḥmā (“the inaccessible plain”), rising 1700 ft. above the Sea of Galilee. North of the Buttauf is a confused hill country, the spurs falling towards a broad valley which lies at the foot of the mountains of Upper Galilee. This broad valley, running westwards to the coast, is perhaps the old boundary of Zebulun—the valley of Jiphthah-el (Josh, xix. 14). The great plain of Esdraelon is of triangular form, bounded by Gilboa on the east and by the ridge which runs to Carmel on the west. It is 14 m. long from Jenīn to the Nazareth hills, and its southern border is about 20 m. long. It rises 200 ft. above the sea, the hills on both sides being some 1500 ft. higher. The whole drainage is collected by the Kishon, which runs through a narrow gorge at the north-west corner of the plain, descending beside the ridge of Carmel to the sea. The broad valley of Jezreel on the east, descending towards the Jordan valley, forms the gate by which Palestine is entered from beyond Jordan. Mount Tabor stands isolated in the plain at the north-east corner, and rather farther south the conical hill called Nebi Duḥi rises between Tabor and Gilboa. The whole of Lower Galilee is well watered. The Kishon is fed by springs from near Tabor and from a copious stream from the west side of the plain of Esdraelon. North-west of Nazareth is Wādi el Melek, an open valley full of springs. The river Belus, just south of Acre, rising in the sea-coast marshes, drains the whole valley above identified with Jiphthah-el. On the east the broad valley of Jezreel is full of magnificent springs, many of which are thermal. The plains of Esdraelon, and the Buttauf, and the plateau of el-Aḥmā are all remarkable for the rich basaltic soil which covers them, in which corn, cotton, maize, sesame, tobacco, millet

and various kinds of vegetable are grown, while indigo and sugar-cane were cultivated in former times. The Nazareth hills and Gilboa are bare and white, but west of Nazareth is a fine oak wood, and another thick wood spreads over the northern slopes of Tabor. The hills west of the great plain are partly of bare white chalk, partly covered with dense thickets. The mountains north of the Buttauf are rugged and covered with scrub, except near the villages, where fine olive groves exist. The principal places of importance in Lower Galilee are Nazareth (10,000 inhabitants), Sepphoris (now Seffuria), a large village standing above the Buttauf on the spurs of the southern hills, and Jenīn (En Gannim), a flourishing village, with a palm garden (3000 inhabitants). The ancient capital, Jezreel (Zerin), is now a miserable village on a precipitous spur of Gilboa; north of this are the small mud hamlets, Solam (Shunem), Endūr (Endor), Nein (Nain); on the west side of the plain is the ruin of Lejjūn (the Legio of the 4th century, which was then a place of importance). In the hills north of the Buttauf is Jefāt, situated on a steep hill-top, and representing the Jotapata defended by Josephus. Kefr Kenna, now a flourishing Christian village at the foot of the Nazareth hills, south of the Buttauf, is one of the sites identified with Cana of Galilee, and the ruin Kāna, on the north side of the same plain, represents the site pointed out to the pilgrims of the 12th and 13th centuries.

Upper Galilee.

The mountains are tilted up towards the Sea of Galilee, and the drainage of the district is towards the north-west. On the south the rocky range of Jebel Jarmūk rises to nearly 4000 ft. above the sea; on the east a narrow ridge 2800 ft. high forms the watershed, with steep eastern slopes falling towards Jordan. Immediately west of the watershed are two small plateaus covered with basaltic débris, near el-Jish and Kades. On the west are rugged mountains with deep intricate valleys. The main drains of the country are—first, Wādi el ʻAyūn, rising north of Jebel Jarmūk, and running north-west as an open valley; and secondly, Wādi el Ahjār, a rugged precipitous gorge running north to join the Leontes. The district is well provided with springs throughout, and the valleys are full of water in the spring-time. Though rocky and difficult, Upper Galilee is not barren, the soil of the plateaus is rich, and the vine flourishes in the higher hills, especially in the neighbourhood of Kefr Birʼīm. The principal town is Ṣafed, perched on a white mountain 2700 ft. above the sea. It has a population of about 9000, including Jews, Christians and Moslems.

Josephus gives a good description of the Galilee of his time in *Wars*, iii. 3. 2: “The Galileans are inured to war from their infancy, and have been always very numerous; nor hath the country been ever destitute of men of courage or wanted a numerous set of them; for their soil is universally rich and fruitful, and full of plantations of trees of all sorts, insomuch that it invites the most slothful to take pains in its cultivation.... Moreover, the cities lie here very thick, and the very many villages there are here are everywhere full of people.” Though the population is diminished and the cities ruinous, the country is still remarkable for fertility, thanks to the copiousness of its water-supply draining from the Lebanon mountains.

The principal products of the country are corn, wine, oil and soap (from the olives), with every species of pulse and gourd.

The antiquities of Galilee include dolmens and rude stone monuments, rock-cut tombs, and wine-presses, with numerous remains of Byzantine monasteries and fine churches of the time of the crusades. There are also remains of Greek architecture in various places; but the most interesting buildings are the ancient synagogues, of which some eleven examples are now known. They are rectangular, with the door to the south, and two rows of columns forming aisles east and west. The architecture is a peculiar and debased imitation of classic style, attributed by architects to the 2nd century A.D. In Kefr Birʼīm there were remains of two synagogues, but early in the 20th century one of them was completely destroyed by a local stone-mason. At Irbid, above Tiberias, is another synagogue of rather different character. Traces of synagogues have also been found on Carmel, and at Tireh, west of Nazareth. It is curious to find the representation of various animals in relief on the lintels of these buildings. Hebrew inscriptions also occur, and the carved work of the cornices and capitals is rich though debased.

In the 12th century Galilee was the outpost of the Christian kingdom of Jerusalem, and its borders were strongly protected by fortresses, the magnificent remains of which still crown the most important strategical points. Toron (mod. *Tibnīn*) was built in 1104, the first fortress erected by the crusaders, and standing on the summit of the mountains of Upper Galilee. Beauvoir (Kaukab el-Hawa, built in 1182) stood on a precipice above Jordan south-west of the Sea of Galilee, and guarded the advance by the valley of Jezreel; and about the same time Château Neuf (Hunīn) was erected above the Hüleh lake. Belfort (esh Shukif), on the north bank of the Leontes, the finest and most important, dates somewhat earlier; and

Montfort (Kalat el Kurn) stood on a narrow spur north-east of Acre, completing the chain of frontier fortresses. The town of Banias, with its castle, formed also a strong outpost against Damascus, and was the scene, in common with the other strongholds, of many desperate encounters between Moslems and Christians. Lower Galilee was the last remaining portion of the Holy Land held by the Christians. In 1250 the knights of the Teutonic order owned lands extending round Acre as far east as the Sea of Galilee, and including Ṣafed. These possessions were lost in 1291, on the fall of Acre.

The population of Galilee is mixed. In Lower Galilee the peasants are principally Moslem, with a sprinkling of Greek Christians round Nazareth, which is a Christian town. In Upper Galilee, however, there is a mixture of Jews and Maronites, Druses and Moslems (natives or Algerine settlers), while the slopes above the Jordan are inhabited by wandering Arabs. The Jews are engaged in trade, and the Christians, Druses and Moslems in agriculture; and the Arabs are an entirely pastoral people.

(C. R. C.; R. A. S. M.)

GALILEE, an architectural term sometimes given to a porch or chapel which formed the entrance to a church. This is the case at Durham and Ely cathedrals, and in Lincoln cathedral the name is sometimes given to the south-west porch. The name is said to be derived from the scriptural expression “Galilee of the Gentiles” (Matt. iv. 15). Galilees are supposed to have been used sometimes as courts of law, but they probably served chiefly for penitents not yet admitted to the body of the church. The Galilee would also appear to have been the vestibule of an abbey church where women were allowed to see the monks to whom they were related, or from which they could hear divine service. The foundation of what is considered to have been a Galilee exists at the west end of Fountains Abbey. Sometimes also corpses were placed there before interment.

GALILEE, SEA OF, a lake in Palestine consisting of an expansion of the Jordan, on the latitude of Mt. Carmel. It is 13 m. long, 8 m. broad, 64 sq. m. in area, 680 ft. below the level of the Mediterranean, and, according to Merrill and Barrois (who have corrected the excessive depth said to have been found by Lortet at the northern end), 150 ft. in maximum depth. It is pear-shaped, the narrow end pointing southward. In the Hebrew Scriptures it is called the Sea of Chinnereth or Chinneroth (probably derived from a town of the same name mentioned in Joshua xi. 2 and elsewhere; the etymology that connects it with כנור, “a harp,” is very doubtful.) In Josephus and the book of Maccabees it is named Gennesar; while in the Gospels it is usually called Sea of Galilee, though once it is called Lake of Gennesaret (Luke v. i) and twice Sea of Tiberias (John vi. 1, xxi. 1). The modern Arabic name is *Baḥr Tubarīya*, which is often rendered “Lake of Tiberias.” Pliny refers to it as the Lake of Taricheae.

Like the Dead Sea it is a “rift” lake, being part of the great fault that formed the Jordan-Araba depression. Deposits show that originally it formed part of the great inland sea that filled this depression in Pleistocene times. The district on each side of the lake has a number of hot springs, at least one of which is beneath the sea itself, and has always shown indications of volcanic and other subterranean disturbances. It is especially liable to earthquakes. The water of the sea, though slightly brackish and not very clear, is generally used for drinking. The shores are for the greater part formed of fine gravel; some yards from the shore the bed is uniformly covered with fine greyish mud. The temperature in summer is tropical, but after noon falls about 10º F. owing to strong north-west winds. This range of temperature affects the water to a depth of about 49 ft.; below that depth the water is uniformly about 59° F. The sea is set deep in hills which rise on the east side to a height of about 2000 ft. Sudden and violent storms (such as are described in Matt. viii. 23, xiv. 22, and the parallel passages) are often produced by the changes of temperature in the air resulting from these great differences of level.

The Sea of Galilee is best seen from the top of the western precipices. It presents a desolate appearance. On the north the hills rise gradually from the shore, which is fringed

with oleander bushes and indented with small bays. The ground is here covered with black basalt. On the west the plateau known as Sahel el-Ahma terminates in precipices 1700 ft. above the lake, and over these the black rocky tops called “the Horns of Hattīn” are conspicuous objects. On the south is a broad valley through which the Jordan flows. On the east are furrowed and rugged slopes, rising to the great plateau of the Jaulān (Gaulonitis). The Jordan enters the lake through a narrow gorge between lower hills. A marshy plain, 2½ m. long and 1½ broad, called el-Batīhah, exists immediately east of the Jordan inlet. There is also on the west side of the lake a small plain called el-Ghuweir, formed by the junction of three large valleys. It measures 3¼ m. along the shore, and is 1 m. wide. This plain, naturally fertile, but now almost uncultivated, is supposed to be the plain of Gennesareth, described by Josephus (B. J. iii. 10, 8). On the east the hills approach in one place within 40 ft. of the water, but there is generally a width of about ¾ of a mile from the hills to the beach. On the west the flat ground at the foot of the hills has an average width of about 200 yds. A few scattered palms dot the western shores, and a palm grove is to be found near Kefr Hārib on the south-east. The hot baths south of Tiberias include seven springs, the largest of which has a temperature of 137° F. In these springs a distinct rise in temperature was observed in 1837, when Tiberias and Ṣafed were destroyed by an earthquake. The plain of Gennesareth, with its environs, is the best-watered part of the lake-basin. North of this plain are the five springs of et-Tabighah, the largest of which was enclosed about a century ago in an octagonal reservoir by ‘Ali, son of Dhahr el-Amīr, and the water led off by an aqueduct 52 ft. above the lake. The Tabighah springs, though abundant, are warm and brackish. At the north end of the plain is ’Ain et-Tīneh (“spring of the fig-tree”), also a brackish spring with a good stream; south of the plain is ‘Ain el-Bardeh (“the cold spring”), which is sweet, but scarcely lower in temperature than the others. One of the most important springs is ‘Ain el-Madawwera (“the round spring”), situated 1 m. from the south end of the plain and half a mile from the shore. The water rises in a circular well 32 ft. in diameter, and is clear and sweet, with a temperature of 73° F. The bottom is of loose sand, and the fish called *coracinus* by Josephus (B.J. iii. 10, 8) is here found (see below). Dr Tristram was the first explorer to identify this fish, and on account of its presence suggested the identification of the “round spring” with the fountain of *Capharnaum*, which, according to Josephus, watered the plain of Gennesareth. There is, however, a difficulty in this identification; there are no ruins at ‘Ain el-Madawwera.

Fauna and Flora.—For half the year the hillsides are bare and steppe-like, but in spring are clothed with a subtropical vegetation. Oleanders flourish round the lake, and the large papyrus grows at ’Ain et-Tin as well as at the mouth of the Jordan. The lake swarms with fish, which are caught with nets by a gild of fishermen, whose boats are the only representatives of the many ships and boats which plied on the lake as late as the 10th century. Fishing was a lucrative industry at an early date, and the Jews ascribed the laws regulating it to Joshua. The fish, which were classed as clean and unclean, the good and bad of the parable (Matt. xiii. 47, 48), belong to the genera *Chromis*, *Barbus*, *Capoeta*, *Discognathus*, *Nemachilus*, *Blennius* and *Clarias*; and there is a great affinity between them and the fish of the East African lakes and streams. There are eight species of *Chromis*, most of which hatch their eggs and raise their young in the buccal cavities of the males. The *Chromis simonis* is popularly supposed to be the fish from which Peter took the piece of money (Matt. xvii. 27). *Clarias macracanthus* (Arab. *Burbur*) is the *coracinus* of Josephus. It was found by Lortet in the springs of ‘Ain el-Madawwera, ‘Ain et-Tīneh and ‘Ain et-Tabighah, on the lake shore where muddy, and in Lake Hüleh. It is a scaleless, snake-like fish, often nearly 5 ft. long, which resembles the *C. anguillaris* of Egypt. From the absence of scales it was held by the Jews to be unclean, and some commentators suppose it to be the serpent of Matt. vii. 10 and Luke xi. 11. Large numbers of grebes—great crested, eared, and little,—gulls and pelicans frequent the lake. On its shores are tortoises, mud-turtles, crayfish and innumerable sand-hoppers; and at varying depths in the lake several species of *Melania*, *Melanopsis*, *Neritina*, *Corbicula* and *Unio* have been found.

Antiquities.—The principal sites of interest round the lake may be enumerated from north to west and from south to east. Kerazeh, the undoubted site of Chorazin, stands on a rocky spur 900 ft. above the lake, 2 m. north of the shore. Foundations and scattered stones cover the slopes and the flat valley below. On the west is a rugged gorge. In the middle of the ruins are the scattered remains of a synagogue of richly ornamental style built of black basalt. A small spring occurs on the north. Tell Ḥum (as the name is generally spelt, though *Talḥūm* would probably be preferable for several reasons) is an important ruin on the shore, south of the last-mentioned site. The remains consist of foundations and piles of stones (in spring concealed by gigantic thistles) extending about half a mile along the shore. The foundations of a fine synagogue, measuring 75 ft. by 57, and built in white limestone, have been excavated. A conspicuous building has been erected close to the water, from the fragments of the Tell Ḥum synagogue. Since the 4th century Tell Ḥum has been pointed out by all the Christian writers of importance as the site of Capernaum. Some modern

geographers question this identification, but without sufficient reason (see CAPERNAUM). Minyeh is a ruined site at the north end of the plain of Gennesareth, 2½ m. from the last, and close to the shore. There are extensive ruins on flat ground, consisting of mounds and foundations. Masonry of well-dressed stones has also been here discovered in course of excavation. Near the ruins are remains of an old khān, which appears to have been built in the middle ages. This is another suggested identification for Capernaum; but all the remains belong to the Arab period. Between Tell Ḥum and Minyeh is *Tell 'Oreimeh*, the site of a forgotten Amorite city.

South of the supposed plain of Gennesareth is Mejdel, commonly supposed to represent the New Testament town of Magdala. A few lotus trees and some rock-cut tombs are here found beside a miserable mud hamlet on the hill slope, with a modern tombhouse (*kubbeh*). Passing beneath rugged cliffs a recess in the hills is next reached, where stands Tubarīya, the ancient Tiberias or Rakkath, containing 3000 inhabitants, more than half of whom are Jews. The walls, flanked with round towers, but partly destroyed by the earthquake of 1837, were built by Dhahr el-Amīr, as was the court-house. The two mosques, now partly ruinous, were erected by his sons. There are remains of a Crusaders' church, and the tomb of the celebrated Maimonides is shown in the town, while Rabbi Aqība and Rabbi Meir lie buried outside. The ruins of the ancient city, including granite columns and traces of a sea-wall with towers, stretch southwards a mile beyond the modern town. An aqueduct in the cliff once brought water a distance of 9 m. from the south.

Kerak, at the south end of the lake, is an important site on a peninsula surrounded by the water of the lake, by the Jordan, and by a broad water ditch, while on the north-west a narrow neck of land remains. The plateau thus enclosed is partly artificial, and banked up 50 or 60 ft. above the water. A ruined citadel remains on the north-west, and on the east was a bridge over the Jordan; broken pottery and fragments of sculptured stone strew the site. The ruin of Kerak answers to the description given by Josephus of the city of Taricheae, which lay 30 stadia from Tiberias, the hot baths being between the two cities. Taricheae was situated, as is Kerak, on the shore below the cliffs, and partly surrounded by water, while before the city was a plain (the Ghor). Pliny further informs us that Taricheae was at the south end of the Sea of Galilee. *Sinn en-Nabreh*, a ruin on a spur of the hills close to the last-mentioned site, represents the ancient Sennabris, where Vespasian (Josephus, *B.J.* iii. 9, 7) fixed his camp, advancing from Scythopolis (Beisen) on Taricheae and Tiberias. Sennabris was 30 stadia from Tiberias, or about the distance of the ruin now existing.

The eastern shores of the Sea of Galilee have been less fully explored than the western, and the sites are not so perfectly recovered. The site of Hippos, one of the cities of Decapolis, is fixed by Clermont-Ganneau at Khurbet Susieh. Kalat el-Hosn ("castle of the stronghold") is a ruin on a rocky spur opposite Tiberias. Two large ruined buildings remain, with traces of an old street and fallen columns and capitals. A strong wall once surrounded the town; a narrow neck of land exists on the east where the rock has been scarped. Rugged valleys enclose the site on the north and south; broken sarcophagi and rock-cut tombs are found beneath the ruin. This site is not identified; the suggestion that it is Gamala is doubtful, and not borne out by Josephus (*War*, iv. 1, 1), who says Gamala was over against Taricheae. Kersa, an insignificant ruin north of the last, is thought to represent the Gerasa or Gergesa of the 4th century, situated east of the lake; and the projecting spur of hill south of this ruin is conjectured to be the place where the swine "ran violently down a steep place" (Matt. viii. 32).

(C. R. C; C. W. W.; R. A. S. M.)

GALILEO GALILEI (1564-1642), Italian astronomer and experimental philosopher, was born at Pisa on the 15th of February 1564. His father, Vincenzio, was an impoverished descendant of a noble Florentine house, which had exchanged the surname of Bonajuti for that of Galilei, on the election, in 1343, of one of its members, Tommaso de' Bonajuti, to the college of the twelve Buonuomini. The family, which was nineteen times represented in the signoria, and in 1445 gave a gonfalonier to Florence, flourished with the republic and declined with its fall. Vincenzio Galilei was a man of better parts than fortune. He was a competent mathematician, wrote with considerable ability on the theory and practice of music, and was especially distinguished amongst his contemporaries for the grace and skill of his performance upon the lute. By his wife, Giulia Ammannati of Pescia, he had three sons

and four daughters.

From his earliest childhood Galileo, the eldest of the family, was remarkable for intellectual aptitude as well as for mechanical invention. His favourite pastime was the construction of original and ingenious toy-machines; but his application to literary studies was equally conspicuous. In the monastery of Vallombrosa, near Florence, where his education was principally conducted, he not only made himself acquainted with the best Latin authors, but acquired a fair command of the Greek tongue, thus laying the foundation of his brilliant and elegant style. From one of the monks he also received instruction in logic; but the subtleties of the scholastic science were thoroughly distasteful to him. A document published by F. Selmi in 1864 proves that he was at this time so far attracted towards a religious life as to have joined the novitiate; but his father, who had other designs for him, seized the opportunity of an attack of ophthalmia to withdraw him permanently from the care of the monks. Having had personal experience of the unremunerative character both of music and of mathematics, he desired that his son should apply himself to the cultivation of medicine, and, not without some straining of his slender resources, placed him, before he had completed his eighteenth year, at the university of Pisa. He accordingly matriculated there on the 5th of November 1581, and immediately entered upon attendance at the lectures of the celebrated physician and botanist, Andrea Cesalpino.

The natural gifts of the young student seemed at this time equally ready to develop in any direction towards which choice or hazard might incline them. In musical skill and invention he already vied with the best professors of the art in Italy; his personal taste would have led him to choose painting as his profession, and one of the most eminent artists of his day, Lodovico Cigoli, owned that to his judgment and counsel he was mainly indebted for the success of his works. In 1581, while watching a lamp set swinging in the cathedral of Pisa, he observed that, whatever the range of its oscillations, they were invariably executed in equal times. The experimental verification of this fact led him to the important discovery of the isochronism of the pendulum. He at first applied the new principle to pulse-measurement, and more than fifty years later turned it to account in the construction of an astronomical clock. Up to this time he was entirely ignorant of mathematics, his father having carefully held him aloof from a study which he rightly apprehended would lead to his total alienation from that of medicine. Accident, however, frustrated this purpose. A lesson in geometry, given by Ostilio Ricci to the pages of the grand-ducal court, chanced, tradition avers, to have Galileo for an unseen listener; his attention was riveted, his dormant genius was roused, and he threw all his energies into the new pursuit thus unexpectedly presented to him. With Ricci’s assistance, he rapidly mastered the elements of the science, and eventually extorted his father’s reluctant permission to exchange Hippocrates and Galen for Euclid and Archimedes. In 1585 he was withdrawn from the university, through lack of means, before he had taken a degree, and returned to Florence, where his family habitually resided. We next hear of him as lecturing before the Florentine Academy on the site and dimensions of Dante’s *Inferno*; and he shortly afterwards published an essay descriptive of his invention of the hydrostatic balance, which rapidly made his name known throughout Italy. His first patron was the Marchese Guidubaldo del Monte of Pesaro, a man equally eminent in science, and influential through family connexions. At the Marchese’s request he wrote, in 1588, a treatise on the centre of gravity in solids, which obtained for him, together with the title of “the Archimedes of his time,” the honourable though not lucrative post of mathematical lecturer at the Pisan university. During the ensuing two years (1589-1591) he carried on that remarkable series of experiments by which he established the first principles of dynamics and earned the undying hostility of bigoted Aristotelians. From the leaning tower of Pisa he afforded to all the professors and students of the university ocular demonstration of the falsehood of the Peripatetic dictum that heavy bodies fall with velocities proportional to their weights, and with unanswerable logic demolished all the time-honoured maxims of the schools regarding the motion of projectiles, and elemental weight or levity. But while he convinced, he failed to conciliate his adversaries. The keen sarcasm of his polished rhetoric was not calculated to soothe the susceptibilities of men already smarting under the deprivation of their most cherished illusions. He seems, in addition, to have compromised his position with the grand-ducal family by the imprudent candour with which he condemned a machine for clearing the port of Leghorn, invented by Giovanni de’ Medici, an illegitimate son of Cosmo I. Princely favour being withdrawn, private rancour was free to show itself. He was publicly hissed at his lecture, and found it prudent to resign his professorship and withdraw to Florence in 1591. Through the death of his father in July of that year family cares and responsibilities devolved upon him, and thus his nomination to the chair of mathematics at the university of Padua, secured by the influence of the Marchese Guidubaldo with the Venetian senate, was welcome both as

affording a relief from pecuniary embarrassment and as opening a field for scientific distinction.

His residence at Padua, which extended over a period of eighteen years, from 1592 to 1610, was a course of uninterrupted prosperity. His appointment was three times renewed, on each occasion with the expressions of the highest esteem on the part of the governing body, and his yearly salary was progressively raised from 180 to 1000 florins. His lectures were attended by persons of the highest distinction from all parts of Europe, and such was the charm of his demonstrations that a hall capable of containing 2000 people had eventually to be assigned for the accommodation of the overflowing audiences which they attracted. His invention of the proportional compass or sector—an implement still used in geometrical drawing—dates from 1597; and about the same time he constructed the first thermometer, consisting of a bulb and tube filled with air and water, and terminating in a vessel of water. In this instrument the results of varying atmospheric pressure were not distinguishable from the expansive and contractive effects of heat and cold, and it became an efficient measure of temperature only when Rinieri, in 1646, introduced the improvement of hermetically sealing the liquid in glass. The substitution, in 1670, of mercury for water completed the modern thermometer.

Galileo seems, at an early period of his life, to have adopted the Copernican theory of the solar system, and was deterred from avowing his opinions—as is proved by his letter to Kepler of August 4, 1597—by the fear of ridicule rather than of persecution. The appearance, in September 1604, of a new star in the constellation Serpentarius afforded him indeed an opportunity, of which he eagerly availed himself, for making an onslaught upon the Aristotelian axiom of the incorruptibility of the heavens; but he continued to conform his public teachings in the main to Ptolemaic principles, until the discovery of a novel and potent implement of research in the shape of the telescope (*q.v.*) placed at his command startling and hitherto unsuspected evidence as to the constitution and mutual relations of the heavenly bodies. Galileo was not the original inventor of the telescope.[1] That honour must be assigned to Johannes Lippershey, an obscure optician of Middleburg, who, on the 2nd of October 1608, petitioned the states-general of the Low Countries for exclusive rights in the manufacture of an instrument for increasing the apparent size of remote objects. A rumour of the new invention, which reached Venice in June 1609, sufficed to set Galileo on the track; and after one night's profound meditation on the principles of refraction, he succeeded in producing a telescope of threefold magnifying power. Upon this first attempt he rapidly improved, until he attained to a power of thirty-two, and his instruments, of which he manufactured hundreds with his own hands, were soon in request in every part of Europe. Two lenses only—a plano-convex and a plano-concave—were needed for the composition of each, and this simple principle is that still employed in the construction of opera-glasses. Galileo's direction of his new instrument to the heavens formed an era in the history of astronomy. Discoveries followed upon it with astounding rapidity and in bewildering variety. The *Sidereus Nuncius*, published at Venice early in 1610, contained the first-fruits of the new mode of investigation, which were sufficient to excite learned amazement on both sides of the Alps. The mountainous configuration of the moon's surface was there first described, and the so-called "phosphorescence" of the dark portion of our satellite attributed to its true cause—namely, illumination by sunlight reflected from the earth.[2] All the time-worn fables and conjectures regarding the composition of the Milky Way were at once dissipated by the simple statement that to the eye, reinforced by the telescope, it appeared as a congeries of lesser stars, while the great nebulae were equally declared to be resolvable into similar elements. But the discovery which was at once perceived to be most important in itself, and most revolutionary in its effects, was that of Jupiter's satellites, first seen by Galileo on the 7th of January 1610, and by him named *Sidera Medicea*, in honour of the grand-duke of Tuscany, Cosmo II., who had been his pupil, and was about to become his employer. An illustration is, with the general run of mankind, more powerful to convince than an argument; and the cogency of the visible plea for the Copernican theory offered by the miniature system, then first disclosed to view, was recognizable in the triumph of its advocates as well as in the increased acrimony of its opponents.

In September 1610 Galileo finally abandoned Padua for Florence. His researches with the telescope had been rewarded by the Venetian senate with the appointment for life to his professorship, at an unprecedentedly high salary. His discovery of the "Medicean Stars" was acknowledged by his nomination (July 12, 1610) as philosopher and mathematician extraordinary to the grand-duke of Tuscany. The emoluments of this office, which involved no duties save that of continuing his scientific labours, were fixed at 1000 scudi; and it was the desire of increased leisure, rather than the promptings of local patriotism, which induced him to accept an offer the original suggestion of which had indeed come from

himself. Before the close of 1610 the memorable cycle of discoveries begun in the previous year was completed by the observation of the ansated or, as it appeared to Galileo, triple form of Saturn (the ring-formation was first recognized by Christiaan Huygens in 1655), of the phases of Venus, and of the spots upon the sun. As regards sun-spots, however, Johann Fabricius of Osteel in Friesland can claim priority of publication, if not of actual detection. In the spring of 1611 Galileo visited Rome, and exhibited in the gardens of the Quirinal Palace the telescopic wonders of the heavens to the most eminent personages at the pontifical court. Encouraged by the flattering reception accorded to him, he ventured, in his *Letters on the Solar Spots*, printed at Rome in 1613, to take up a more decided position towards that doctrine on the establishment of which, as he avowed in a letter to Belisario Vinta, secretary to the grand-duke, "all his life and being henceforward depended." Even in the time of Copernicus some well-meaning persons, especially those of the reformed persuasion, had suspected a discrepancy between the new view of the solar system and certain passages of Scripture—a suspicion strengthened by the anti-Christian inferences drawn from it by Giordano Bruno; but the question was never formally debated until Galileo's brilliant disclosures, enhanced by his formidable dialectic and enthusiastic zeal, irresistibly challenged for it the attention of the authorities. Although he had no desire to raise the theological issue, it must be admitted that, the discussion once set on foot, he threw himself into it with characteristic impetuosity, and thus helped to precipitate a decision which it was his interest to avert. In December 1613 a Benedictine monk named Benedetto Castelli, at that time professor of mathematics at the university of Pisa, wrote to inform Galileo of a recent discussion at the grand-ducal table, in which he had been called upon to defend the Copernican doctrine against theological objections. This task Castelli, who was a steady friend and disciple of the Tuscan astronomer, seems to have discharged with moderation and success. Galileo's answer, written, as he said himself, *currente calamo*, was an exposition of a formal theory as to the relations of physical science to Holy Writ, still further developed in an elaborate apology addressed by him in the following year (1614) to Christina of Lorraine, dowager grand-duchess of Tuscany. Not satisfied with explaining adverse texts, he met his opponents with unwise audacity on their own ground, and endeavoured to produce scriptural confirmation of a system which seemed to the ignorant many an incredible paradox, and to the scientific few a beautiful but daring innovation. The rising agitation on the subject, fomented for their own purposes by the rabid Aristotelians of the schools, was heightened rather than allayed by these manifestoes, and on the fourth Sunday of the following Advent found a voice in the pulpit of Santa Maria Novella. Padre Caccini's denunciation of the new astronomy was indeed disavowed and strongly condemned by his superiors; nevertheless, on the 5th of February 1615, another Dominican monk named Lorini laid Galileo's letter to Castelli before the Inquisition.

Cardinal Robert Bellarmin was at that time by far the most influential member of the Sacred College. He was a man of vast learning and upright piety, but, although personally friendly to Galileo, there is no doubt that he saw in his scientific teachings a danger to religion. The year 1615 seems to have been a period of suspense. Galileo received, as the result of a conference between Cardinals Bellarmin and Del Monte, a semi-official warning to avoid theology, and limit himself to physical reasoning. "Write freely," he was told by Monsignor Dini, "but keep outside the sacristy." Unfortunately, he had already committed himself to dangerous ground. In December he repaired personally to Rome, full of confidence that the weight of his arguments and the vivacity of his eloquence could not fail to convert the entire pontifical court to his views. He was cordially received, and eagerly listened to, but his imprudent ardour served but to injure his cause. On the 24th of February 1616 the consulting theologians of the Holy Office characterized the two propositions—that the sun is immovable in the centre of the world, and that the earth has a diurnal motion of rotation—the first as "absurd in philosophy, and formally heretical, because expressly contrary to Holy Scripture," and the second as "open to the same censure in philosophy, and at least erroneous as to faith." Two days later Galileo was, by command of the pope (Paul V.), summoned to the palace of Cardinal Bellarmin, and there officially admonished not thenceforward to "hold, teach or defend" the condemned doctrine. This injunction he promised to obey. On the 5th of March the Congregation of the Index issued a decree reiterating, with the omission of the word "heretical," the censure of the theologians, suspending, *usque corrigatur*, the great work of Copernicus, *De revolutionibus orbium coelestium*, and absolutely prohibiting a treatise by a Carmelite monk named Foscarini, which treated the same subject from a theological point of view. At the same time it was given to be understood that the new theory of the solar system might be held *ex hypothesi*, and the trivial verbal alterations introduced into the Polish astronomer's book in 1620, when the work of revision was completed by Cardinal Gaetani, confirmed this interpretation. This edict, it is essential to observe, the responsibility for which rests with a disciplinary

congregation in no sense representing the church, was never confirmed by the pope, and was virtually repealed in 1757 under Benedict XIV.

Galileo returned to Florence three months later, not ill-pleased, as his letters testify, with the result of his visit to Rome. He brought with him, for the refutation of calumnious reports circulated by his enemies, a written certificate from Cardinal Bellarmin, to the effect that no abjuration had been required of or penance imposed upon him. During a prolonged audience he had received from the pope assurances of private esteem and personal protection; and he trusted to his dialectical ingenuity to find the means of presenting his scientific convictions under the transparent veil of an hypothesis. Although a sincere Catholic, he seems to have laid but little stress on the secret admonition of the Holy Office, which his sanguine temperament encouraged him gradually to dismiss from his mind. He preserved no written memorandum of its terms, and it was represented to him, according to his own deposition in 1633, solely by Cardinal Bellarmin's certificate, in which, for obvious reasons, it was glossed over rather than expressly recorded. For seven years, nevertheless, during which he led a life of studious retirement in the Villa Segni at Bellosguardo, near Florence, he maintained an almost unbroken silence. At the end of that time he appeared in public with his *Saggiatore*, a polemical treatise written in reply to the *Libra astronomica* of Padre Grassi (under the pseudonym of Lotario Sarsi), the Jesuit astronomer of the Collegio Romano. The subject in debate was the nature of comets, the conspicuous appearance of three of which bodies in the year 1618 furnished the occasion of the controversy. Galileo's views, although erroneous, since he held comets to be mere atmospheric emanations reflecting sunlight after the evanescent fashion of a halo or a rainbow, were expressed with such triumphant vigour, and embellished with such telling sarcasms, that his opponent did not venture upon a reply. The *Saggiatore* was printed at Rome in October 1623 by the Academy of the Lincei, of which Galileo was a member, with a dedication to the new pope, Urban VIII., and notwithstanding some passages containing a covert defence of Copernican opinions, was received with acclamation by ecclesiastical, no less than by scientific authorities.

Everything seemed now to promise a close of unbroken prosperity to Galileo's career. Maffeo Barberini, his warmest friend and admirer in the Sacred College, was, by the election of the 8th of August 1623, seated on the pontifical throne; and the marked distinction with which he was received on his visit of congratulation to Rome in 1624 encouraged him to hope for the realization of his utmost wishes. He received every mark of private favour. The pope admitted him to six long audiences in the course of two months, wrote an enthusiastic letter to the grand-duke praising the great astronomer, not only for his distinguished learning, but also for his exemplary piety, and granted a pension to his son Vincenzio, which was afterwards transferred to himself, and paid, with some irregularities, to the end of his life. But on the subject of the decree of 1616, the revocation of which Galileo had hoped to obtain through his personal influence, he found him inexorable. Yet there seemed reason to expect that it would at least be interpreted in a liberal spirit, and Galileo's friends encouraged his imprudent confidence by eagerly retailing to him every papal utterance which it was possible to construe in a favourable sense. To Cardinal Hohenzollern, Urban was reported to have said that the theory of the earth's motion had not been and could not be condemned as heretical, but only as rash; and in 1630 the brilliant Dominican monk Tommaso Campanella wrote to Galileo that the pope had expressed to him in conversation his disapproval of the prohibitory decree. Thus, in the full anticipation of added renown, and without any misgiving as to ulterior consequences, Galileo set himself, on his return to Florence, to complete his famous but ill-starred work, the *Dialogo dei due massimi sistemi del mondo*. Finished in 1630, it was not until January 1632 that it emerged from the presses of Landini at Florence. The book was originally intended to appear in Rome, but unexpected obstacles interposed. The Lincean Academy collapsed with the death of Prince Federigo Cesi, its founder and president; an outbreak of plague impeded communication between the various Italian cities; and the *imprimatur* was finally extorted, rather than accorded, under the pressure of private friendship and powerful interest. A tumult of applause from every part of Europe followed its publication; and it would be difficult to find in any language a book in which animation and elegance of style are so happily combined with strength and clearness of scientific exposition. Three interlocutors, named respectively Salviati, Sagredo, and Simplicio, take part in the four dialogues of which the work is composed. The first-named expounds the views of the author; the second is an eager and intelligent listener; the third represents a well-meaning but obtuse Peripatetic, whom the others treat at times with undisguised contempt. Salviati and Sagredo took their names from two of Galileo's early friends, the former a learned Florentine, the latter a distinguished Venetian gentleman; Simplicio ostensibly derived his from the Cilician commentator of Aristotle, but the choice was doubtless instigated by a sarcastic regard to

the double meaning of the word. There were not wanting those who insinuated that Galileo intended to depict the pope himself in the guise of the simpleton of the party; and the charge, though preposterous in itself, was supported by certain imprudences of expression, which Urban was not permitted to ignore.

It was at once evident that the whole tenor of this remarkable work was in flagrant contradiction with the edict passed sixteen years before its publication, as well as with the author's personal pledge of conformity to it. The ironical submission with which it opened, and the assumed indetermination with which it closed, were hardly intended to mask the vigorous assertion of Copernican principles which formed its substance. It is a singular circumstance, however, that the argument upon which Galileo mainly relied as furnishing a physical demonstration of the truth of the new theory rested on a misconception. The ebb and flow of the tides were, he asserted, a visible proof of the terrestrial double movement, since they resulted from inequalities in the absolute velocities through space of the various parts of the earth's surface, due to its rotation. To this notion, which took its rise in a confusion of thought, he attached capital importance, and he treated with scorn Kepler's suggestion that a certain occult attraction of the moon was in some way concerned in the phenomenon. The theological censures which the book did not fail to incur were not slow in making themselves felt. Towards the end of August the sale was prohibited; on the 1st of 409
October the author was cited to Rome by the Inquisition. He pleaded his age, now close upon seventy years, his infirm health, and the obstacles to travel caused by quarantine regulations; but the pope was sternly indignant at what he held to be his ingratitude and insubordination, and no excuse was admitted. At length, on the 13th of February 1633, he arrived at the residence of Niccolini, the Tuscan ambassador to the pontifical court, and there abode in retirement for two months. From the 12th to the 30th of April he was detained in the palace of the Inquisition, where he occupied the best apartments and was treated with unexampled indulgence. On the 30th he was restored to the hospitality of Niccolini, his warm partisan. The accusation against him was that he had written in contravention of the decree of 1616, and in defiance of the command of the Holy Office communicated to him by Cardinal Bellarmin; and his defence consisted mainly in a disavowal of his opinions, and an appeal to his good intentions. On the 21st of June he was finally examined under menace of torture; but he continued to maintain his assertion that after its condemnation by the Congregation of the Index, he had never held the Copernican theory. Since the publication of the documents relating to this memorable trial, there can no longer be any doubt, not only that the threat of torture was not carried into execution, but that it was never intended that it should be. On the 22nd of June, in the church of Santa Maria sopra Minerva, Galileo read his recantation, and received his sentence. He was condemned, as "vehemently suspected of heresy," to incarceration at the pleasure of the tribunal, and by way of penance was enjoined to recite once a week for three years the seven penitential psalms. This sentence was signed by seven cardinals, but did not receive the customary papal ratification. The legend according to which Galileo, rising from his knees after repeating the formula of abjuration, stamped on the ground, and exclaimed, "*Eppur si muove!*" is, as may readily be supposed, entirely apocryphal. Its earliest ascertained appearance is in the Abbé Irailh's *Querelles littéraires* (vol. iii. p. 49, 1761).

Galileo remained in the custody of the Inquisition from the 21st to the 24th of June, on which day he was relegated to the Villa Medici on the Trinità de' Monti. Thence, on the 6th of July, he was permitted to depart for Siena, where he spent several months in the house of the archbishop, Ascanio Piccolomini, one of his numerous and trusty friends. It was not until December that his earnest desire of returning to Florence was realized, and the remaining eight years of his life were spent in his villa at Arcetri called "Il Giojello," in the strict seclusion which was the prescribed condition of his comparative freedom. Domestic afflictions combined with numerous and painful infirmities to embitter his old age. His sister-in-law and her whole family, who came to live with him on his return from Rome, perished shortly afterwards of the plague; and on the 2nd of April 1634 died, to the inexpressible grief of her father, his eldest and best-beloved daughter, a nun in the convent of San Matteo at Arcetri. Galileo was never married; but by a Venetian woman named Marina Gamba he had three children—a son who married and left descendants, and two daughters who took the veil at an early age. His prodigious mental activity continued undiminished to the last. In 1636 he completed his *Dialoghi delle nuove scienze*, in which he recapitulated the results of his early experiments and mature meditations on the principles of mechanics. This in many respects his most valuable work was printed by the Elzevirs at Leiden in 1638, and excited admiration equally universal and more lasting than that accorded to his astronomical treatises. His last telescopic discovery—that of the moon's diurnal and monthly librations—was made in 1637, only a few months before his eyes were

for ever closed in hopeless blindness. It was in this condition that Milton found him when he visited him at Arcetri in 1638. But the fire of his genius was not even yet extinct. He continued his scientific correspondence with unbroken interest and undiminished logical acumen; he thought out the application of the pendulum to the regulation of clockwork, which Huygens successfully realized fifteen years later; and he was engaged in dictating to his disciples, Viviani and Torricelli, his latest ideas on the theory of impact when he was seized with the slow fever which in two months brought him to the grave. On the 8th of January 1642 he closed his long life of triumph and humiliation, which just spanned the interval between the death of Michelangelo and the birth of Isaac Newton.

The direct services which Galileo rendered to astronomy are virtually summed up in his telescopic discoveries. To the theoretical perfection of the science he contributed little or nothing. He pointed out indeed that the so-called “third motion,” introduced by Copernicus to account for the constant parallelism of the earth’s axis, was a superfluous complication. But he substituted the equally unnecessary hypothesis of a magnetic attraction, and failed to perceive that the phenomenon to be explained was, in relation to absolute space, not a movement but the absence of movement. The circumstance, however, which most seriously detracts from his scientific reputation is his neglect of the discoveries made during his lifetime by the greatest of his contemporaries. Kepler’s first and second laws were published in 1609, and his third ten years later. By these momentous inductions the geometrical theory of the solar system was perfected, and a hitherto unimagined symmetry was perceived to regulate the mutual relations of its members. But by Galileo they were passed over in silence. In his *Dialogo dei massimi sistemi*, printed not less than thirteen years after the last of the three laws had been given to the world, the epicycles by which Copernicus, adhering to the ancient postulate of uniform circular motion, had endeavoured to reduce to theory the irregularities of the planetary movements, were neither expressly adopted nor expressly rejected; and the conclusion seems inevitable that this grave defection from the cause of progress was due to his perhaps unconscious reluctance to accept discoveries which he had not originated. His name is nevertheless justly associated with that vast extension of the bounds of the visible universe which has rendered modern astronomy the most sublime of sciences, and his telescopic observations are a standing monument to his sagacity and acumen.

With the sure instinct of genius, he seized the characteristic features of the phenomena presented to his attention, and his inferences, except when distorted by polemical exigencies, have been strikingly confirmed by modern investigations. Of his two capital errors, regarding respectively the theory of the tides and the nature of comets, the first was insidiously recommended to him by his passionate desire to find a physical confirmation of the earth’s double motion; the second was adopted for the purpose of rebutting an anti-Copernican argument founded on the planetary analogies of those erratic subjects of the sun. Within two years of their first discovery, he had constructed approximately accurate tables of the revolutions of Jupiter’s satellites, and he proposed their frequent eclipses as a means of determining longitudes, not only on land, but at sea. This method, on which he laid great stress, and for the facilitation of which he invented a binocular glass, and devised some skilful mechanical contrivances, was offered by him in 1616 to the Spanish government, and afterwards to that of Tuscany, but in each case unsuccessfully; and the close of his life was occupied with prolonged but fruitless negotiations on the same subject with the states-general of Holland. The idea, though ingenious, has been found of little practical utility at sea.

A series of careful observations made him acquainted with the principal appearances revealed by modern instruments in the solar spots. He pointed out that they were limited to a certain defined zone on the sun’s surface; he noted the *faculae* with which they are associated, the penumbra by which they are bordered, their slight proper motions and their rapid changes of form. He inferred from the regularity of their general movements the rotation of the sun on its axis in a period of little less than a month; and he grounded on the varying nature of the paths seemingly traversed by them a plausible, though inconclusive, argument in favour of the earth’s annual revolution. Twice in the year, he observed, they seem to travel across the solar disk in straight lines; at other times, in curves. These appearances he referred with great acuteness to the slight inclination of the sun’s axis of rotation to the plane of the ecliptic. Thus, when the earth finds herself in the plane of the sun’s equator, which occurs at two opposite points of her orbit, the spots, travelling in circles parallel with that plane, necessarily appear to describe right lines; but when the earth is above or below the equatorial level, the paths of the spots open out into curves turned downwards or upwards, according to the direction in which they are seen. But the explanation of this phenomenon is equally consistent with the geocentric as with the

heliocentric theory of the solar system. The idea of a universal force of gravitation seems to have hovered on the borders of this great man's mind, without ever fully entering it. He perceived the analogy between the power which holds the moon in the neighbourhood of the earth, and compels Jupiter's satellites to circulate round their primary, and the attraction exercised by the earth on bodies at its surface;[3] but he failed to conceive the combination of central force with tangential velocity, and was disposed to connect the revolutions of the planets with the axial rotation of the sun. This notion, it is plain, tended rather towards Descartes's theory of vortices than towards Newton's theory of gravitation. More valid instances of the anticipation of modern discoveries may be found in his prevision that a small annual parallax would eventually be found for some of the fixed stars, and that extra-Saturnian planets would at some future time be ascertained to exist, and in his conviction that light travels with a measurable, although, in relation to terrestrial distances, infinite velocity.

The invention of the microscope, attributed to Galileo by his first biographer, Vincenzio Viviani, does not in truth belong to him. Such an instrument was made as early as 1590 by Zacharias Jansen of Middleburg; and although Galileo discovered, in 1610, a means of adapting his telescope to the examination of minute objects, he did not become acquainted with the compound microscope until 1624 when he saw one of Drebbel's instruments in Rome, and, with characteristic ingenuity, immediately introduced some material improvements into its construction.

The most substantial, if not the most brilliant part of his work consisted undoubtedly in his contributions towards the establishment of mechanics as a science. Some valuable but isolated facts and theorems had been previously discovered and proved, but it was he who first clearly grasped the idea of force as a mechanical agent, and extended to the external world the conception of the invariability of the relation between cause and effect. From the time of Archimedes there had existed a science of equilibrium, but the science of motion began with Galileo. It is not too much to say that the final triumph of the Copernican system was due in larger measure to his labours in this department than to his direct arguments in its favour. The problem of the heavens is essentially a mechanical one; and without the mechanical conceptions of the dependence of motion upon force which Galileo familiarized to men's minds, that problem might have remained a sealed book even to the intelligence of Newton. The interdependence of motion and force was not indeed formulated into definite laws by Galileo, but his writings on dynamics are everywhere suggestive of those laws, and his solutions of dynamical problems involve their recognition. The extraordinary advances made by him in this branch of knowledge were owing to his happy method of applying mathematical analysis to physical problems. As a pure mathematician he was, it is true, surpassed in profundity by more than one among his pupils and contemporaries; and in the wider imaginative grasp of abstract geometrical principles he cannot be compared with Fermat, Descartes or Pascal, to say nothing of Newton or Leibnitz. Still, even in the region of pure mathematics, his powerful and original mind left notable traces of its working. He studied the properties of the cycloid, and attempted the problem of its quadrature; and in the "infinitesimals," which he was one of the first to introduce into geometrical demonstrations, was contained the fruitful germ of the differential calculus. But the method which was peculiarly his, and which still forms the open road to discoveries in natural science, consisted in the combination of experiment with calculation—in the transformation of the concrete into the abstract, and the assiduous comparison of results. The first-fruits of the new system of investigation was his determination of the laws of falling bodies. Conceiving that the simplest principle is the most likely to be true, he assumed as a postulate that bodies falling freely towards the earth descend with a uniformly accelerated motion, and deduced thence that the velocities acquired are in the direct, and the spaces traversed in the duplicate ratio of the times, counted from the beginning of motion; finally, he proved, by observing the times of descent of bodies falling down inclined planes, that the postulated law was the true law. Even here, he was obliged to take for granted that the velocities acquired in descending from the same height along planes of every inclination are equal; and it was not until shortly before his death that he found the mathematical demonstration of this not very obvious principle.

The first law of motion—that which expresses the principle of inertia—is virtually contained in the idea of uniformly accelerated velocity. The recognition of the second—that of the independence of different motions—must be added to form the true theory of projectiles. This was due to Galileo. Up to his time it was universally held in the schools that the motion of a body should cease with the impulse communicated to it, but for the "reaction of the medium" helping it forward. Galileo showed, on the contrary, that the nature of motion once impressed is to continue indefinitely in a uniform direction, and that the effect

of the medium is a retarding, not an impelling one. Another commonly received axiom was that no body could be affected by more than one movement at one time, and it was thus supposed that a cannon ball, or other projectile, moves forward in a right line until its first impulse is exhausted, when it falls vertically to the ground. In the fourth of Galileo's dialogues on mechanics, he demonstrated that the path described by a projectile, being the result of the combination of a uniform transverse motion with a uniformly accelerated vertical motion, must, apart from the resistance of the air, be a parabola. The establishment of the principle of the composition of motions formed a conclusive answer to the most formidable of the arguments used against the rotation of the earth, and we find it accordingly triumphantly brought forward by Galileo in the second of his dialogues on the systems of the world. It was urged by anti-Copernicans that a body flung upward or cast downward would, if the earth were in motion, be left behind by the rapid translation of the point from which it started; Galileo proved on the contrary that the reception of a fresh impulse in no way interfered with the movement already impressed, and that the rotation of the earth was insensible, because shared equally by all bodies at its surface. His theory of the inclined plane, combined with his satisfactory definition of "momentum," led him towards the third law of motion. We find Newton's theorem, that "action and reaction are equal and opposite," stated with approximate precision in his treatise *Della scienza meccanica*, which contains the substance of lectures delivered during his professorship at Padua; and the same principle is involved in the axiom enunciated in the third of his mechanical dialogues, that "the propensity of a body to fall is equal to the least resistance which suffices to support it." The problems of percussion, however, received no definitive solution until after his death.

His services were as conspicuous in the statical as in the kinetical division of mechanics. He gave the first satisfactory demonstration of equilibrium on an inclined plane, reducing it to the level by a sound and ingenious train of reasoning; while, by establishing the theory of "virtual velocities," he laid down the fundamental principle which, in the opinion of Lagrange, contains the general expression of the laws of equilibrium. He studied with attention the still obscure subject of molecular cohesion, and little has been added to what he ascertained on the question of transverse strains and the strength of beams, first brought by him within the scope of mechanical theory. In his *Discorso intorno alle cose che stanno su l'acqua*, published in 1612, he used the principle of virtual velocities to demonstrate the more important theorems of hydrostatics, deducing from it the equilibrium of fluid in a siphon, and proved against the Aristotelians that the floating of solid bodies in a liquid depends not upon their form, but upon their specific gravities relative to such liquid.

In order to form an adequate estimate of the stride made by Galileo in natural philosophy, it would be necessary to enumerate the confused and erroneous opinions prevailing on all such subjects in his time. His best eulogium, it has been truly said, consists in the fallacies which he exposed. The scholastic distinctions between corruptible and incorruptible substances, between absolute gravity and absolute levity, between natural and violent motions, if they did not wholly disappear from scientific phraseology, ceased thenceforward to hold the place of honour in the controversies of the learned. Discarding these obscure and misleading notions, Galileo taught that gravity and levity are relative terms, and that all bodies are heavy, even those which, like the air, are invisible; that motion is the result of force, instantaneous or continuous; that weight is a continuous force, attracting towards the centre of the earth; that, in a vacuum, all bodies would fall with equal velocities; that the "inertia of matter" implies the continuance of motion, as well as the permanence of rest; and that the substance of the heavenly bodies is equally "corruptible" with that of the earth. These simple elementary ideas were eminently capable of development and investigation, and were not only true but the prelude to further truth; while those they superseded defied inquiry by their vagueness and obscurity. Galileo was a man born in due time. He was superior to his contemporaries, but not isolated amongst them. He represented and intensified a growing tendency of the age in which he lived. It was beginning to be suspected that from Aristotle an appeal lay to nature, and some were found who no longer treated the *ipse dixit* of the Stagirite as the final authority in matters of science. A vigorous but ineffectual warfare had already been waged against the blind traditions of the schools by Ramus and Telesius, by Patricius and Campanella, and the revolution which Galileo completed had been prepared by his predecessors. Nevertheless, the task which he so effectually accomplished demanded the highest and rarest quality of genius. He struck out for himself the happy middle path between the *a priori* and the empirical systems, and exemplified with brilliant success the method by which experimental science has wrested from nature so many of her secrets. His mind was eminently practical. He concerned himself above all with what fell within the range of exact inquiry, and left to others the larger but

less fruitful speculations which can never be brought to the direct test of experiment. Thus, while far-reaching but hasty generalizations have had their day and been forgotten, his work has proved permanent, because he made sure of its foundations. His keen intuition of truth, his vigour and yet sobriety of argument, his fertility of illustration and acuteness of sarcasm, made him irresistible to his antagonists; and the evanescent triumphs of scornful controversy have given place to the sedate applause of a long-lived posterity.

The first complete edition of Galileo's writings was published at Florence (1842-1856), in 16 8vo vols., under the supervision of Signor Eugenio Albèri. Besides the works already enumerated, it contained the *Sermones de motu gravium* composed at Pisa between 1589 and 1591; his letters to his friends, with many of their replies, as well as several of the essays of his scientific opponents; his laudatory comments on the *Orlando Furioso*, and depreciatory notes on the *Gerusalemme Liberata*, some stanzas and sonnets of no great merit, together with the sketch of a comedy; finally, a reprint of Viviani's *Life*, with valuable notes and corrections. The original documents from the archives of the Inquisition, relating to the events of 1616 and 1633, recovered from Paris in 1846 by the efforts of Count Rossi, and now in the Vatican Library, were to a limited extent made public by Monsignor Marino-Marini in 1850, and more unreservedly by M. Henri de l'Épinois, in an essay entitled *Galilée, son procès, sa condemnation*, published in 1867 in the *Revue des questions historiques*. He was followed by M. Karl von Gebler, who, in an able and exhaustive but somewhat prejudiced work, *Galileo Galilei und die römische Curie* (Stuttgart, 1876), sought to impeach the authenticity of a document of prime importance in the trial of 1633. He was victoriously answered by Signor Domenico Berti, in *Il Processo originale di Galileo Galilei* (Rome, 1876), and by M. de l'Épinois, with *Les pièces du procès de Galilée* (Rome, Paris, 1877). The touching letters of Galileo's eldest daughter, Sister Maria Celeste, to her father were printed in 1864 by Professor Carlo Arduini, in a publication entitled *La Primogenita di Galileo Galilei*.

The issue of a "national edition" of the Works of Galileo, in 20 large volumes, was begun at Florence in 1890. It includes a mass of previously inedited correspondence and other documents, collected by the indefatigable director, Professor Antonio Favaro, among whose numerous publications on Galilean subjects may be mentioned: *Galileo e lo studio di Padova* (2 vols., 1883); *Scampoli Galileani* (12 series, 1886-1897); *Nuovi Studii Galileani* (1891); *Galileo Galilei e Suor Maria Celeste* (1891). See also Th. Henri Martin's *Galilée, les droits de la science et la méthode des sciences physiques* (1868); *Private Life of Galileo* (by Mrs Olney, 1870); J.J. Fahie's *Galileo; his Life and Work* (1903); *Galilée et Marius*, by J.A.C. Oudemans and J. Bosscha (1903). The relations of Galileo to the Church are temperately and ably discussed by F.R. Wegg-Prosser in *Galileo and his Judges* (1889), and in two articles published in the *American Catholic Quarterly* for April and July 1901.

(A. M. C.)

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1 The word *telescope*, from τῆλε, far, σκοπεῖν, to view, was invented by Demiscianus, an eminent Greek scholar, at the request of Prince Cesi, president of the Lyncean Academy. It was used by Galileo as early as 1612, but was not introduced into England until much later. In 1655 the word *telescope* was inserted and explained in Bagwell's *Mysteries of Astronomy*, *trunk* or *cylinder* being the terms until then ordinarily employed.

2 Leonardo da Vinci, more than a hundred years earlier, had come to the same conclusion.

3 The passage is sufficiently remarkable to deserve quotation in the original:—"Le parti della Terra hanno tal propensione al centro di essa, che quando ella cangiasse luogo, le dette parti, benchè lontane dal globo nel tempo delle mutazioni di esso, lo seguirebbero per tutto; esempio di ciò sia il seguito perpetuo delle Medicee, ancorchè separate continuamente da Giove. L'istesso si deve dire della Luna, obbligata a seguir la Terra."—*Dialogo dei massimi sistemi*, Giornata terza, p. 351 of Albèri's edition.

GALION, a city of Crawford County, Ohio, U.S.A., about 75 m. S.W. of Cleveland. Pop. (1890) 6326; (1900) 7282 (703 foreign-born); (1910) 7214. It is served by the Cleveland, Cincinnati, Chicago & St Louis, and the Erie railways, and by an interurban electric railway. The city is about 1165 ft. above sea level, and has extensive railway shops (of the Erie railway) and manufactories of brick and tile machinery, carriages and wagons, and grain and seed cleaners. The municipality owns and operates its electric-lighting plant. Galion was laid out as a town in 1831, was incorporated as a borough in 1840, and was chartered as a city in 1878.

GALL, FRANZ JOSEPH (1758-1828), anatomist, physiologist, and founder of phrenology (*q.v.*), was born at Tiefenbrunn near Pforzheim, Baden, on the 9th of March 1758. After completing the usual literary course at Baden and Bruchsal, he began the study of medicine under J. Hermann (1738-1800) at Strassburg, whence, attracted by the names of Gerhard van Swieten (1700-1772) and Maximilian Stoll (1742-1788), he removed to Vienna in 1781. Having received his diploma, he began to practise as a physician there in 1785; but his energies were mainly devoted to the scientific investigation of problems which had occupied his attention from boyhood. At a comparatively early period he formed the generalization that in the human subject at least a powerful memory is invariably associated with prominent eyes; and further observation enabled him, as he thought, also to define the external characteristics indicative of special talents for painting, music and the mechanical arts. Following out these researches, he gradually reached the strong conviction, not only that the talents and dispositions of men are dependent upon the functions of the brain, but also that they may be inferred with perfect exactitude and precision from the external appearances of the skull. Gall's first appearance as an author was made in 1791, when he published the first two chapters of a (never completed) work entitled *Philosophisch-medicinische Untersuchungen über Natur u. Kunst im kranken u. gesunden Zustande des Menschen*. The first public notice of his inquiries in cranioscopy, however, was in the form of a letter addressed to a friend, which appeared in C.M. Wieland's *Deutscher Mercur* in 1798; but two years previously he had begun to give private courses of phrenological lectures in Vienna, where his doctrines soon attracted general attention, and met with increasing success until, in 1802, they were interdicted by the government as being dangerous to religion. This step on the part of the authorities had the effect of greatly stimulating public curiosity and increasing Gall's celebrity.

In March 1805 he finally left Vienna in company with his friend and associate J.C. Spurzheim, and made a tour through Germany, in the course of which he lectured in Berlin, Dresden, Magdeburg and several of the university towns. His expositions, which he knew how to make popular and attractive, were much resorted to by the public, and excited considerable controversy in the scientific world. He had almost reached the zenith of his fame when, in 1807, he repaired to Paris and established himself there as a medical practitioner, at the same time continuing his activity as a lecturer and writer. In 1808 appeared his *Introduction au cours de physiologie du cerveau*, which was followed in 1809 by the *Recherches sur le système nerveux en général, et sur celui du cerveau en particulier* (originally laid before the Institute of France in March 1808), and in 1810 by the first instalment of the *Anatomie et physiologie du système nerveux en général, et du cerveau en particulier, avec des observations sur la possibilité de reconnaître plusieurs dispositions intellectuelles et morales de l'homme et des animaux par la configuration de leurs têtes.* The *Recherches* and the first two volumes of the *Anatomie* bear the conjoint names of Gall and Spurzheim. The latter work was completed in 1819, and appeared in a second edition of six volumes in 1822-1825. In 1811 he replied to a charge of Spinozism or atheism, which had been strongly urged against him, by a treatise entitled *Des dispositions innées de l'âme et de l'esprit*, which he afterwards incorporated with his greater work. In 1819 he became a naturalized French subject, but his efforts two years afterwards to obtain admission to the Academy of Sciences, although supported by E. Geoffroy Saint-Hilaire, were unsuccessful. In 1823 he visited London with the intention of giving a series of phrenological lectures, but his reception was not what he had anticipated, and he speedily abandoned his plans. He continued to lecture and practise in Paris until the beginning of 1828, when he was disabled by an apoplectic seizure. His death took place at Montrouge near Paris, on the 22nd of August 1828.

GALL (a word common to many Teutonic languages, cf. Dutch *gal*, and Ger. *Galle*; the Indo-European root appears in Gr. χολή and Lat. *fel*; possibly connected with "yellow," with reference to the colour of bile), the secretion of the liver known as "bile," the term being also used of the pear-shaped *diverticulum* of the bile-duct, which forms a reservoir for the

bile, more generally known as the “gall-bladder” (see Liver). From the extreme bitterness of the secretion, “gall,” like the Lat. *fel*, is used for anything extremely bitter, whether actually or metaphorically. From the idea that the gall-bladder was the dominating organ of a bitter, sharp temperament, “gall” was formerly used in English for such a spirit, and also for one very ready to resent injuries. It thus survives in American slang, with the meaning “impudence” or “assurance.”

“Gall,” meaning a sore or painful swelling, especially on a horse, may be the same word, derived from an early use of the word as meaning “poison.” On the other hand, in Romanic languages, the Fr. *galle*, Sp. *agalla*, a wind-gall or puffy distension of the synovial bursa on the fetlock joint of a horse, is derived from the Lat. *galla*, oak-apple, from which comes the English “gall,” meaning an excrescence on trees caused by certain insects. (See Galls.)

GALLABAT, or Galabat, called by the Abyssinians Matemma (Metemma), a town of the Anglo-Egyptian Sudan, in 13° N. 36° 12′ E. It is built, at the foot of a steep slope, on the left bank of a tributary of the Atbara called the Khor Abnaheir, which forms here the Sudan-Abyssinian frontier. Gallabat lies 90 m. W. by N. of Gondar, the capital of Amhara, and being on the main route from Sennar to Abyssinia, is a trade centre of some importance. Pop. about 3000. The majority of the buildings are grass *tukls*. Slaves, beeswax, coffee, cotton and hides were formerly the chief articles of commerce. The slave market was closed about 1874. Being on the frontier line, the possession of the town was for long a matter of dispute between the Sudanese, and later the Egyptians, on the one hand and the Abyssinians on the other. About 1870 the Egyptians garrisoned the town, which in 1886 was attacked by the dervishes and sacked. From Gallabat a dervish raiding party penetrated to Gondar, which they looted. In revenge an Abyssinian army under King John attacked the dervishes close to Gallabat in March 1889. The dervishes suffered very severely, but King John being killed by a stray bullet, the Abyssinians retired (see Egypt: *Military Operations*, 1885-1896). In December 1898 an Anglo-Egyptian force entered Gallabat. The Abyssinians then held the fort, but as the result of frontier arrangement the town was definitely included in the Sudan, though Abyssinia takes half the customs revenue. Since 1899 the trade of the place has revived, coffee and live stock being the most important items.

The town and district form a small ethnographical island, having been peopled in the 18th century by a colony of Takruri from Darfur, who, finding the spot a convenient resting-place for their fellow-pilgrims on their way to Mecca and back, obtained permission from the negus of Abyssinia to make a permanent settlement. They are an industrious agricultural race, and cultivate cotton with considerable success. They also collect honey in large quantities. The Takruri possess jagged throwing knives, which are said to have been brought from their original home in the Upper Congo regions.

GALLAIT, LOUIS (1810-1887), Belgian painter, was born at Tournay, in Hainaut, Belgium, on the 9th of May 1810. He first studied in his native town under Hennequin. In 1832 his first picture, “Tribute to Caesar,” won a prize at the exhibition at Ghent. He then went to Antwerp to prosecute his studies under Mathieu Ignace Van Brée, and in the following year exhibited at the Brussels Salon “Christ Healing the Blind.” This picture was purchased by subscription and placed in the cathedral at Tournay. Gallait next went to Paris, whence he sent to the Belgian Salons “Job on the Dunghill,” “Montaigne Visiting Tasso in Prison”; and, in 1841, “The Abdication of Charles V.,” in the Brussels Gallery. This was hailed as a triumph, and gained for the painter a European reputation. Official invitations then caused him to settle at Brussels, where he died on the 20th of November 1887. Among his greater works may be named: “The Last Honours paid to Counts Egmont and Horn by the Corporations of the Town of Brussels,” now at Tournay; “The Death of Egmont,” in the Berlin gallery; the “Coronation of Baudouin, Emperor of Constantinople,” painted for Versailles; “The Temptation of St Anthony,” in the palace at Brussels; “The Siege of Antioch,” “Art and Liberty,” a “Portrait of M.B. Dumortier” and “The Plague at Tournay,” all

in the Brussels gallery. “A Gipsy Woman and her Children” was painted in 1852. “M. Gallait has all the gifts that may be acquired by work, taste, judgment and determination,” wrote Théophile Gautier; his art is that of a man of tact, a skilled painter, happy in his dramatic treatment but superficial. No doubt, this Walloon artist, following the example of the Flemings of the Renaissance and the treatment of Belgian classical painters and the French Romantic school, sincerely aimed at truth; unfortunately, misled by contemporary taste, he could not conceive of it excepting as dressed in sentimentality. As an artist employed by the State he exercised considerable influence, and for a long period he was the leader of public taste in Brussels.

See Teichlin, *Louis Gallait und die Malerei in Deutschland* (1853); J. Dujardin, *L’Art flamand* (1899); C. Lemonnier, *Histoire des beaux-arts en Belgique* (1881).

GALLAND, ANTOINE (1646-1715), French Orientalist and archaeologist, the first European translator of the *Arabian Nights*, was born on the 4th of April 1646 at Rollot, in the department of Somme. The completion of his school education at Noyon was followed by a brief apprenticeship to a trade, from which, however, he soon escaped, to pursue his linguistic studies at Paris. After having been employed for some time in making a catalogue of the Oriental manuscripts at the Sorbonne, he was, in 1670, attached to the French embassy at Constantinople; and in 1673 he travelled in Syria and the Levant, where he copied a great number of inscriptions, and sketched, and in some cases removed historical monuments. After a brief visit to France, where his collection of ancient coins attracted some attention, Galland returned to the Levant in 1676; and in 1679 he undertook a third voyage, being commissioned by the French East India Company to collect for the cabinet of Colbert; on the expiration of this commission he was instructed by the government to continue his researches, and had the title of “antiquary to the king” conferred upon him. During his prolonged residences abroad he acquired a thorough knowledge of the Arabic, Turkish and Persian languages and literatures, which, on his final return to France, enabled him to render valuable assistance to Thevenot, the keeper of the royal library, and to Barthélemy d’Herbelot. After their deaths he lived for some time at Caen under the roof of Nicolas Foucault (1643-1721), the intendant of Caen, himself no mean archaeologist; and there he began the publication (12 vols., 1704-1717) of *Les mille et une nuits*, which excited immense interest during the time of its appearance, and is still the standard French translation. It had no pretensions to verbal accuracy, and the coarseness of the language was modified to suit European taste, but the narrative was adequately rendered. In 1701 Galland had been admitted into the Academy of Inscriptions, and in 1709 he was appointed to the chair of Arabic in the Collège de France. He continued to discharge the duties of this post until his death, which took place on the 17th of February 1715.

Besides a number of archaeological works, especially in the department of numismatics, he published a compilation from the Arabic, Persian and Turkish, entitled *Paroles remarquables, bons mots et maximes des orientaux* (1694), and a translation from an Arabic manuscript, *De l’origine et du progrès du café* (1699). The former of these works appeared in an English translation in 1795. His *Contes et fables indiennes de Bidpaï et de Lokman* was published (1724) after his death. Among his numerous unpublished manuscripts are a translation of the Koran and a *Histoire générale des empereurs turcs*. His *Journal* was published by M. Charles Schefer in 1881.

GALLARATE, a town of Lombardy, Italy, in the province of Milan, from which it is 25 m. N.W. by rail. Pop. (1901) 12,002. The town is of medieval origin. It is remarkable mainly for its textile factories. It is the junction of railways to Varese, Laveno and Arona (for the Simplon). Six miles to the W. are the electric works of Vizzola, the largest in Europe, where 23,000 h.p. are derived from the river Ticino.

GALLARS [in Lat. GALLASIUS], **NICOLAS DES** (*c.* 1520-*c.* 1580), Calvinistic divine, first appears as author of a *Defensio* of William Farel, published at Geneva in 1545, followed (1545-1549) by translations into French of three tracts by Calvin. In 1551 he was admitted burgess of Geneva, and in 1553 made pastor of a country church in the neighbourhood. In 1557 he was sent to minister to the Protestants at Paris; his conductor, Nicolas du Rousseau, having prohibited books in his possession, was executed at Dijon; des Gallars, having nothing suspicious about him, continued his journey. On the revival of the Strangers' church in London (1560), he, being then minister at Geneva, came to London to organize the French branch; and in 1561 he published *La Forme de police ecclésiastique instituée à Londres en l'Église des François*. In the same year he assisted Beza at the colloquy of Poissy. He became minister to the Protestants at Orleans in 1564; presided at the synod of Paris in 1565; was driven out of Orleans with other Protestants in 1568; and in 1571 was chaplain to Jeanne d'Albret, queen of Navarre. Calvin held him in high esteem, employing him as amanuensis, and as editor as well as translator of several of his exegetical and polemical works. He himself wrote a commentary on Exodus (1560); edited an annotated French Bible (1562) and New Testament (1562); and published tracts against Arians (1565-1566). His main work was his edition of Irenaeus (1570) with prefatory letter to Grindal, then bishop of London, and giving, for the first time, some fragments of the Greek text. His collaboration with Beza in the *Histoire des Églises Réformées du royaume de France* (1580) is doubted by Bayle.

See Bayle, *Dictionnaire hist. et crit.*; Jean Senebier, *Hist. littéraire de Genève* (1786); *Nouvelle Biog. gén.* (1857).

(A. GO.*)

GALLAS, MATTHIAS, COUNT OF CAMPO, DUKE OF LUCERA (1584-1647), Austrian soldier, first saw service in Flanders, and in Savoy with the Spaniards, and subsequently joined the forces of the Catholic League as captain. On the general outbreak of hostilities in Germany, Gallas, as colonel of an infantry regiment, distinguished himself, especially at the battle of Stadtlohn (1623). In 1630 he was serving as *General-Feldwachtmeister* under Collalto in Italy, and was mainly instrumental in the capture of Mantua. Made count of the Empire for this service, he returned to Germany for the campaign against Gustavus Adolphus. In command of a corps of Wallenstein's army, he covered Bohemia against the Swedes in 1631-1632, and served at the Alte Veste near Nuremberg, and at Lützen. Further good service against Bernhard of Saxe-Weimar commended General Gallas to the notice of the emperor, who made him lieutenant-general in his own army. He was one of the chief conspirators against Wallenstein, and after the tragedy of Eger was appointed to the command of the army which Wallenstein had formed and led. At the great battle of Nördlingen (23rd of August 1634) in which the army of Sweden was almost annihilated, Gallas commanded the victorious Imperialists. His next command was in Lorraine, but even the Moselle valley had suffered so much from the ravages of war that his army perished of want. Still more was this the case in northern Germany, where Gallas commanded against the Swedish general Banér in 1637 and 1638. At first driving the Swedes before him, in the end he made a complete failure of the campaign, lost his command, and was subject to much ridicule. It was, however, rather the indiscipline of his men (the baneful legacy of Wallenstein's methods) than his own faults which brought about his disastrous retreat across North Germany, and at a moment of crisis he was recalled to endeavour to stop Torstenson's victorious advance, only to be shut up in Magdeburg, whence he escaped with the barest remnant of his forces. Once more relieved of his command, he was again recalled to make head against the Swedes in 1645 (after their victory at Jankow). Before long, old and warworn, he resigned his command, and died in 1647 at Vienna. His army had earned for itself the reputation of being the most cruel and rapacious force even in the Thirty Years' War, and his *Merode Brüder* have survived in the word *marauder*. Like many other generals of that period, he had acquired much wealth and great territorial possessions (the latter mostly his share of Wallenstein's estates). He was the founder of the Austrian family of Clam-Gallas, which furnished many distinguished soldiers to the Imperial army.

GALLAS, or more correctly GALLA, a powerful Hamitic people of eastern Africa, scattered over the wide region which extends for about 1000 m. from the central parts of Abyssinia to the neighbourhood of the river Sabaki in British East Africa. The name “Galla” or “Gala” appears to be an Abyssinian nickname, unknown to the people, who call themselves *Ilm’ Orma*, “sons of men” or “sons of Orma,” an eponymous hero. In Shoa (Abyssinia) the word is connected with the river Gála in Guragie, on the banks of which a great battle is said to have been fought between the Galla and the Abyssinians. Arnaud d’Abbadie says that the Abyssinian Moslems recount that, when summoned by the Prophet’s messenger to adopt Islam, the chief of the Galla said “No,”—in Arabic *kāl* (or *gāl*) *la*,—and the Prophet on hearing this said, “Then let their very name imply their denial of the Faith.” Of all Hamitic peoples the Galla are the most numerous. Dr J. Ludwig Krapf estimated them (*c.* 1860) at from six to eight millions; later authorities put them at not much over three millions. Individual tribes are said to be able to bring 20,000 to 30,000 horsemen into the field.

Hardly anything is definitely known as to the origin and early home of the race, but it appears to have occupied the southern part of its present territory since the 16th century. According to Hiob Ludolf and James Bruce, the Galla invaders first crossed the Abyssinian frontiers in the year 1537. The Galla of Gojam (a district along the northern side of the river Abai) tell how their savage forefathers came from the south-east from a country on the other side of a bahr (lake or river), and the Yejju and Raia Galla also point towards the east and commemorate the passage of a bahr. Among the southern Galla tradition appears to be mainly concerned with the expulsion of the race from the country now occupied by the Somali. Their original home was possibly in the district east of Victoria Nyanza, for the tribes near Mount Kenya are stated to go on periodical pilgrimages to the mountain, making offerings to it as if to their mother. A theory has been advanced that the great exodus which it seems certain took place among the peoples throughout eastern Africa during the 15th century was caused by some great eruption of Kenya and other volcanoes of equatorial Africa. As a geographical term Galla-land is now used mainly to denote the south-central regions of the Abyssinian empire, the country in which the Galla are numerically strongest. There is no sharp dividing line between the territory occupied respectively by the Galla and by the Somali.

In any case the Galla must be regarded as members of that vast eastern Hamitic family which includes their neighbours, the Somali, the Afars (Danakil) and the Abyssinians. As in all the eastern Hamites, there is a perceptible strain of Negro blood in the Galla, who are, however, described by Sir Frederick Lugard as “a wonderfully handsome race, with high foreheads, brown skins, and soft wavy hair quite different from the wool of the Bantus.” As a rule their features are quite European. Their colour is dark brown, but many of the northern Galla are of a coffee and milk tint. The finest men are to be found among the Limmu and Gudru on the river Abai.

> The Galla are for the most part still in the nomadic and pastoral stage, though in Abyssinia they have some agricultural settlements. Their dwellings, circles of rough stones roofed with grasses, are generally built under trees. Their wealth consists chiefly in cattle and horses. Among the southern tribes it is said that about seven or eight head of cattle are kept for every man, woman and child; and among the northern tribes, as neither man nor woman ever thinks of going any distance on foot, the number of horses is very large. The ordinary food consists of flesh, blood, milk, butter and honey, the last being considered of so much importance by the southern Galla that a rude system of bee-keeping is in vogue, and the husband who fails to furnish his wife with a sufficient supply of honey may be excluded from all conjugal rights. In the south monogamy is the rule, but in the north the number of a man’s wives is limited only by his wishes and his wealth. Marriage-forms are numerous, that of bride-capture being common. Each tribe has its own chief, who enjoys the strange privilege of being the only merchant for his people, but in all public concerns must take the advice of the fathers of families assembled in council. The greater proportion of the tribes are still pagan, worshipping a supreme god Waka, and the subordinate god and goddess Oglieh and Atetieh, whose favour is secured by sacrifices of oxen and sheep. With a strange liberality of sentiment, they say that at a certain time of the year Waka leaves them and goes to attend to the wants of their enemies the Somali, whom also he has created. Some tribes, and notably the Wollo Galla, have been converted to Mahommedanism and are very bigoted adherents of the Prophet. In the north, where the Galla are under Abyssinian rule, a kind of superficial Christianization has taken place, to the extent at least that the people are familiar with the names of Maremma or Mary, Balawold or Jesus, Girgis or St George, &c.; but to all practical intents paganism is still in force. The serpent is a special object of worship, the northern Galla believing that he is the author of the human race. There is a belief in were-wolves (*buda*), and the northern Galla have sorcerers who terrorize the people. Though cruel in war, all Galla respect their pledged word. They are armed with a lance, a two-edged knife,

and a shield of buffalo or rhinoceros hide. A considerable number find employment in the Abyssinian armies.

Among the more important tribes in the south (the name in each instance being compounded with Galla) are the Ramatta, the Kukatta, the Baõle, the Aurova, the Wadjole, the Ilani, the Arrar and the Kanigo Galla; the Borani, a very powerful tribe, may be considered to mark the division between north and south; and in the north we find the Amoro, the Jarso, the Toolama, the Wollo, the Ambassil, the Aijjo, and the Azobo Galla.

See C.T. Beke, “On the Origin of the Gallas,” in *Trans. of Brit. Assoc.* (1847); J. Ludwig Krapf, *Travels in Eastern Africa* (1860); and *Vocabulary of the Galla Language* (London, 1842); Arnaud d’Abbadie, *Douze Ans dans la Haute-Éthiopie* (1868); Ph. Paulitschke, *Ethnographie Nord-Ost-Afrikas*; *Die geistige Kultur der Dan’akil, Galla u. Somâl* (Berlin, 1896); P.M. de Salviac, *Les Galla* (Paris, 1901).

GALLATIN, ALBERT (1761-1849), American statesman, was born in Geneva (Switzerland) on the 29th of January 1761. The Gallatins were both an old and a noble family. They are first heard of in Savoy in the year 1258, and more than two centuries later they went to Geneva (1510), united with Calvin in his opposition to Rome, and associated their fortunes with those of the little Swiss city. Here they remained, and with one or two other great families governed Geneva, and sent forth many representatives to seek their fortune and win distinction in the service of foreign princes, both as soldiers and ministers. On the eve of the French Revolution the Gallatins were still in Geneva, occupying the same position which they had held for two hundred years. Albert Gallatin’s father died in 1765, his mother five years later, and his only sister in 1777. Although left an orphan at nine, he was by no means lonely or unprotected. His grandparents, a large circle of near relatives and Mlle Catherine Pictet (d. 1795), an intimate friend of his mother, cared for him during his boyhood. He was thoroughly educated at the schools of Geneva, and graduated with honour from the college or academy there in 1779. His grandmother then wished him to enter the army of the landgrave of Hesse, but he declined to serve “a tyrant,” and a year later slipped away from Geneva and embarked for the United States. A competent fortune, good prospects, social position, and a strong family connexion were all thrown aside in order to tempt fate in the New World. His relatives very properly opposed his course, but they nevertheless did all in their power to smooth his way, and continued to treat him kindly. In after life he himself admitted the justice of their opinions. The temper of the times, a vague discontent with the established order of things, and some political enthusiasm imbibed from the writings of Rousseau, are the best reasons which can now be assigned for Gallatin’s desertion of home and friends.

In July 1780 Gallatin and his friend Henri Serre (d. 1784) landed in Massachusetts. They brought with them youth, hope and courage, as well as a little money, and at once entered into business. The times, however, were unfavourable. The great convulsion of the Revolution was drawing to a close, and everything was in an unsettled condition. The young Genevans failed in business, passed a severe winter in the wilds of Maine, and returned to Boston penniless. Gallatin tried to earn a living by teaching French in Harvard College, apparently not without success, but the cold and rigid civilization of New England repelled him, and he made his way to the South. In the backwoods of Pennsylvania and Virginia there seemed to be better chances for a young adventurer. Gallatin engaged in land speculations, and tried to lay the foundation of his fortune in a frontier farm. In 1789 he married Sophie Allègre, and every prospect seemed to be brightening. But clouds soon gathered again. After only a few months of wedlock his wife died, and Gallatin was once more alone. The solitary and desolate frontier life became now more dreary than ever; he flung himself into politics, the only outside resource open to him, and his long, and eventful public career began.

The constitution of 1787 was then before the public, and Gallatin, with his dislike of strong government still upon him, threw himself into opposition and became one of the founders of the Anti-Federalist, or, as it was afterwards called, the Republican party. He was a member of the Pennsylvania Constitutional Convention of 1789-1790, and of the Pennsylvania Assembly in 1790, 1791, and 1792, and rose with surprising rapidity, despite his foreign birth and his inability to speak English with correctness or fluency. He was helped of course by his sound education; but the true cause of his success lay in his strong sense, untiring industry, courage, clear-sightedness and great intellectual force. In 1793 he was chosen

United States senator from Pennsylvania by the votes of both political parties. No higher tribute was ever paid to character and ability than that conveyed by this election. But the staunch Federalists of the senate, who had begun to draw the party lines rather sharply, found the presence of the young Genevan highly distasteful. They disliked his French origin, and suspected him to be a man of levelling principles. His seat was contested on account of a technical flaw in regard to the duration of his citizenship, and in February 1794, almost three months after the beginning of the session, the senate annulled the election and sent him back to Pennsylvania with all the glory of political martyrdom.

The leading part which Gallatin had taken in the “Whisky Insurrection” in Western Pennsylvania had, without doubt, been an efficient cause in his rejection by the senate. He intended fully to restrain within legal bounds the opposition which the excise on domestic spirits had provoked, but he made the serious mistake of not allowing sufficiently for the character of the backwoods population. When legal resistance developed into insurrection, Gallatin did his best to retrieve his error and prevent open war. At Redstone Old Fort (Brownsville) on the 29th of August 1794, before the “Committee of Sixty” who were appointed to represent the disaffected people, he opposed with vigorous eloquence the use of force against the government, and refused to be intimidated by an excited band of riflemen who happened to be in the vicinity and represented the radical element. He effectively checked the excitement, and when a month later an overwhelming Federal force began moving upon the western counties, the insurrection collapsed without bloodshed. Of all the men who took part in the opposition to the excise, Gallatin alone came out with credit. He was at once elected to the national house of representatives, and took his seat in December 1795. There, by sheer force of ability and industry, he wrested from all competitors the leadership of the Republicans, and became the most dangerous opponent whom the Federalists had ever encountered in congress. Inflamed with a hatred of France just then rising to the dignity of a party principle, they found in Gallatin an enemy who was both by origin and opinion peculiarly obnoxious to them. They attacked him unsparingly, but in vain. His perfect command of temper, his moderation of speech and action, in a bitterly personal age, never failed, and were his most effective weapons; but he made his power felt in other ways. His clear mind and industrious habits drew him to questions of finance. He became the financier of his party, preached unceasingly his cardinal doctrines of simplicity and economy, and was an effective critic of the measures of government. Cool and temperate, Gallatin, when following his own theories, was usually in the right, although accused by his followers of trimming. Thus, in regard to the Jay treaty, he defended the constitutional right of the house to consider the treaty, but he did not urge rejection in this specific case. On the other hand, when following a purely party policy he generally erred. He resisted the navy, the mainspring of Washington’s foreign policy; he opposed commercial treaties and diplomatic intercourse in a similar fashion. On these points he was grievously wrong, and on all he changed his views after a good deal of bitter experience.

The greatest period of Gallatin’s career in congress was in 1798, after the publication of the famous X.Y.Z. despatches. The insults of Talleyrand, and his shameless attempts to extort bribes from the American commissioners, roused the deep anger of the people against France. The Federalists swept all before them, and the members of the opposition either retired from Philadelphia or went over to the government. Alone and single-handed, Gallatin carried on the fight in congress. The Federalists bore down on him unmercifully, and even attempted (1798) a constitutional amendment in regard to citizenship, partly, it appears, in order to drive him from office. Still he held on, making a national struggle in the national legislature, and relying very little upon the rights of States so eagerly grasped by Jefferson and Madison. But even then the tide was turning. The strong measures of the Federalists shocked the country; the leaders of the dominant party quarrelled fiercely among themselves; and the Republicans carried the elections of 1800. In the exciting contest for the presidency in the house of representatives between Jefferson and Burr, it was Gallatin who led the Republicans.

When, after this contest, Jefferson became president (1801), there were two men whose commanding abilities marked them for the first places in the cabinet. James Madison became secretary of state, and Albert Gallatin secretary of the treasury. Wise, prudent and conservative, Gallatin made few changes in Hamilton’s arrangements, and for twelve years administered the national finances with the greatest skill. He and Jefferson were both imbued with the idea that government could be carried on upon a priori principles resting on the assumed perfectness of human nature, and the chief burden of carrying out this theory fell upon Gallatin. His guiding principles were still simplicity of administration and speedy extinction of all debt, and everything bent to these objects. Fighting or bribing the Barbary pirates was a mere question of expense. It was cheaper to seize Louisiana than to

await the settlement of doubtful points. Commercial warfare was to be avoided because of the cost. All wars were bad, but if they could not be evaded it was less extravagant to be ready than to rush to arms unprepared. Amid many difficulties, and thwarted even by Jefferson himself in the matter of the navy, Gallatin pushed on; and after six years the public debt was decreased (in spite of the Louisiana purchase) by $14,260,000, a large surplus was on hand, a comprehensive and beneficent scheme of internal improvements was ready for execution, and the promised land seemed in sight. Then came the stress of war in Europe, a wretched neutrality at home, fierce outbreaks of human passions, and the fair structure of government by a priori theories based on the goodness of unoppressed humanity came to the ground. Gallatin was thrown helplessly back upon the rejected Federalist doctrine of government according to circumstances. He uttered no vain regrets, but the position was a trying one. The sworn foe of strong government, he was compelled, in pursuance of Jefferson's policy, to put into execution the Embargo and other radical and stringent measures. He did his best, but all was in vain. Commercial warfare failed, the Embargo was repealed, and Jefferson, having entangled foreign relations and brought the country to the verge of civil war, retired to private life, leaving to his successor Madison, and to Gallatin, the task of extricating the nation from its difficulties. From 1809 the new administration, drifting steadily towards war, struggled on from one abortive and exasperating negotiation to another. It was a period of sore trial to Gallatin. The peace policy had failed, and nothing else replaced it. He had lost his hold upon Pennsylvania and his support in the house, while a cabal in the senate, bitterly and personally hostile to the treasury, crippled the administration and reduced every government measure to mere inanity. At last, however, in June 1812, congress on Madison's recommendation declared war against England.

Gallatin never wasted time in futile complaints. His cherished schemes were shattered. War and extravagant expenditure had come, and he believed both to be fatal to the prosperity and progress of America. He therefore put the finances in the best order he could, and set himself to mitigate the evil effects of the war by obtaining an early peace. With this end in view he grasped eagerly at the proffered mediation of Russia, and without resigning the treasury sailed for Europe in May 1813.

Russian mediation proved barren, but Gallatin persevered, catching at every opportunity for negotiation. In the midst of his labours came the news that the senate had refused to confirm his appointment as peace commissioner. He still toiled on unofficially until, the objection of the senate having been met by the appointment of a new secretary of the treasury, his second nomination was approved, and he was able to proceed with direct negotiations. The English and American commissioners finally met at Ghent, and in the tedious and irritating discussions which ensued Gallatin took the leading part. His great difficulty lay in managing his colleagues, who were, especially Henry Clay and John Quincy Adams, able men of strong wills and jarring tempers. He succeeded in preserving harmony, and thus established his own reputation as an able diplomatist. Peace was his reward; on the 24th of December 1814 the treaty was signed; and after visiting Geneva for the first time since his boyhood, and assisting in negotiating a commercial convention (1815) with England by which all discriminating duties were abolished, Gallatin in July 1815 returned to America.

While still in Europe he had been asked by Madison to become minister to France; this appointment he accepted in January 1816, and adhered to his acceptance in spite of his being asked in April 1816 to serve once more as secretary of the treasury. He remained in France for the next seven years. He passed his time in thoroughly congenial society, seeing everybody of note or merit in Europe. He did not neglect the duties of his official position, but strove assiduously and with his wonted patience to settle the commercial relations of his adopted country with the nations of Europe, and in 1818 assisted Richard Rush, then United States minister in London, in negotiating a commercial convention with Great Britain to take the place of that negotiated in 1815.

In June 1823 he returned to the United States, where he found himself plunged at once into the bitter struggle then in progress for the presidency. His favourite candidate was his personal friend William H. Crawford, whom he regarded as the true heir and representative of the old Jeffersonian principles. With these feelings he consented in May 1824 to stand for the vice-presidency on the Crawford ticket. But Gallatin had come home to new scenes and new actors, and he did not fully appreciate the situation. The contest was bitter, personal, factious and full of intrigue. Martin Van Buren, then in the Crawford interest, came to the conclusion that the candidate for the second place, by his foreign origin, weakened the ticket, and in October Gallatin retired from the contest. The election, undecided by the popular vote, was thrown into the house, and resulted in the choice of John Quincy Adams,

who in 1826 drew Gallatin from his retirement and sent him as minister to England to conduct another complicated and arduous negotiation. Gallatin worked at his new task with his usual industry, tact and patience, but the results were meagre, although an open breach on the delicate question of the north-east boundary of the United States was avoided by referring it to the arbitration of the king of the Netherlands. In November 1827 he once more returned to the United States and bade farewell to public life.

Taking up his residence in New York, he was in 1832-1839 president of the National Bank (afterwards the Gallatin Bank) of New York, but his duties were light, and he devoted himself chiefly to the congenial pursuits of science and literature. In both fields he displayed much talent, and by writing his *Synopsis of the Indian Tribes within the United States East of the Rocky Mountains and in the British and Russian Possessions in North America* (1836), and by founding the American Ethnological Society of New York in 1842, he earned the title of "Father of American Ethnology." He continued, of course, to interest himself in public affairs, although no longer an active participant, and in all financial questions, especially in regard to the bank charter, the resumption of specie payments, and the panic of 1837, he exerted a powerful influence. The rise of the slavery question touched him nearly. Gallatin had always been a consistent opponent of slavery; he felt keenly, therefore, the attempts of the South to extend the slave power and confirm its existence, and the remnant of his strength was devoted in his last days to writing and distributing two able pamphlets against the war with Mexico. Almost his last public act was a speech, on the 24th of April 1844, in New York City, against the annexation of Texas; and in his eighty-fourth year he confronted a howling New York mob with the same cool, unflinching courage which he had displayed half a century before when he faced the armed frontiersmen of Redstone Old Fort. During the winter of 1848-1849 his health failed, and on the 12th of August 1849, at the home of his daughter in Astoria, Long Island, he passed peacefully away.

Gallatin was twice married. His second wife, whom he married in November 1793, was Miss Hannah Nicholson, of New York, the daughter of Com. James Nicholson (1737-1804), an American naval officer, commander-in-chief of the navy from 1777 until August 1781, when with his ship the "Virginia," he was taken by the British "Iris" and "General Monk." By her he had three children, two sons and a daughter, who all survived him. In personal appearance he was above middle height, with strongly-marked features, indicating great strength of intellect and character. He was reserved and very reticent, cold in manner and not sympathetic. There was, too, a certain Calvinistic austerity about him. But he was much beloved by his family. He was never a popular man, nor did he ever have a strong personal following or many attached friends. He stood, with Jefferson and Madison, at the head of his party, and won his place by force of character, courage, application and intellectual power. His eminent and manifold services to his adopted country, his great abilities and upright character, assure him a high position in the history of the United States.

The Writings of Albert Gallatin, edited by Henry Adams, were published at Philadelphia, in three volumes, in 1879. With these volumes was published an excellent biography, *The Life of Albert Gallatin*, also by Henry Adams; another good biography is John Austin Stevens's *Albert Gallatin* (Boston, 1884) in the "American Statesmen" series.

(H. C. L.)

GALLAUDET, THOMAS HOPKINS (1787-1851), American educator of the deaf and dumb, was born in Philadelphia, Pennsylvania, of French Huguenot ancestry, on the 10th of December 1787. He graduated at Yale in 1805, where he was a tutor from 1808 to 1810. Subsequently he studied theology at Andover, and was licensed to preach in 1814, but having determined to abandon the ministry and devote his life to the education of deaf mutes, he visited Europe in 1815-1816, and studied the methods of the abbé Sicard in Paris, and of Thomas Braidwood (1715-1806) and his successor Joseph Watson (1765-1829) in Great Britain. Returning to the United States in 1816, he established at Hartford, Connecticut, with the aid of Laurent Clerc (1785-1869), a deaf mute assistant of the abbé Sicard, a school for deaf mutes, in support of which Congress, largely through the influence of Henry Clay, made a land grant, and which Gallaudet presided over with great success until ill-health compelled him to retire in 1830. It was the first institution of the sort in the United States, and served as a model for institutions which were subsequently established. He died at Hartford, Connecticut, on the 5th of September 1851.

There are three accounts of his life, one by Henry Barnard, *Life, Character and Services of the Rev. Thomas H. Gallaudet* (Hartford, 1852); another by Herman Humphrey (Hartford, 1858), and a third (and the best one) by his son Edward Miner Gallaudet (1888).

His son, Thomas Gallaudet (1822-1902), after graduating at Trinity College in 1842, entered the Protestant Episcopal ministry, settled in New York City, and there in 1852 organized St Anne's Episcopal church, where he conducted services for deaf mutes. In 1872 he organized and became general manager of the Church mission to deaf mutes, and in 1885 founded the Gallaudet home for deaf mutes, particularly the aged, at Wappingers Falls, near Poughkeepsie, New York.

Another son, Edward Miner Gallaudet (b. 1837), was born at Hartford, Connecticut, on the 3rd of February 1837, and graduated at Trinity College in 1856. After teaching for a year in the institution for deaf mutes founded by his father at Hartford, he removed with his mother, Sophia Fowler Gallaudet (1798-1877), to Washington, D.C., where at the request of Amos Kendall (1789-1869), its founder, he organized and took charge of the Columbia Institution for the deaf and dumb, which received support from the government, and of which he became president. This institution was the first to furnish actual collegiate education for deaf mutes (in 1864 it acquired the right to grant degrees), and was successful from the start. The Gallaudet College (founded in 1864 as the National Deaf Mute College and renamed in 1893 in honour of Thomas H. Gallaudet) and the Kendall School are separate departments of this institution, under independent faculties (each headed by Gallaudet), but under the management of one board of directors.

GALLE, or Point de Galle, a town and port of Ceylon on the south-west coast. It was made a municipality in 1865, and divided into the five districts of the Fort, Callowelle, Galopiadde, Hirimbure and Cumbalwalla. The fort, which is more than a mile in circumference, overlooks the whole harbour, but is commanded by a range of hills. Within its enclosure are not only several government buildings, but an old church erected by the Dutch East India Company, a mosque, a Wesleyan chapel, a hospital, and a considerable number of houses occupied by Europeans. The old Dutch building known as the queen's house, or governor's residence, which dated from 1687, was in such a dilapidated state that it was sold by the governor, Sir William Gregory, in 1873. Elsewhere there are few buildings of individual note, but the general style of domestic architecture is pleasant and comfortable, though not pretentious. One of the most delightful features of the place is the profusion of trees, even within the town, and along the edge of the shore—suriyas, palms, coco-nut trees and bread-fruit trees. The ramparts towards the sea furnish fine promenades. In the harbour deep water is found close to the shore, and the outer roads are spacious; but the south-west monsoon renders entrance difficult, and not unfrequently drives vessels from their moorings.

The opening of the Suez Canal in 1869, and the construction of a breakwater at Colombo, leading to the transfer of the mail and most of the commercial steamers to the capital of the island, seriously diminished the prosperity of Galle. Although a few steamers still call to coal and take in some cargo, yet the loss of the Peninsular and Oriental and other steamer agencies reduced the port to a subordinate position; nor has the extension of the railway from Colombo, and beyond Galle to Matara, very much improved matters. The tea-planting industry has, however, spread to the neighbourhood, and a great deal is done in digging plumbago and in growing grass for the distillation of citronella oil. The export trade is chiefly represented by coco-nut oil, plumbago, coir yarn, fibre, rope and tea. In the import trade cotton goods are the chief item. Both the export and import trade for the district, however, now chiefly passes through Colombo. Pop. (1901) 37,165.

Galle is mentioned by none of the Greek or Latin geographers, unless the identification with Ptolemy's Avium Promontorium or Cape of Birds be a correct one. It is hardly noticed in the native chronicles before 1267, and Ibn Batuta, in the middle of the 14th century, distinctly states that Kali—that is, Galle—was a *small* town. It was not till the period of Portuguese occupation that it rose to importance. When the Dutch succeeded the Portuguese they strengthened the fortifications, which had been vigorously defended against their admiral, Kosten; and under their rule the place had the rank of a commandancy. In the marriage treaty of the infanta of Portugal with Charles II. of England it was agreed that if the Portuguese recovered Ceylon they were to hand over Galle to the English; but as the Portuguese did not recover Ceylon the town was left to fall into English hands at the

conquest of the island from the Dutch in 1796. The name Galle is derived from the Sinhalese *galla*, equivalent to “rock”; but the Portuguese and Dutch settlers, being better fighters than philologists, connected it with the Latin *gallus*, a cock, and the image of a cock was carved as a symbol of the town in the front of the old government house.

GALLENGA, ANTONIO CARLO NAPOLEONE (1810-1895), Italian author and patriot, born at Parma on the 4th of November 1810, was the eldest son of a Piedmontese of good family, who served for ten years in the French army under Masséna and Napoleon. He had finished his education at the university of Parma, when the French Revolution of 1830 caused a ferment in Italy. He sympathized with the movement, and within a few months was successively a conspirator, a state prisoner, a combatant and a fugitive. For the next five years he lived a wandering life in France, Spain and Africa. In August 1836 he embarked for New York, and three years later he proceeded to England, where he supported himself as a translator and teacher of languages. His first book, *Italy; General Views of its History and Literature*, which appeared in 1841, was well received, but was not successful financially. On the outbreak of the Italian revolution in 1848 he at once put himself in communication with the insurgents. He filled the post of Chargé d’Affaires for Piedmont at Frankfort in 1848-1849, and for the next few years he travelled incessantly between Italy and England, working for the liberation of his country. In 1854, through Cavour’s influence, he was elected a deputy to the Italian parliament. He retained his seat until 1864, passing the summer in England and fulfilling his parliamentary duties at Turin in the winter. On the outbreak of the Austro-French War of 1859 he proceeded to Lombardy as war correspondent of *The Times*. The campaign was so brief that the fighting was over before he arrived, but his connexion with *The Times* endured for twenty years. He was a forcible and picturesque writer, with a command of English remarkable for an Italian. He materially helped to establish that friendly feeling towards Italy which became traditional in England. In 1859 Gallenga purchased the Falls, at Llandogo on the Wye, as a residence, and thither he retired in 1885. He died at this house on the 17th of December 1895. He was twice married. Among his chief works are an *Historical Memoir of Frà Dolcino and his Times* (1853); a *History of Piedmont* (3 vols., 1855; Italian translation, 1856); *Country Life in Piedmont* (1858); *The Invasion of Denmark* (2 vols., 1864); *The Pearl of the Antilles* [travels in Cuba] (1873); *Italy Revisited* (2 vols., 1875); *Two Years of the Eastern Question* (2 vols., 1877); *The Pope* [Pius IX.] *and the King* [Victor Emmanuel] (2 vols., 1879); *South America* (1880); *A Summer Tour in Russia* (1882); *Iberian Reminiscences* (2 vols., 1883); *Episodes of my Second Life* (1884); *Italy, Present and Future* (2 vols., 1887). Gallenga’s earlier publications appeared under the pseudonym of Luigi Mariotti.

GALLERY (through Ital. *galleria*, from Med. Lat. *galeria*, of which the origin is unknown),[1] a covered passage or space outside a main wall, sometimes used as a verandah if on the ground floor, and as a balcony if on an upper floor and supported by columns, piers or corbels; similarly the upper seats in a theatre or a church, on either side as in many 17th-century churches, or across the west end under the organ. The word is also used of an internal passage primarily provided to place various rooms in communication with one another; but if of narrow width this is usually called a corridor or passage. When of sufficient width the gallery is utilized to exhibit pictures and other art treasures. In the 16th century the picture gallery formed the largest room or hall in English mansions, with wainscoted walls and a richly decorated plaster ceiling; the principal examples are those of Audley End, Essex (226 ft. by 34 ft.); Hardwick, Derbyshire (166 ft. by 22 ft.); Hatfield, Hertfordshire (163 ft. by 19 ft. 6 in.); Aston Hall, near Birmingham (136 ft. by 18 ft.); Haddon Hall, Derbyshire (116 ft. by 17 ft.); and Montacute in Somersetshire (189 ft. by 22 ft.). Hence the application of the term to art museums (the National Gallery, &c.) and also to smaller rooms with top-light in which temporary exhibitions are held.

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1 Du Cange, *Glossarium, s.v.* “Galeria,” suggests an origin from *galera*, a galley, on the analogy of

"nave," from *navis*, the galley being a long and narrow ship; but, he adds, *alii alia opinantur*.

GALLEY (derived through the O. Fr. *galee*, *galie*, from the Med. Lat. *galea*, Ital. *galea*, Port. *galé*, of uncertain origin; from the Med. Lat. variant form *galera* are derived the Mod. Fr. *galère*, Span. and Ital. *galera*), a long single or half decked vessel of war, with low free-board, propelled primarily by oars or sweeps; but also having masts for sails. The word is used generally of the ancient war vessels of Greece and Rome of various types, whose chief propelling power was the oar or sweep, but its more specific application is to the medieval war vessel which survived in the navies of the Mediterranean sea-powers after the general adoption of the larger many-decked ship of war, propelled solely by sail-power. Lepanto (1571) was the last great naval battle in which the galley played the principal part. The "galleass" or "galliass" (Med. Lat. *galeasea*, Ital. *galeazza*, an augmented form of *galea*) was a larger and heavier form of galley; it usually carried three masts and had at bow and stern a castellated structure. The "galliot" (O. Fr. *galiot*, Span. and Port. *galeota*, Ital. *galeotta*, a diminutive of *galea*) was a small light type of galley. The "galleon" (formerly in English "galloon," Fr. *galion*, derived from the Med. Lat. *galio*, *galionis*, a derivative of *galea*) was a sailing ship of war and trade, shorter than the galley and standing high out of the water with several decks, chiefly used by the Spaniards during the 16th century in the carrying of treasure from America. The number of oars or sweeps varied, the larger galley having twenty-five on each side; the galleass as many as thirty-two, each being worked by several men. This labour was from the earliest times often performed by slaves or prisoners of war. It became the custom among the Mediterranean powers to sentence condemned criminals to row in the war galleys of the state. Traces of this in France can be found as early as 1532, but the first legislative enactment is in the *Ordonnance d'Orléans* of 1561. In 1564 Charles IX. forbade the sentencing of prisoners to the galleys for less than ten years. The galley-slaves were branded with the letters *Gal.* At the end of the reign of Louis XIV. the use of the galley for war purposes had practically ceased, but the corps of the galleys was not incorporated with the navy till 1748. The headquarters of the galleys and of the convict rowers (*galériens*) was at Marseilles. The majority of these latter were brought to Toulon, the others were sent to Rochefort and Brest, where they were used for work in the arsenal. At Toulon the convicts remained (in chains) on the galleys, which were moored as hulks in the harbour. Shore prisons were, however, provided for them, known as *bagnes*, baths, a name given to such penal establishments first by the Italians (*bagno*), and said to have been derived from the prison at Constantinople situated close by or attached to the great baths there. The name *galérien* was still given to all convicts, though the galleys had been abandoned, and it was not till the French Revolution that the hated name with all it signified was changed to *forçat*. In Spain *galera* is still used for a criminal condemned to penal servitude.

A vivid account of the life of galley-slaves in France is given in Jean Marteilhes's *Memoirs of a Protestant*, translated by Oliver Goldsmith (new edition, 1895), which describes the experiences of one of the Huguenots who suffered after the revocation of the edict of Nantes.

GALLIA CISALPINA (Lat. *Cis*, on this side, *i.e.* of the Alps), in ancient geography, that portion of northern Italy north of Liguria and Umbria and south of the Alps, which was inhabited by various Celtic and other peoples, of whom the Celts were in continual hostility to Rome. In early times it was bounded on the S. by Liguria and the Aesis, in Caesar's time by Liguria and the Rubicon. After the Second Punic War (203 B.C.) these tribes were severely punished by the Roman generals for the assistance they had rendered to Hannibal. Sulla divided the district into two parts; the region between the Aesis and the Rubicon was made directly subject to the government at Rome, while the northern portion was put under a distinct authority, probably similar to the usual transmarine commands (see Mommsen, *Hist. of Rome*, Eng. trans., bk. iv. c. 10).

For the early Celtic and other peoples and the later history of the district see ITALY (ancient), and ROME: *History, Ancient.*

GALLIC ACID, trioxybenzoic acid $(HO)_3(3.4.5.)C_6H_2CO_2H{\cdot}H_2O$, the *acidum gallicum* of pharmacy, a substance discovered by K. W. Scheele; it occurs in the leaves of the bearberry, in pomegranate root-bark, in tea, in gall-nuts to the extent of about 3%, and in other vegetable productions. It may be prepared by keeping moist and exposed to the air for from four to six weeks, at a temperature of 20° to 25° C., a paste of powdered gall-nuts and water, and removing from time to time the mould which forms on its surface; the paste is then boiled with water, the hot solution filtered, allowed to cool, the separated gallic acid drained, and purified by dissolving in boiling water, recrystallization at about 27° C., and washing of the crystals with ice-cold water. The production of the acid appears to be due to the presence in the galls of a ferment. Gallic acid is most readily obtained by boiling the tannin procured from oak-galls by means of alcohol and ether with weak solution of acids. It may also be produced by heating an aqueous solution of di-iodosalicylic acid with excess of alkaline carbonate, by acting on dibromosalicylic acid with moist silver oxide, and by other methods. It crystallizes in white or pale fawn-coloured acicular prisms or silky needles, and is soluble in alcohol and ether, and in 100 parts of cold and 3 of boiling water; it is without odour and has an astringent and an acid taste and reaction. It melts at about 200° C., and at 210º to 215° it is resolved into carbon dioxide and pyrogallol, $C_6H_3(OH)_3$. With ferric salts its solution gives a deep blue colour, and with ferrous salts, after exposure to the air, an insoluble, blue-black, ferroso-ferric gallate. Bases of the alkali metals give with it four series of salts; these are stable except in alkaline solutions, in which they absorb oxygen and turn brown. Solution of calcium bicarbonate becomes with gallic acid, on exposure to the air, of a dark blue colour. Unlike tannic acid, gallic acid does not precipitate albumen or salts of the alkaloids, or, except when mixed with gum, gelatin. Salts of gold and silver are reduced by it, slowly in cold, instantaneously in warm solutions, hence its employment in photography. With phosphorus oxychloride at 120° C. gallic acid yields tannic acid, and with concentrated sulphuric acid at 100°, *rufigallic acid*, $C_{14}H_8O_8$, an anthracene derivative. Oxidizing agents, such as arsenic acid, convert it into *ellagic acid*, $C_{14}H_8O_9 + H_2O$, probably a fluorene derivative, a substance which occurs in gall-nuts, in the external membrane of the episperm of the walnut, and probably in many plants, and composes the “bezoar stones” found in the intestines of Persian wild goats. Medicinally, gallic acid has been, and is still, largely used as an astringent, styptic and haemostatic. Gallic acid, however, does not coagulate albumen and therefore possesses no local astringent action. So far is it from being an haemostatic that, if perfused through living blood-vessels, it actually dilates them. Its rapid neutralization in the intestine renders it equally devoid of any remote actions.

GALLICANISM, the collective name for various theories maintaining that the church and king of France had ecclesiastical rights of their own, independent and exclusive of the jurisdiction of the pope. Gallicanism had two distinct sides, a constitutional and a dogmatic, though both were generally held together, the second serving as the logical basis of the first. And neither is intelligible, except in relation to the rival theory of Ultramontanism (*q.v.*). Dogmatic Gallicanism was concerned with the question of ecclesiastical government. It maintained that the church’s infallible authority was committed to pope and bishops jointly. The pope decided in the first instance, but his judgments must be tacitly or expressly confirmed by the bishops before they had the force of law. This ancient theory survived much longer in France than in other Catholic countries. Hence the name of Gallican is loosely given to all its modern upholders, whether of French nationality or not. Constitutional Gallicanism dealt with the relation of church and state in France. It began in the 13th century, as a protest against the theocratic pretensions of the medieval popes. They claimed that they, as vicars of Christ, had the right to interfere in the temporal concerns of princes, and even to depose sovereigns of whom they disapproved. Gallicanism answered that kings held their power directly of God; hence their temporal concerns lay altogether

outside the jurisdiction of the pope. During the troubles of the Reformation era, when the papal deposing power threatened to become a reality, the Gallican theory became of great importance. It was elaborated, and connected with dogmatic Gallicanism, by the famous theologian, Edmond Richer (1559-1631), and finally incorporated by Bossuet in a solemn Declaration of the French Clergy, made in 1682. This document lays down: (1) that the temporal sovereignty of kings is independent of the pope; (2) that a general council is above the pope; (3) that the ancient liberties of the Gallican Church are sacred; (4) that the infallible teaching authority of the church belongs to pope and bishops jointly. This declaration led to a violent quarrel with Rome, and was officially withdrawn in 1693, though its doctrines continued to be largely held. They were asserted in an extreme form in the Civil Constitution of the Clergy (1790), which almost severed connexion between France and the papacy. In 1802 Napoleon contented himself by embodying Bossuet's declaration textually in a statute. Long before his time, however, the issue had been narrowed down to determining exactly how far the pope should be allowed to interfere in French ecclesiastical affairs. Down to the repeal of the Concordat in 1905 all French governments continued to uphold two of the ancient "Gallican Liberties." The secular courts took cognizance of ecclesiastical affairs whenever the law of the land was alleged to have been broken; and papal bulls were not allowed to be published without the leave of the state. (See also Febronianism.)

(St. C.)

GALLIENI, JOSEPH SIMON (1849-), French soldier and colonial administrator, was born at Saint-Béat, in the department of Haute-Garonne, on the 24th of April 1849. He left the military academy of Saint-Cyr in July 1870 as a second lieutenant in the Marines, becoming lieutenant in 1873 and captain in 1878. He saw service in the Franco-German War, and between 1877 and 1881 took an important part in the explorations and military expeditions by which the French dominion was extended in the basin of the upper Niger. He rendered a particularly valuable service by obtaining, in March 1881, a treaty from Ahmadu, almany of Segu, giving the French exclusive rights of commerce on the upper Niger. For this he received the gold medal of the Société de Géographie. From 1883 to 1886 Gallieni was stationed in Martinique. On the 24th of June 1886 he attained the rank of lieutenant-colonel, and on the 20th of December was nominated governor of Upper Senegal. He obtained several successes against Ahmadu in 1887, and compelled Samory to agree to a treaty by which he abandoned the left bank of the Niger (see Senegal: *History*). In connexion with his service in West Africa, Gallieni published two works—*Mission d'exploration du Haut-Niger, 1879-1881* (Paris, 1885), and *Deux Campagnes au Sudan français* (Paris, 1891)—which, besides possessing great narrative interest, give information of considerable value in regard to the resources and topography of the country. In 1888 Gallieni was made an officer of the Legion of Honour. In 1891 he attained the rank of colonel, and from 1893 to 1895 he served in Tongking, commanding the second military division of the territory. In 1899 he published his experiences in *Trois Colonnes au Tonkin*. In 1896 Madagascar was made a French colony, and Gallieni was appointed resident-general (a title changed in 1897 to governor-general) and commander-in-chief. Under the weak administration of his predecessor a widespread revolt had broken out against the French. By a vigorous military system Gallieni succeeded in completing the subjugation of the island. He also turned his attention to the destruction of the political supremacy of the Hovas and the restoration of the autonomy of the other tribes. The execution of the queen's uncle, Ratsimamanga, and of Rainandrianampandry, the minister of the interior, in October 1896, and the exile of Queen Ranavalo III. herself in 1897, on the charge of fomenting rebellion, broke up the Hova hegemony, and made an end of Hova intrigues against French rule. The task of government was one of considerable difficulty. The application of the French customs and other like measures, disastrous to British and American trade, were matters for which Gallieni was not wholly responsible. His policy was directed to the development of the economic resources of the island and was conciliatory towards the non-French European population. He also secured for the Protestants religious liberty. In 1899 he published a *Rapport d'ensemble sur la situation générale de Madagascar*. In 1905, when he resigned the governorship, Madagascar enjoyed peace and a considerable measure of prosperity. In 1906 General Gallieni was appointed to command the XIV. army corps and military government of Lyons. He reviewed the results of his Madagascar administration in a book entitled *Neuf Ans à Madagascar* (Paris, 1908).

GALLIENUS, PUBLIUS LICINIUS EGNATIUS, Roman emperor from A.D. 260 to 268, son of the emperor Valerian, was born about 218. From 253 to 260 he reigned conjointly with his father, during which time he gave proof of military ability and bravery. But when his father was taken prisoner by Shapur I. of Persia, in 260, Gallienus made no effort to obtain his release, or to withstand the incursions of the invaders who threatened the empire from all sides. He occupied part of his time in dabbling in literature, science and various trifling arts, but gave himself up chiefly to excess and debauchery. He deprived the senators of their military and provincial commands, which were transferred to equites. During his reign the empire was ravaged by a fearful pestilence; and the chief cities of Greece were sacked by the Goths, who descended on the Greek coast with a fleet of five hundred. His generals rebelled against him in almost every province of the empire, and this period of Roman history came to be called the reign of the Thirty Tyrants. Nevertheless, these usurpers probably saved the empire at the time, by maintaining order and repelling the attacks of the barbarians. Gallienus was killed at Mediolanum by his own soldiers while besieging Aureolus, who was proclaimed emperor by the Illyrian legions. His sons Valerianus and Saloninus predeceased him.

Life by Trebellius Pollio in *Script. Hist. Aug.*; on coins see articles in *Numism. Zeit.* (1908) and *Riv. ital. d. num.* (1908).

GALLIFFET, GASTON ALEXANDRE AUGUSTE, MARQUIS DE, Prince de Martignes (1830-1909), French general, was born in Paris on the 23rd of January 1830. He entered the army in 1848, was commissioned as sub-lieutenant in 1853, and served with distinction at the siege of Sevastopol in 1855, in the Italian campaign of 1859, and in Algeria in 1860, after which for a time he served on the personal staff of the emperor Napoleon III. He displayed great gallantry as a captain at the siege and storm of Puebla, in Mexico, in 1863, when he was severely wounded. When he returned to France to recover from his wounds he was entrusted with the task of presenting the captured standards and colours to the emperor, and was promoted *chef d'escadrons*. He went again to Algeria in 1864, took part in expeditions against the Arabs, returned to Mexico as lieutenant-colonel, and, after winning further distinction, became in 1867 colonel of the 3rd Chasseurs d'Afrique. In the Franco-German War of 1870-71 he commanded this regiment in the army of the Rhine, until promoted to be general of brigade on the 30th of August. At the battle of Sedan he led the brigade of Chasseurs d'Afrique in the heroic charge of General Margueritte's cavalry division, which extorted the admiration of the old king of Prussia. Made prisoner of war at the capitulation, he returned to France during the siege of Paris by the French army of Versailles, and commanded a brigade against the Communists. In the suppression of the Commune he did his duty rigorously and inflexibly, and on that ground earned a reputation for severity, which, throughout his later career, and in all his efforts to improve the French army, made him the object of unceasing attacks in the press and the chamber of deputies. In 1872 he took command of the Batna subdivision of Algeria, and commanded an expedition against El Golea, surmounting great difficulties in a rapid march across the desert, and inflicting severe chastisement on the revolted tribes. On the general reorganization of the army he commanded the 31st infantry brigade. Promoted general of division in 1875, he successively commanded the 15th infantry division at Dijon, the IX. army corps at Tours, and in 1882 the XII. army corps at Limoges. In 1885 he became a member of the Conseil Supérieur de la Guerre. He conducted the cavalry manœuvres in successive years, and attained a European reputation on all cavalry questions, and, indeed, as an army commander. Decorated with the grand cross of the Legion of Honour in 1887, he received the military medal for his able conduct of the autumn manœuvres in 1891, and after again commanding at the manœuvres of 1894 he retired from the active list. Afterwards he took an important part in French politics, as war minister (22nd of June 1899 to 29th of May 1900) in M. Waldeck-Rousseau's cabinet, and distinguished himself by the firmness with which he dealt with cases of unrest in the army, but he then retired into private life, and died on the 8th of July 1909.

GALLIO, JUNIUS ANNAEUS (originally LUCIUS ANNAEUS NOVATUS), son of the rhetorician L. Annaeus Seneca and the elder brother of L. Annaeus Seneca the philosopher, was born at Corduba (Cordova) about the beginning of the Christian era. At Rome he was adopted by L. Junius Gallio, a rhetorician of some repute, from whom he took the name of Junius Gallio. His brother Seneca, who dedicated to him the treatises *De Ira* and *De Vita Beata*, speaks of the charm of his disposition, also alluded to by the poet Statius (*Silvae*, ii. 7, 32). It is probable that he was banished to Corsica with his brother, and that both returned together to Rome when Agrippina selected Seneca to be tutor to Nero. Towards the close of the reign of Claudius, Gallio was proconsul of the newly constituted senatorial province of Achaea, but seems to have been compelled by ill-health to resign the post within a few years. During his tenure of office (in 53) he dismissed the charge brought by the Jews against the apostle Paul (Acts xviii.). His behaviour on this occasion ("But Gallio cared for none of these things") shows the impartial attitude of the Roman officials towards Christianity in its early days. He survived his brother Seneca, but was subsequently put to death by order of Nero (in 65) or committed suicide.

Tacitus, *Annals*, xv. 73; Dio Cassius lx. 35, lxii. 25; Sir W.M. Ramsay, *St Paul the Traveller*, pp. 257-261; art. in Hastings' *Dict. of the Bible* (H. Cowan). An interesting reconstruction is given by Anatole France in *Sur la pierre blanche*.

GALLIPOLI (anc. *Callipolis*), a seaport town and episcopal see of Apulia, Italy, in the province of Lecce, 31 m. S. by W. of it by rail, 46 ft. above sea-level. Pop. (1901) town, 10,399; commune, 13,459. It is situated on a rocky island in the Gulf of Taranto, but is united to the mainland by a bridge, protected by a castle constructed by Charles I. of Anjou. 420
The other fortifications have been removed. The handsome cathedral dates from 1629. The town was once famous for its exports of olive-oil, which was stored, until it clarified, in cisterns cut in the rock. This still continues, but to a less extent; the export of wine, however, is increasing, and fruit is also exported.

The ancient Callipolis was obviously of Greek origin, as its name ("beautiful city") shows. It is hardly mentioned in ancient times. Pliny tells us that in his time it was known as Anxa. It lay a little off the road from Tarentum to Hydruntum, but was reached by a branch from Aletium (the site is marked by the modern church of S. Maria della Lizza), among the ruins of which many Messapian inscriptions, but no Latin ones, have been found.

(T. As.)

GALLIPOLI (Turk. *Gelibolu*, anc. Καλλίπολις), a seaport and city of European Turkey, in the vilayet of Adrianople; at the north-western extremity of the Dardanelles, on a narrow peninsula 132 m. W.S.W. of Constantinople, and 90 m. S. of Adrianople, in 40° 24′ N. and 26° 40′ 30″ E. Pop. (1905) about 25,000. Nearly opposite is Lapsaki on the Asiatic side of the channel, which is here about 2 m. wide. Gallipoli has an unattractive appearance; its streets are narrow and dirty, and many of its houses are built of wood, although there are a few better structures, occupied by the foreign residents and the richer class of Turkish citizens. The only noteworthy buildings are the large, crowded and well-furnished bazaars with leaden domes. There are several mosques, none of them remarkable, and many interesting Roman and Byzantine remains, especially a magazine of the emperor Justinian (483-565), a square castle and tower attributed to Bayezid I. (1389-1403), and some tumuli on the south, popularly called the tombs of the Thracian kings. The lighthouse, built on a cliff, has a fine appearance as seen from the Dardanelles. Gallipoli is the seat of a Greek bishop. It has two good harbours, and is the principal station for the Turkish fleet. From its position as the key of the Dardanelles, it was occupied by the allied French and British armies in 1854. Then the

isthmus a few miles north of the town, between it and Bulair, was fortified with strong earthworks by English and French engineers, mainly on the lines of the old works constructed in 1357. These fortifications were renewed and enlarged in January 1878, on the Russians threatening to take possession of Constantinople. The peninsula thus isolated by the fortified positions has the Gulf of Saros on the N.W., and extends some 50 m. S.W. The guns of Gallipoli command the Dardanelles just before the strait joins the Sea of Marmora. The town itself is not very strongly fortified, the principal fortifications being farther down the Dardanelles, where the passage is narrower.

The district (*sanjak*) of Gallipoli is exceedingly fertile and well adapted for agriculture. It has about 100,000 inhabitants, and comprises four *kazas* (cantons), namely, (1) Maitos, noted for its excellent cotton; (2) Keshan, lying inland north of Gallipoli, noted for its cattle-market, and producing grain, linseed and canary seed; (3) Myriofyto; and (4) Sharkeui or Shar-Koi (Peristeri) on the coast of the Sea of Marmora. Copper ore and petroleum are worked at Sharkeui, and the neighbourhood formerly produced wine that was highly esteemed and largely exported to France for blending. Heavy taxation, however, amounting to 55% of the value of the wine, broke the spirit of the viticulturists, most of whom uprooted their vines and replanted their lands with mulberry trees, making sericulture their occupation.

There are no important industrial establishments in Gallipoli itself, except steam flour-mills and a sardine factory. The line of railway between Adrianople and the Aegean Sea has been prejudicial to the transit trade of Gallipoli, and several attempts have been made to obtain concessions for the construction of a railway that would connect this port with the Turkish railway system. Steamers to and from Constantinople call regularly. In 1904 the total value of the exports was £80,000. Wheat and maize are exported to the Aegean islands and to Turkish ports on the mainland; barley, oats and linseed to Great Britain; canary seed chiefly to Australia; beans to France and Spain. Semolina and bran are manufactured in the district. Live stock, principally sheep, pass through Gallipoli in transit to Constantinople and Smyrna. Cheese, sardines, goats' skins and sheepskins are also exported. The imports include woollen and cotton fabrics from Italy, Germany, France and Great Britain, and hardware from Germany and Austria. These goods are imported through Constantinople. Cordage is chiefly obtained from Servia. Other imports are fuel, iron and groceries.

The Macedonian city of Callipolis was founded in the 5th century B.C. At an early date it became a Christian bishopric, and in the middle ages developed into a great commercial city, with a population estimated at 100,000. It was fortified by the East Roman emperors owing to its commanding strategic position and its valuable trade with Greece and Italy. In 1190 the armies of the Third Crusade, under the emperor Frederick I. (Barbarossa), embarked here for Asia Minor. After the capture of Constantinople by the Latins in 1204, Gallipoli passed into the power of Venice. In 1294 the Genoese defeated a Venetian force in the neighbourhood. A body of Catalans, under Roger Florus, established themselves here in 1306, and after the death of their leader massacred almost all the citizens; they were vainly besieged by the allied troops of Venice and the Empire, and withdrew in 1307, after dismantling the fortifications. About the middle of the 14th century the Turks invaded Europe, and Gallipoli was the first city to fall into their power. The Venetians under Pietro Loredano defeated the Turks here in 1416.

GALLIPOLIS, a city and the county-seat of Gallia county, Ohio, U.S.A., on the Ohio river, about 125 m. E. by S. of Cincinnati. Pop. (1890) 4498; (1900) 5432 (852 negroes); (1910) 5560. It is served by the Kanawha & Michigan (Ohio Central Lines) and the Hocking Valley railways, and (at Gallipolis Ferry, West Virginia, across the Ohio) by the Baltimore & Ohio railway. The city is built on a level site several feet above the river's high-water mark. It has a United States marine hospital and a state hospital for epileptics. Among the city's manufactures are lumber, furniture, iron, stoves, flour and brooms. The municipality owns and operates its water-works. Gallipolis was settled in 1790 by colonists from France, who had received worthless deeds to lands in Ohio from the Scioto Land Company, founded by Col. William Duer (1747-1799) and others in 1787 and officially organized in 1789 as the Compagnie du Scioto in Paris by Joel Barlow, the agent of Duer and his associates abroad, William Playfair, an Englishman, and six Frenchmen. This company had arranged with the Ohio Company in 1787 for the use of about 4,000,000 acres, N. of the Ohio and E. of the

Scioto, on which the Ohio Company had secured an option only. The dishonesty of those who conducted the sales in France, the unbusinesslike methods of Barlow, and the failure of Duer and his associates to meet their contract with the Ohio Company, caused the collapse of the Scioto Company early in 1790, and two subsequent attempts to revive it failed. Meanwhile about 150,000 acres had been sold to prospective settlers in France, and in October 1790 the French immigrants, who had been detained for two months at Alexandria, Virginia, arrived on the site of Gallipolis, where rude huts had been built for them. This land, however, fell within the limits of the tract bought outright by the Ohio Company, which sold it to the Scioto Company, and to which it reverted on the failure of the Scioto Company to pay. In 1794 William Bradford, attorney-general of the United States, decided that all rights in the 4,000,000 acres, on which the Ohio Company had secured an option for the Scioto Company, were legally vested in the Ohio Company. In 1795 the Ohio Company sold to the French settlers for $1.25 an acre the land they occupied and adjacent improved lots, and the United States government granted to them 24,000 acres in the southern part of what is now Scioto County in 1795; little of this land (still known as the “French Grant”), however, was ever occupied by them. Gallipolis was incorporated as a village in 1842, and was first chartered as a city in 1865.

See Theodore T. Belote, *The Scioto Speculation and the French Settlement at Gallipolis* (Cincinnati, 1907), series 2, vol. iii. No. 3 of the *University Studies* of the University of Cincinnati.

GALLITZIN, DEMETRIUS AUGUSTINE (1770-1840), American Roman Catholic priest, called “The Apostle of the Alleghanies,” was born at the Hague on the 22nd of December 1770. His name is a form of Golitsuin (*q.v.*), the Russian family from which he came. His father, Dimitri Alexeievich Gallitzin (1735-1803), Russian ambassador to Holland, was an intimate friend of Voltaire and a follower of Diderot; so, too, for many years was his mother, Countess Adelheid Amalie von Schmettau (1748-1806), until a severe illness in 1786 led her back to the Roman Catholic church, in which she had been reared. At the age of seventeen he too became a member of that church. His father had planned for him a diplomatic or military career, and in 1792 he was aide-de-camp to the commander of the Austrian troops in Brabant; but, after the assassination of the king of Sweden, he, like all other foreigners, was dismissed from the service. He then set out to complete his education by travel, and on the 28th of October 1792 arrived in Baltimore, Maryland, where he finally decided to enter the priesthood. He was ordained priest in March 1795, being the first Roman Catholic priest ordained in America, and then worked in the mission at Port Tobacco, Maryland, whence he was soon transferred to the Conewago district. His impulsive objection to some of Bishop Carroll’s instructions was sharply rebuked, and he was recalled to Baltimore. But in 1796 he removed to Taneytown, Maryland, and in both Maryland and Pennsylvania worked with such misdirected zeal and autocratic manners that he was again reproved by his bishop in 1798. In the Alleghanies, in 1799, he planned a settlement in what is now Cambria county, Pennsylvania, and bought up much land which he gave or sold at low prices to Catholic immigrants, spending $150,000 or more in the purchase of some 20,000 acres in a spot singularly ill suited for such an enterprise. In 1808, after his father’s death, he was disinherited by the emperor Alexander I. of Russia “by reason of your Catholic faith and your ecclesiastical profession”; and although his sister Anne repeatedly promised him his half of the valuable estate and sent him money from time to time, after her death her brother received little or nothing from the estate. The priest, who after his father’s death had in 1809 discarded the name of Augustine Smith, under which he had been naturalized, and had taken his real name, was soon deeply in debt. No small part was a loan from Charles Carroll, and when Gallitzin was suggested for the see of Philadelphia in 1814, Bishop Carroll gave as an objection Gallitzin’s “great load of debt rashly, though for excellent and charitable purposes, contracted.” In 1815 Gallitzin was suggested for the bishopric of Bardstown, Kentucky, and in 1827 for the proposed see of Pittsburg, and he refused the bishopric of Cincinnati. He died at Loretto, the settlement he had founded in Cambria county, on the 6th of May 1840. Among his parishioners Gallitzin was a great power for good. His part in building up the Roman Catholic Church in western Pennsylvania cannot be estimated; but it is said that at his death there were 10,000 members of his church in the district where forty years before he had found a scant dozen. One of the villages he founded bears his name. Among his controversial pamphlets are: *A Defence of Catholic Principles* (1816), *Letter to a*

Protestant Friend on the Holy Scriptures (1820), *Appeal to the Protestant Public* (1834), and *Six Letters of Advice* (1834), in reply to attacks on the Catholic Church by a Presbyterian synod.

See Sarah M. Brownson, *Life of D.A. Gallitzin, Prince and Priest* (New York, 1873); a brief summary of his life by A.A. Lambing in *American Catholic Records* (Pittsburg, Pennsylvania, October 1886, pp. 58-68); and a good bibliography by Thomas C. Middleton in *The Gallitzin Memorandum Book*, in *American Catholic Historical Society of Philadelphia, Records*, vol. 4, pp. 32 sqq.

GALLIUM (symbol Ga; atomic weight 69.9), one of the metallic chemical elements. It was discovered in 1875 through its spectrum, in a specimen of zinc blende by Lecoq de Boisbaudran (*Comptes rendus*, 1875, 81, p. 493, and following years). The chief chemical and physical properties of gallium had been predicted many years before by D. Mendeléeff (*c.* 1869) from a consideration of the properties of aluminium, indium and zinc (see Element). The metal is obtained from zinc blende (which only contains it in very small quantity) by dissolving the mineral in an acid, and precipitating the gallium by metallic zinc. The precipitate is dissolved in hydrochloric acid and foreign metals are removed by sulphuretted hydrogen; the residual liquid being then fractionally precipitated by sodium carbonate, which throws out the gallium before the zinc. This precipitate is converted into gallium sulphate and finally into a pure specimen of the oxide, from which the metal is obtained by the electrolysis of an alkaline solution. Gallium crystallizes in greyish-white octahedra which melt at 30.15° C. to a silvery-white liquid. It is very hard and but slightly malleable and flexible, although in thin plates it may be bent several times without breaking. The specific gravity of the solid form is 5.956 (24.5° C.), of the liquid 6.069, whilst the specific heats of the two varieties are, for the solid form 0.079 (12-23° C.) and for the liquid 0.082 (106-119°) [M. Berthelot, *Comptes rendus*, 1878, 86, p. 786]. It is not appreciably volatilized at a red heat. Chlorine acts on it readily in the cold, bromine not so easily, and iodine only when the mixture is heated. The atomic weight of gallium has been determined by Lecoq de Boisbaudran by ignition of gallium ammonium alum, and also by L. Meyer and K. Seubert.

Gallium oxide Ga_2O_3 is obtained when the nitrate is heated, or by solution of the metal in nitric acid and ignition of the nitrate. It forms a white friable mass which after ignition is insoluble in acids. On heating to redness in a stream of hydrogen it forms a bluish mass which is probably a lower oxide of composition GaO. Gallium forms colourless salts, which in neutral dilute aqueous solutions are converted on heating into basic salts. The gallium salts are precipitated by alkaline carbonates and by barium carbonate, but not by sulphuretted hydrogen unless in acetic acid solution. Potassium ferrocyanide gives a precipitate even in very dilute solution. In neutral solutions, zinc gives a precipitate of gallium oxide. By heating gallium in a regulated stream of chlorine the *dichloride* $GaCl_2$ is obtained as a crystalline mass, which melts at 164° C. and readily decomposes on exposure to moist air. The trichloride $GaCl_3$ is similarly formed when the metal is heated in a rapid stream of chlorine, and may be purified by distillation in an atmosphere of nitrogen. It forms very deliquescent long white needles melting at 75.5° C. and boiling at 215-220° C. The bromide, iodide and sulphate are known, as is also gallium ammonium alum. Gallium is best detected by means of its spark spectrum, which gives two violet lines of wave length 4171 and 4031.

GALLON, an English measure of capacity, usually of liquids, but also used as a dry measure for corn. A gallon contains four quarts. The word was adapted from an O. Norm. Fr. *galon*, Central Fr. *jalon*, and was Latinized as *galo* and *galona*. It appears to be connected with the modern French *jale*, a bowl, but the ultimate origin is unknown; it has been referred without much plausibility to Gr. γαυλός, a milk pail. The British imperial gallon of four quarts contains 277.274 cub. in. The old English wine gallon of 231 cub. in. capacity is the standard gallon of the United States.

GALLOWAY, JOSEPH (1731-1803), American lawyer and politician, one of the most prominent of the Loyalists, was born in West River, Anne Arundel county, Maryland, in 1731. He early removed to Philadelphia, where he acquired a high standing as a lawyer. From 1756 until 1774 (except in 1764) he was one of the most influential members of the Pennsylvania Assembly, over which he presided in 1766-1773. During this period, with his friend Benjamin Franklin, he led the opposition to the Proprietary government, and in 1764 and 1765 attempted to secure a royal charter for the province. With the approach of the crisis in the relations between Great Britain and the American colonies he adopted a conservative course, and, while recognizing the justice of many of the colonial complaints, discouraged radical action and advocated a compromise. As a member of the First Continental Congress, he introduced (28th September 1774) a "Plan of a Proposed Union between Great Britain and the Colonies," and it is for this chiefly that he is remembered. It provided for a president-general appointed by the crown, who should have supreme executive authority over all the colonies, and for a grand council, elected triennially by the several provincial assemblies, and to have such "rights, liberties and privileges as are held and exercised by and in the House of Commons of Great Britain"; the president-general and grand council were to be "an inferior distinct branch of the British legislature, united and incorporated with it." The assent of the grand council and of the British parliament was to be "requisite to the validity of all ... general acts or statutes," except that "in time of War, all bills for granting aid to the crown, prepared by the grand council and approved by the president-general, shall be valid and passed into a law, without the assent of the British parliament." The individual colonies, however, were to retain control over their strictly internal affairs. The measure was debated at length, was advocated by such influential members as John Jay and James Duane of New York and Edward Rutledge of South Carolina, and was eventually defeated only by the vote of six colonies to five. Galloway declined a second election to Congress in 1775, joined the British army at New Brunswick, New Jersey (December 1776), advised the British to attack Philadelphia by the Delaware, and during the British occupation of Philadelphia (1777-1778) was superintendent of the port, of prohibited articles, and of police of the city. In October 1778 he went to England, where he remained until his death at Watford, Hertfordshire, on the 29th of August 1803. After he left America his life was attainted, and his property, valued at £40,000, was confiscated by the Pennsylvania Assembly, a loss for which he received a partial recompense in the form of a small parliamentary pension. He was one of the clearest thinkers and ablest political writers among the American Loyalists, and, according to Prof. Tyler, "shared with Thomas Hutchinson the supreme place among American statesmen opposed to the Revolution."

Among his pamphlets are *A Candid Examination of the Mutual Claims of Great Britain and the Colonies* (1775); *Historical and Political Reflections on the Rise and Progress of the American Rebellion* (1780); *Cool Thoughts on the Consequences to Great Britain of American Independence* (1780); and *The Claim of the American Loyalists Reviewed and Maintained upon Incontrovertible Principles of Law and Justice* (1788).

See Thomas Balch (Ed.), *The Examination of Joseph Galloway by a Committee of the House of Commons* (Philadelphia, 1855); Ernest H. Baldwin, *Joseph Galloway, the Loyalist Politician* (New Haven, 1903); and M.C. Tyler, *Literary History of the American Revolution* (2 vols., New York, 1897).

GALLOWAY, THOMAS (1796-1851), Scottish mathematician, was born at Symington, Lanarkshire, on the 26th of February 1796. In 1812 he entered the university of Edinburgh, where he distinguished himself specially in mathematics. In 1823 he was appointed one of the teachers of mathematics at the military college of Sandhurst, and in 1833 he was appointed actuary to the Amicable Life Assurance Office, the oldest institution of that kind in London; in which situation he remained till his death on the 1st of November 1851. Galloway was a voluminous, though, for the most part, an anonymous writer. His most interesting paper is "On the Proper Motion of the Solar System," and was published in the *Phil. Trans.*, 1847. He contributed largely to the seventh edition of the *Encyclopaedia Britannica*, and also wrote several scientific papers for the *Edinburgh Review* and various scientific journals. His *Encyclopaedia* article, "Probability," was published separately.

See *Transactions of the Royal Astronomical Society* (1852).

GALLOWAY, a district in the south-west of Scotland, comprising the counties of Kirkcudbright and Wigtown. It was the *Novantia* of the Romans, and till the end of the 12th century included Carrick, now the southern division of Ayrshire. Though the designation has not been adopted civilly, its use historically and locally has been long established. Thus the Bruces were lords of Galloway, and the title of earl of Galloway (created 1623) is now held by a branch of the Stewarts. Galloway also gives its name to a famous indigenous breed of black hornless cattle. See KIRKCUDBRIGHTSHIRE and WIGTOWNSHIRE.

GALLOWS[1] (a common Teutonic word—cf. Goth. *galga*, O. H. Ger. *galgo*, Mod. Ger. *Galgen*, A.S. *galzan*, &c.—of uncertain origin), the apparatus for executing the sentence of death by hanging. It usually consists of two upright posts and a cross-beam, but sometimes of a single upright with a beam projecting from the top. The Roman gallows was the cross, and in the older translations of the Bible "gallows" was used for the cross on which Christ suffered (so *galga* in Ulfilas's Gothic Testament).[2] Another form of gallows in the middle ages was that of which the famous example at Montfaucon near Paris was the type. This was a square structure formed of columns of masonry connected in each tier with cross-pieces of wood, and with pits beneath, into which the bodies fell after disarticulation by exposure to the weather.

According to actual usage the condemned man stands on a platform or drop (introduced in England in 1760), the rope hangs from the cross-beam, and the noose at its end is placed round his neck. He is hanged by the falling of the drop, the knot in the noose being so adjusted that the spinal cord is broken by the fall and death instantaneous. In old times the process was far less merciful; sometimes the condemned man stood in a cart, which was drawn away from under him; sometimes he had to mount a ladder, from which he was thrust by the hangman. Until 1832 malefactors in England were sometimes hanged by being drawn up from the platform by a heavy weight at the other end of the rope. Death in these cases was by strangulation. At the present time executions in the United Kingdom are private, the gallows being erected in a chamber or enclosed space set apart for the purpose inside the gaol.

The word "gibbet," the Fr. *gibet*, gallows, which appears in the first instance to have meant a crooked stick,[3] was originally used in English synonymously with gallows, as it sometimes still is. Its later and more special application, however, was to the upright posts with a projecting arm on which the bodies of criminals were suspended after their execution. These gibbets were erected in conspicuous spots, on the tops of hills (Gallows Hill is still a common name) or near frequented roads. The bodies, smeared with pitch to prevent too rapid decomposition, hung in chains as a warning to evildoers. From the gruesome custom comes the common use of the word "to gibbet" for any holding up to public infamy or contempt.

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1 The word "gallows" is the plural of a word (*galwe*, *galowe*, *gallow*) which, according to the *New English Dictionary*, was occasionally used as late as the 17th century, though from the 13th century onwards the plural form was more usual. Caxton speaks both of "a gallows," and, in the older form, of "a pair of gallows," this referring probably to the two upright posts. From the 16th century onwards "gallows" has been consistently treated as a singular form, a new plural, "gallowses," having come into use. "The latter, though not strictly obsolete, is now seldom used; the formation is felt to be somewhat uncouth, so that the use of the word in the plural in commonly evaded" (*New Eng. Dict.* s.v. "Gallows").

2 In Med. Lat. "gallows" was translated by *furia* and *patibulum*, both words applied in classical Latin to a fork-shaped instrument of punishment fastened on the neck of slaves and criminals. *Furia*, in feudal law, was the right granted to tenants having major jurisdiction to erect a gallows within the limits of their fief.

3 Cf. Wace, *Roman de Rou*, iii. 8349:

“Et il a le gibet saisi
Qui a son destre braz pendi.”

GALLS. In animals galls occur mostly on or under the skin of living mammals and birds, and are produced by Acaridea, and by dipterous insects of the genus *Oestrus*. Signor Moriggia[1] has described and figured a horny excrescence, nearly 8 in. in length, from the back of the human hand, which was caused by *Acarus domesticus*. What are commonly known as galls are vegetable excrescences, and, according to the definition of Lacaze-Duthiers, comprise “all abnormal vegetable productions developed on plants by the action of animals, more particularly by insects, whatever may be their form, bulk or situation.” For the larvae of their makers the galls provide shelter and sustenance. The exciting cause of the hypertrophy, in the case of the typical galls, appears to be a minute quantity of some irritating fluid, or virus, secreted by the female insect, and deposited with her egg in the puncture made by her ovipositor in the cortical or foliaceous parts of plants. This virus causes the rapid enlargement and subdivision of the cells affected by it, so as to form the tissues of the gall. Oval or larval irritation also, without doubt, plays an important part in the formation of many galls. Though, as Lacaze-Duthiers remarks, a certain relation is necessary between the “stimulus” and the “supporter of the stimulus,” as evidenced by the limitation in the majority of cases of each species of gall-insect to some one vegetable structure, still it must be the quality of the irritant of the tissues, rather than the specific peculiarities or the part of the plant affected, that principally determines the nature of the gall. Thus the characteristics of the currant-gall of *Spathegaster baccarum*, L., which occurs alike on the leaves and on the flower-stalks of the oak, are obviously due to the act of oviposition, and not to the functions of the parts producing it; the bright red galls of the saw-fly *Nematus gallicola* are found on four different species of willow, *Salix fragilis*, *S. alba*, *S. caprea* and *S. cinerea*;[2] and the galls of a Cynipid, *Biorhiza aptera*, usually developed on the rootlets of the oak, have been procured also from the deodar.[3] Often the gall bears no visible resemblance to the structures out of which it is developed; commonly, however, outside the larval chamber, or gall proper, and giving to the gall its distinctive form, are to be detected certain more or less modified special organs of the plant. The gall of *Cecidomyia strobilina*, formed from willow-buds, is mainly a rosette of leaves the stalks of which have had their growth arrested. The small, smooth, seed-shaped gall of the American *Cynips seminator*, Harris, according to W.F. Bassett,[4] is the petiole, and its terminal tuft of woolly hairs the enormously developed pubescence of the young oak-leaf. The moss-like covering of the “bedeguars” of the wild rose, the galls of a Cynipid, *Rhodites rosae*, represents leaves which have been developed with scarcely any parenchyma between their fibro-vascular bundles; and the “artichoke-galls” or “oak-strobile,” produced by *Aphilothrix gemmae*, L., which insect arrests the development of the acorn, consists of a cupule to which more or less modified leaf-scales are attached, with a peduncular, oviform, inner gall.[5] E. Newman held the view that many oak-galls are pseudobalani or false acorns: “to produce an acorn has been the intention of the oak, but the gall-fly has frustrated the attempt.” Their formation from buds which normally would have yielded leaves and shoots is explained by Parfitt as the outcome of an effort at fructification induced by oviposition, such as has been found to result in several plants from injury by insect-agency or otherwise.[6] Galls vary remarkably in size and shape according to the species of their makers. The polythalamous gall of *Aphilothrix radicis*, found on the roots of old oak-trees, may attain the size of a man’s fist; the galls of another Cynipid, *Andricus occultus*, Tschek,[7] which occurs on the male flowers of *Quercus sessiliflora*, is 2 millimetres, or barely a line, in length. Many galls are brightly coloured, as, for instance, the oak-leaf hairy galls of *Spathegaster tricolor*, which are of a crimson hue, more or less diffused according to exposure to light. The variety of forms of galls is very great. Some are like urns or cups, others lenticular. The “knoppern” galls of *Cynips polycera*, Gir., are cones having the broad, slightly convex upper surface surrounded with a toothed ridge. Of the Ceylonese galls, “some are as symmetrical as a composite flower when in bud, others smooth and spherical like a berry; some protected by long spines, others clothed with yellow wool formed of long cellular hairs, others with regularly tufted hairs.”[8] The characters of galls are constant, and as a rule exceedingly diagnostic, even when, as in the case of ten different gall-gnats of an American willow, *Salix humilis*, it is difficult or impossible to tell the full-grown insects that produce them from one another.

In degree of complexity of internal structure galls differ considerably. Some are monothalamous, and contain but one larva of the gall-maker, whilst others are many-celled and numerously inhabited. The largest class are the unilocular, or simple, external galls, divided by Lacaze-Duthiers into those with and those without a superficial protective layer or rind, and composed of hard, or spongy, or cellular tissue. In a common gall-nut that authority distinguished seven constituent portions: an epidermis; a subdermic cellular tissue; a spongy and a hard layer, composing the parenchyma proper; vessels which, without forming a complete investment, underlie the parenchyma; a hard protective layer; and lastly, within that, an alimentary central mass inhabited by the growing larva.[9]

Galls are formed by insects of several orders. Among the Hymenoptera are the gall-wasps (*Cynips* and its allies), which infect the various species of oak. They are small insects, having straight antennae, and a compressed, usually very short abdomen with the second or second and third segments greatly developed, and the rest imbricated, and concealing the partially coiled ovipositor. The transformations from the larval state are completed within the gall, out of which the imago, or perfect insect, tunnels its way,—usually in autumn, though sometimes, as has been observed of some individuals of *Cynips Kollari*, after hibernation.

Among the commoner of the galls of the *Cynipidae* are the “oak-apple” or “oak-sponge” of *Andricus terminalis*, Fab.; the “currant” or “berry galls” of *Spathegaster baccarum*, L., above mentioned; and the “oak-spangles” of *Neuroterus lenticularis*,[10] Oliv., generally reputed to be fungoid growths, until the discovery of their true nature by Frederick Smith,[11] and the succulent “cherry-galls” of *Dryophanta scutellaris*, Oliv. The “marble” or “Devonshire woody galls” of oak-buds, which often destroy the leading shoots of young trees, are produced by *Cynips Kollari*,[12] already alluded to. They were first introduced into Devonshire about the year 1847, had become common near Birmingham by 1866, and two or three years later were observed in several parts of Scotland.[13] They contain about 17% of tannin.[14] On account of their regular form they have been used, threaded on wire, for making ornamental baskets. The large purplish Mecca or Bussorah galls,[15] produced on a species of oak by *Cynips insana*, Westw., have been regarded by many writers as the Dead Sea fruit, mad-apples (*mala insana*), or apples of Sodom (*poma sodomitica*), alluded to by Josephus and others, which, however, are stated by E. Robinson (*Bibl. Researches in Palestine*, vol. i. pp. 522-524, 3rd ed., 1867) to be the singular fruit called by the Arabs *’Ösher*, produced by the *Asclepias gigantea* or *procera* of botanists. What in California are known as “flea seeds” are oak-galls made by a species of *Cynips*; in August they become detached from the leaves that bear them, and are caused to jump by the spasmodic movements of the grub within the thin-walled gall-cavity.[16]

Common gall-nuts, nut-galls, or oak-galls, the Aleppo, Turkey, or Levant galls of commerce (Ger. *Galläpfel*, *levantische Gallen*; Fr. *noix de Galle*), are produced on *Quercus infectoria*, a variety of *Q. Lusitanica*, Webb, by *Cynips* (*Diplolepis*, Latr.) *tinctoria*, L., or *C. gallae tinctoriae* Oliv. Aleppo galls (*gallae halepenses*) are brittle, hard, spherical bodies, ⅖-⅘ in. in diameter, ridged and warty on the upper half, and light brown to dark greyish-yellow within. What are termed “blue,” “black,” or “green” galls contain the insect; the inferior “white” galls, which are lighter coloured, and not so compact, heavy or astringent, are gathered after its escape (see fig. 1.). Less valued are the galls of Tripoli (Taraplus or Tarabulus, whence the name “Tarablous galls”). The most esteemed Syrian galls, according to Pereira, are those of Mosul on the Tigris. Other varieties of nut-galls, besides the above-mentioned, are employed in Europe for various purposes. Commercial gall-nuts have yielded on analysis from 26 (H. Davy) to 77 (Buchner) % of tannin (see Vinen, *loc. cit.*), with gallic and ellagic acids, ligneous fibre, water, and minute quantities of proteids, chlorophyll, resin, free sugar and, in the cells around the inner shelly chamber, calcium oxalate. Oak-galls are mentioned by Theophrastus, Dioscorides (i. 146), and other ancient writers, including Pliny *(Nat. Hist.* xvi. 9, 10, xxiv. 5), according to whom they may be produced “in a single night.” Their insect origin appears to have been entirely unsuspected until within comparatively recent times, though Pliny, indeed, makes the observation that a kind of gnat is produced in certain excrescences on oak leaves. Bacon describes oak-apples as “an exudation of plants joined with putrefaction.” Pomet[17] thought that gall-nuts were the fruit of the oak, and a similar opinion obtains among the modern Chinese, who apply to them the term *Mu-shih-tsze*, or “fruits for the foodless.”[18] Hippocrates administered gall-nuts for their astringent properties, and Pliny (*Nat. Hist.* xxiv. 5) recommends them as a remedy in affections of the gums and uvula, ulcerations of the mouth and some dozen more complaints. In British pharmacy gall-nuts are used in the preparation of the two astringent ointments *unguentum gallae* and *unguentum gallae cum opio*, and of the tinctura gallae, and also as a source of tannin and of gallic acid (*q.v.*). They have from very early times been resorted to as a means

of staining the hair of a dark colour, and they are the base of the tattooing dye of the Somali women.[19]

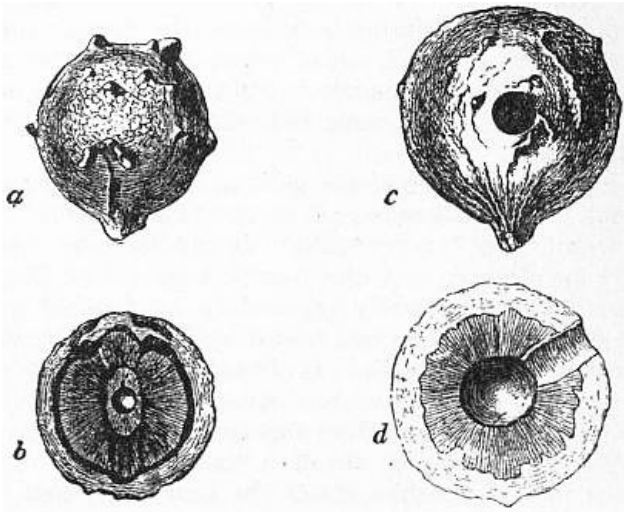

FIG. 1.—*a*, Aleppo "blue" gall; *b*, ditto in section, showing central cavity for grub; *c*, Aleppo "white" gall, perforated by insect; *d*, the same in section (natural size).

The gall-making Hymenoptera include, besides the *Cynipidae* proper, certain species of the genus *Eurytoma* (*Isosoma*, Walsh) and family *Chalcididae*, *e.g. E. hordei*, the "joint-worm" of the United States, which produces galls on the stalks of wheat;[20] also various members of the family *Tenthredinidae*, or saw-flies. The larvae of the latter usually vacate their galls, to spin their cocoons in the earth, or, as in the case of *Athalia abdominalis*, Klg., of the clematis, may emerge from their shelter to feed for some days on the leaves of the gall-bearing plant.

The dipterous gall-formers include the gall-midges, or gall-gnats (*Cecidomyidae*), minute slender-bodied insects, with bodies usually covered with long hairs, and the wings folded over the back. Some of them build cocoons within their galls, others descend to the ground or become pupae. The true willow-galls are the work either of these or of saw-flies. Their galls are to be met with on a great variety of plants of widely distinct genera, *e.g.* the ash, maple, horn-beam, oak,[21] grape-vine,[22] alder, gooseberry, blackberry, pine, juniper, thistle, fennel, meadowsweet,[23] common cabbage and cereals. In the northern United States, in May, "legions of these delicate minute flies fill the air at twilight, hovering over wheat-fields and shrubbery. A strong north-west wind, at such times, is of incalculable value to the farmer."[24] Other gall-making dipterous flies are members of the family *Trypetidae*, which disfigure the seed-heads of plants, and of the family *Mycetophilidae*, such as the species *Sciara tilicola*,[25] Löw, the cause of the oblong or rounded green and red galls of the young shoots and leaves of the lime.

Galls are formed also by hemipterous and homopterous insects of the families *Tingidae*, *Psyllidae*, *Coccidae* and *Aphidae*. *Coccus pinicorticis* causes the growth of patches of white flocculent and downy matter on the smooth bark of young trees of the white pine in America.[26] The galls of examples of the last family are common objects on lime-leaves, and on the petioles of the poplar. An American Aphid of the genus *Pemphigus* produces black, ragged, leathery and cut-shaped excrescences on the young branches of the hickory.

The Chinese galls of commerce (*Woo-pei-tsze*) are stated to be produced by *Aphis Chinensis*, Bell, on *Rhus semialata*, Murr. (*R. Bucki-amela*, Roxb.), an Anacardiaceous tree indigenous to N. India, China and Japan. They are hollow, brittle, irregularly pyriform, tuberculated or branched vesicles, with thin walls, covered externally with a grey down, and internally with a white chalk-like matter, and insect-remains (see fig. 2). The escape of the insect takes place on the spontaneous bursting of the walls of the vesicle, probably when, after viviparous (thelytokous) reproduction for several generations, male winged insects are developed. The galls are gathered before the frosts set in, and are exposed to steam to kill the insects.[27]

Chinese galls examined by Viedt[28] yielded 72% of tannin, and less mucilage than Aleppo galls. Several other varieties of galls are produced by Aphides on species of *Pistacia*.

M.J. Lichtenstein has established the fact that from the egg of the Aphis of Pistachio galls, *Anopleura lentisci*, is hatched an apterous insect (the gall-founder), which gives birth to young Aphides (emigrants), and that these, having acquired wings, fly to the roots of certain

grasses (*Bromus sterilis* and *Hordeum vulgare*), and by budding underground give rise to several generations of apterous insects, whence finally comes a winged brood (the pupifera). These last issuing from the ground fly to the Pistachio, and on it deposit their pupae. From the pupae, again, are developed sexual individuals, the females of which lay fecundated eggs productive of gall-founders, thus recommencing the biological cycle (see *Compt. rend.*, Nov. 18, 1878, p. 782, quoted in *Ann. and Mag. Nat. Hist.*, 1879, p. 174).

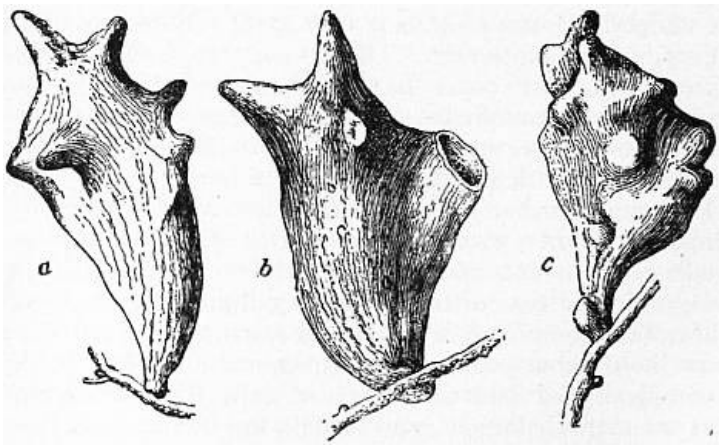

FIG. 2.—*a*, Chinese gall (abt. ½ natural size); *b*, ditto broken, showing thin-walled cavity; *c*, Japanese gall (natural size).

Of other insects which have been recognized as gall-makers there are, among the Coleoptera, certain Curculionids (gall-weevils), and species of the exotic *Sagridae* and *Lamiadae* and an American beetle, *Saperda inornata* (*Cerambycidae*), which forms the pseudo-galls of *Salix longifolia* and *Populus angulata*, or cottonwood. Among the Lepidoptera are gall-forming species belonging to the *Tineidae*, *Aegeriidae*, *Tortricidae* and *Pterophoridae*. The larva of a New Zealand moth, *Morova subfasciata*, Walk. (*Cacoëcia gallicolens*), of the family *Drepanulidae*, causes the stem of a creeping plant, on the pith of which it apparently subsists, to swell up into a fusiform gall.[29]

Mite-galls, or *acarocecidia*, are abnormal growths of the leaves of plants, produced by microscopic Acaridea of the genus *Phytoptus* (gall-mites), and consist of little tufts of hairs, or of thickened portions of the leaves, usually most hypertrophied on the upper surface, so that the lower is drawn up into the interior, producing a bursiform cavity. Mite-galls occur on the sycamore, pear, plum, ash, alder, vine, mulberry and many other plants; and formerly, *e.g.* the gall known as *Erineum quercinum*, on the leaves of *Quercus Cerris*, were taken for cryptogamic structures. The lime-leaf "nail-galls" of *Phytoptus tiliae* closely resemble the "trumpet-galls" formed on American vines by a species of *Cecidomyia*.[30] Certain minute Nematoid worms, as *Anguillula scandens*, which infests the ears of wheat, also give rise to galls.

Besides the larva of the gall-maker, or the householder, galls usually contain inquilines or lodgers, the larvae of what are termed guest-flies or cuckoo-flies. Thus the galls of *Cynips* and its allies are inhabited by members of other cynipideous genera, as *Synergus*, *Amblynotus* and *Synophrus*; and the pine-cone-like gall of *Salix strobiloides*, as Walsh has shown,[30] is made by a large species of *Cecidomyia*, which inhabits the heart of the mass, the numerous smaller cecidomyidous larvae in its outer part being mere inquilines. In many instances the lodgers are not of the same order of insects as the gall-makers. Some saw-flies, for example, are inquilinous in the galls of gall-gnats and some gall-gnats in the galls of saw-flies. Again, galls may afford harbour to insects which are not essentially gall-feeders, as in the case of the Curculio beetle *Conotrachelius nenuphar*, Hbst., of which one brood eats the fleshy part of the plum and peach, and another lives in the "black knot" of the plum-tree, regarded by Walsh as probably a true cecidomyidous gall. The same authority (*loc. cit.* p. 550) mentions a willow-gall which provides no less than sixteen insects with food and protection; these are preyed upon by about eight others, so that altogether some twenty-four insects, representing eight orders, are dependent for their existence on what to the common observer appears to be nothing but "an unmeaning mass of leaves." Among the numerous insects parasitic on the inhabitants of galls are hymenopterous flies of the family *Proctotrypidae*, and of the family *Chalcididae*, *e.g. Callimome regius*, the larva of which preys on the larvae of both *Cynips glutinosa* and its lodger *Synergus facialis*. The oak-apple often contains the larvae of *Braconidae* and *Ichneumonidae*, which Von Schlechtendal (*loc. sup. cit.* p. 33) considers to be parasites not on the owner of the gall, *Andricus terminalis*, but on inquilinous *Tortricidae*. Birds are to be included among the enemies of gall-insects.

Oak-galls, for example, are broken open by the titmouse in order to obtain the grub within, and the “button-galls” of *Neuroterus numismatis*, Oliv., are eaten by pheasants.

A great variety of deformations and growths produced by insects and mites as well as by fungi have been described. They are in some cases very slight, and in others form remarkably large and definite structures. The whole are now included under the term Cecidia; a prefix gives the name of the organism to which the attacks are due, *e.g.* Phytoptocecidia are the galls formed by Phytoptid mites. Simple galls are those that arise when only one member of a plant is involved; compound galls are the result of attacks on buds. Amongst the most remarkable galls recently discovered we may mention those found on Eucalyptus, Casuarina and other trees and plants in Australia. They are remarkable for their variety, and are due to small scale-insects of the peculiar sub-family Brachyscelinae. As regards the mode of production of galls, the most important distinction is between galls that result from the introduction of an egg, or other matter, into the interior of the plant, and those that are due to an agent acting externally, the gall in the latter case frequently growing in such a manner as ultimately to enclose its producers. The form and nature of the gall are the result of the powers of growth possessed by the plant. It has long been known, and is now generally recognized, that a gall can only be produced when the tissue of a plant is interfered with during, or prior to, the actual development of the tissue. Little more than this is known. The power that gall-producers possess of influencing by direct interference the growth of the cells of the plant that affords them the means of subsistence is an art that appears to be widely spread among animals, but is at the same time one of which we have little knowledge. The views of Adler as to the alternation of generations of numerous gall-flies have been fully confirmed, it having been ascertained by direct observation that the galls and the insects produced from them in one generation are entirely different from the next generation; and it has also been rendered certain that frequently one of the alternate generations is parthenogenetic, no males being produced. It is supposed that these remarkable phenomena have gradually been evoked by difference in the nutrition of the alternating generations. When two different generations are produced in one year on the same kind of tree it is clear the properties of the sap and tissues of the tree must be diverse so that the two generations are adapted to different conditions. In some cases the alternating generations are produced on different species of trees, and even on different parts of the two species.

On galls and their makers and inhabitants see further—J.T.C. Ratzeburg, *Die Forst-Insecten*, Teil iii. pp. 53 seq. (Berlin, 1844); T.W. Harris, *Insects injurious to Vegetation* (Boston, U.S., 2nd ed., 1852); C.L. Koch, *Die Pflanzenläuse Aphiden* (Nuremberg, 1854); T. Hartig, *Die Familien der Blattwespen und Holzwespen* (Berlin, 1860); Walsh, “On the Insects, Coleopterous, Hymenopterous and Dipterous, inhabiting the Galls of certain species of Willow,” *Proc. Ent. Soc. Philadelphia*, iii. (1863-1864), pp. 543-644, and vi. (1866-1867), pp. 223-288; T.A. Marshall, “On some British Cynipidae,” *Ent. Month. Mag.* iv. pp. 6-8, &c.; H.W. Kidd and Albert Müller, “A List of Gall-bearing British Plants,” *ib.* v. pp. 118 and 216; G.L. Mayr, *Die mitteleuropäischen Eichengallen in Wort und Bild* (Vienna, 1870-1871), and the translation of that work, with notes, in the *Entomologist*, vols. vii. seq.; also, by the same author, “Die Einmiethler der mitteleuropäischen Eichengallen,” *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxii. pp. 669-726; and “Die europäischen Torymiden,” *ib.* xxiv. pp. 53-142 (abstracted in *Cistula entomologica*, i., London, 1869-1876); F. Löw, “Beiträge zur Kenntnis der Gallmücken,” *ib.* pp. 143-162, and 321-328; J.E. von Bergenstamm and P. Löw, “Synopsis Cecidomyidarum,” *ib.* xxvi. pp. 1-104; Perris, *Ann. Soc. Entom. de France*, 4th ser. vol. x. pp. 176-185; R. Osten-Sacken, “On the North American Cecidomyidae,” *Smithsonian Miscellaneous Collections*, vol. vi. (1867), p. 173; E.L. Taschenberg, *Entomologie für Gärtner und Gartenfreunde* (Leipzig, 1871); J.W.H. Traill, “Scottish Galls,” *Scottish Naturalist*, i. (1871), pp. 123, &c.; Albert Müller, “British Gall Insects,” *The Entomologist’s Annual for 1872*, pp. 1-22; B. Altum, *Forstzoologie*, iii. “Insecten,” pp. 250 seq. (Berlin, 1874); J.H. Kaltenbach, *Die Pflanzenfeinde aus der Classe der Insecten* (Stuttgart, 1874); A. d’Arbois de Jubainville and J. Vesque, *Les Maladies des plantes cultivées*, pp. 98-105 (Paris, 1878).

(F. H. B.)

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1 Quoted in *Zoological Record*, iv. (1867), p. 192.

2 P. Cameron, *Scottish Naturalist*, ii. pp. 11-15.

3 *Entomologist*, vii. p. 47.

4 See in *Proc. Entom. Soc. of London for the Year 1873*, p. xvi.

5 See A. Müller, *Gardener’s Chronicle* (1871), pp. 1162 and 1518; and E.A. Fitch, *Entomologist*, xi. p. 129.

6 *Entomologist*, vi. pp. 275-278, 339-340.

7 *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxi. p. 799.

8 Darwin, *Variations of Animals and Plants under Domestication*, ii. p. 282.

9 "Recherches pour servir à l'histoire des galles," *Ann. des sci. nat.* xix. pp. 293 sqq.

10 According to Dr Adler, alternation of generations takes place between *N. lenticularis* and *Spathegaster baccarum* (see E.A. Ormerod, *Entomologist*, xi. p. 34).

11 See Westwood, *Introd. to the Mod. Classif. of Insects*, ii. (1840) p. 130.

12 For figures and descriptions of insect and gall, see *Entomologist*, iv. p. 17, vii. p. 241, ix. p. 53, xi. p. 131.

13 *Scottish Naturalist*, i. (1871) p. 116, &c.

14 Vinen, *Journ. de pharm. et de chim.* xxx. (1856) p. 290; "English Ink-Galls," *Pharm. Journ.* 2nd ser. iv. p. 520.

15 See Pereira, *Materia Medica*, vol. ii. pt. i. p. 347; *Pharm. Journ.* 1st ser. vol. viii. pp. 422-424.

16 See R.H. Stretch and C.D. Gibbes, *Proc. California Acad. of Sciences*, iv. pp. 265 and 266.

17 *A Complete History of Drugs* (translation), p. 169 (London, 1748).

18 F. Porter Smith, *Contrib. towards the Mat. Medica ... of China*, p. 100 (1871).

19 R.F. Burton, *First Footsteps in E. Africa*, p. 178 (1856).

20 A.S. Packard, jun., *Guide to the Study of Insects*, p. 205 (Salem, 1870).

21 On the Cecidomyids of *Quercus Cerris*, see Fitch, *Entomologist*, xi. p. 14.

22 See, on *Cecidomyia oenephila*, Von Haimhoffen, *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxv. pp. 801-810.

23 See *Entomologist's Month. Mag.* iv. (1868) p. 233; and for figure and description, *Entomologist*, xi. p. 13.

24 A.S. Packard, jun., *Our Common Insects*, p. 203 (Salem, U.S. 1873). On the Hessian fly, *Cecidomyia destructor*, Say, the May brood of which produces swellings immediately above the joints of barley attacked by it, see Asa Fitch, *The Hessian Fly* (Albany, 1847), reprinted from *Trans. New York State Agric. Soc.* vol. vi.

25 J. Winnertz, *Beitrag zu einer Monographie der Sciarinen*, p. 164 (Vienna, 1867).

26 Asa Fitch, *First and Second Rep. on the Noxious ... Insects of the State of New York*, p. 167 (Albany, 1856).

27 See E. Doubleday, *Pharm. Journ.* 1st ser, vol. vii. p. 310: and Pereira, *ib.* vol. iii. p. 377.

28 *Dingler's Polyt. Journ.* ccxvi. p. 453.

29 For figure and description see *Zoology of the "Erebus" and "Terror,"* ii. pp. 46, 47 (1844-1875).

30 On the mite-galls and their makers, see F. Löw, "Beiträge zur Naturgesch. der Gallmilben (*Phytoptus*, Duj.)," *Verhandl. d. zoolog.-bot. Ges. in Wien*, xxiv. (1874), pp. 2-16, with plate; and "Über Milbengallen (Acarocecidien) der Wiener-Gegend," *ib.* pp. 495-508; Andrew Murray, *Economic Entomology, Aptera*, pp. 331-374 (1876); and F.A.W. Thomas, *Ältere und neue Beobachtungen über Phytopto-Cecidien* (Halle, 1877).

GALLUPPI, PASQUALE (1770-1846), Italian philosopher, was born on the 2nd of April 1770 at Tropea, in Calabria. He was of good family, and after studying at the university of Naples he entered the public service, and was for many years employed in the office of the administration of finances. At the age of sixty, having become widely known by his writings on philosophy, he was called to the chair of logic and metaphysics in the university of Naples, which he held till his death in November 1846. His most important works are: *Lettere filosofiche* (1827), in which he traces his philosophical development; *Elementi di filosofia* (1832); *Saggio filosofico sulla critica della conoscenza* (1819-1832); *Sull' analisi e sulla sintesi* (1807); *Lezioni di logica e di metafisica* (1832-1836); *Filosofia della volontà* (1832-1842, incomplete); *Storia della filosofia* (i., 1842); *Considerazioni filosofiche sull' idealismo trascendentale* (1841), a memoir on the system of Fichte.

On his philosophical views see L. Ferri, *Essai sur l'histoire de la philosophie en Italie au XIX^e^ siècle*, i. (1869); V. Botta in Ueberweg's *Hist. of Philosophy*, ii. app. 2; G. Barzellotti, "Philosophy in Italy," in Mind, iii. (1878); V. Lastrucci, *Pasquale Galluppi. Studio critico* (Florence, 1890).

GALLUS, CORNELIUS (*c.* 70-26 B.C.), Roman poet, orator and politician, was born of humble parents at Forum Julii (*Fréjus*) in Gaul. At an early age he removed to Rome, where he was taught by the same master as Virgil and Varius Rufus. Virgil, who dedicated one of his eclogues (x.) to him, was in great measure indebted to the influence of Gallus for the restoration of his estate. In political life Gallus espoused the cause of Octavianus, and as a reward for his services was made praefect of Egypt (Suetonius, *Augustus*, 66). His conduct in this position afterwards brought him into disgrace with the emperor, and having been deprived of his estates and sentenced to banishment, he put an end to his life (Dio Cassius liii. 23). Gallus enjoyed a high reputation among his contemporaries as a man of intellect, and Ovid (*Tristia*, iv. 10) considered him the first of the elegiac poets of Rome. He wrote four books of elegies chiefly on his mistress Lycoris (a poetical name for Cytheris, a notorious actress), in which he took for his model Euphorion of Chalcis (*q.v.*); he also translated some of this author's works into Latin. Nothing by him has survived; the fragments of the four poems attributed to him (first published by Aldus Manutius in 1590 and printed in A. Riese's *Anthologia Latina*, 1869) are generally regarded as a forgery.

See C. Völker, *De C. Galli vita et scriptis* (1840-1844); A. Nicolas, *De la vie et des ouvrages de C. Gallus* (1851), an exhaustive monograph. An inscription found at Philae (published 1896) records the Egyptian exploits; see M. Schanz, *Geschichte der römischen Litteratur*, and Plessis, *Poésie latine* (1909).

GALLUS, GAIUS AELIUS, praefect of Egypt 26-24 B.C. By order of Augustus he undertook an expedition to Arabia Felix, with disastrous results. The troops suffered greatly from disease, heat, want of water and the obstinate resistance of the inhabitants. The treachery of a foreign guide also added to his difficulties. After six months Gallus was obliged to return to Alexandria, having lost the greater part of his force. He was a friend of the geographer Strabo, who gives an account of the expedition (xvi. pp. 780-782; see also Dio Cassius liii. 29; Pliny, *Nat. Hist.* vi. 32; C. Merivale, *Hist. of the Romans under the Empire*, ch. 34; H. Krüger, *Der Feldzug des A. G. nach dem glücklichen Arabien*, 1862). He has been identified with the Aelius Gallus frequently quoted by Galen, whose remedies are stated to have been used with success in an Arabian expedition.

GALLUS, GAIUS CESTIUS, governor of Syria during the reign of Nero. When the Jews in Jerusalem, stirred to revolt by the outrages of the Roman procurators, had seized the fortress of Masada and treacherously murdered the garrison of the palace of Herod, Gallus set out from Antioch to restore order. On the 17th of November A.D. 66 he arrived before Jerusalem. Having gained possession of the northern suburb, he attacked the temple mount; but, after five days' fighting, just when (according to Josephus) success was within his grasp, he unaccountably withdrew his forces. During his retreat he was closely pursued by the Jews and surrounded in a ravine, and only succeeded in making good his escape to Antioch by sacrificing the greater part of his army and a large amount of war material. Soon after his return Gallus died (before the spring of 67), and was succeeded in the governorship by Licinius Mucianus, the prosecution of the war being entrusted to Vespasian.

See Tacitus, *Hist.* v. 10, 13; Suetonius, *Vespasian*, 4; Josephus, *Bell. Jud.* ii. 14-20; E.

Schürer, *Hist. of the Jewish People*, div. i. vol. ii. p. 212 (Eng. tr., 1890).

GALLUS, GAIUS SULPICIUS, Roman general, statesman and orator. Under Lucius Aemilius Paulus, his intimate friend, he commanded the 2nd legion in the campaign against Perseus, king of Macedonia, and gained great reputation for having predicted an eclipse of the moon on the night before the battle of Pydna (168 B.C.). On his return from Macedonia he was elected consul (166), and in the same year reduced the Ligurians to submission. In 164 he was sent as ambassador to Greece and Asia, where he held a meeting at Sardis to investigate the charges brought against Eumenes of Pergamum by the representatives of various cities of Asia Minor. Gallus was a man of great learning, an excellent Greek scholar, and in his later years devoted himself to the study of astronomy, on which subject he is quoted as an authority by Pliny.

See Livy xliv. 37, *Epit.* 46; Polybius xxxi. 9, 10; Cicero, *Brutus*, 20, *De officiis*, i. 6, *De senectute*, 14; Pliny, *Nat. Hist.* ii. 9.

GALOIS, EVARISTE (1811-1832), French mathematician, was born on the 25th of October 1811, and killed in a duel on the 31st of May 1832. An obituary notice by his friend Auguste Chevalier appeared in the *Revue encyclopédique* (1832); and his collected works are published, *Journal de Liouville* (1846), pp. 381-444, about fifty of these pages being occupied by researches on the resolubility of algebraic equations by radicals. This branch of algebra he notably enriched, and to him is also due the notion of a group of substitutions (see EQUATION: *Theory of Equations*; also GROUPS, THEORY OF).

His collected works, with an introduction by C.F. Picard, were published in 1897 at Paris.

GALSTON, a police burgh and manufacturing town of Ayrshire, Scotland. Pop. (1901) 4876. It is situated on the Irvine, 5 m. E. by S. of Kilmarnock, with a station on the Glasgow & South-Western railway. The manufactures include blankets, lace, muslin, hosiery and paper-millboard, and coal is worked in the vicinity. About 1 m. to the north, amid the "bonnie woods and braes," is Loudoun Castle, a seat of the earl of Loudoun.

GALT, SIR ALEXANDER TILLOCH (1817-1893), Canadian statesman, was the youngest son of John Galt the author. Born in London on the 6th of September 1817, he emigrated to Canada in 1835, and settled in Sherbrooke, in the province of Quebec, where he entered the service of the British American Land Company, of which he rose to be chief commissioner. Later he was one of the contractors for extending the Grand Trunk railway westward from Toronto. He entered public life in 1849 as Liberal member for the county of Sherbrooke, but opposed the chief measure of his party, the Rebellion Losses Bill, and in the same year signed a manifesto in favour of union with the United States, believing that in no other way could Protestant and Anglo-Saxon ascendancy over the Roman Catholic French majority in his native province be maintained. In the same year he retired from parliament but re-entered it in 1853, and was till 1872 the chief representative of the English-speaking Protestants of Quebec province. On the fall of the Brown-Dorion administration in 1858 he was called on to form a ministry, but declined the task, and became finance minister under

Sir John Macdonald and Sir George Cartier on condition that the federation of the British North American provinces should become a part of their programme. From 1858 to 1862 and 1864 to 1867 he was finance minister, and did much to reduce the somewhat chaotic finances of Canada into order. To him are due the introduction of the decimal system of currency and the adoption of a system of protection to Canadian manufactures. To his diplomacy was due the coalition in 1864 between Macdonald, Brown and Cartier, which carried the federation of the British North American provinces, and throughout the three years of negotiation which followed his was one of the chief influences. He became finance minister in the first Dominion ministry, but suddenly and mysteriously resigned on the 4th of November 1867. After his retirement he gave to the administration of Sir John Macdonald a support which grew more and more fitful, and advocated independence as the final destiny of Canada. In 1871 he was again offered the ministry of finance on condition of abandoning these views, but declined. In 1877 he was the Canadian nominee on the Anglo-American fisheries commission at Halifax, and rendered brilliant service. In 1880 he was appointed Canadian high commissioner to Great Britain, but retired in 1883 in favour of Sir Charles Tupper. During this period he advocated imperial federation. He was Canadian delegate at the Paris Monetary Conference of 1881, and to the International Exhibition of Fisheries in 1883. From this date till his death on the 19th of September 1893 he lived in retirement. No Canadian statesman has had sounder or more abundant ideas, but a certain intellectual fickleness made him always a somewhat untrustworthy colleague in political life.

(W. L. G.)

GALT, JOHN (1779-1839), Scottish novelist, was born at Irvine, Ayrshire, on the 2nd of May 1779. He received his early education at Irvine and Greenock, and read largely from one of the public libraries while serving as a clerk in a mercantile office. In 1804 he went to settle in London, where he published anonymously a poem on the *Battle of Largs*. After unsuccessful attempts to succeed in business Galt entered at Lincoln's Inn, but was never called to the bar. He obtained a commission from a British firm to go abroad to find out whether the Berlin and Milan decrees could be evaded. He met Byron and Sir John Hobhouse at Gibraltar, travelled with Byron to Malta, and met him again at Athens. He was afterwards employed by the Glasgow merchant Kirkman Finlay on similar business at Gibraltar, and in 1814 visited France and Holland. His early works are the *Life and Administration of Wolsey*, *Voyages and Travels*, *Letters from the Levant*, the *Life of Benjamin West*, *Historical Pictures* and *The Wandering Jew*; and he induced Colburn to publish a periodical containing dramatic pieces rejected by London managers. These were afterwards edited by Galt as the *New British Theatre*, which included some plays of his own. He first showed his real power as a writer of fiction in *The Ayrshire Legatees*, which appeared in *Blackwood's Magazine* in 1820. This was followed in 1821 by his masterpiece —*The Annals of the Parish*; and, at short intervals, *Sir Andrew Wylie*, *The Entail*, *The Steam-Boat* and *The Provost* were published. These humorous studies of Scottish character are all in his happiest manner. His next works were *Ringan Gilhaize* (1823), a story of the Covenanters; *The Spaewife* (1823), which relates to the times of James I. of Scotland; *Rothelan* (1824), a novel founded on the reign of Edward III.; *The Omen* (1825), which was favourably criticized by Sir Walter Scott; and *The Last of the Lairds*, another picture of Scottish life.

In 1826 he went to America as secretary to the Canada Land Company. He carried out extensive schemes of colonization, and opened up a road through what was then forest country between Lakes Huron and Erie. In 1827 he founded Guelph in upper Canada, passing on his way the township of Galt on the Grand river, named after him by the Hon. William Dixon. But all this work proved financially unprofitable to Galt. In 1829 he returned to England commercially a ruined man, and devoted himself with great ardour to literary pursuits, of which the first fruit was *Lawrie Todd*—one of his best novels. Then came *Southennan*, a tale of Scottish life in the times of Queen Mary. In 1830 he was appointed editor of the *Courier* newspaper—a post he soon relinquished. His untiring industry was seen in the publication, in rapid succession, of a *Life of Byron*, *Lives of the Players*, *Bogle Corbet*, *Stanley Buxton*, *The Member*, *The Radical*, *Eben Erskine*, *The Stolen Child*, his *Autobiography*, and a collection of tales entitled *Stories of the Study*. In 1834 appeared his *Literary Life and Miscellanies*, dedicated by permission to William IV., who sent the author a present of £200. As soon as this work was published Galt retired to Greenock, where he

continued his literary labours till his death on the 11th of April 1839.

Galt, like almost all voluminous writers, was exceedingly unequal. His masterpieces are *The Ayrshire Legatees*, *The Annals of the Parish*, *Sir Andrew Wylie*, *The Entail*, *The Provost* and *Lawrie Todd*. *The Ayrshire Legatees* gives, in the form of a number of exceedingly diverting letters, the adventures of the Rev. Dr Pringle and his family in London. The letters are made the excuse for endless tea-parties and meetings of kirk-session in the rural parish of Garnock. *The Annals of the Parish* are told by the Rev. Micah Balwhidder, Galt's finest character. This work (which, be it remembered, existed in MS. before *Waverley* was published) is a splendid picture of the old-fashioned Scottish pastor and the life of a country parish; and, in rich humour, genuine pathos and truth to nature it is unsurpassed even by Scott. It is a fine specimen of the homely graces of the Scottish dialect, and preserves much vigorous Doric phraseology fast passing out of use even in country districts. In this novel Mr Galt used, for the first time, the term "Utilitarian," which afterwards became so intimately associated with the doctrines of John Stuart Mill and Bentham (see *Annals of the Parish*, chap. xxxv., and a note by Mill in *Utilitarianism*, chap. ii.). In *Sir Andrew Wylie* the hero entered London as a poor lad, but achieved remarkable success by his shrewd business qualities. The character is somewhat exaggerated, but excessively amusing. *The Entail* was read thrice by Byron and Scott, and is the best of Galt's longer novels. Leddy Grippy is a wonderful creation, and was considered by Byron equal to any female character in literature since Shakespeare's time. *The Provost*, in which Provost Pawkie tells his own story, portrays inimitably the jobbery, bickerings and self-seeking of municipal dignitaries in a quaint Scottish burgh. In *Lawrie Todd* Galt, by giving us the Scot in America, accomplished a feat which Sir Walter never attempted. This novel exhibits more variety of style and a greater love of nature than his other books. The life of a settler is depicted with unerring pencil, and with an enthusiasm and imaginative power much more poetical than any of the author's professed poems.

The best of Galt's novels were reprinted in Blackwood's *Standard Novels*, to volume i. of which his friend Dr Moir prefixed a memoir.

GALT, a town in Waterloo county, Ontario, Canada, 23 m. N.N.W. of Hamilton, on the Grand river and on the Grand Trunk and Canadian Pacific railways. Pop. (1881) 5187; (1901) 7866. It is named after John Galt, the author. It has excellent water privileges which furnish power for flour-mills and for manufactures of edge tools, castings, machinery, paper and other industries.

GALTON, SIR FRANCIS (1822-), English anthropologist, son of S.T. Galton, of Duddeston, Warwickshire, was born on the 16th of February 1822. His grandfather was the poet-naturalist Erasmus Darwin, and Charles Darwin was his cousin. After attending King Edward VI.'s grammar school, Birmingham, he studied at Birmingham hospital, and afterwards at King's College, London, with the intention of making medicine his profession; but after taking his degree at Trinity College, Cambridge, in 1843 he changed his mind. The years 1845-1846 he spent in travelling in the Sudan, and in 1850 he made an exploration, with Dr John Anderson, of Damaraland and the Ovampo country in south-west Africa, starting from Walfisch Bay. These tracts had practically never been traversed before, and on the appearance of the published account of his journey and experiences under the title of *Narrative of an Explorer in Tropical South Africa* (1853) Galton was awarded the gold medal of the Royal Geographical Society. His *Art of Travel; or, Shifts and Contrivances in Wild Countries* was first published in 1855. In 1860 he visited the north of Spain, and published the fruits of his observations of the country and the people in the first of a series of volumes, which he edited, entitled *Vacation Tourists*. He then turned to meteorology, the result of his investigations appearing in *Meteorographica*, published in 1863. This work was the first serious attempt to chart the weather on an extensive scale, and in it also the author first established the existence and theory of anti-cyclones. Galton was a member of the

meteorological committee (1868), and of the Meteorological Council which succeeded it, for over thirty years. But his name is most closely associated with studies in anthropology and especially in heredity. In 1869 appeared his *Hereditary Genius, its Laws and Consequences*, a work which excited much interest in scientific and medical circles. This was followed by *English Men of Science, their Nature and Nurture*, published in 1874; *Inquiries into Human Faculty and its Development*, issued in 1883; *Life-History Album* (1884); *Record of Family Faculties* (1884) (tabular forms and directions for entering data, with a preface); and *Natural Inheritance* (1889). The idea that systematic efforts should be made to improve the breed of mankind by checking the birth-rate of the unfit and furthering the productivity of the fit was first put forward by him In 1865; he mooted it again in 1884, using the term "eugenics" for the first time in *Human Faculty*, and in 1904 he endowed a research fellowship in the university of London for the promotion of knowledge of that subject, which was defined as "the study of agencies under social control that may improve or impair the racial qualities of future generations, either physically or mentally." Galton was the author of memoirs on various anthropometric subjects; he originated the process of composite portraiture, and paid much attention to finger-prints and their employment for the identification of criminals, his publications on this subject including *Finger Prints* (1892), *Decipherment of Blurred Finger Prints* (1893) and *Finger Print Directories* (1895). From the Royal Society, of which he was elected a fellow in 1860, he received a royal medal in 1886 and the Darwin medal in 1902, and honorary degrees were bestowed on him by Oxford (1894) and Cambridge (1895). In 1908 he published *Memories of My Life*, and in 1909 he received a knighthood.

GALUPPI, BALDASSARE (1706-1785), Italian musical composer, was born on the 18th of October 1706 on the island of Burano near Venice, from which he was often known by the nickname of Buranello. His father, a barber, and violinist at the local theatre, was his first teacher. His first opera, composed at the age of sixteen, being hissed off the stage, he determined to study seriously, and entered the Conservatorio degli Incurabili at Venice, as a pupil of Antonio Lotti. After successfully producing two operas in collaboration with a fellow-pupil, G.B. Pescetti, in 1728 and 1729, he entered upon a busy career as a composer of operas for Venetian theatres, writing sometimes as many as five in a year. He visited London in 1741, and arranged a *pasticcio*, *Alexander in Persia*, for the Haymarket. Burney considered his influence on English music to have been very powerful. In 1740 he became *vice-maestro di cappella* at St Mark's and *maestro* in 1762. In 1749 he began writing comic operas to libretti by Goldoni, which enjoyed an enormous popularity. He was invited to Russia by Catherine II. in 1766, where his operas made a favourable impression, and his influence was also felt in Russian church music. He returned to Venice in 1768, where he had held the post of director of the Conservatorio degli Incurabili since 1762. He died on the 3rd of January 1785.

Galuppi's best works are his comic operas, of which *Il Filosofo di Campagna* (1754), known in England as *The Guardian Trick'd* (Dublin, 1762) was the most popular. His melody is attractive rather than original, but his workmanship in harmony and orchestration is generally superior to that of his contemporaries. He seems to have been the first to extend the concerted finales of Leo and Logroscino into a chain of several separate movements, working up to a climax, but in this respect he is much inferior to Sarti and Mozart.

Browning's poem, "A Toccata of Galuppi," does not refer to any known composition, but more probably to an imaginary extemporization on the harpsichord, such as was of frequent occurrence in the musical gatherings of Galuppi's day.

See also Alfred Wotquerme, *Baldassare Galuppi, étude bibliographique sur ses œuvres dramatiques* (Brussels, 1902). Many of his autograph scores are in the library of the Brussels conservatoire.

(E. J. D.)

GALVANI, LUIGI (1737-1798), Italian physiologist, after whom galvanism received its name, was born at Bologna on the 9th of September 1737. It was his wish in early life to enter the church, but by his parents he was educated for a medical career. At the university of Bologna, in which city he practised, he was in 1762 appointed public lecturer in anatomy, and soon gained repute as a skilled though not eloquent teacher, and, chiefly from his researches on the organs of hearing and genito-urinary tract of birds, as a comparative anatomist. His celebrated theory of animal electricity he enunciated in a treatise, “De viribus electricitatis in motu musculari commentarius,” published in the 7th volume of the memoirs of the Institute of Sciences at Bologna in 1791, and separately at Modena in the following year, and elsewhere subsequently. The statement has frequently been repeated that, in 1786, Galvani had noticed that the leg of a skinned frog, on being accidentally touched by a scalpel which had lain near an electrical machine, was thrown into violent convulsions; and that it was thus that his attention was first directed to the relations of animal functions to electricity. From documents in the possession of the Institute of Bologna, however, it appears that twenty years previous to the publication of his *Commentary* Galvani was already engaged in investigations as to the action of electricity upon the muscles of frogs. The observation that the suspension of certain of these animals on an iron railing by copper hooks caused twitching in the muscles of their legs led him to the invention of his metallic arc, the first experiment with which is described in the third part of the *Commentary*, with the date September 20, 1786. The arc he constructed of two different metals, which, placed in contact the one with a frog’s nerve and the other with a muscle, caused contraction of the latter. In Galvani’s view the motions of the muscle were the result of the union, by means of the metallic arc, of its exterior or negative electrical charge with positive electricity which proceeded along the nerve from its inner substance. Volta, on the other hand, attributed them solely to the effect of electricity having its source in the junction of the two dissimilar metals of the arc, and regarded the nerve and muscle simply as conductors. On Galvani’s refusal, from religious scruples, to take the oath of allegiance to the Cisalpine republic in 1797, he was removed from his professorship. Deprived thus of the means of livelihood, he retired to the house of his brother Giacomo, where he soon fell into a feverish decline. The republican government, in consideration of his great scientific fame, eventually, but too late, determined to reinstate him in his chair, and he died at Bologna on the 4th of December 1798.

A quarto edition of his works was published at Bologna in 1841-1842, by the Academy of Sciences of the Institute of that city, under the title *Opere edite ed inedite del professore Luigi Galvani*.

GALVANIZED IRON, sheet iron having its surface covered with a thin coating of zinc. In spite of the name, galvanic action has often no part in the production of galvanized iron, which is prepared by dipping the iron, properly cleaned and pickled in acid, in a bath of molten zinc. The hotter the zinc the thinner the coating, but as a high temperature of the bath is attended with certain objections, it is a common practice to use a moderate temperature and clear off the excess of zinc by passing the plates between rollers. In Norwood and Rogers’s process a thin coating of tin is applied to the iron before it is dipped in the zinc, by putting the plates between layers of granulated tin in a wooden tank containing a dilute solution of stannous chloride, when tin is deposited on them by galvanic action. In “cold galvanizing” the zinc is deposited electrolytically from a bath, preferably kept neutral or slightly acid, containing a 10% solution of crystallized zinc sulphate, $ZnSO_4 \cdot 7H_2O$. The resulting surface is usually duller and less lustrous than that obtained by the use of molten zinc. Another method of forming a coating of zinc, known as “sherardizing,” was invented by Sherard Cowper-Coles, who found that metals embedded in zinc dust (a product obtained in zinc manufacture and consisting of metallic zinc mixed with a certain amount of zinc oxide) and heated to temperatures well below the melting point of zinc, become coated with a layer of that metal. In carrying out the process the articles are placed in an air-tight vessel with the zinc dust, which must be dry, and subjected to a heat of 250-330°C., the time for which the heating is continued depending on the thickness of the deposit required and varying from one-half to several hours. If an air-tight receptacle is not available, a small percentage of powdered carbon is added to the zinc-dust, to prevent increase in the amount of oxide, which, if present in excess, tends to make the deposit dull.

Galvanized iron by its zinc surface is protected from corrosion by the weather, though the protection is not very efficient in the presence of acid or sulphurous fumes, and accordingly it is extensively employed for roofing, especially in the form of corrugated sheets. The iron wire used for wire-netting, telegraphic purposes, &c., is commonly galvanized, as also are bolts, nuts, chains and other fittings on ships.

GALVANOMETER, an instrument for detecting or measuring electric currents. The term is generally applied to instruments which indicate electric current in scale divisions or arbitrary units, as opposed to instruments called amperemeters (*q.v.*), which show directly on a dial the value of the current in amperes. Galvanometers may be divided into direct current and alternating current instruments, according as they are intended to measure one or other of these two classes of currents (see ELECTROKINETICS).

Direct Current Galvanometers.—The principle on which one type of direct current galvanometer, called a movable needle galvanometer, depends for its action is that a small magnet when suspended in the centre of a coil of wire tends to set its magnetic axis in the direction of the magnetic field of the coil at that point due to the current passing through it. In the other type, or movable coil galvanometer, the coil is suspended and the magnet fixed; hence the coil tends to set itself with its axis parallel to the lines of force of the magnet. The movable system must be constrained in some way to take up and retain a definite position when no current is passing by means which are called the “control.”

Movable needle galvanometer.

In its simple and original form the movable needle galvanometer consisted of a horizontal magnetic needle suspended within a coil of insulated wire by silk fibres or pivoted on a point like a compass needle. The direction of such a needle is controlled by the direction of the terrestrial magnetic force within the coil. If the needle is so placed that its axis is parallel to the plane of the coil, then when an electric current passes through the coil it is deflected and places itself at an angle to the axis of the coil determined by the strength of the current and of the controlling field. In the early forms of movable needle galvanometer the needle was either a comparatively large magnet several inches in length, or else a smaller magnet was employed carrying a long pointer which moved over a scale of degrees so as to indicate the deflexion. A method of measuring the deflexion by means of a mirror scale and telescope was introduced by K.F. Gauss and W. Weber. The magnet had a mirror attached to it, and a telescope having cross wires in the focus was used to observe the scale divisions of a fixed scale seen reflected in the mirror. Lord Kelvin (Professor W. Thomson) made the important improvement of reducing the size of the needle and attaching it to the back of a very small mirror, the two being suspended by a single fibre of cocoon silk. The mirror was made of silvered microscopic glass about ¼ in. in diameter, and the magnetic needle or needles consisted of short fragments of watchspring cemented to its back. A ray of light being thrown on the mirror from a lamp the deflexions of the needle were observed by watching the movements of a spot of light reflected from it upon a fixed scale. This form of mirror galvanometer was first devised in connexion with submarine cable signalling, but soon became an indispensable instrument in the physical laboratory.

Mirror galvanometers.

In course of time both the original form of single needle galvanometer and mirror galvanometer were improved by introducing the astatic principle and weakening the external controlling magnetic field. If two magnetic needles of equal size and moment are attached rigidly to one stem parallel to each other but with poles placed in opposite directions an astatic system results; that is, if the needles are so suspended as to be free to move in a horizontal plane, and if they are made exactly equal in magnetic strength, the system will have no directive power. If one needle is slightly weaker than the other, the suspended system will set itself with some axis parallel to the lines of force of a field in which it is placed. In a form of astatic needle galvanometer devised by Professor A. Broca of Paris, the pair of magnetized needles are suspended vertically and parallel to each other with poles in opposite directions. The upper poles are included in one coil and the lower poles within another coil, so connected that the current circulates in the right direction in each coil to displace the pairs of poles in the same direction. By this mode of arrangement a greater magnetic moment can be secured, together with more perfect astaticity and freedom from disturbance by external fields. The earth’s magnetic field can be weakened by means of a controlling magnet arranged to create in the space in the interior of the galvanometer coils an extremely feeble

Astatic galvanometers.

controlling magnetic field. In instruments having a coil for each needle and designed so that the current in both coils passes so as to turn both needles in the same direction, the controlling magnet is so adjusted that the normal position of the needles is with the magnetic axis parallel to the plane of the coil. An astatic magnetic system used in conjunction with a mirror galvanometer gives a highly sensitive form of instrument (fig. 1); it is, however, easily disturbed by stray magnetic fields caused by neighbouring magnets or currents through conductors, and therefore is not suitable for use in many places.

This fact led to the introduction of the movable coil galvanometer which was first devised by Lord Kelvin as a telegraphic signalling instrument but subsequently modified by A. d'Arsonval and others into a laboratory galvanometer (fig. 2). In this instrument a permanent magnet, generally of the horseshoe shape, is employed to create a strong magnetic field, in which a light movable coil is suspended. The suspension is bifilar, consisting of two fine wires which are connected to the ends of the coil and serve to lead the current in and out. If such a coil is placed with its plane parallel to the lines of force of the permanent magnet, then when a current is passing through it it displaces itself in the field, so as to set with its axis more nearly parallel to the lines of force of the field. The movable coil may carry a pointer or a mirror; in the latter form it is well represented by several much used laboratory instruments. The movable coil galvanometer has the great advantage that it is not easily disturbed by the magnetic fields caused by neighbouring magnets or electric currents, and thus is especially useful in the electrical workshop and factory.

Movable coil galvanometer.

In the practical construction of the suspended needle fixed coil galvanometer great care must be taken with the insulation of the wire of the coil. This wire is generally silk-covered, wound on a frame, the whole being thoroughly saturated with paraffin wax. In some cases two wires are wound on in parallel, constituting a "differential galvanometer." When properly adjusted this instrument can be used for the exact comparison of electric currents by a null method, because if an electric current is passed through one wire and creates certain deflexions of the needle, the current which annuls this deflexion when passed through the other wire must be equal to the first current. In the construction of a movable coil galvanometer, it is usual to intensify the magnetic field by inserting a fixed soft iron core in the interior of the movable coil. If the current to be measured is too large to be passed entirely through the galvanometer, a portion is allowed to flow through a circuit connecting the two terminals of the instrument. This circuit is called a *shunt* and is generally arranged so as to take 0.9, 0.99, or 0.999 of the total current, leaving 0.1, 0.01 or 0.001 to flow through the galvanometer. W.E. Ayrton and T. Mather have designed a universal shunt box or resistance which can be applied to any galvanometer and by which a known fraction of any current can be sent through the galvanometer when we know its resistance (see *Jour. Inst. Elec. Eng. Lond.*, 1894, 23, p. 314). A galvanometer can be calibrated, or the meaning of its deflexion determined, by passing through it an electric current of known value and observing the deflexion of the needle or coil. The known current can be provided in the following manner:—a single secondary cell of any kind can have its electromotive force measured by the potentiometer (*q.v.*), and compared with that of a standard voltaic cell. If the secondary cell is connected with the galvanometer through a known high resistance R, and if the galvanometer is shunted, that is, has its terminals connected by another resistance S, then if the resistance of the galvanometer itself is denoted by G, the whole resistance of the shunted galvanometer and high resistance has a value represented by R + GS/(G + S), and therefore the current through the galvanometer produced by an electromotive force E of the cell is represented by

Construction and use.

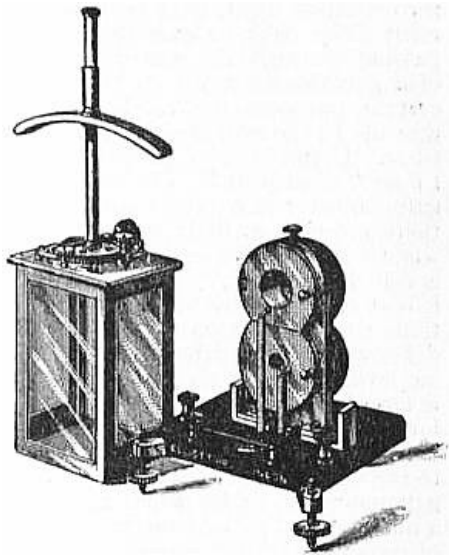

FIG. 1.—Kelvin Astatic Mirror Galvanometer. Elliott square pattern.

$$\frac{SE}{R(G + S) + GS}.$$

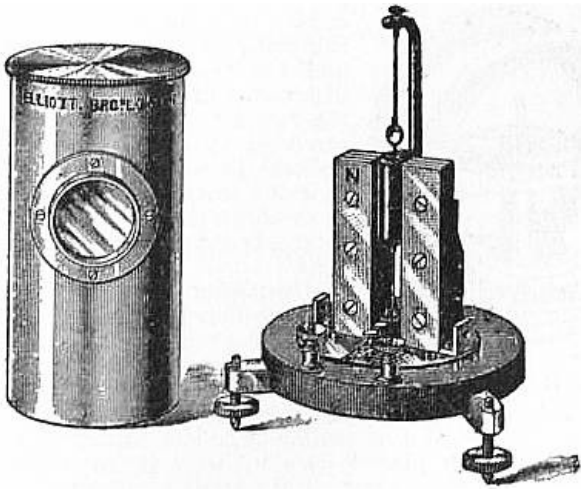

Fig. 2.—Movable Coil Galvanometer.

Suppose this current produces a deflexion of the needle or coil or spot of light equal to X scale divisions, we can then alter the value of the resistances R and S, and so determine the relation between the deflexion and the current. By the sensitiveness of the galvanometer is 430
meant the deflexion produced by a known electromotive force put upon its terminals or a known current sent through it. It is usual to specify the sensitiveness of a mirror galvanometer by requiring a certain deflexion, measured in millimetres, of a spot of light thrown on the scale placed at one metre from the mirror, when an electromotive force of one-millionth of a volt (microvolt) is applied to the terminals of the galvanometer; it may be otherwise expressed by stating the deflexion produced under the same conditions when a current of one microampere is passed through the coil. In modern mirror galvanometers a deflexion of 1 mm. of the spot of light upon a scale at 1 metre distance can be produced by a current as small as one hundred millionth (10^{-8}) or even one ten thousand millionth (10^{-10}) of an ampere. It is easy to produce considerable sensitiveness in the galvanometer, but for practical purposes it must always be controlled by the condition that the zero remains fixed, that is to say, the galvanometer needle or coil must come back to exactly the same position when no current is passing through the instrument. Other important qualifications of a galvanometer are its time-period and its dead-beatness. For certain purposes the needle or coil should return as quickly as possible to the zero position and with either no, or very few, oscillations. If the latter condition is fulfilled the galvanometer is said to be "dead-beat." On the other hand, for some purposes the galvanometer is required with the opposite quality, that is to say, there must be as little retardation as possible to the needle or coil when set in motion under an impulsive blow. Such a galvanometer is called "ballistic." The quality of a galvanometer in this respect is best estimated by taking the logarithmic decrement of the oscillations when the movable system is set swinging. This last term is defined as the logarithm of the ratio of one swing to the next succeeding swing, and a galvanometer of which the logarithmic decrement is large, is said to be highly damped. For many purposes, such as for resistance measurement, it is desirable to have a galvanometer which is highly damped; this result can be obtained by affixing to the needles either light pieces of mica, when it is a movable needle galvanometer, or by winding the coil on a silver frame when it is a movable coil galvanometer. On the other hand, for the comparison of capacities of condensers and for other purposes, a galvanometer is required which is as little damped as possible, and for this purpose the coil must have the smallest possible frictional resistance to its motion through the air. In this case the moment of inertia of the movable system must be decreased or the control strengthened.

The Einthoven string galvanometer is another form of sensitive instrument for the measurement of small direct currents. It consists of a fine wire or silvered quartz fibre stretched in a strong magnetic field. When a current passes through the wire it is displaced across the field and the displacement is observed with a microscope.

Tangent galvanometer.

For the measurement of large currents a "tangent galvanometer" is employed (fig. 3). Two fixed circular coils are placed apart at a distance equal to the radius of either coil, so that a current passing through them creates in the central region between them a nearly uniform magnetic field. At the centre of the coils is suspended a small magnetic needle the length of which should not be greater than $\frac{1}{10}$ the radius of either coil. The normal position of the needle is at right angles to the line joining the centre of the coils. If a current is passed through the

coils, the needle will be deflected, and the tangent of the angle of its deflexion will be nearly proportional to the current passing through the coil, provided that the controlling field is uniform in strength and direction, and that the length of the magnetic needle is so short that the space in which it rotates is a practically uniform magnetic field.

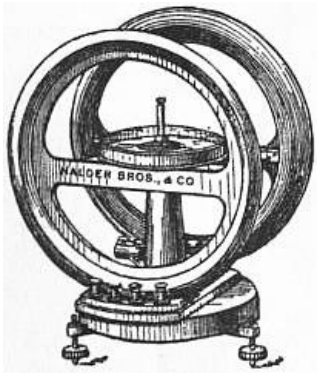

FIG. 3.—Helmholtz Tangent Galvanometer.

Alternating Current Galvanometers.—For the detection of small alternating currents a magnetic needle or movable coil galvanometer is of no utility. We can, however, construct an instrument suitable for the purpose by suspending within a coil of insulated wire a small needle of soft iron placed with its axis at an angle of 45° to the axis of the coil. When an alternating current passes through the coil the soft iron needle tends to set itself in the direction of the axis of the coil, and if it is suspended by a quartz fibre or metallic wire so as to afford a control, it can become a metrical instrument. Another arrangement, devised by J.A. Fleming in 1887, consists of a silver or copper disk suspended within a coil, the plane of the disk being held at 45° to that of the coil. When an alternating current is passed through the coil, induced currents are set up in the disk and the mutual action causes the disk to endeavour to set itself so that these currents are a minimum. This metal disk galvanometer has been made sufficiently sensitive to detect the feeble oscillatory electric currents set up in the receiving wire of a wireless telegraph apparatus. The Duddell thermal ammeter is another very sensitive form of alternating current galvanometer. In it the current to be detected or measured is passed through a high resistance wire or strip of metal leaf mounted on glass, over which is suspended a closed loop of bismuth and antimony, forming a thermoelectric couple. This loop is suspended by a quartz fibre in a strong magnetic field, and one junction of the couple is held just over the resistance wire and as near it as possible without touching. When an alternating current passes through the resistance it creates heat which in turn acts on the thermo-junction and generates a continuous current in the loop, thus deflecting it in the magnetic field. The sensitiveness of such a thermal ammeter can be made sufficiently great to detect a current of a few microamperes.

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(J. A. F.)

GALVESTON, a city and port of entry and the county-seat of Galveston county, Texas, U.S.A., on the Gulf of Mexico, near the N.E. extremity of Galveston Island and at the entrance to Galveston Bay. It is about 48 m. S.E. of Houston and 310 m. W. of New Orleans. Pop. (1890) 29,084; (1900) 37,789, (6339 were foreign-born and 8291 negroes); (1910) 36,981; land area (1906) 7.8 sq. m. It is served by the Galveston, Houston & Henderson, the Galveston, Harrisburg & San Antonio, the Gulf, Colorado & Santa Fé, the Trinity & Brazos Valley, the International & Great Northern, and the Missouri, Kansas & Texas railways, and by numerous steamship lines to Gulf ports in the United States and Mexico, and to Cuba, South America, Europe and the Atlantic ports of the United States. Galveston Island is a low, sandy strip of land about 28 m. long and 1½ to 3½ m. wide, lying from 2 to 3 m. off the mainland. The city, which extends across the island from Gulf to Bay, faces and has its harbour on the latter. The island was connected with the mainland before the 1900 storm by a road bridge and several railway bridges, which, a short distance W. of the city, crossed the narrow strip of water separating the West Bay from Galveston Bay proper; the bridge least harmed (a single-track railway bridge) was repaired immediately and was for a time the city’s only connexion with the mainland, but in 1908 bonds were issued for building a concrete causeway, accommodating four railway tracks, one interurban car track, and a roadway for vehicles and pedestrians. An enormous sea-wall (completed in 1904 at a cost of $2,091,000) was constructed on the eastern and Gulf sides of the city, about 5 m. long, 17 ft.

above mean low tide (1.5 ft. above the high-water mark of the storm of 1900 and 7.5 ft. above the previous high-water mark, that of September 1875), 16 ft. wide at the base and 5 ft. at the top, weighing 20 tons to the lineal foot, and with a granite rip-rap apron extending out 27 ft. on the Gulf side. The entire grade of the city was raised from 1 to 15 ft. above the old level. Between the sea-wall and the sea there is a splendid beach, the entire length of which is nearly 30 m. Among the principal buildings are the city hall, the court-house, the masonic temple, the Federal custom-house and post-office, the Y.M.C.A. building and the public library. The United States government maintains a marine hospital, a live-saving station, an immigrant landing station, and the state and the Federal government separate quarantine stations. In addition to the Ball public high school, Galveston is the seat of St Mary's University (1854), the Sacred Heart and Ursuline academies, and the Cathedral school, all under Roman Catholic control.

The government of the municipality was long vested in a council of ward aldermen, controlled by a "machine," which was proved corrupt in 1894 by an investigation undertaken at the personal expense of the mayor; it gave place in 1895 to a city council of aldermen at large, which by 1901 had proved its inefficiency especially in the crisis following the storm of the preceding year. Government then seemed a business question and was practically undertaken by the city's commercial experts, the Deepwater commission, whose previous aim had been harbour improvement, and who now drew up a charter providing for government by a board of five appointed by the governor of the state. A compromise measure making three members appointees of the governor and two elected by the voters of the city was in force for a time but was declared unconstitutional. A third charter was adopted providing for five commissioners, chosen by the people, dividing among themselves the posts of mayor-president and commissioners of finance and revenue, of water-works and sewerage, of streets and public property, and of police and fire protection, each commissioner being held individually responsible for the management of his department. These are business departments carefully systematized by their heads. The legislative power is vested in the commission as a whole, over whose meetings the mayor-president presides; he has a vote like every other commissioner, and has no veto power. The success of this commission government has been remarkable: in 1901-1908 the city, without issuing bonds except for grade raising, paid off a large debt, raised the salaries of city employees, paid its running expenses in cash, planned and began public improvements and sanitary reforms, and did much for the abolition of gambling and the regulation of other vice. The Galveston Plan and similar schemes of government have been adopted in many other American cities.

Galveston's manufactories, the products of which in 1900 were valued at $5,016,360, a decrease of 12.4% from 1890 (value of products under "factory system," $3,675,323 in 1900; $2,996,654 in 1905, a decrease of 18.5%), include cotton-seed oil refineries, flour and feed mills, lumber mills, wooden-ware factories, breweries, cement works, creosoting works, ship-yards and ice factories. There are extensive cotton warehouses, coal and grain elevators, and large wholesale supply depots. The Gulf Fisheries Company has its fleet's headquarters and large packing-houses at Galveston. It is as a commercial port that Galveston is chiefly important. In 1907 it was the second port in the United States in the value of its exports (domestic and foreign, $196,627,382, or 10.22% of the total), being surpassed only by New York City; and was the first of the Gulf ports (having 45.43% of the total value), New Orleans being second with $164,998,540. Galveston's imports in 1907 were valued at $7,669,458. Galveston is the greatest cotton-exporting port in the Union, its exports of cotton in 1907 being valued at $163,564,445. Other exports of great value are cotton seed products (oil and cake, $10,188,594 in 1907), Indian corn ($3,457,279 in 1907), wheat ($9,443,901 in 1906), lumber and flour. The electric lighting and water-supply systems are owned and operated by the municipality.

The harbour of Galveston seems to have been named about 1782 by Spanish explorers in honour either of José de Galvez, Marquis of Sonora, or his nephew Bernardo, governor of Louisiana; and in the early days of the 19th century was the principal rendezvous of a powerful band of buccaneers and pirates, of whom, for many years, the notorious Jean Lafitte was chief. After much difficulty these were finally dispersed about 1820 by the United States authorities, and in 1837 the first settlement from the United States was made on the site of the present city. The town was incorporated by the legislature of the Republic of Texas in 1839. On the 8th of October 1862 the city was taken by a Federal naval force under Commander William B. Renshaw (1816-1863). After a sharp engagement a Confederate force under General John B. Magruder (1810-1871) retook the city on the 1st of January 1863, one of the Federal ships, the "Harriet Lane," falling into Confederate hands, and another, the "Westfield," being blown up with Commander Renshaw on board. Thereafter Galveston remained in Confederate hands, although rigidly blockaded by the

Federal navy, until the close of the war. On the 8th of September 1900 the city was seriously damaged by a West Indian hurricane, which, blowing steadily for eighteen hours, reached a velocity of 135 m. an hour. The waters of the Gulf were piled up in enormous waves that swept across a large part of the city, destroying or badly damaging more than 8000 buildings, entailing a loss of about 5000 lives, and a property loss estimated at about $17,000,000. Liberal contributions came from all over the country, and the state partially remitted the city's taxes for 17 years. The city was rapidly rebuilt on a more substantial plan.

GALWAY, a county in the west of Ireland, in the province of Connaught, bounded N. by Mayo and Roscommon; E. by Roscommon, King's County and Tipperary; S. by Clare and Galway Bay; and W. by the Atlantic Ocean. The area is 1,519,699 acres or about 2375 sq. m., the county being second in size to Cork among the Irish counties.

The county is naturally divided by Lough Corrib into two great divisions. The eastern, which comprehends all the county except the four western baronies, rests on a limestone base, and is, generally speaking, a level champaign country, but contains large quantities of wet bog. Its southern portion is partly a continuation of the Golden Vale of Limerick, celebrated for its fertility, and partly occupied by the Slievebaughty Mountains. The northern portion of the division contains rich pasture and tillage ground, beautifully diversified with hill and dale. Some of the intermediate country is comparatively uncultivated, but forms excellent pasturage for sheep. The western division of the county has a substratum of granite, and is barren, rugged and mountainous. It is divided into the three districts of Connemara, Jar-Connaught and Joyce's Country; the name of Connemara is, however, often applied to the whole district. Its highest mountains are the grand and picturesque group of Bunnabeola, or the Twelve Bens or Pins, which occupy a space of about 25 sq. m., the highest elevation being 2695 ft. Much of this district is a gently sloping plain, from 100 to 300 ft. above sea-level. Joyce's Country, farther north, is an elevated tract, with flat-topped hills 1300 to 2000 ft. high, and deep narrow valleys lying between them.

Galway possesses the advantage of a very extended line of sea-coast, indented by numerous harbours, which, however, are rarely used except by a few coasting and fishing vessels. At the boundary with the county Mayo in the north is Killary Harbour which separates the two counties. The first bay on the western coast capable of accommodating large ships is Ballynakill, sheltered by Freaghillaun or Heath Island. Next in succession is Cleggan Bay. Off these inlets lie the islands of Inishbofin and Inishark, with others. Streamstown is a narrow inlet, within which are the inhabited islands of Omey, Inishturk and Turbot. Ardbear harbour is divided into two inlets, the northern terminating at the town of Clifden, with excellent anchorage; the southern inlet has also good anchorage within the bar, and has a good salmon fishery. Mannin Bay, though large, is much exposed and little frequented by shipping. From Slyne Head the coast turns eastward to Roundstone Bay, which has its entrance protected by the islands of Inishnee and Inishlacken. Next in order is Bertraghboy Bay, studded with islets and rocks, but deep and sheltered. Kilkieran Bay, the largest on this coast, has a most productive kelp shore of nearly 100 m.; its mouth is but 3 m. broad. Between Gorumna Island and the mainland is Greatman's Bay and close to it Costello Bay, the most eastern of those in Connemara. The whole of the coast from Greatman's Bay eastward is comprehended in the Bay of Galway, the entrance of which is protected by the three limestone islands of Aran, Inishmore (or Aranmore), Inishmann and Inisheer.

The rivers are few, and, except the Shannon, of small size. The Suck, which forms the eastern boundary of the county, rises in Roscommon, and passing by Ballinasloe, unites with the Shannon at Shannonbridge. The Shannon forms the south-eastern boundary of the county, and passing Shannon Harbour, Banagher, Meelick and Portumna, swells into the great expanse of water called Lough Derg, which skirts the county as far as the village of Mount Shannon. The Claregalway flows southward through the centre of the county, and enters Lough Corrib some 4 m. above the town of Galway. The Ballynahinch, considered one of the best salmon-fishing rivers in Connaught, rises in the Twelve Pins, passes through Ballynahinch Lake, and after a short but rapid course falls into Bertraghboy Bay. Lakes are numerous. Lough Corrib extends from Galway town northwards over 30,000 acres, with a shore of 50 m. in extent. The lake is studded with many islands, some of them thickly

inhabited. The district west of Lough Corrib contains a vast number of lakes, about twenty-five of them more than a mile in length. Lough Rea, by the town of the same name, is more remarkable for scenic beauty than for extent. Besides these perennial lakes, there are several low tracts, called turloughs, which are covered with water during a great part of the year. Loughs Mask and Corrib are connected by a salmon ladder, and contain large trout. Galway, with the Screab Waters, draining into Camus Bay, a branch of Kilkieran Bay, with Recess and the Ballynahinch waters, are the best fishing centres. On account of its scenic beauty, both coastal and inland, together with its facilities for sport, county Galway is frequented by summer visitors. Though for long the remoter parts were difficult of access, as in the case of Donegal, Mayo, Clare and the western counties generally, the Galway and Clifden railway assisted private enterprise to open up the country. The western mountains, broken by deep landlocked and island-sheltered bays, as well as by the innumerable small loughs of the Connemara districts, afford scenes varying from gentle slopes occasionally well wooded along the water's edge to wild, bare moorlands among the heights, while the summits are usually bold and rocky cones. Several small fishing villages have acquired the dignity of watering-places from the erection of hotels, which have also been planted in previously untenanted situations of high scenic attractions; among these may be mentioned Leenane at the head of Killary harbour, Renvyle House at its entrance, Letterfrack on Ballynakill Bay, Streamstown and Clifden, and Cashel on Bertraghboy Bay. Inland are Recess, near Lough Derryclare, and Ballynahinch, on the lough of that name, both on the railway, at the foot of the Twelve Pins.

Geology.—The east of this county lies in the Carboniferous Limestone plain, with domes of Old Red Sandstone rising near Dunmore and Mount Bellew. As Galway town is neared, the grey rock appears freely on the surface, and Lough Corrib spreads itself over almost level land. Its west branches, however, run up into "Dalradian" hills, which rise abruptly on the threshold of Connemara. A broad mass of ice-worn gneiss and granite lies between Lough Corrib and Galway Bay, cut off so sharply at the sea as to suggest the presence of an east-and-west line of fracture. The Twelve Bens owe their supremacy to the quartzites, which are here well bedded and associated with limestone and mica-schist. Silurian conglomerates and sandstones, with andesitic lavas, overlie the Dalradians, with marked unconformity, south of Leenane and round Lough Nafooey. The surfaces of the hard rocks admirably record the action of ice throughout the county. There is black Carboniferous marble at Menlough near Galway; and the well-known "Connemara Marble" is a banded serpentinous crystalline limestone in the Dalradians at Recess, Ballynahinch and Streamstown. Compact red granite is worked at Shantallow, and the region west of Galway contains many handsome porphyritic red varieties.

Climate and Industries.—The climate is mild and healthy but variable, and violent winds from the west are not uncommon. Frost or snow seldom remains long on the western coast, and cattle of every description continue unhoused during the winter. The eastern part of the county produces the best wheat. Oats are frequently sown after potatoes in moorish soils less adapted for wheat. The flat shores of the bays afford large supplies of seaweed for manure. Limestone, gravel and marl are to be had in most other parts. When a sufficient quantity of manure for potatoes cannot be had, the usual practice is to pare and burn the surface. In many places on the seashore fine early potatoes are raised in deep sea-sand manured with seaweed, and the crop is succeeded by barley. Those parts of the eastern district less fitted for grain are employed in pasturage. Heathy sheep-walks occupy a very large tract between Monivea and Galway. An extensive range from Athenry, stretching to Galway Bay at Kinvarra, is also chiefly occupied by sheep. Over half the total acreage of the county is pasture-land, and cattle, sheep, pigs and poultry are extensively reared. The proportion of tillage to pasturage is roughly as one to four; and owing to the nature of the country fully one-third of the total area is quite barren.

Manufactures are not carried on beyond the demand caused by the domestic consumption of the people. Coarse friezes, flannels and blankets are made in all parts and sold largely in Galway and Loughrea. Connemara has been long celebrated for its hand-knit woollen stockings. Coarse linen, of a narrow breadth, called bandle linen, is also made for home consumption. There is a linen-weaving factory at Oughterard. The manufacture of kelp, formerly a great source of profit on the western shores, is still carried on to some extent. Feathers and sea-fowls' eggs are brought in great quantities from the islands of Aran, the produce of the puffins and other sea-fowl that frequent the cliffs. Fishing affords occupation to many of the inhabitants, the industry having as its centres the ports of Galway and Clifden.

The Midland Great Western main line enters the county at Ballinasloe, and runs by Athenry to Galway, with an extension to Oughterard (Lough Corrib) and Clifden. The Great Southern & Western line from Sligo to Limerick traverses the county from N. to S., by way of

Tuam, Athenry and Gort.

Population and Administration.—The population of county Galway (211,227 in 1891; 192,549 in 1901) decreased by more than half in the last seventy years of the 19th century, and the decrease continues, as emigration is heavy. About 97% of the population are Roman Catholics, and a somewhat less percentage are rural. The Erse tongue is maintained by many in this remote county. The chief towns are Galway (pop. 13,426), Tuam (3012), Ballinasloe (4904) and Loughrea (2815), with the smaller towns of Portumna, Gort, Clifden, Athenry, Headford, Oughterard and Eyrecourt. The county is divided into four parliamentary divisions (returning one member each); north, south, east and Connemara, while the town of Galway returns one member. There are eighteen baronies. Assizes are held at Galway, quarter-sessions at Galway, Ballinasloe, Clifden, Gort, Loughrea, Oughterard, Portumna and Tuam. The county comprises parts of the Protestant dioceses of Tuam and of Killaloe; and of the Roman Catholic dioceses of Elphin, Galway, Clonfert and Killaloe.

History.—The history of county Galway is exceedingly obscure, and nearly every one of its striking physical features carries its legend with it. For centuries local septs struggled together for mastery undeterred by outside influence. The wreck of part of the Spanish Armada on this coast in 1588 left survivors whose influence is still to be traced. The formation of Galway into a county was effected about 1579 by Sir Henry Sydney, lord deputy of Ireland. In the county at Aughrim (*q.v.*) the decisive battle of the English Revolution was fought in 1691. Among the antiquities are several round towers. The only perfect one is at Kilmacduagh, a very fine example 112 ft. high, leaning considerably out of the perpendicular. Raths or encampments are numerous and several cromlechs are to be seen in good preservation. The ruins of monastic buildings are also numerous. That of Knockmoy, about 6 m. from Tuam, said to have been founded in 1180 by Cathal O’Connor, was adorned with rude fresco paintings, still discernible, which were considered valuable as being the best authentic representations existing of ancient Irish costumes. Ancient castles and square towers of the Anglo-Norman settlers are frequently met with; some have been kept in repair, but the greater number are in ruins. The castle of Tuam, built in 1161 by Roderick O’Connor, king of Ireland, at the period of the English invasion, is said to have been the first building of this description of stone and mortar in Ireland. The remains of a round castle, a form of building very uncommon in the military architecture of the country, are to be seen between Gort and Kilmacduagh. The extraordinary cyclopean and monastic ruins on the Aran Islands (*q.v.*) must be mentioned; and the town of Galway, Athenry, and the neighbourhood of Ballinasloe all show interesting remains. The small church of Clonfert, in the south of the county, with a fine Romanesque doorway, is a cathedral, the diocese of which was united with Kilfenora, Kilmacduagh and Killaloe in 1833.

GALWAY, a seaport, parliamentary borough and the county town of county Galway, Ireland, on the north shore of Galway Bay, and on the main line of the Midland Great Western railway. Pop. of urban district (1901) 13,426. Some of the streets are very narrow, and contain curious specimens of old buildings, chiefly in antique Spanish style, being square, with a central court, and a gateway opening into the street. The most noteworthy of these is the pile known as Lynch’s Castle. This residence takes its name from the family of whom James Lynch Fitzstephen, mayor of Galway in 1493, was a member; whose severity as a magistrate is exemplified in the story that he executed his own son, and thus gave origin (according to one of several theories) to the familiar term of Lynch law. The principal streets are broad and contain good shops. St Nicholas church is a fine cruciform building founded in 1320, and containing monuments, and a bell, one of a peal, which appears to have been brought from Cavron in France, but how this happened is not known. The church was made collegiate in 1484, and Edward VI. created the Royal College of Galway in connexion with it; but the old college buildings no longer serve this purpose, and the church ceased to be collegiate in 1840. There are remains of a Franciscan friary founded in 1296. St Augustine’s church (Roman Catholic) is modern (1859). The town is the seat of a Roman Catholic diocese. There are grammar, model and industrial schools, the first with exhibitions to Trinity College, Dublin; but the principal educational establishment is University College, a quadrangular building in Tudor Gothic style, of grey limestone. It was founded as Queen’s College, with other colleges of the same name at Belfast and Cork, under an act of 1845, and its name was changed when it was granted a new charter pursuant to the Irish Universities

Act 1908. The harbour comprises an extensive line of quays, and is connected for inland navigation with Lough Corrib. The shipping trade is considerable, but as a trans-Atlantic port Galway was exploited unsuccessfully. The fisheries, both sea and salmon, are important. The chief exports are wool, agricultural produce and black marble, which is polished in local mills. Other industrial establishments include corn-mills, iron-foundries, distilleries, and brush and bag factories. The borough, which returned two members to parliament until 1885, now returns one.

Galway is divided into the old and new towns, while a suburb known as the Claddagh is inhabited by fishermen. This is a curious collection of small cottages, where communal government by a locally elected mayor long prevailed, together with peculiar laws and customs, strictly exclusive inter-marriage, and a high moral and religious standard. Specimens of the distinctive Claddagh ring, for example, were worn and treasured as venerated heirlooms. These customs, with the distinctive dress of the women, died out but slowly, and even to-day their vestiges remain.

The environs of Galway are pleasant, with several handsome residences. The most interesting point in the vicinity is Roscam, with its round tower, ruined church and other remains. Salthill, with golf links, is a waterside residential suburb.

Little is known of the history of Galway until after the arrival of the English, at which time it was under the protection of O'Flaherty, who possessed the adjoining district to the west. On the extinction of the native dynasty of the O'Connors, the town fell into the hands of the De Burgos, the head of a branch of which, under the name of M'William Eighter, long governed it by magistrates of his own appointment. After it had been secured by walls, which began to be built about 1270 and are still in part traceable, it became the residence of a number of enterprising settlers, through whom it attained a position of much commercial celebrity. Of these settlers the principal families, fourteen in number, were known as the tribes of Galway. They were of Norman, Saxon or Welsh descent, and became so exclusive in their relationships that dispensations were frequently requisite for the canonical legality of marriages among them. The town rapidly increased from this period in wealth and commercial rank, far surpassing in this respect the rival city of Limerick. Richard II. granted it a charter of incorporation with liberal privileges, which was confirmed by his successor. It had the right of coinage by act of parliament, but there is no evidence to show that it exercised the privilege. Another charter, granted in 1545, extended the jurisdiction of the port to the islands of Aran, permitted the exportation of all kinds of goods except linens and woollens, and confirmed all the former privileges. Large numbers of Cromwell's soldiers are said to have settled in the town; and there are many traces of Spanish blood among the population. Its municipal privileges were extended by a charter from James I., whereby the town, and a district of two miles round in every direction, were formed into a distinct county, with exclusive jurisdiction and a right of choosing its own magistrates. During the civil wars of 1641 the town took part with the Irish, and was surrendered to the Parliamentary forces under Sir Charles Coote; after which the ancient inhabitants were mostly driven out, and their property was given to adventurers and soldiers, chiefly from England. On the accession of James II. the old inhabitants entertained sanguine hopes of recovering their former rights. But the successes of King William soon put an end to their expectations; and the town, after undergoing another siege, again capitulated to the force brought against it by General Ginkell.

GAMA, VASCO DA (*c.* 1460-1524), Portuguese navigator and discoverer of the sea-route to India, was born at Sines, a small seaport in the province of Alemtejo. Of da Gama's early history little is known. His descent, according to the *Nobiliario* of Antonio de Lima, was derived from a noble family which is mentioned in the year 1166; but the line cannot be traced without interruption farther back than the year 1280, to one Alvaro da Gama, from whom was descended Estevão da Gama, civil governor of Sines, whose third son Vasco was born probably about the year 1460. In that year died Prince Henry the Navigator, to whose intelligence and foresight must be traced back all the fame that Portugal gained on the seas in the 15th and 16th centuries. Explorers sent out at his instigation discovered the Azores and unknown regions on the African coast, whence continually came reports of a great monarch, "who lived east of Benin, 350 leagues in the interior, and who held both temporal and spiritual dominion over all the neighbouring kings," a story which tallied so remarkably

with the accounts of “Prester John” which had been brought to the Peninsula by Abyssinian priests, that John II. of Portugal steadfastly resolved that both by sea and by land the attempt should be made to reach the country of this potentate. For this purpose Pedro de Covilham and Affonso de Payva were despatched eastward by land; while Bartholomeu Diaz (*q.v.*), in command of two vessels, was sent westward by sea (see Abyssinia, 14). That there was in truth an ocean highway to the East was proved by Diaz, who returned in December 1488 with the report that when sailing southward he was carried far to the east by a succession of fierce storms, past—as he discovered only on his return voyage—what he ascertained to be the southern extremity of the African continent. The condition of John’s health and concerns of state, however, prevented the fitting out of the intended expedition; and it was not till nine years later, when Emanuel I. had succeeded to the throne, that the preparations for this great voyage were completed—hastened, doubtless, by Columbus’s discovery of America in the meanwhile.

For the supreme command of this expedition the king selected Vasco da Gama, who had in his youth fought in the wars against Castile, and in his riper years gained distinction as an intrepid mariner. The fleet, consisting of four vessels specially built for this mission, sailed down the Tagus on the 9th of July 1497, after prayers and confession made by the officers and crews in a small chapel on the site where now stands the church of S. Maria de Belem (see Lisbon), afterwards built to commemorate the event. Four months later the flotilla cast anchor in St Helena Bay, South Africa, rounded the Cape in safety, and in the beginning of the next year reached Malindi, on the east coast of Africa. Thence, steering eastward, under the direction of a pilot obtained from Indian merchants met with at this port, da Gama arrived at Calicut, on the Malabar coast, on the 20th May 1498, and set up, according to the custom of his country, a marble pillar as a mark of conquest and a proof of his discovery of India. His reception by the zamorin, or Hindu ruler of Calicut, would have in all probability been favourable enough, had it not been for the jealousy of the Mahommedan traders who, fearing for their gains, so incited the Hindus against the new-comers that da Gama was unable to establish a Portuguese factory. Having seen enough of India to assure him of its great resources, he returned to Portugal in September 1499. The king received him with every mark of distinction, granted him the use of the prefix *Dom*, thus elevating him to the rank of an untitled noble, and conferred on him pensions and other property. In prosecution of da Gama’s discoveries another fleet of thirteen ships was immediately sent out to India under Pedro Alvares Cabral, who, in sailing too far westward, by accident discovered Brazil, and on reaching his destination established a factory at Calicut. The natives, again instigated by the Mahommedan merchants, rose up in arms and murdered all whom Cabral had left behind. To avenge this outrage a powerful armament of ten ships was fitted out at Lisbon, the command of which was at first given to Cabral, but was afterwards transferred to da Gama, who received the title admiral of India (January 1502). A few weeks later the fleet sailed, and on reaching Calicut da Gama immediately bombarded the town, treating its inhabitants with a savagery too horrible to describe. From Calicut he proceeded in November to Cochin, “doing all the harm he could on the way to all that he found at sea,” and having made favourable trading terms with it and with other towns on the coast, he returned to Lisbon in September 1503, with richly laden ships. He and his captains were welcomed with great rejoicings and he received additional privileges and revenues.

Soon after his return da Gama retired to his residence in Evora, possibly from pique at not obtaining so high rewards as he expected, but more probably in order to enjoy the wealth and position which he had acquired; for he was now one of the richest men in the kingdom. He had married, probably in 1500, a lady of good family, named Catherina de Ataide, by whom he had six sons. According to Correa, he continued to advise King Emanuel I. on matters connected with India and maritime policy up to 1505, and there are extant twelve documents dated 1507-1522 which prove that he continued to enjoy the royal favour. The most important of these is a grant dated December 1519 by which Vasco da Gama was created count of Vidigueira, with the extraordinary privileges of civil and criminal jurisdiction and ecclesiastical patronage. During this time the Portuguese conquests increased in the East, and were presided over by successive viceroys. The fifth of these was so unfortunate that da Gama was recalled from his seclusion by Emanuel’s successor, John III., and nominated viceroy of India, an honour which in April 1524 he left Lisbon to assume. Arriving at Goa during September of the same year, he immediately set himself to correct with vigour the many abuses which had crept in under the rule of his predecessors. He was not destined, however, to prosecute far the reforms he had inaugurated, for, on the Christmas-eve following his arrival, he died at Cochin after a short illness, and was buried in the Franciscan monastery there. In 1538 his body was conveyed to Portugal and entombed in the town of Vidigueira. In 1880 what were supposed on insufficient evidence to have been

his remains were transferred to the church of Santa Maria de Belem. His voyage had the immediate result of enriching Portugal, and raising her to one of the foremost places among the nations of Europe, and eventually the far greater one of bringing to pass the colonization of the East by opening its commerce to the Western world.

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GAMALIEL (גמליאל). This name, which in Old Testament times figures only as that of a prince of the tribe of Manasseh (*vide* Num. i. 10, &c.), was hereditary among the descendants of Hillel. Six persons bearing the name are known.

1. GAMALIEL I., a grandson of Hillel, and like him designated Ha-Zāqēn (the Elder), by which is apparently indicated that he was numbered among the Sanhedrin, the high council of Jerusalem. According to the tradition of the schools of Palestine Gamaliel succeeded his grandfather and his father (of the latter nothing is known but his name, Simeon) as *Nasi*, or president of the Sanhedrin. Even if this tradition does not correspond with historic fact, it is at any rate certain that Gamaliel took a leading position in the Sanhedrin, and enjoyed the highest repute as an authority on the subject of knowledge of the Law and in the interpretation of the Scriptures. He was the first to whose name was prefixed the title Rabban (Master, Teacher). It is related in the Acts of the Apostles (v. 34 et seq.) that his voice was uplifted in the Sanhedrin in favour of the disciples of Jesus who were threatened with death, and on this occasion he is designated as a Pharisee and as being "had in reputation among all the people" (νομοδιδάσκαλος τίμιος παντὶ τῷ λαῷ). In the Mishna (*Giṭṭin* iv. 1-3) he is spoken of as the author of certain legal ordinances affecting the welfare of the community (the expression in the original is "*tiqqun ha-ʿōlām*," *i.e.* improvement of the world) and regulating certain questions as to conjugal rights. In the tradition was also preserved the text of the epistles regarding the insertion of the intercalary month, which he sent to the inhabitants of Galilee and the Darom (*i.e.* southern Palestine) and to the Jews of the Dispersion (Sanhedrin 11b and elsewhere). He figures in two anecdotes as the religious adviser of the king and queen, *i.e.* Agrippa I. and his wife Cypris (Pesahim 88 *b*). His function as a teacher is proved by the fact that the Apostle Paul boasts of having sat at the feet of Gamaliel (Acts. xxii. 3). Of his teaching, beyond the saying preserved in Aboth i. 16, which enjoins the duty of study and of scrupulousness in the observance of religious ordinances, only a very remarkable characterization of the different natures of the scholars remains (Aboth di R. Nathan, ch. xl.). His renown in later days is summed up in the words (Mishna, end of Soṭah): "When Rabban Gamaliel the Elder died, regard for the Torah (the study of the Law) ceased, and purity and piety died." As Gamaliel I. is the only Jewish scribe whose name is mentioned in the New Testament he became a subject of Christian legend, and a monk of the 12th century (Hermann the Premonstratensian) relates how he met Jews in Worms studying Gamaliel's commentary on the Old Testament, thereby most probably meaning the Talmud.

2. GAMALIEL II., the son of Simon ben Gamaliel, one of Jerusalem's foremost men in the war against the Romans (*vide* Josephus, *Bellum Jud*. iv. 3, 9, *Vita* 38), and grandson of Gamaliel I. To distinguish him from the latter he is also called Gamaliel of Jabneh. In Jabneh (Jamnia), where during the siege of Jerusalem the scribes of the school of Hillel had taken refuge by permission of Vespasian, a new centre of Judaism arose under the leadership of the aged Johanan ben Zakkai, a school whose members inherited the authority of the Sanhedrin of

Jerusalem. Gamaliel II. became Johanan ben Zakkai's successor, and rendered immense service in the strengthening and reintegration of Judaism, which had been deprived of its former basis by the destruction of the Temple and by the entire loss of its political autonomy. He put an end to the division which had arisen between the spiritual leaders of Palestinian Judaism by the separation of the scribes into the two schools called respectively after Hillel and Shammai, and took care to enforce his own authority as the president of the chief legal assembly of Judaism with energy and often with severity. He did this, as he himself said, not for his own honour nor for that of his family, but in order that disunion should not prevail in Israel. Gamaliel's position was recognized by the Roman government also. Towards the end of Domitian's reign (*c.* A.D. 95) he went to Rome in company with the most prominent members of the school of Jabneh, in order to avert a danger threatening the Jews from the action of the terrible emperor. Many interesting particulars have been given regarding the journey of these learned men to Rome and their sojourn there. The impression made by the capital of the world upon Gamaliel and his companions was an overpowering one, and they wept when they thought of Jerusalem in ruins. In Rome, as at home, Gamaliel often had occasion to defend Judaism in polemical discussions with pagans, and also with professed Christians. In an anecdote regarding a suit which Gamaliel was prosecuting before a Christian judge, a converted Jew, he appeals to the Gospel and to the words of Jesus in Matt. v. 17 (Shabbath 116 *a, b*). Gamaliel devoted special attention to the regulation of the rite of prayer, which after the cessation of sacrificial worship had become all-important. He gave the principal prayer, consisting of eighteen benedictions, its final revision, and declared it every Israelite's duty to recite it three times daily. He was on friendly terms with many who were not Jews, and was so warmly devoted to his slave Tabi that when the latter died he mourned for him as for a beloved member of his own family. He loved discussing the sense of single portions of the Bible with other scholars, and made many fine expositions of the text. With the words of Deut. xiii. 18 he associated the lesson: "So long as thou thyself art merciful, God will also be merciful to thee." Gamaliel died before the insurrections under Trajan had brought fresh unrest into Palestine. At his funeral obsequies the celebrated proselyte Aquila (Akylas Onkelos), reviving an ancient custom, burned costly materials to the value of seventy minae. Gamaliel himself had given directions that his body was to be wrapped in the simplest possible shroud. By this he wished to check the extravagance which had become associated with arrangements for the disposal of the dead, and his end was attained; for his example became the rule, and it also became the custom to commemorate him in the words of consolation addressed to the mourners (Kethub. 8 *b*). Gamaliel's son, Simon, long after his father's death, and after the persecutions under Hadrian, inherited his office, which thenceforward his descendants handed on from father to son.

3. Gamaliel III., son of Jehuda I. the redactor of the Mishna, and his successor as *Nasi* (patriarch). The redaction of the Mishna was completed under him, and some of his sayings are incorporated therein (Aboth ii. 2-4). One of these runs as follows: "Beware of those in power, for they permit men to approach them only for their own uses; they behave as friends when it is for their advantage, but they do not stand by a man when he is in need." Evidently this was directed against the self-seeking of the Roman government. Gamaliel III. lived during the first half of the 3rd century.

4. Gamaliel IV., grandson of the above, patriarch in the latter half of the 3rd century: about him very little is known.

5. Gamaliel V., son and successor of the patriarch Hillel II.: beyond his name nothing is known of him. He lived in the latter half of the 4th century. He is the patriarch Gamaliel whom Jerome mentions in his letter to Pamachius, written in 393.

6. Gamaliel VI., grandson of the above, the last of the patriarchs, died in 425. With him expired the office, which had already been robbed of its privileges by a decree of the emperors Honorius and Theodosius II. (dated the 17th of October 415). Gamaliel VI. was also a physician, and a celebrated remedy of his is mentioned by his contemporary Marcellus (*De Medicamentis*, liber 21).

(W. Ba.)

GAMBETTA, LÉON (1838-1882), French statesman, was born at Cahors on the 2nd of

April 1838. His father, a Genoese, who had established himself as a grocer and had married a Frenchwoman named Massabie, is said to have been his son's prototype in vigour and fluency of speech. In his sixteenth year young Gambetta lost by an accident the sight of his left eye, which eventually had to be removed. Notwithstanding this privation, he highly distinguished himself at the public school of Cahors, and in 1857 proceeded to Paris to study law. His southern vehemence gave him great influence among the students of the Quartier Latin, and he was soon known as an inveterate enemy of the imperial government. He was called to the bar in 1859, but, although contributing to a Liberal review, edited by Challemel Lacour, did not make much way until, on the 17th of November 1868, he was selected to defend the journalist Delescluze, prosecuted for having promoted the erection of a monument to the representative Baudin, who was killed in resisting the *coup d'état* of 1851. Gambetta seized his opportunity and assailed both the *coup d'état* and the government with an eloquence of invective which made him immediately famous.

In May 1869 he was returned to the Assembly, both by the first circumscription of Paris and by Marseilles, defeating Hippolyte Carnot for the former constituency and Thiers and Lesseps for the latter. He elected to sit for Marseilles, and lost no opportunity of attacking the Empire in the Assembly. He was at first opposed to the war with Germany, but when satisfied that it had been forced upon France he did not, like some of his colleagues, refuse to vote supplies, but took the patriotic line of supporting the flag. When the news of the disaster at Sedan reached Paris, Gambetta called for strong measures. He himself proclaimed the fall of the emperor at the *corps législatif*, and the establishment of a republic at the hôtel de ville. He was one of the first members of the new government of national defence, becoming minister of the interior. He advised his colleagues to leave Paris and conduct the government from some provincial city. This advice was rejected from dread of another revolution in Paris, and a delegation to organize resistance in the provinces was despatched to Tours, but when this was seen to be inefficient Gambetta himself (7th October) quitted Paris in a balloon, and upon arriving at Tours took the supreme direction of affairs as minister of the interior and of war. Aided by M. de Freycinet, then a young officer of engineers, as his assistant secretary of war, he displayed prodigies of energy and intelligence. He speedily organized an army, which might possibly have effected the relief of Paris if Metz had held out, but the surrender of Bazaine brought the army of the crown prince into the field, and success was impossible. After the defeats of the French near Orleans early in December the seat of government had to be transferred to Bordeaux, and when Paris surrendered at the end of January, Gambetta, though resisting and protesting, was compelled to submit to the capitulation concluded with Prince Bismarck. He immediately resigned his office. Elected by nine departments to the National Assembly meeting at Bordeaux (on the 1st of March 1871) he chose to sit for Strassburg, which by the terms of the treaty about to be submitted to the Assembly for ratification was to be ceded to Prussia, and when the treaty was adopted he resigned in protest and retired to Spain.

He returned to France in June, was elected by three departments in July, and commenced an agitation for the definitive establishment of the Republic. On the 5th of November 1871 he established a journal, *La République française*, which soon became the most influential in France. His orations at public meetings were more effective than those delivered in the Assembly, especially that made at Bordeaux on his return, and that at Grenoble on the 26th of November 1872, in which he spoke of political power having passed to les *nouvelles couches sociales*. When Thiers, however, fell from power in May 1873, and a Royalist was placed at the head of the government in the person of Marshal MacMahon, Gambetta gave proof of his statesmanship by unceasingly urging his friends to a moderate course, and by his tact and parliamentary dexterity, no less than by his eloquence, he was mainly instrumental in the voting of the constitution in February 1875. This policy he continued during the early days of the now consolidated Republic, and gave it the appropriate name of "opportunism." It was not until the 4th of May 1877, when the peril from reactionary intrigues was notorious, and the clerical party had begun a campaign for the restoration of the temporal power of the pope, that he delivered his famous speech denouncing "clericalism" as "the enemy." On the 16th of May Marshal MacMahon, in order to support the clerical reactionaries, perpetrated his parliamentary *coup d'état*, and on the 15th of August Gambetta, in a speech at Lille, gave him the alternative se *soumettre ou se démettre*. He then undertook a political campaign to rouse the republican party throughout France, which culminated in a speech at Romans (September 18, 1878) formulating its programme. MacMahon, equally unwilling to resign or to provoke civil war, had no choice but to dismiss his advisers and form a moderate republican ministry under the premiership of Dufaure.

When the resignation of the Dufaure cabinet brought about the abdication of Marshal MacMahon, Gambetta declined to become a candidate for the presidency, but gave his

support to Grévy; nor did he attempt to form a ministry, but accepted the office of president of the chamber of deputies (January 1879). This position, which he filled with much ability, did not prevent his occasionally descending from the presidential chair to make speeches, one of which, advocating an amnesty to the communards, was especially memorable. Although he really directed the policy of the various ministries, he evidently thought that the time was not ripe for asserting openly his own claims to direct the policy of the Republic, and seemed inclined to observe a neutral attitude as far as possible; but events hurried him on, and early in 1881 he placed himself at the head of a movement for restoring *scrutin de liste*, or the system by which deputies are returned by the entire department which they represent, so that each elector votes for several representatives at once, in place of *scrutin d'arrondissement*, the system of small constituencies, giving one member to each district and one vote to each elector. A bill to re-establish *scrutin de liste* was passed by the Assembly on 19th May 1881, but rejected by the Senate on the 19th of June.

But this personal rebuff could not alter the fact that in the country his was the name which was on the lips of the voters at the election. His supporters were in a large majority, and on the reassembling of the chamber, the Ferry cabinet quickly resigned. Gambetta was unwillingly entrusted by Grévy on the 14th of November 1881 with the formation of a ministry—known as *Le Grand Ministère*. He now experienced the Nemesis of his over-cautious system of abstinence from office for fear of compromising his popularity. Every one suspected him of aiming at a dictatorship; attacks, not the less formidable for their injustice, were directed against him from all sides, and his cabinet fell on the 26th of January 1882, after an existence of only sixty-six days. Had he remained in office his declarations leave no doubt that he would have cultivated the British alliance and cooperated with Great Britain in Egypt; and when the Freycinet administration, which succeeded, shrank from that enterprise only to see it undertaken with signal success by England alone, Gambetta's foresight was quickly justified. His fortunes were presenting a most interesting problem when, on the 31st of December 1882, at his house in Ville d'Avray, near Sèvres, he died by a shot from a revolver which accidentally went off. Then all France awoke to a sense of her obligation to him, and his public funeral on the 6th of January 1883 evoked one of the most overwhelming displays of national sentiment ever witnessed on a similar occasion.

Gambetta rendered France three inestimable services: by preserving her self-respect through the gallantry of the resistance he organized during the German War, by his tact in persuading extreme partisans to accept a moderate Republic, and by his energy in overcoming the usurpation attempted by the advisers of Marshal MacMahon. His death, at the early age of forty-four, cut short a career which had given promise of still greater things, for he had real statesmanship in his conceptions of the future of his country, and he had an eloquence which would have been potent in the education of his supporters. The romance of his life was his connexion with Léonie Léon (d. 1906), the full details of which were not known to the public till her death. This lady, with whom Gambetta fell in love in 1871, was the daughter of a French artillery officer. She became his mistress, and the *liaison* lasted till he died. Gambetta himself constantly urged her to marry him during this period, but she always refused, fearing to compromise his career; she remained, however, his confidante and intimate adviser in all his political plans. It is understood that at last she had just consented to become his wife, and the date of the marriage had been fixed, when the accident which caused his death occurred in her presence. Contradictory accounts have indeed been given as to this fatal episode, but that it was accidental, and not suicide, is certain. On Gambetta the influence of Léonie was absorbing, both as lover and as politician, and the correspondence which has been published shows how much he depended upon her. But in various matters of detail the serious student of political history must be cautious in accepting her later recollections, some of which have been embodied in the writings of M. Francis Laur, such as that an actual interview took place in 1878 between Gambetta and Bismarck. That Gambetta after 1875 felt strongly that the relations between France and Germany might be improved, and that he made it his object, by travelling incognito, to become better acquainted with Germany and the adjoining states, may be accepted, but M. Laur appears to have exaggerated the extent to which any actual negotiations took place. On the other hand, the increased knowledge of Gambetta's attitude towards European politics which later information has supplied confirms the view that in him France lost prematurely a master mind, whom she could ill spare. In April 1905 a monument by Dalou to his memory at Bordeaux was unveiled by President Loubet.

Gambetta's *Discours et plaidoyers politiques* were published by J. Reinach in 11 vols. (Paris, 1881-1886); his *Dépêches, circulaires, décrets* ... in 2 vols. (Paris, 1886-1891). Many biographies have appeared. The principal are J. Reinach, *Léon Gambetta* (1884), *Gambetta orateur* (1884) and *Le Ministère Gambetta, histoire et doctrine* (1884); Neucastel, *Gambetta,*

sa vie, et ses idées politiques (1885); J. Hanlon, *Gambetta* (London, 1881); Dr Laborde, *Léon Gambetta biographie psychologique* (1898); P.B. Gheusi, Gambetta, *Life and Letters* (Eng. trans. by V.M. Montagu, 1910). See also G. Hanotaux, *Histoire de la France contemporaine* (1903, &c.). F. Laur's *Le Cœur de Gambetta* (1907, Eng. trans., 1908) contains the correspondence with Léonie Léon; see also his articles on "Gambetta and Bismarck" in *The Times* of August 17 and 19, 1907, with the correspondence arising from them.

(H. Ch.)

GAMBIA, an important river of West Africa, and the only river of Africa navigable by ocean-going boats at all seasons for over 200 m. from its mouth. It rises in about 11° 25′ N. and 12° 15′ W., within 150 m. of the sea on the north-eastern escarpment of the Futa Jallon highlands, the massif where also rise the head-streams of the Senegal and some of the Niger tributaries, besides the Rio Grande and many other rivers flowing direct to the Gulf of Guinea. The Gambia, especially in its lower course, is very serpentine, and although the distance from the source to the mouth of the river is little more than 300 m. in a direct line, the total length of the stream is about 1000 m. It flows first N.N.E., receiving many left-hand tributaries, but about 12° 35′ N. takes a sharp bend N.W. and maintains this direction until it leaves the fertile and hilly region of Bondu. The descent to the lower district is marked by the Barraconda rapids, formed by a ledge of rock stretching across the river. Between 30 and 50 m. above the falls the Gambia is joined by two considerable affluents, the Nieriko from the north and the Kuluntu or Grey river from the south. From the Barraconda rapids to the Atlantic the Gambia has a course of about 350 m. Throughout this distance the waters are tidal, and the river is navigable all the year round by boats drawing 6 ft. of water. At Yarbatenda, a few miles below Barraconda, the river has a breadth, even at the dry season, of over 300 ft., with a depth of 13 to 20 ft. From the falls to McCarthy's Island, a distance of 200 m., the river valley, which here presents a park-like appearance, is enclosed by low rocky hills of volcanic character. For 50 m. below the island, where the stream is about 800 yds. wide, the banks of the river are steep and thickly wooded. They then become low and are fringed with mangrove swamps. From Devil's Point, a sharp promontory on the north bank—up to which place the water is salt—the river widens considerably and enters the Atlantic, in about 13½° N. and 16½° W., by a broad estuary. Near the mouth of the river on the south side is St Mary's Island (3½ m. long by 1½ broad), and opposite on the north bank is Barra Point, the river being here contracted to 2½ m. Eighteen miles lower down the distance from shore to shore is 27 m. There is a sand-bar at the entrance to the river, but at the lowest state of the tide there are 26 ft. of water over the bar. The Gambia is in flood from November to June, when the Barraconda rapids are navigable by small boats. Above the rapids the stream is navigable for 160 m. Politically the Gambia is divided between Great Britain and France—Britain possessing both banks of the river up to, but not including, Yarbatenda.

The Gambia was one of the rivers passed by Hanno the Carthaginian in his famous voyage along the west coast of Africa. It was known to Ptolemy and the Arabian geographers, and was at one time supposed to be a mouth of the Nile, and, later (18th century), a branch of the Niger. It was possibly visited by Genoese navigators in 1291, and was certainly discovered by the Portuguese *c.* 1446, but was first explored for any distance from its mouth (1455) by the Venetian Alvise Cadamosto (*q.v.*), who published an account of his travels at Vicenza in 1507 (*La Prima Navigazione per l'Oceano alle terre de' Negri della Bassa Ethiopia*). Afterwards the Gambia became a starting-place for explorers of the interior, among them Mungo Park, who began both his journeys (1795 and 1805) from this river. It was not until 1818 that the sources of the Gambia were reached, the discovery being made by a Frenchman, Gaspard Mollien, who had travelled by way of the Senegal and Bondu. The middle course of the river was explored in 1851 by R.G. MacDonnell, then governor of the Gambia colony, and in 1881 Dr V.S. Gouldsbury also navigated its middle course. No native craft of any kind was seen above Barraconda. The more correct name of the river is Gambra, and it is so called in old books of travel.

See Mungo Park's *Travels* (London, 1799); G. Mollien, *Travels ... to the Sources of the Senegal and Gambia ...*, edited by T.E. Bowdich (London, 1820); the account of Dr Gouldsbury's journey in the Blue Book C 3065 (1881); also under the country heading below.

GAMBIA, the most northerly of the British West African dependencies. It consists of a stretch of land on both sides of the lower Gambia. The colony, with the protectorate dependent upon it, has an area of about 4000 sq. m. and a population officially estimated (1907) at 163,000. The colony proper (including St Mary's Island, British Kommbo, the Ceded Mile, McCarthy's Island and other islets) has an area of about 69 sq. m. The protectorate consists of a strip of land extending ten kilometres (about 6 m.) on each side of the river to a distance of about 200 m. in a direct line from the sea. The land outside these limits is French. Within the protectorate are various petty kingdoms, such as Barra, to the north of the Gambia, and Kommbo, to the south. The breadth of the colony near the coast is somewhat greater than it is higher up. The greatest breadth is 39 m.

Physical Features, Fauna and Flora.—The colony, as its name implies, derives its character and value from the river Gambia (*q.v.*), which is navigable throughout and beyond the limits of the colony, while large ocean-going ships can always cross the bar at its mouth and enter the port of Bathurst. Away from the swamps by the river banks, the country is largely "bush." The region above McCarthy's Island is hilly. Much of the land is cleared for cultivation. The fauna includes lions, leopards, several kinds of deer, monkeys, bush-cow and wild boar. Hippopotami are found in the upper part of the river, and crocodiles abound in the creeks. The birds most common are bush-fowl, bustards, guinea-fowl, quail, pigeon and sand-grouse. Bees are very numerous in parts of the country. The flora resembles that of West Africa generally, the mangrove being common. Mahogany and rosewood (*Pterocarpus erinaceus*) trees are found, though not in large numbers, and the rubber-vine and oil-palm are also comparatively scarce. There are many varieties of fern. The cassava (manioca) and indigo plants are indigenous.

Climate.—The climate during the dry season (November-June) is the best on the British West African coast, and the Gambia is then considered fairly healthy. Measures for the extermination of the malarial mosquito are carried on with good effect. The mean temperature at Bathurst is 77° F., the shade minimum being 56° and the solar maximum 165°. Upriver the variation in temperature is even greater than at Bathurst, from 50° in the morning to 100°-104° at 3 P.M. being common at McCarthy's Isle. The average rainfall is about 50 in. a year, but save for showers in May and June there is rarely any rain except between July and October. The first instance of rain in December in twenty-six years was recorded in 1906. The dry east wind known as the harmattan blows intermittently from December to March.

Inhabitants.—The inhabitants, who are both thrifty and industrious, are almost entirely of Negro or Negroid race, the chief tribes represented being the Mandingo (*q.v.*), the Jolof and the Jola. Numbers of Fula (*q.v.*) are also settled in the country. Fully four-fifths of the natives are Mahommedans. The few European residents are officials, traders or missionaries.

Towns and Trade.—Bathurst, pop. about 8000, the chief town of the colony, in 13° 24′ N., 16° 36′ W., is built on St Mary's Island, which lies at the mouth of the river near its south bank and is connected with the mainland by a bridge across Oyster Creek. It was founded in 1816 and is named after the 3rd earl Bathurst, secretary of state for the colonies from 1812 to 1827. Bathurst is a fairly well-built town, the chief material employed being red sandstone. It lies about 12 to 14 ft. above the level of the river. The principal buildings face the sea, and include Government House, barracks, a well-appointed hospital, founded by Sir R.G. MacDonnell (administrator, 1847-1852), and various churches. The market-place is shaded by a fine avenue of bombax and other wide-spreading trees. There are no other towns of any size in the Gambia. A trading station called Georgetown is situated on McCarthy's Island, so named after Sir Charles McCarthy, the governor of Sierra Leone, who in 1824 was captured and beheaded by the Ashanti at the battle of Essamako. Albreda, a small port on the north bank of the river, of some historic interest (see below), is in the Barra district.

Products.—Ground-nuts (*Arachis hypogaea*), rubber, beeswax, palm kernels, rice, cotton, and millet are the chief productions. Millet and rice are the staple food of the people. The curing of hides, the catching and drying of fish, boat-building, and especially the weaving of cotton into cloths called "pagns," afford employment to a considerable number of persons. Formerly the principal exports, besides slaves, were gold-dust, wax and hides, the gold being obtained from the Futa Jallon district farther inland. Between 1830 and 1840 from 1500 to 2000 oz. of gold were exported annually, but shipments ceased soon afterwards, though small quantities of gold-dust can still be obtained from native goldsmiths. The export of hides received a severe check in 1892-1893 through the death of nearly all the cattle, but after an interval of seven or eight years the industry gradually revived. The value of hides exported increased from £520 in 1902 to £9615 in 1907. The collection of rubber was started about 1880, but the trade has not assumed large proportions. In 1907 the value of the rubber

exported was £4602. The export of wax, valued at £37,000 in 1843, had dwindled in 1907 to £2325. The cultivation of the ground-nut, first exported in 1830, assumed importance by 1837, and by 1850 had become the chief industry of the colony. In 1907 the value of the nuts was £256,685, over $^{11}/_{12}$ of the total exports (exclusive of specie). Nearly the whole male population is engaged in the industry for eight months of the year. Planted in June, after the early rains, the crop is reaped in October or November and exported to Europe ($^{4}/_{5}$ to Marseilles) for the extraction of its oil, which is usually sold as olive oil. A feature of the industry is the appearance at the beginning of the planting season of thousands of men from a distance, “strange farmers,” as they are called, who are housed and fed and given farms to cultivate. In return they have to give half the produce to the landlords. As soon as he has sold his nuts, the “strange farmer” goes off, often not returning for years.

Apart from the cultivation of the ground-nut, the agricultural resources of the country are undeveloped. Large herds of cattle are kept by the Fula, and in cattle rich natives usually invest their wealth. Land can be hired for 2d. an acre per annum for twenty-one years. All land lying vacant or unused, or to which the occupier is unable to produce any title, is vested in the crown. A botanical station was opened in 1894, and the cultivation of American and Egyptian cotton was taken in hand in 1902. The experiment proved discouraging. Great difficulty was experienced in getting farmers to grow cotton for export, as unless carried on on highly scientific lines its cultivation is not so profitable as that of the ground-nut. The principal imports, of which over $^{2}/_{3}$ come from Great Britain or British colonies, are cotton goods, kola-nuts (from Sierra Leone), tobacco, rice, sugar and spirits. In the ten years 1898 to 1907 the average annual value of the exports was £301,000, of the imports £316,000. There are no mines in the colony, nor any apparent mineral wealth, except ridges of ironstone in the regions above McCarthy’s Island. Bathurst is in telegraphic communication with Europe and the rest of Africa. There are no railways in the colony, but it is traversed by well-made roads of a uniform width of 18 ft. The Liverpool mail steamers call at the port every fortnight. A government steamer runs regularly from Bathurst to McCarthy’s Island, and a smaller boat plies on the upper river. The shipping trade is chiefly British; French and German tonnage coming next.

Surrounded on all sides, save seawards, by French territory, the colony largely depends, economically, upon France, to which country most of the exports go. A considerable entrepôt trade is also done with the neighbouring French colonies. The extent of French influence is indicated by the fact that the five-franc piece, locally known as a dollar, is largely circulated throughout the protectorate, and is accepted as legal tender, although the currency in the colony proper is the English coinage.

Administration, Revenue, &c.—The Gambia is administered by a governor, assisted by an executive and a legislative council. On the last-named body nominated unofficial members have seats. The colony is self-supporting and has no public debt. The revenue, which in 1906 for the first time exceeded £60,000, is mainly derived from customs. A company of the West African Frontier Force is maintained. Travelling commissioners visit the five districts into which, for administrative purposes, the protectorate is divided, and in which the native form of government prevails. From the native law-courts appeal can be made to the supreme court at Bathurst. There is also at Bathurst a Mahommedan court, established in 1906, for the trial of cases involving the civil status of Moslems.

Primary schools are maintained by the various religious denominations, and receive grants from government. The Wesleyans have also a secondary and a technical school. There is a privately supported school for Mahommedans at Bathurst. The Anglicans, Wesleyans and Roman Catholics have numerous converts.

History.—Of the early history of the Gambia district there is scant mention. At what period the stone circles and pillars (apparently of a “Druidical” character), whose ruins are found at several places along the upper Gambia, were erected is not known. Those at Lamin Koto, on the right bank of the river opposite McCarthy’s Island, are still in good preservation, and are an object of veneration to the Mahommedans (see *Geog. Journ.* vol. xii., 1898). The country appears to have formed part, successively, of the states of Ghana, Melle and Songhoi. The relations, political and commercial, of the natives were all with the north and east; consequently no large town was founded on the banks of the river, nor any trade carried on (before the coming of the white man) by vessels sailing the ocean. About the 11th century the district came under Mahommedan influence.

The Portuguese visited the Gambia in the 15th century, and in the beginning of the 16th century were trading in the lower river. Embassies were sent from the Portuguese stations inland to Melle to open up trade with the interior, but about the middle of the century this trade—apparently mostly in gold and slaves—declined. At the end of the century the river was known as the resort of banished men and fugitives from Portugal and Spain. It was on

the initiative of Portuguese living in England that Queen Elizabeth, in 1588, granted a patent to “certain merchants of Exeter and others of the west parts and of London for a trade to the river of Senega and Gambra in Guinea.” This company was granted a monopoly of trade for ten years. Its operations led to no permanent settlement in the Gambia. In 1618 James I. granted a charter to another company named “The Company of Adventurers of London trading into Africa,” and formed at the instigation of Sir Robert Rich, afterwards earl of Warwick, for trade with the Gambia and the Gold Coast. This company sought to open up trade with Timbuktu, then believed to be a great mart for gold, which reached the lower Gambia in considerable quantities. With this object George Thompson (a merchant who had traded with Barbary) was sent out in the “Catherine,” and ascended the Gambia in his ship to Kassan, a Portuguese trading town, thence continuing his journey in small boats. In his absence the “Catherine” was seized and the crew murdered by Portuguese and half-castes, and Thompson himself was later on murdered by natives. Two years afterwards Richard Jobson, another agent of the Company of Adventurers, advanced beyond the falls of Barraconda; and he was followed, about forty years later, by Vermuyden, a Dutch merchant, who on his return to Europe asserted that he had reached a country full of gold.

The Company of Adventurers had built a fort near the mouth of the Gambia. This was superseded in 1664 by a fort built by Captain (afterwards Admiral Sir Robert) Holmes on a small island 20 m. from the mouth of the river and named Fort James, in honour of the duke of York (James II.). This fort was built expressly to defend the British trade against the Dutch, and from that time the British remained in permanent occupation of one or more ports on the river. In 1723 Captain Bartholomew Stibbs was sent out by the Royal African Company, which had succeeded the earlier companies, to verify Vermuyden’s reports of gold. He proceeded 60 m. above the falls, but the land of gold was not found. The French now became rivals for the trade of the Gambia, but the treaty of Versailles in 1783 assigned the trade in the river to Britain, reserving, however, Albreda for French trade, while it assigned the Senegal to France, with the reservation of the right of the British to trade at Portendic for gum. This arrangement remained in force till 1857, when an exchange of possessions was effected and the lower Gambia became a purely British river. In the period between the signing of the treaty of Versailles and 1885 the small territories which form the colony proper were acquired by purchase or cession from native kings. St Mary’s Isle was acquired in 1806; McCarthy’s Isle was bought in 1823; the Ceded Mile was granted by the king of Barra in 1826; and British Kommbo between 1840 and 1855. During this period the colony had gone through an economic crisis by the abolition of the slave trade (1807), which had been since 1662 its chief financial support. The beginning of a return to prosperity came in 1816 when some British traders, obliged to leave Senegal on the restoration of that country to France after the Napoleonic wars, founded a settlement on St Mary’s Isle. From that year the existing colony, as distinct from trading on the river, dates. The Gambia witnessed many administrative changes. When the slave trade was abolished, the settlement was placed under the jurisdiction of the governor of Sierra Leone, and was formally annexed to Sierra Leone on the dissolution of the Royal African Company (1822). It so remained until 1843, when the Gambia was made an independent colony, its first governor being Henry Frowd Seagram. Afterwards (1866) the Gambia became a portion of the officially styled “West African Settlements.” In 1883 it was again made a separate government, administered as a crown colony. Between the years last mentioned—1866-1888—the colony had suffered from the retrograde policy adopted by parliament in respect to the West African Settlements (*vide* Report of the Select Committee of 1865).

In 1870 negotiations were opened between France and Great Britain on the basis of a mutual exchange of territories in West Africa. Suspended owing to the outbreak of the Franco-Prussian War the negotiations were resumed in 1876. “Definite proposals were at that time formulated by which the Gambia was to be exchanged for all posts by France between the Rio Pongas (Pongo river, French Guinea) and the Gabun. This would have been a comprehensive and intelligible arrangement, but so strong a feeling in opposition to any cession of British territory was manifested in parliament, and by various mercantile bodies, that the government of the day was unable to press the scheme.”[1] Nothing was done, however, to secure for the Gambia a suitable *hinterland*, and in 1877 the 4th earl of Carnarvon (then colonial secretary) warned British traders that they proceeded beyond McCarthy’s Isle at their own risk. Meantime the French from Senegal pushed their frontier close to the British settlements, so that when the boundaries were settled by the agreement of the 10th of August 1889 with France, Great Britain was able to secure only a ten-kilometre strip on either side of the river. This document fixed the frontier of the British protectorate inland at a radius of 10 m. from the centre of the town of Yarbatenda; which town is situated at the limit of navigability of the Gambia from the sea. By Art. 5 of the

Anglo-French convention of the 8th of April 1904, Yarbatenda was ceded to France, with the object of giving that country a port on the river accessible to sea-going merchantmen.

Since 1871 the colony had been self-supporting, but on the acquirement of the protectorate it was decided, in order to balance increasing expenditure, to impose a “hut tax” on the natives. This was done in 1895. The tax, which averages 4s. per annum for a family, met with no opposition.

In 1892 a slave-raiding chief, named Fodi Kabba, had to be forcibly expelled from British territory. In 1894 another slave-raider, Fodi Silah, gave much trouble to the protectorate. An expedition under Captain E.H. (afterwards admiral) Gamble succeeded in routing him, and Fodi Silah took refuge in French territory, where he died. During the expedition Captain Gamble was led into an ambush, and in this engagement lost 15 killed and 47 wounded. In 1900 trouble again arose through the agency of Fodi Kabba, who had fixed his residence at Medina, in French territory. Two travelling commissioners (Mr F.C. Sitwell and Mr Silva) were murdered in June of that year, at a place called Suankandi, and a punitive expedition was sent out under Colonel H.E. Brake. Suankandi was captured and, the French co-operating, Medina was also captured, Fodi Kabba being killed on the 23rd of March 1901.

The people of the protectorate are in general peaceful and contented, and slave trading is a thing of the past. Provision was moreover made by an ordinance of 1906 for the extinction of slavery itself throughout the protectorate, it being enacted that henceforth all children born of slaves were free from birth, and that all slaves became free on the death of their master.

See the *Annual Reports* on the colony published by the colonial office, London, which give the latest official information; C.P. Lucas’s *Historical Geography of the British Colonies*, vol. iii., *West Africa* (2nd ed., Oxford, 1900) (this book contains valuable bibliographical notes); and *The Gambia Colony and Protectorate*, an official handbook (with map and considerable historical information), by F.B. Archer, treasurer of the colony (London, 1906). Early accounts of the country will be found in vol. ii. of Thomas Astley’s *New General Collection of Voyages and Travels* (London, 1745-1747). See also Major W. Gray and Surgeon Dochard, *Travels in Western Africa in 1818-1821, from the River Gambia ... to the River Niger* (London, 1829). The flora has been the subject of a special study, A. Rançon, *La Flore utile du bassin de la Gambie* (Bordeaux, 1895). Most of the books mentioned under Gold Coast also deal with the Gambia.

1 Extract from a despatch of Lord Salisbury to the British ambassador to France, dated 30th of March 1892.

GAMBIER, JAMES GAMBIER, Baron (1756-1833), English admiral, was born on the 13th of October 1756 at the Bahamas, of which his father, John Gambier, was at that time lieutenant-governor. He entered the navy in 1767 as a midshipman on board the “Yarmouth,” under the command of his uncle; and, his family interest obtaining for him rapid promotion, he was raised in 1778 to the rank cf post-captain, and appointed to the “Raleigh,” a fine 32-gun frigate. At the peace of 1783 he was placed on half-pay; but, on the outbreak of the war of the French Revolution, he was appointed to the command of the 74-gun ship “Defence,” under Lord Howe; and in her he had an honourable share in the battle on the 1st of June 1794. In recognition of his services on this occasion, Captain Gambier received the gold medal, and was made a colonel of marines; the following year he was advanced to the rank of rear-admiral, and appointed one of the lords of the admiralty. In this office he continued for six years, till, in February 1801, he, a vice-admiral of 1799, hoisted his flag on board the “Neptune,” of 98 guns, as third in command of the Channel Fleet under Admiral Cornwallis, where, however, he remained for but a year, when he was appointed governor of Newfoundland and commander-in-chief of the ships on that station. In May 1804 he returned to the admiralty, and with a short intermission in 1806, continued there during the naval administration of Lord Melville, of his uncle, Lord Barham, and of Lord Mulgrave. In November 1805 he was raised to the rank of admiral; and in the summer of 1807, whilst still a lord of the admiralty, he was appointed to the command of the fleet ordered to the Baltic, which, in concert with the army under Lord Cathcart, reduced Copenhagen, and enforced the surrender of the Danish navy, consisting of nineteen ships of the line, besides

frigates, sloops, gunboats, and naval stores. This service was considered by the government as worthy of special acknowledgment; the naval and military commanders, officers, seamen and soldiers received the thanks of both Houses of Parliament, and Admiral Gambier was rewarded with a peerage.

In the spring of the following year he gave up his seat at the admiralty on being appointed to the command of the Channel Fleet; and in that capacity he witnessed the partial, and prevented the total, destruction of the French fleet in Basque Roads, on the 12th of April 1809. It is in connexion with this event, which might have been as memorable in the history of the British navy as it is in the life of Lord Dundonald (see DUNDONALD), that Lord Gambier's name is now best known. A court-martial, assembled by order of a friendly admiralty, and presided over by a warm partisan, "most honourably acquitted" him on the charge "that, on the 12th of April, the enemy's ships being then on fire, and the signal having been made that they could be destroyed, he did, for a considerable time, neglect or delay taking effectual measures for destroying them"; but this decision was in reality nothing more than a party statement of the fact that a commander-in-chief, a supporter of the government, is not to be condemned or broken for not being a person of brilliant genius or dauntless resolution. No one now doubts that the French fleet should have been reduced to ashes, and might have been, had Lord Gambier had the talents, the energy, or the experience of many of his juniors. He continued to hold the command of the Channel Fleet for the full period of three years, at the end of which time—in 1811—he was superseded. In 1814 he acted in a civil capacity as chief commissioner for negotiating a treaty of peace with the United States; for his exertions in which business he was honoured with the Grand Cross of the Bath. In 1830 he was raised to the high rank of admiral of the fleet, and he died on the 19th of April 1833.

Lord Gambier was a man of earnest, almost morbid, religious principle, and of undoubted courage; but the administration of the admiralty has seldom given rise to such flagrant scandals as during the time when he was a member of it; and through the whole war the self-esteem of the navy suffered no such wound as during Lord Gambier's command in the Bay of Biscay.

The so-called *Memorials, Personal and Historical, of Admiral Lord Gambier*, by Lady Chatterton (1861), has no historical value. The life of Lord Gambier is to be read in Marshall's *Royal Naval Biography*, in Ralfe's *Naval Biography*, in Lord Dundonald's *Autobiography of a Seaman*, in the Minutes of the Courts-Martial and in the general history of the period.

GAMBIER, a village of College township, Knox county, Ohio, U.S.A., on the Kokosing river, 5 m. E. of Mount Vernon. Pop. (1900) 751; (1910) 537. It is served by the Cleveland, Akron & Columbus railway. The village is finely situated, and is the seat of Kenyon College and its theological seminary, Bexley Hall (Protestant Episcopal), and of Harcourt Place boarding school for girls (1889), also Protestant Episcopal. The college was incorporated in 1824 as the "Theological Seminary of the Protestant Episcopal Church in the Diocese of Ohio"; but in 1891 "Kenyon College," the name by which the institution has always been known, became the official title. Its first exercises were held at Worthington, Ohio, in the home of Philander Chase (1775-1852), first Protestant Episcopal bishop in the North-west Territory, by whose efforts the funds for its endowment had been raised in England in 1823-1824, the chief donors being Lords Kenyon and Gambier. The first permanent building, "Old Kenyon" (still standing, and used as a dormitory), was erected on Gambier Hill in 1827 in the midst of a forest. In 1907-1908 the theological seminary had 18 students and the collegiate department 119.

Some account of the founding of the college may be found in Bishop Chase's *Reminiscences; an Autobiography, comprising a History of the Principal Events in the Author's Life to 1847* (2 vols., New York, 1848).

GAMBOGE (from Camboja, a name of the district whence it is obtained), a gum-resin procured from *Garcinia Hanburii*, a dioecious tree with leathery, laurel-like leaves, small yellow flowers, and usually square-shaped and four-seeded fruit, a member of the natural order Guttiferae, and indigenous to Cambodia and parts of Siam and of the south of Cochin China, formerly comprised in Cambojan territory. The juice, which when hardened constitutes gamboge, is contained in the bark of the tree, chiefly in numerous ducts in its middle layer, and from this it is procured by making incisions, bamboo joints being placed to receive it as it exudes. Gamboge occurs in commerce in cylindrical pieces, known as pipe or roll gamboge, and also, usually of inferior quality, in cakes or amorphous masses. It is of a dirty orange externally; is hard and brittle, breaks with a conchoidal and reddish-yellow, glistening fracture, and affords a brilliant yellow powder; is odourless, and has a taste at first slight, but subsequently acrid; forms with water an emulsion; and consists of from 20 to 25% of gum soluble in water, and from 70 to 75% of a resin. Its commonest adulterants are rice-flour and pulverized bark.

Gamboge (*Cambogia*) is a drastic hydragogue cathartic, causing much griping and irritation of the intestine. A small quantity is absorbed, adding a yellow ingredient to the urine and acting as a mild diuretic. Its irritant action on the skin may cause the formation of pustules. It is less active only than croton oil and elaterium, and may be given in doses of half to two grains, combined with some sedative such as hyoscyamus, in apoplexy and in extreme cases of dropsy. Gamboge is used as a pigment, and as a colouring matter for varnishes. It appears to have been first brought into Europe by merchants from the East at the close of the 16th century.

GAMBRINUS, a mythical Flemish king who is credited with the first brewing of beer. His name is usually derived from that of Jan Primus, *i.e.* Jan (John) I., the victorious duke of Brabant, from 1261 to 1294, who was president of the Brussels gild of brewers; his portrait with a foaming glass of ale in his hand had the place of honour in the gild-hall, and this led in time, it is suggested, to the myth of the beer-king who is usually represented outside a barrel with a tankard in his hand.

GAME, a word which in its primary and widest significance means any amusement or sport, often combined in the early examples with “glee,” “play,” “joy” or “solace.” It is a common Teutonic word, in O. Eng. *gamen*, in O.H.G. *gaman*, but only appears in modern usage outside English in Dan. *gammen* and Swed. *gamman*. The ulterior derivation is obscure, but philologists have identified it with the Goth. *gaman*, companion or companionship; if this be so, it is compounded of the prefix *ga-*, with, and the root seen in “man.” Apart from its primary and general meaning the word has two specific applications, first to a contest played as a recreation or as an exhibition of skill, in accordance with rules and regulations; and, secondly, to those wild animals which are the objects of the chase, and their flesh as used for food, distinguished as such from meat, fish and poultry, and from the flesh of deer, to which the name “venison” is given. For “game,” from the legal aspect, and the laws relating to its pursuit and capture see Game Laws. The athletic contests of the ancient Greeks (ἀγῶνες) and the public shows (*ludi*) of the arena and amphitheatre of the ancient Romans are treated below (Games, Classical); the various forms of modern games, indoor and outdoor, whether of skill, strength or chance, are dealt with under their specific titles. A special use (“gaming” or “gambling”) restricts the term to the playing of games for money, or to betting and wagering on the results of events, as in horse-racing, &c. (see Gaming and Wagering). “Gamble,” “gambler” and “gambling” appear very late in English. The earliest quotations in the *New English Dictionary* for the three words are dated 1775, 1747 and 1784 respectively. They were first regarded as cant or slang words, and implied a reproach, either as referring to cheats or sharpers, or to those who played recklessly for extravagant stakes. The form of the words is obscure, but is supposed to represent a local variation *gammle* of the M.E. *gamenian*. From this word must, of course, be distinguished “gambol,” to sport, frisk, which, as the older forms (*gambald, gambaud*) show, is from the

Fr. *gambade*, leap, jump, of a horse, It. *gambado*, *gamba*, leg (Mod. Fr. *jambe*).

GAME LAWS. This title in English law is applied to the statutes which regulate the right to pursue and take or kill certain kinds of wild animals (see above). The existence of these statutes is due to the rules of the common law as to the nature of property, and the interest of the Norman sovereigns and of feudal superiors in the pleasures of sport or the chase. The substantial basis of the law of property is physical possession of things and the power to deal with them as we see fit. By the common law wild animals are regarded as *res nullius*, and as not being the subject of private property until reduced into possession by being killed or captured. A bird in the hand is owned: a bird in the bush is not. Even bees do not become property until hived. “Though a swarm lights in my tree,” says Bracton, “I have no more property therein than I have in the birds which make their nests thereon.” If reclaimed or confined they become property. If they escape, the rights of the owner continue only while he is in pursuit of the fugitive, *i.e.* no other person can in the meantime establish a right of property against him by capturing the animal. A swarm of bees “which fly out of my hive are mine so long as I can keep them in sight and have power to pursue them.” But the right of recapture does not entitle the owner to follow his animals on to the lands of another, and the only case in which any right to follow wild animals on to the lands of others is now expressly recognized is when deer or hares are hunted with hounds or greyhounds. This recognition merely excepts such pursuit from the law as to criminal game trespass, and fox-hunters and those who course hares or hunt stags are civilly liable for trespass if they pass over land without the consent of the occupier (*Paul* v. *Summerhayes*, 1878, 4 Q.B.D. 9).

It is a maxim of the common law that things in which no one can claim any property belong to the crown by its prerogative: this rule has been applied to wild animals, and in particular to deer and what is now called “game.” The crown rights may pass to a subject by grant or equivalent prescription. In the course of time the exclusive right to take game, &c., on lands came to be regarded as incidental to the ownership or occupation of the lands. This is described as the right to game *ratione soli*. In certain districts of England which are crown forests or chases or legal parks, or subject to rights of free warren, the right to take deer and game is not in the owner or occupier of the soil, but is in the crown by prerogative, or *ratione privilegii* in the grantee of the rights of chase, park or free warren, which are anterior to and superior to those of the owner or occupier of the lands over which the privilege has been granted. In all cases where these special rights do not exist, the right to take or kill wild animals is treated as a profit incidental to the ownership or occupation of the land on which they are found, and there is no public right to take them on private land or even on a highway; nor is there any method known to the law by which the public at large or an undefined body of persons can lawfully acquire the right to take wild animals *in alieno solo*.

In the nature of things the right to take wild animals is valuable as to deer and the animals usually described as game, and not as to those which are merely noxious as vermin, or simply valueless, as small birds. Upon the rules of the common law there has been grafted much legislation which up till the end of the 18th century was framed for the preservation of deer and game for the recreation and amusement of persons of fortune, and to prevent persons of inferior rank from squandering in the pursuit of game time which their station in life required to be more profitably employed. These enactments included the rigorous code known as the Laws of the Forest (see Forest Laws), as well as what are usually called the Game Laws.

In England the older statutes relating to game were all repealed early in the 19th century. From the time of Richard II. (1389) to 1831, no person might kill game unless qualified by estate or social standing, a qualification raised from a 40s. freehold in 1389 to an interest of £100 a year in freehold or £150 in long leaseholds (1673). In 1831 this qualification by estate was abolished as to England. But in Scotland the right to hunt is theoretically reserved to persons who have in heritage that unknown quantity a “plough-gate of land” (Scots Act 1621, c. 31); and in Ireland qualifications by estate are made necessary for killing game and keeping sporting dogs (Irish Act 1698, 8 Will. III. c. 8). In England the game laws proper consist of the Night Poaching Acts of 1828 and 1844, the Game Act of 1831, the Poaching Prevention Act 1862, and the Ground Game Acts of 1880 and 1906. From the fact that the right of landowners over wild animals on their land does not amount to ownership it

follows that they cannot prosecute any one for stealing live wild animals: and that apart from the game laws the only remedy against poachers is by civil action for trespass. As between trespasser and landowner the law is peculiar (*Blades* v. *Higgs*, 1865, 11 H.L.C. 621). If A starts and kills a hare on B's land the dead hare belongs to B (*ratione soli*) and not to A, though he has taken the hare by his own efforts (*per industriam*). But if A hunts the hare from B's land on to C's land and there kills it, the dead hare belongs to A and not to B or C. It is not B's because it was not taken on his land, and it is not C's because it was not started on his land. In other words the right of each owner is limited to animals both started and killed on his own land, and in the case of conflicting claims to the animal taken (made *ratione soli*) the captor can make title (*per industriam*) against both landowners. If he is a trespasser he is liable to civil or criminal proceedings by both landowners, but the game is his unless forfeited under a statute. Another peculiar result of the law is that where trespassers (*e.g.* poachers) kill and carry off game or rabbits as part of one continuous transaction they are not guilty of theft, but only of game trespass (*R.* v. *Townley*, 1871, L.R. 1 C.C.R. 315), but it is theft for a trespasser to pick up and carry off a pheasant killed by the owner of the land on his own land or even a pheasant killed by an independent gang of poachers. The young of wild animals belong (*propter impotentiam*) to the owner of the land until they are able to fly or run away. This right does not extend to the eggs of wild birds. 441
But the owner can reduce the eggs into possession by taking them up and setting them under hens or in enclosures. And if this is done persons who take them are thieves and not merely poachers. A game farm, like a decoy for wild water-fowl, is treated as a trade or business; but a game preserve in which full-grown animals fly or run wild is subject to the ordinary incidents of the law as to animals *ferae naturae*.

The classification of wild animals for purposes of sport in England is as follows:—

1. Beasts of forest are hart and hind (red deer), boar, wolf and all beasts of venery.

2. Beasts of chase and park are buck and doe (fallow deer), fox, marten and roe, or all beasts of venery and hunting.

3. Beasts of (free) warren are roe, hare, rabbit, partridge, pheasant, woodcock, quail, rail and heron.

4. Game, as defined by the Night Poaching Act of 1828 and the Game Act of 1831, is pheasant, partridge, black game, red grouse, bustard and hare. In France game (*gibier*) includes everything eatable that runs or flies.

5. Wild fowl not in any of the previous lists which are nevertheless prized for sport, *e.g.* duck, snipe, plovers, &c.

6. Wild birds not falling within class 4 are more or less protected against destruction by the Wild Birds Protection Acts, which were, however, passed with quite other objects than the game laws.

As regards class 1 no subject without special authority of the crown may kill within a forest or its purlieus or on adjacent highways, rivers or enclosures. The right to the animals in a forest does not depend on ownership of the land but on the royal prerogative as to the animals, *i.e.* it exists not *ratione soli* but *ratione privilegii*: and this right is not in any way altered by the Game Act 1831. A chase is a forest in the hands of a subject and a legal park (which is an enclosed chase) is created by crown grant or by prescription founded on a lost grant. The rights of the grantee are in substance the same as those of the crown in a forest, and do not depend on ownership of the soil. In the case of a free warren the grantee usually but not necessarily owns some or all of the soil over which the right of warren runs. The right of free warren depends on crown grant or prescription founded on lost grant, and involves a right of property over beasts and fowl of warren on all lands within the franchise. As will appear from the list above, some game birds are not fowl of warren, *e.g.* black game and red grouse (*Duke of Devonshire* v. *Lodge*, 1827, 7 B. & C. 39). Free warren is quite different from ordinary warrens, in which hares or rabbits are bred by the owner of the soil for sport or profit. Ground game in such warrens is protected under the Larceny Act 1861, s. 17, as well as by the game laws. In manors, of which none have been created since 1290, the lord by his franchise had the sporting rights over the manor, but at the present time this right is restricted to the commons and wastes of the manor, the freehold whereof is in him, and does not extend to enclosed freeholds nor as a general rule to enclosed copyholds, unless at the time of enclosure the sporting rights were reserved to him by the Enclosure Act or award (*Sowerby* v. *Smith*, 1873, L.R. 8 C.P. 514). In other words his rights exist ratione *soli* and not *ratione privilegii*. The Game Act 1831 gives lords of manors and privileged persons certain rights as to appointing gamekeepers with special powers to protect game within the district over which their rights extend (ss. 13, 14, 15, 16). The game laws in no way cut down the special privileges as to forest, park, chase or free warren (1831, s. 9), and

confirm the sporting right of lords of manors on the wastes of the manor (1831, s. 10). As to all lands not affected by these rights, the right to kill or take game on the land is presumably in the occupier. On letting land the owner may, subject to the qualifications hereinafter stated, reserve to himself the right to kill or take “game” or rabbits or other wild animals concurrently with or in exclusion of the tenant. Where the exclusive right is in the landlord the tenant is not only liable to forfeiture or damages for breaches of covenants in the lease, but is also liable to penalties on summary conviction if without the lessor’s authority he pursues, kills or takes any “game” upon the land or gives permission to others to do so (1831, s. 12). In effect he is made criminally liable for game trespass on lands in his own occupation, so far as relates to game, but is not so liable if he takes rabbits, snipe, woodcock, quails or rails.

The net effect of the common law and the game laws is to give the occupier of lands and the owner of sporting rights over them the following remedies against persons who infringe their right to kill or take wild animals on the land. A stranger who enters on the land of another to take any wild animals is liable to the occupier for trespass on the land and for the animals started and killed on the land by the trespasser. He is also criminally liable for game trespass if he has entered on the land to search for or in pursuit of “game” or woodcock, snipe, quail, landrails or rabbits. If the trespass is in the daytime (whether on lands of the subject or in royal forests, &c.), the penalty on conviction may not exceed 40s., unless five or more persons go together, in which case the maximum penalty is £5. If a single offender refuses his name or address or gives a false address to the occupier or to the owner of the sporting rights or his representatives, or refuses to leave the land, he may be arrested by them, and is liable to a penalty not exceeding £5, and if five or more concerned together in game trespass have a gun with them and use violence, intimidation or menace, to prevent the approach of persons entitled to take their names or order them off the land, they incur a further penalty up to £5.

If the trespass is in search or pursuit of game *or rabbits* in the nighttime, the maximum penalty on a first conviction is imprisonment with hard labour for not over three months; on a second, imprisonment, &c., for not over six months, and the offender may be put under sureties not to offend again for a year after a first conviction or for two years after a second conviction. For a first or second offence the conviction is summary, subject to appeal to quarter sessions, but for a third offence the offender is tried on indictment and is liable to penal servitude (3-7 years) or imprisonment with hard labour (2 years). The offenders may be arrested by the owner or occupier of the land or their servants, and if the offenders assault or offer violence by firearms or offensive weapons they are liable to be indicted and on conviction punished to the same extent as in the last offence. In 1844 the above penalties were extended to persons found by night on highways in search or pursuit of game. If three or more trespass together on land by night to take or destroy game or rabbits, and any of them is armed with firearms, bludgeon or other offensive weapon, they are liable to be indicted and on conviction sentenced to penal servitude (3-14 years) or imprisonment with hard labour (2 years). By “day” time is meant from the beginning of the first hour before sunrise to the end of the first hour after sunset, and by “night” from the end of the first hour after sunset to the beginning of the first hour before sunrise (act of 1828, s. 12; act of 1831, s. 34). The time is reckoned by local and not by Greenwich time.

The penalties for night poaching are severe, but encounters between the owners of sporting rights and armed gangs of poachers have often been attended by homicide. It is to be observed that it is illegal and severely punishable to set traps or loaded spring guns for poachers (Offences against the Person Act 1861, s. 31), whereby any grievous bodily harm is intended or may be caused even to a trespasser, so that the incursions of poachers can be prevented only by personal attendance on the scene of their activities; and it is to be observed also that the provisions of the Game Laws above stated are, so far as concerns private land, left to be enforced by private enterprise without the interference of the police, with the result that in some districts there are scenes of private nocturnal war. Even in the Night Poaching Act 1844, which applies to highways, the arrest of offenders is made by owners, occupiers or their gamekeepers. The police were not given any direct authority as to poachers until the Poaching Prevention Act 1862, under which a constable is empowered “on any highway, street or public place, to search any person whom he may have good cause to suspect of coming from any land where he shall have been unlawfully in search or pursuit of ‘game,’ or any persons aiding or abetting such person, and having in his possession any game unlawfully obtained, or any gun, part of gun, or nets or engines used for the killing or taking game; and also to stop and search any cart or other conveyance in or upon which such constable or peace officer shall have good cause to suspect that any such game, or any such article or thing, is being carried by such person.” If any such thing be found the constable is to detain it, and apply for a summons against the offender, summoning him to appear before a petty sessional court, on conviction before which he may be fined not more than £5, and forfeits the game, guns, &c., found in his possession. In this act “game”

includes woodcock, snipe and rabbits, and the eggs of game birds other than bustards; and the act applies to poaching either by night or by day. In all cases of summary conviction for poaching an appeal lies to quarter sessions. In all cases of poaching the game, &c., taken may be forfeited by the court which tries the poacher.

Close Time.—On certain days, and within periods known as "close time," it is illegal to kill deer or game. The present close times are as follows:—

	England.	Ireland.	Scotland.
Hare	None	April 21 to Aug. 11*	None
Red deer (male)	None	Jan. 1 to June 9	None
Fallow deer	None	Sept. 29 to June 10	None
Roe deer	None	None	None
Pheasant	Feb. 1 to Sept. 30	Feb.1 to Sept. 30 (1845)	Feb. 1 to Sept. 30
Partridge	Feb. 1 to Aug. 31	Feb. 1 to Aug. 31 (1899)	Feb. 1 to Aug. 31
Black game	Dec. 10 to Aug. 20**	Dec. 10 to Aug. 20	Dec. 10 to Aug. 20
Red grouse	Dec. 10 to Aug. 12	Dec. 10 to Aug. 12	Dec. 10 to Aug. 12
Ptarmigan	None	Dec. 10 to Aug. 20	Dec. 10 to Aug. 12
Bustard (wild turkey)	March 1 to Sept. 1	Jan. 10 to Sept. 1	None

* Unless varied by order of lord-lieutenant.

** Except in Devon, Somerset and New Forest, where to Sept. 1.

In England and Ireland the winged game above named and hares may not be killed on Sundays or Christmas Day. It is illegal to sell or expose for sale hares or leverets in March, April, May, June and July. It is illegal throughout the United Kingdom to buy or sell winged game birds after ten days from the beginning of the close season as fixed by the English law (1831, s. 4; 1860, s. 13). This prohibition applies to the sale of live game, British or foreign, and to the sale of British dead game. It is illegal to lay poison for game or rabbits except in rabbit holes, and it is illegal to kill game by firearms at night. Wild birds not within the list above given but of interest for sport are protected by close times fixed under the Wild Birds Protection Acts, which may vary in each county of each kingdom.

Licences.—Besides the restrictions on the right to take or kill game which arise out of the law as to ownership or occupation of the lands on which it is found, there are further restrictions imposed by the laws of excise. From the time of Richard II. (1389) until 1831 the right of persons other than gamekeepers properly deputed by the lord of a manor to take game was made to depend on the social rank of the person, or on the amount of his interest in land, which ranged from a 40s. freehold (in 1389) to £100 a year (1671). These restrictions were abolished in 1831, and the right to kill game was made conditional on the possession of a game certificate, now called a game licence in Great Britain (act of 1831, ss. 6, 23). By s. 4 of the Game Licences Act 1860 "any person, before he shall in Great Britain take, kill or pursue, or aid or assist in any manner in the taking, killing or pursuing, by any means whatever, or use any dog, gun, net or other engine for the purpose of taking, killing or pursuing any game, or any woodcock, snipe, quail, landrail, or any coney, or any deer, shall take out a proper licence to kill game under this act"—subject to a penalty of £20. There are certain exceptions and exemptions as to royal personages, royal gamekeepers, and with reference to taking woodcock or snipe by nets or springes, by coursing or hunting hares or deer, or killing deer, rabbits or hares (Hares Acts 1848, Game Licences Act 1860) in certain enclosed lands by the owners or occupiers. A licence is not required for beaters and assistants who go out with holders of a game licence. The licence is granted by the Inland Revenue Department. The issue is regulated by the Game Licences Act 1860 as amended by the Customs and Inland Revenue Act 1883. The licences now in use are of four kinds:—

Those taken out after 31st July—			
To expire on the next 31st July	£3	0	0
To expire on the next 31st October	2	0	0
Those taken out after 1st November—			
To expire on the next 31st July	2	0	0
Those taken out for any continuous period of fourteen days specified in the licence	1	0	0

In the case of gamekeepers in Great Britain for whom the employer pays the duty on male servants, the annual licence fee is £2, but the licence extends only to lands on which the employer has a right to kill game. A licence granted to a person in his own right and not as gamekeeper or servant is effective throughout the United Kingdom. The game licence does not authorize trespass on the lands of others in search of game nor the shooting of game, &c., at night, and is forfeited on a conviction of game trespass (1831, s. 30; 1860, s. 11).

Persons who have game licences need not have a gun licence, but the possession of a gun licence does not qualify the holder to kill game or even rabbits.

The sale of game when killed is also subject to statutory regulation. Gamekeepers may not sell game except under the authority of their employer (1831, ss. 17, 25). Persons who hold a full game licence may sell game, but only to persons who hold a licence to deal in game. These licences are annual (expiring on the 1st of July), and are granted in London by justices of the peace, and in the rest of England by the council of the borough or urban or rural district in which the dealer seeks to carry on business (1831, s. 18; 1893, c. 73, s. 27), and a notice of the existence of the licence must be posted on the licensed premises. A licence must be taken out for each shop. The following persons are disqualified for holding the licence: innkeepers, persons holding licences to sell intoxicants, owners, guards or drivers of mail-carts, stagecoaches or public conveyances, carriers and higglers (1831, s. 18). This enactment interferes with the grant of game licences to large stores which also have licences to sell beer. The licensed dealer may buy British game only from persons who are lawfully entitled to sell game. Conviction of an offence under the Game Act 1831 avoids the licence (s. 22). The local licence must also be supplemented by an excise licence for which a fee of £2 is charged. Licensed dealers in game are prohibited from selling game killed in the United Kingdom from the tenth day after the beginning of close time to the end of that period. The provisions above stated under the act of 1831 applied only to England, but were in 1860 extended to the rest of the United Kingdom, and were in 1893 applied to dealers in game imported from abroad. The main effect of the system of licences is to prevent the disposal of game by poachers rather than to benefit the revenue.

Deer.—Deer are not included within the definition of game in any of the English game laws. Deer-stealing was very seriously punished by the old law, and under an act of 9 George I. c. 22, known as the Waltham Black Act, passed because of the depredations of disguised deer-stealers in Epping Forest, it was under certain circumstances made a capital offence. At present offences with reference to deer are included in the Larceny Act 1861. It is a felony to hunt or kill deer in enclosures in forests, chases or purlieus, or in enclosed land where deer is usually kept, or after a previous conviction to hunt or kill deer in the open parts of a forest, &c., and certain minor provisions are made as to arrest by foresters, forfeiture of venison unlawfully possessed and for unlawfully setting traps for deer. These enactments do not prevent a man from killing on his own land deer which have strayed there (*Threlkeld* v. *Smith*, 1901, 2 K.B. 531). In Scotland the unlawful killing of deer is punished as theft.

Eggs.—The owner or occupier of land has no property in the eggs of wild birds found on his lands unless he takes them up. But under s. 24 of the Game Act 1831 a penalty of 5s. per egg is incurred by persons who unlawfully (*i.e.* without being, or having licence from, the person entitled to kill the game) and wilfully take from the nest or destroy in the nest the eggs of any game bird, or of a swan, wild duck, teal or widgeon. Similar provisions exist in Ireland under an act of 1698, and by the Poaching Prevention Act 1862 (United Kingdom) power is given to constables to search persons suspected of poaching and to take from them the eggs of pheasants, partridges, grouse or black game. And the Wild Birds Protection Acts deal with the eggs of all wild birds except game and swans.

Damage to Crops by Game.—Where an occupier of lands has not the right to kill game or rabbits he runs the risk of suffering damage by the depredations of the protected animals, which he may not kill without incurring a liability to summary conviction or for breach of the conditions on which he holds the land. At common law the owner of land who has reserved to himself the sporting rights, and his sporting tenants, must use the reserved rights reasonably. They are liable for any damage wilfully or unnecessarily done to the crops, &c., of the occupier, such as trampling down standing crops or breaking hedges or fences. They are not directly liable to the occupier for damage done to the crops by game bred on the land or frequenting it in the ordinary course of nature; but are not entitled to turn down game or rabbits on the land. And if game or rabbits are for the purposes of sport imported or artificially raised on land, the person who breeds or brings them there is liable for the damage done to the crops of adjoining owners or occupiers (*Farrer* v. *Nelson*, 1885, 15 Q.B.D. 258; *Birkbeck* v. *Paget*, 31 Beav. 403; *Hilton* v. *Green*, 1862, 2 F. & F. 821).

Recent legislation has greatly increased the rights of the occupiers of land as against the owners of sporting rights over it. As regards hares and rabbits the occupier’s rights are regulated by the Ground Game Act 1880 (which is expressed to be made “in the interests of good husbandry and for the better security of capital and labour invested in the cultivation of the soil”). By that act the occupier of land as incident to and inseparable from his occupation has the right to kill and take hares and rabbits on the land. The right is indefeasible and cannot be divested by contract with the owner or landlord or even by letting the occupier’s sporting rights to another. But where apart from the act the right to kill game on the land is vested in a person other than the occupier, such person has a right

concurrent with the statutory right of the occupier to take hares and rabbits on the land. The act does not extend to common lands nor to lands over which rights of grazing or pasturage for not more than nine months in the year exist. Consequently over such lands exclusive rights of killing ground game still continue, and the law appears not to apply in cases where a special right of killing or taking ground game vested before the 7th of September 1880 in any person (other than the landlord) by statute, charter or franchise (s. 5). The mode of exercise of the occupier's right is subject to certain limitations. The ground game is only to be taken by him or by persons whom he has duly authorized in writing, who must be members of his family or his servants or bona fide employed by him for reward to take ground game. The written authority must be produced on demand to persons having concurrent rights to take and kill the ground game (s. 1 (1) (c)). Firearms may not be used by night, nor may poison be used, nor may spring traps be set except in rabbit holes (s. 6); nor may ground game be killed on days or seasons or by methods prohibited by statute in 1880 (s. 10).

In the case of moorland and unenclosed lands (which are not arable and do not consist of small detached portions of less than 25 acres) the occupier may between the 1st of September and the 31st of March kill and take ground game; but between the 1st of September and the 10th of December firearms may not be used (1880, s. 1 (3); 1906, s. 2). In the case of such lands the occupiers and the owners of the sporting rights may between the 1st of September and the 10th of December make and enforce for their joint benefit agreements for taking the ground game. The Agricultural Holdings Act 1906 (operating from 1909) deals, *inter alia*, with damage to crops by deer and winged game, but does not apply to damage by hares or rabbits. The tenant of agricultural land is entitled to compensation for damage to his crops exceeding 1s. per acre over the area affected if caused by game, "the right to kill or take which is vested neither in him nor in any one claiming under him other than the landlord and which the tenant has not permission in writing to kill" (s. 2). The right of the tenant is indefeasible and cannot be contracted away. Disputes as to amount are to be settled by arbitration; but claims to be effectual must be made as to growing crops before reaping, raising or feeding off, and as to cut crops before carrying. In the case of contracts of tenancy created before the 1st of January 1909, allowances are to be made if by their terms compensation for damage by game is stipulated for, or an allowance of an agreed amount for damage by game was expressly made in fixing the rent. The compensation is payable by the landlord subject to his right to be indemnified in cases where the sporting rights are not vested in him.

Sporting Rights.—Sporting rights (*i.e.* rights of fowling or of shooting, or of taking or killing game or rabbits, or of fishing), when severed from the occupation of land, are subject to income or property tax, and to assessment for the purpose of local rates (Rating Act 1874); and in valuing land whether for rates or taxes the value of the sporting rights is now an important and often the chief item of value in beneficial occupation of the land. Where the sporting rights are the landlord's, the rate thereon is paid in the first instance by the tenant and deducted from his rent. Where the sporting right is reserved and let, the rating authority may rate either the landlord or the sporting tenant as occupier of the right. The Ground Game Acts have not affected the liability to assessment of concurrent rights of killing hares and rabbits reserved by a landlord, or of a concurrent right granted by the occupier (Ryde (2nd ed.), 385-387). The ownership of sporting rights severed from the ownership or occupation of the land over which they are exercisable is not an interest in land giving the electoral franchise or a claim for compensation if the land is taken under the Lands Clauses Consolidation Acts.

Scotland.—By the law of Scotland all men have right and privilege of game on their own estates as a real right incident thereto, which does not pass by an agricultural lease except by express words, or in the case of ground game by the act of 1880. The landlord is liable to the tenant for damage done to the surface of the lands in exercise of his right to the game and also for extraordinary damage by over-preserving or over-stocking. Under an act of 1877 he was liable for excessive damage done by rabbits or game reserved to or retained under a lease granted after the 1st of January 1878, or reserved by presumption of common law; this act from 1909 onwards is superseded by the provisions of the Agricultural Holdings Act 1906. Night poaching is punished by the same act as in England, and day poaching by an act of 1832 and the act of 1882. Until 1887 poaching by night under arms was a capital offence. The definition of game in Scotland for purposes of night poaching is the same as in England. The provisions of the act of 1832 as to game trespass by day apply also to deer, roe, rabbits, woodcock, snipe, rails and wild duck; but in other respects closely resemble those of the English act of 1831.

Offences against the game laws are not triable by justices of the peace, but only in the sheriff court. The close time for game birds in Scotland is the same as in England, so far as dealing in them is concerned, but differs slightly as to killing. Black game may not be killed

between the 10th of December and the 25th of August, nor ptarmigan between the 10th of December and the 20th of August. There is no close time for red, fallow or roe deer, or rabbits. By an old Scots act of 1621 (omitted from the recent wholesale repeal of such acts) no one may lawfully kill game in Scotland who does not own a plough-gate of land except on the land of a person so qualified.

Ireland.—The common law as to game is the same for Ireland as for England. The game laws of Ireland are contained partly in acts passed prior to the union (1698, 1707, 1787 and 1797), partly in acts limited to Ireland, and as to the rest in acts common to the whole United Kingdom.

Under the act of 1698 no one may kill game in Ireland who has not a freehold worth £40 a year or £1000 net personality, and elaborate provisions are made by that and later acts against the keeping of sporting dogs by persons not qualified by estate to kill game. British officers and soldiers in Ireland appear to have been much addicted to poaching, and their activities were restrained by enactments of 1698 and 1707.

Night poaching in Ireland is dealt with by an act of 1826. Trespass on lands in pursuit of game to which the landlord or lessor has by reservation exclusive right is summarily punishable under an act of 1864, which includes in the definition of game, woodcock, snipe, quails, landrails, wild duck, widgeon and teal. Under the Land Act 1881 the landlord of a statutory holding may at the commencement of the term subject to the Ground Game Acts retain and exercise the exclusive right of taking "game" as above defined.

A game licence is not required for taking or killing rabbits. But in other respects the law as to game licences, dog licences and licences to deal in game is the same as in Great Britain.

British Possessions Abroad.—The English game laws have not been carried to any colony as part of the personal law of the colonists, nor have they been extended to them by imperial or colonial legislation. But the legislatures of many colonies have passed acts to preserve or protect native or imported wild animals, and in some of these statutes the protected animals are described as game. These statutes are free from feudal prepossessions as to sporting rights, and are framed rather on the lines of the Wild Birds Protection Acts than on the English game laws, but in some possessions, *e.g.* Quebec, sporting leases by the crown are recognized. The acts since 1895 are indicated in the annual summary of colonial legislation furnished in the *Journal* of the Society of Comparative Legislation.

See also Oke's *Game Laws*, 4th ed., by Willis Bund (1897); Warry, *Game Laws of England* (1897); Marchant and Watkins, *Wild Birds Protection Act* (1897).

(W. F. C.)

GAMES, CLASSICAL. 1. *Public Games*.—The public games of Greece (ἀγῶνες) and Rome (*Ludi*) consisted in athletic contests and spectacles of various kinds, generally connected with and forming part of a religious observance. Probably no institution exercised a greater influence in moulding the national character, and producing that unique type of physical and intellectual beauty which we see reflected in Greek art and literature, than the public contests of Greece (see Athlete; Athletic Sports). For them each youth was trained in the gymnasium, they were the central mart whither poet, artist and merchant each brought his wares, and the common ground of union for every member of the Hellenic race. It is to Greece, then, that we must look for the earliest form and the fullest development of ancient games. The shows of the Roman circus and amphitheatre were at best a shadow, and in the later days of the empire a travesty, of the Olympia and Pythia, and require only a cursory notice.

Greek.

The earliest games of which we have any record are those at the funeral of Patroclus, which form the subject of the twenty-third Iliad. They are noteworthy as showing that Greek games were in their origin clearly connected with religion; either, as here, a part of the funeral rites, or else instituted in honour of a god, or as a thank-offering for a victory gained or a calamity averted, or in expiation of some crime. Each of the great contests was held near some shrine or sacred place and is associated with some deity or mythical hero. It was not before the 4th century that this honour was paid to a living man (see Plutarch, *Lysander*, 18). The games of the *Iliad* and those of the *Odyssey* at the court of Alcinous are also of interest as showing at what an early date the distinctive forms of Greek athletics—boxing, wrestling, putting the weight, the foot

and the chariot race—were determined.

The *Olympian* games were the earliest, and to the last they remained the most celebrated of the four national festivals. Olympia was a naturally enclosed spot in the rich plain of Elis, bounded on the N. by the rocky heights of Cronion, and on the S. and W. by the Alpheus and its tributary the Cladeus. There was the grove of Altis, in which were ranged the statues of the victorious athletes, and the temple of Olympian Zeus with the chryselephantine statue of the god, the masterpiece of Pheidias. There Heracles (so ran the legend which Pindar has introduced in one of his finest odes), when he had conquered Elis and slain its king Augeas, consecrated a temenos and instituted games in honour of his victory. A later legend, which probably embodies historical fact, tells how, when Greece was torn by dissensions and ravaged by pestilence, Iphitus inquired of the oracle for help, and was bidden restore the games which had fallen into desuetude; and there was in the time of Pausanias, suspended in the temple of Hera at Olympia, a bronze disk whereon were inscribed, with the regulations of the games, the names of Iphitus and Lycurgus. From this we may safely infer that the games were a primitive observance of the Eleians and Pisans, and first acquired their celebrity from the powerful concurrence of Sparta. The sacred armistice, or cessation of all hostilities, during the month in which the games were held, is also credited to Iphitus.

In 776 B.C. the Eleians engraved the name of their countryman Coroebus as victor in the foot race, and thenceforward we have an almost unbroken list of the victors in each succeeding Olympiad or fourth recurrent year. For the next fifty years no names occur but those of Eleians or their next neighbours. After 720 B.C. we find Corinthians and Megareans, and later still Athenians and extra-Peloponnesians. Thus what at first was nothing more than a village feast became a bond of union for all the branches of the Doric race, and grew in time to be the high festival to which every Greek gathered, from the mountain fastnesses of Thessaly to the remotest colonies of Cyrene and Marseilles. It survived even the extinction of Greek liberty, and had nearly completed twelve centuries when it was abolished by the decree of the Christian emperor Theodosius, in the tenth year of his reign. The last Olympian victor was a Romanized Armenian named Varastad.

Let us attempt to call up the scene which Olympia in its palmy days must have presented as the great festival approached. Heralds had proclaimed throughout Greece the “truce of God.” So religiously was this observed that the Spartans chose to risk the liberties of Greece, when the Persians were at the gates of Pylae, rather than march during the holy days. Those white tents which stand out against the sombre grey of the olive groves belong to the Hellanodicae, or ten judges of the games, chosen one for each tribe of the Eleians. They have been here already ten months, receiving instruction in their duties. All, too, or most of the athletes must have arrived, for they have been undergoing the indispensable training in the gymnasium of the Altis. But along the “holy road” from the town of Elis there are crowding a motley throng. Conspicuous in the long train of pleasure-seekers are the θεωροί or sacred deputies, clad in their robes of office, and bearing with them in their carriages of state offerings to the shrine of the god. Nor is there any lack of distinguished visitors. It may be Alcibiades, who, they say, has entered no less than seven chariots; or Gorgias, who has written a famous ἐπίδειξις for the occasion; or the sophist Hippias, who boasts that all he bears about him, from the sandals on his feet to the dithyrambs he carries in his hand, are his own manufacture; or Aetion, who will exhibit his picture of the Marriage of Alexander and Roxana—the picture which gained him no less a prize than the daughter of the Hellanodices Praxonides; or, in an earlier age, the poet-laureate of the Olympians, Pindar himself. One feature of the medieval tournament and the modern racecourse is wanting. Women might indeed compete and win prizes as the owners of teams, but all except the priestesses of Demeter were forbidden, matrons on pain of death, to enter the enclosure.

At daybreak the athletes presented themselves in the Bouleuterium, where the presidents were sitting, and proved by witnesses that they were of pure Hellenic descent, and had no stain, religious or civil, on their character. Laying their hands on the bleeding victim, they swore that they had duly qualified themselves by ten months’ continuous training in the gymnasium, and that they would use no fraud or guile in the sacred contests. Thence they proceeded to the stadium, where they stripped to the skin and anointed themselves. A herald proclaimed, “Let the runners put their feet to the line,” and called on the spectators to challenge any disqualified by blood or character. If no objection was made, they were started by the note of the trumpet, running in heats of four, ranged in the places assigned them by lot. The presidents seated near the goal adjudged the victory. The foot-race was only one of twenty-four Olympian contests which Pausanias enumerates, though we must not suppose that these were all exhibited at any one festival. Till the 77th Olympiad all was

concluded in one day, but afterwards the feast was extended to five.

The order of the games is for the most part a matter of conjecture, but, roughly speaking, the historical order of their institution was followed. We will now describe in this order the most important.

(1) The *Foot-race*.—For the first 13 Olympiads the δρόμος, or single lap of the stadium, which was 200 yds. long, was the only contest. The δίαυλος, in which the course was traversed twice, was added in the 14th Olympiad, and in the 15th the δόλιχος, or long race, of 7, 12 or, according to the highest computation, 24 laps, about 2⅔ m. in length. We are told that the Spartan Ladas, after winning this race, dropped down dead at the goal. There was also, for a short time, a race in heavy armour, which Plato highly commends as a preparation for active service. (2) *Wrestling* was introduced in the 18th Olympiad. The importance attached to this exercise is shown by the very word *palaestra*, and Plutarch calls it the most artistic and cunning of athletic games. The practice differed little from that of modern times, save that the wrestler's limbs were anointed with oil and sprinkled with sand. The third throw, which decided the victory, passed into a proverb, and struggling on the ground, such as we see in the famous statue at Florence, was not allowed, at least at the Olympia. (3) In the same year was introduced the πένταθλον (pentathlon), a combination of the five games enumerated in the well-known pentameter ascribed to Simonides:—

ἅλμα, ποδωκείην, δίσκον, ἄκοντα, πάλην.

Only the first of these calls for any comment. The only leap practised seems to have been the long jump. The leapers increased their momentum by means of ἁλτῆρες or dumb-bells, which they swung in the act of leaping and dropped as they "took off." The take-off may have been slightly raised, and some commentators with very little warrant have stated that spring-boards were used. The record jump with which Phayllus of Croton is credited, 55 ft., is incredible with or without a spring-board. It is disputed whether a victory in all five contests, or in three at least, was required to win the πένταθλον. (4) The rules for boxing were not unlike those of the modern ring (see Pugilism), and the chief difference was in the use of the *caestus*. This in Greek times consisted of leather thongs bound round the boxer's fists and wrists; and the weighting with lead or iron or metal studs, which made the caestus more like a "knuckle-duster" than a boxing-glove, was a later Roman development. The death of an antagonist, unless proved to be accidental, not only disqualified for a prize but was severely punished. The use of ear-guards and the comic allusions to broken ears, not noses, suggest that the Greek boxer did not hit out straight from the shoulder, but fought windmill fashion, like the modern rustic. In the *pancratium*, a combination of wrestling and boxing, the use of the caestus, and even of the clenched fist, was disallowed. (5) The *chariot-race* had its origin in the 23rd Olympiad. Of the hippodrome, or racecourse, no traces remain, but from the description of Pausanias we may infer that the dimensions were approximately 1600 ft. by 400. Down the centre there ran a bank of earth, and at each end of this bank was a turning-post round which the chariots had to pass. "To shun the goal with rapid wheels" required both nerve and skill, and the charioteer played a more important part in the race than even the modern jockey. Pausanias tells us that horses would shy as they passed the fatal spots. The places of the chariots were determined by lot, and there were elaborate arrangements for giving all a fair start. The number of chariots that might appear on the course at once is uncertain. Pindar (*Pyth.* v. 46) praises Arcesilaus of Cyrene for having brought off his chariot uninjured in a contest where no fewer than forty took part. The large outlay involved excluded all but rich competitors, and even kings and tyrants eagerly contested the palm. Thus in the list of victors we find the names of Cylon, the would-be tyrant of Athens, Pausanias the Spartan king, Archelaus of Macedon, Gelon and Hiero of Syracuse, and Theron of Agrigentum. Chariot-races with mules, with mares, with two horses in place of four, were successively introduced, but none of these present any special interest. Races on horseback date from the 33rd Olympiad. As the course was the same, success must have depended on skill as much as on swiftness. Lastly, there were athletic contests of the same description for boys, and a competition of heralds and trumpeters, introduced in the 93rd Olympiad.

The prizes were at first, as in the Homeric times, of some intrinsic value, but after the 6th Olympiad the only prize for each contest was a garland of wild olive, which was cut with a golden sickle from the kallistephanos, the sacred tree brought by Hercules "from the dark fountains of Ister in the land of the Hyperboreans, to be a shelter common to all men and a crown of noble deeds" (Pindar, *Ol.* iii. 18). Greek writers from Herodotus to Plutarch dwell with complacency on the magnanimity of a people who cared for nothing but honour and were content to struggle for a corruptible crown. But though the Greek games present in this respect a favourable contrast to the greed and gambling of the modern racecourse, yet to represent men like Milon and Damoxenus as actuated by pure love of glory is a pleasing fiction of the moralists. The successful athlete received in addition to the immediate honours very substantial rewards. A herald proclaimed his name, his parentage and his country; the

Hellanodicae took from a table of ivory and gold the olive crown and placed it on his head, and in his hand a branch of palm; as he marched in the sacred revel to the temple of Zeus, his friends and admirers showered in his path flowers and costly gifts, singing the old song of Archilochus, τήνελλα καλλίνικε, and his name was canonized in the Greek calendar. Fresh honours and rewards awaited him on his return home. If he was an Athenian he received, according to the law of Solon, 500 drachmae, and free rations for life in the Prytaneum; if a Spartan, he had as his prerogative the post of honour in battle. Poets like Pindar, Simonides and Euripides sung his praises, and sculptors like Pheidias and Praxiteles were engaged by the state to carve his statue. We even read of a breach in the town walls being made to admit him, as if the common road were not good enough for such a hero; and there are well-attested instances of altars being built and sacrifices offered to a successful athlete. No wonder then that an Olympian prize was regarded as the crown of human happiness. Cicero, with a Roman's contempt for Greek frivolity, observes with a sneer that an Olympian victor receives more honours than a triumphant general at Rome, and tells the story of the Rhodian Diagoras, who, having himself won the prize at Olympia, and seen his two sons crowned on the same day, was addressed by a Laconian in these words:—"Die, Diagoras, for thou hast nothing short of divinity to desire." Alcibiades, when setting forth his services to the state, puts first his victory at Olympia, and the prestige he had won for Athens by his magnificent display. But perhaps the most remarkable evidence of the exaggerated value which the Greeks attached to athletic prowess is a casual expression which Thucydides employs when describing the enthusiastic reception of Brasidas at Scione. The state, he says, voted him a crown of gold, and the multitude flocked round him and decked him with garlands, *as though he were an athlete*.

The *Pythian* games originated in a local festival held at Delphi, anciently called Pytho, in honour of the Pythian Apollo, and were limited to musical competitions. The date at which they became a Panhellenic ἀγών (so Demosthenes calls them) cannot be determined, but the Pythiads as a chronological era date from 527 B.C., by which time music had been added to all the Panhellenic contests. Now, too, these were held at the end of every fourth year; previously there had been an interval of eight years. The Amphictyones presided and the prize was a chaplet of laurel.

The *Nemean* games were biennial and date from 516 B.C. They were by origin an Argive festival in honour of Nemean Zeus, but in historical times were open to all Greece and provided the established round of contests, except that no mention is made of a chariot-race. A wreath of wild celery was the prize.

The *Isthmian* games, held on the Isthmus of Corinth in the first and third year of each Olympiad, date, according to Eusebius, from 523 B.C. They are variously reported to have been founded by Poseidon or Sisyphus in honour of Melicertes, or by Theseus to celebrate his victory over the robbers Sinis and Sciron. Their early importance is attested by the law of Solon which bestowed a reward of 100 drachmae on every Athenian who gained a victory. The festival was managed by the Corinthians; and after the city was destroyed by Mummius (146 B.C.) the presidency passed to the Sicyonians until Julius Caesar rebuilt Corinth (46 B.C.). They probably continued to exist till Christianity became the religion of the Roman empire. The Athenians were closely connected with the festival, and had the privilege of *proedria*, the foremost seat at the games, while the Eleans were absolutely excluded from participation. The games included gymnastic, equestrian and musical contests, differing little from those of the other great festivals, and the prize was a crown made at one time of parsley (more probably wild celery), at a later period of pine. The importance of the Isthmian games in later times is shown by the fact that Flamininus chose the occasion for proclaiming the liberation of Greece, 196 B.C. That at a later anniversary (A.D. 67) Nero repeated the proclamation of Flamininus, and coupled with it the announcement of his own infamous victory at Olympia, shows alike the hollowness of the first gift and the degradation which had befallen the Greek games, the last faint relic of Greek nationality.

Roman.

The *Ludi Publici* of the Romans included feasts and theatrical exhibitions as well as the public games with which alone we are concerned. As in Greece, they were intimately connected with religion. At the beginning of each civil year it was the duty of the consuls to vow to the gods games for the safety of the commonwealth, and the expenses were defrayed by the treasury. Thus, at no cost to themselves, the Roman public were enabled to indulge at the same time their religious feelings and their love of amusement. Their taste for games naturally grew till it became a passion, and under the empire games were looked upon by the mob as one of the two necessaries of life. The aediles who succeeded to this duty of the consuls were expected to supplement the state allowance from their private purse. Political adventurers were not slow to discover so ready a road to popularity, and what at first had been exclusively a state

charge devolved upon men of wealth and ambition. A victory over some barbarian horde or the death of a relation served as the pretext for a magnificent display. But the worst extravagance of private citizens was eclipsed by the reckless prodigality of the Caesars, who squandered the revenues of whole provinces in catering for the mob of idle sightseers on whose favour their throne depended. But though public games played as important a part in Roman as in Greek history, and must be studied by the Roman historian as an integral factor in social and political life, yet, regarded solely as exhibitions, they are comparatively devoid of interest, and we sympathize with Pliny, who asks his friend how any man of sense can go day after day to view the same dreary round of fights and races.

It is easy to explain the different feelings which the games of Greece and of Rome excite. The Greeks at their best were actors, the Romans from first to last were spectators. It is true that even in Greek games the professional element played a large and ever-increasing part. As early as the 6th century B.C. Xenophanes complains that the wrestler's strength is preferred to the wisdom of the philosopher, and Euripides, in a well-known fragment, holds up to scorn the brawny swaggering athlete. But what in Greece was a perversion and acknowledged to be such, the Romans not only practised but held up as their ideal. No Greek, however high in birth, was ashamed to compete in person for the Olympic crown. The Roman, though little inferior in gymnastic exercises, kept strictly to the privacy of the palaestra; and for a patrician to appear in public as a charioteer is stigmatized by the satirist as a mark of shameless effrontery.

Roman games are generally classified as *fixed*, *extraordinary* and *votive*; but they may be more conveniently grouped according to the place where they were held, viz. the circus or the amphitheatre.

For the Roman world the circus was at once a political club, a fashionable lounge, a rendezvous of gallantry, a betting ring, and a playground for the million. Juvenal, speaking loosely, says that in his day it held the whole of Rome; but there is no reason to doubt the precise statement of P. Victor, that in the Circus Maximus there were seats for 350,000 spectators.

Of the various *Ludi Circenses* it may be enough here to give a short account of the most important, the *Ludi Magni* or *Maximi*.

Initiated according to legend by Tarquinius Priscus, the *Ludi Magni* were originally a votive feast to Capitoline Jupiter, promised by the general when he took the field, and performed on his return from the annual campaign. They thus presented the appearance of a military spectacle, or rather a review of the whole burgess force, which marched in solemn procession from the capitol to the forum and thence to the circus, which lay between the Palatine and Aventine. First came the sons of patricians mounted on horseback, next the rest of the burghers ranged according to their military classes, after them the athletes, naked save for the girdle round their loins, then the company of dancers with the harp and flute players, next the priestly colleges bearing censers and other sacred instruments, and lastly the simulacra of the gods, carried aloft on their shoulders or drawn in cars. The games themselves were fourfold:—(1) the chariot race; (2) the *ludus Troiae*; (3) the military review; and (4) gymnastic contests. Of these only the first two call for any comment. (1) The chariot employed in the circus was the two-wheeled war car, at first drawn by two, afterwards by four, and more rarely by three horses. Originally only two chariots started for the prize, but under Caligula we read of as many as twenty-four heats run in the day, each of four chariots. The distance traversed was fourteen times the length of the circus or nearly 5 m. The charioteers were apparently from the first professionals, though the stigma under which the gladiator lay never attached to their calling. Indeed a successful driver may compare in popularity and fortune with a modern jockey. The drivers were divided into companies distinguished by the colours of their tunics, whence arose the faction of the circus which assumed such importance under the later emperors. In republican times there were two factions, the white and the red; two more, the green and the blue, were added under the empire, and for a short time in Domitian's reign there were also the gold and the purple. Even in Juvenal's day party spirit ran so high that a defeat of the green was looked upon as a second Cannae. After the seat of empire had been transferred to Constantinople these factions of the circus were made the basis of political cabals, and frequently resulted in sanguinary tumults, such as the famous Nika revolt (A.D. 532), in which 30,000 citizens lost their lives. (2) The Ludus Troiae was a sham-fight on horseback in which the actors were patrician youths. A spirited description of it will be found in the 5th Aeneid. (See also CIRCUS.)

The two exhibitions we shall next notice, though occasionally given in the circus, belong more properly to the amphitheatre. *Venatio* was the baiting of wild animals who were pitted either with one another or with men—captives, criminals or trained hunters called *bestiarii*.

The first certain instance on record of this amusement is in 186 B.C., when M. Fulvius exhibited lions and tigers in the arena. The taste for these brutalizing spectacles grew apace, and the most distant provinces were ransacked by generals and proconsuls to supply the arena with rare animals—giraffes, tigers and crocodiles. Sulla provided for a single show 100 lions, and Pompey 600 lions, besides elephants, which were matched with Gaetulian hunters. Julius Caesar enjoys the doubtful honour of inventing the bull-fight. At the inauguration of the Colosseum 5000 wild and 4000 tame beasts were killed, and to commemorate Trajan's Dacian victories there was a butchery of 11,000 beasts. The *naumachia* was a sea-fight, either in the arena, which was flooded for the occasion by a system of pipes and sluices, or on an artificial lake. The rival fleets were manned by prisoners of war or criminals, who often fought till one side was exterminated. In the sea-fight on Lake Fucinus, arranged by the emperor Claudius, 100 ships and 19,000 men were engaged.

But the special exhibition of the amphitheatre was the *munus gladiatorium*, which dates from the funeral games of Marcus and Decimus Brutus, given in honour of their father, 264 B.C. It was probably borrowed from Etruria, and a refinement on the common savage custom of slaughtering slaves or captives on the grave of a warrior or chieftain. Nothing so clearly brings before us the vein of coarseness and inhumanity which runs through the otherwise noble character of the Roman, as his passion for gladiatorial shows. We can fancy how Pericles, or even Alcibiades, would have loathed a spectacle that Augustus tolerated and Trajan patronized. Only after the conquest of Greece we hear of their introduction into Athens, and they were then admitted rather out of compliment to the conquerors than from any love of the sport. In spite of numerous prohibitions from Constantine downwards, they continued to flourish even as late as St Augustine. To a Christian martyr, if we may credit the story told by Theodoret and Cassiodorus, belongs the honour of their final abolition. In the year 404 Telemachus, a monk who had travelled from the East on this sacred mission, rushed into the arena and endeavoured to separate the combatants. He was instantly despatched by the praetor's orders; but Honorius, on hearing the report, issued an edict abolishing the games, which were never afterwards revived. (See GLADIATORS.)

Of the other Roman games the briefest description must suffice. The *Ludi Apollinares* were established in 212 B.C., and were annual after 211 B.C.; mainly theatrical performances. The *Megalenses* were in honour of the great goddess, Cybele: instituted 204 B.C., and from 191 B.C. celebrated annually. A procession of Galli, or priests of Cybele, was a leading feature. Under the empire the festival assumed a more orgiastic character. Four of Terence's plays were produced at these games. The *Ludi Saeculares* were celebrated at the beginning or end of each *saeculum*, a period variously interpreted by the Romans themselves as 100 or 110 years. The celebration by Augustus in 17 B.C. is famous by reason of the Ode composed by Horace for the occasion. They were solemnized by the emperor Philip A.D. 248 to commemorate the millennium of the city.

2. *Private Games.*—These may be classified as outdoor and indoor games. There is naturally all the world over a much closer resemblance between the pursuits and amusements of children than of adults. Homer's children built castles in the sand, and Greek and Roman children alike had their dolls, their hoops, their skipping-ropes, their hobby-horses, their kites, their knuckle-bones and played at hopscotch, the tug-of-war, pitch and toss, blind-man's buff, hide and seek, and kiss in the ring or at closely analogous games. Games of ball were popular in Greece from the days of Nausicaa, and at Rome there were five distinct kinds of ball and more ways of playing with them. For particulars the dictionary of antiquities must be consulted. It is strange that we can find in classical literature no analogy to cricket, tennis, golf or polo, and though the *follis* resembled our football, it was played with the hand and arm, not with the leg. Cock-fighting was popular both at Athens and Rome, and quails were kept and put to various tests to prove their pluck.

Under indoor games we may distinguish games of chance and games of skill, though in some of them the two elements are combined. *Tesserae*, shaped and marked with pips like modern dice, were evolved from the *tali*, knuckle-bones with only four flat sides. The old Roman threw a hazard and called a main, just as did Charles Fox, and the vice of gambling was lashed by Juvenal no less vigorously than by Pope. The Latin name for a dice-box has survived in the *fritillary* butterfly and flower.

The primitive game of guessing the number of fingers simultaneously held up by the player and his opponent is still popular in Italy where it is known as "morra." The proverbial phrase for an honest man was *quicum in tenebris mices*, one you would trust to play at morra in the dark.

Athena found the suitors of Penelope seated on cowhides and playing at πεσσοί, some kind of draughts. The invention of the game was ascribed to Palamedes. In its earliest form it was played on a board with five lines and with five pieces. Later we find eleven lines, and a

further development was the division of the board into squares, as in the game of πόλεις (cities). In the Roman *latrunculi* (soldiers), the men were distinguished as common soldiers and "rovers," the equivalent of crowned pieces.

Duodecim scripta, as the name implies, was played on a board with twelve double lines and approximated very closely to our backgammon. There were fifteen pieces on each side, and the moves were determined by a throw of the dice; "blots" might be taken, and the object of the player was to clear off all his own men. Lastly must be mentioned the *Cottabus* (*q.v.*), a game peculiar to the Greeks, and with them the usual accompaniment of a wine party. In its simplest form each guest threw what was left in his cup into a metal basin, and the success of the throw, determined partly by the sound of the wine in falling, was reckoned a divination of love. For the various elaborations of the game (in Sicily we read of Cottabus houses), Athenaeus and Pollux must be consulted.

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(F. S.)

GAMING AND WAGERING. It is somewhat difficult exactly to define or adequately to distinguish these terms of allied meaning. The word "game" (*q.v.*) is applicable to most pastimes and many sports, irrespective of their lawful or unlawful character. "Gaming" is now always associated with the staking of money or money's worth on the result of a game of pure chance, or mixed skill and chance; and "gambling" has the same meaning, with a suggestion that the stakes are excessive or the practice otherwise reprehensible, while "wager" and "wagering" are applied to money hazarded on any contingency in which the person wagering has no interest at risk other than the amount at stake. "Betting" is usually restricted to wagers on events connected with sports or games, and "lottery" applies to speculation to obtain prizes by lot or chance.

At English common law no games were unlawful and no penalties were incurred by gambling, nor by keeping gaming-houses, unless by reason of disorder they became a public nuisance. From very early times, however, the English statute law has attempted to exercise control over the sports, pastimes and amusements of the lieges. Several points of view have been taken: (1) their competition with military exercises and training; (2) their attraction to workmen and servants, as drawing them from work to play; (3) their interference with the observance of Sunday; (4) their combination with betting or gambling as causing impoverishment and dishonesty in children, servants and other unwary persons; (5) the use of fraud or deceit in connexion with them. The legislation has assumed several forms: (1) declaring certain games unlawful either absolutely or if accompanied by staking or betting money or money's worth on the event of the game; (2) declaring the keeping of establishments for betting, gaming or lotteries illegal, or prohibiting the use of streets or public places for such purposes; (3) prohibiting the enforcement in courts of justice of gambling contracts.

Games, lawful and unlawful.

The earliest English legislation against games was passed in the interests of archery and other manly sports which were believed to render the lieges more fit for service in war. A statute of Richard II. (1388) directed servants and labourers to have bows and arrows and to use them on Sundays and holidays, and to cease from playing football, quoits, dice, putting the stone, kails and other such importune games. A more drastic statute was passed in 1409 (11 Hen. IV. c. 4) and penalties were imposed in 1477 (17 Edw. IV. c. 3) on persons allowing unlawful games to be played on their premises. These acts were superseded in 1541 (33 Hen. VIII. c. 9) by a statute passed on the petition of the bowyers, fletchers (*fléchiers*), stringers and arrowhead makers of the realm. This act (still partly in force) is entitled an "act for maintenance of archery and debarring of unlawful games"; and it recites that, since the last statutes (of 3 & 6 Hen. VIII.) "divers and many subtil inventative and crafty persons have found and daily find many and sundry new and crafty games and plays, as logating in the fields, slide-thrift, otherwise called shove-groat, as well within the city of

London as elsewhere in many other and divers parts of this realm, keeping houses, plays and alleys for the maintenance thereof, by reason whereof archery is sore decayed, and daily is like to be more minished, and divers bowyers and fletchers, for lack of work, gone and inhabit themselves in Scotland and other places out of this realm, there working and teaching their science, to the puissance of the same, to the great comfort of strangers and detriment of this realm." Accordingly penalties are imposed on all persons keeping houses for unlawful games, and all persons resorting thereto (s. 8). The games specified are dicing, table (backgammon) or carding, or any game prohibited by any statute theretofore made or any unlawful new game then or thereafter invented or to be invented. It is further provided that "no manner of artificer or craftsman of any handicraft or occupation, husbandman, apprentice, labourer, servant at husbandry, journeyman or servant of artificer, mariners, fishermen, watermen, or any serving man, shall play at the tables, tennis, dice, cards, bowls, clash, coyting, logating or any other unlawful game out of Christmas under the pain of xxs. to be forfeit for every time; and in Christmas to play at any of the said games in their masters' houses or in their masters' presence; and also that no manner of person shall at any time play at any bowl or bowls in open places out of his garden or orchard" (s. 11). The social evils of gambling (impoverishment, crime, neglect of divine service) are incidentally alluded to in the preamble, but only in connexion with the main purpose of the statute—the maintenance of archery. No distinction is made between games of skill and games of chance, and no reference is made to playing for money or money's worth. The *Book of Sports* of James I. (1617), republished by Charles I. (1633), was aimed at encouraging certain sports on Sundays and holidays; but with the growth of Puritanism the royal efforts failed. The Sunday Observance Act 1625 prohibits the meeting of people out of their own parishes on the Lord's Day for any sports or pastimes whatsoever. It has been attempted to enforce this act against Sunday football. The act goes on to prohibit any bear-baiting, bull-baiting, interludes, common plays or other unlawful exercises or plays on Sunday by parishioners within their own parishes. According to Blackstone (iv. *Comm.* c. 13) the principal ground of complaint leading to legislation in the 18th century was "gambling in high life." He collects the statutes made with this view, but only those still in force need have been mentioned.

The first act directed against gambling as distinct from playing games was that of 1665 (16 Car. II. c. 7) "against deceitful, disorderly and excessive gaming" which deals with games both of skill and chance at which people cheat, or play otherwise than with ready money, or lose more than £100 on credit. In 1698 (13 Will. III. c. 23) legislation was passed against lotteries, therein described as "mischievous and unlawful games." This act was amended in 1710 (9 Anne c. 6), and in the same year was passed a statute which is the beginning of the modern legislation against gambling (9 Anne c. 19). It includes within its scope money won by "gaming or playing" at cards, &c., and money won by "betting" on the sides or hands of those who game at any of the forbidden games. But it refers to tennis and bowls as well as to games with cards and dice.

The following list of lawful games, sports and exercises is given in *Oliphant on Horses, &c.* (6th ed.): horse-races, steeplechases, trotting matches, coursing matches, foot-races, boat-races, regattas, rowing matches, golf, wrestling matches, cricket, tennis, fives, rackets, bowls, skittles, quoits, curling, putting the stone, football, and presumably every bona-fide variety, *e.g.* croquet, knurr and spell, hockey or any similar games. Cock-fighting is said to have been unlawful at common law, and that and other modes of setting animals to fight are offences against the Prevention of Cruelty to Animals Acts. The following are also lawful games: whist and other lawful games at cards, backgammon, bagatelle, billiards, chess, draughts and dominoes. But to allow persons to play for money at these games or at skittles or "skittle pool" or "puff and dart" on licensed premises is gaming within the Licensing Act 1872. The earlier acts declared unlawful the following games of skill: football, quoits, putting the stone, kails, tennis, bowls, clash or kails, or cloyshcayls, logating, half bowl, slide-thrift or shove-groat and backgammon. Backgammon and other games in 1739 played with backgammon tables were treated as lawful in that year. Horse-racing, long under restriction, being mentioned in the act of 1665 and many 18th-century acts, was fully legalized in 1840 (3 & 4 Vict. c. 35). The act of 1541, so far as it declared any game of mere skill unlawful, was repealed by the Gaming Act 1845. Billiards is legal in private houses or clubs and in public places duly licensed. The following games have been declared by the statutes or the judges to be unlawful, whether played in public or in private, unless played in a royal palace where the sovereign is residing: ace of hearts, pharaoh (faro), basset and hazard (1738), passage, and every game then invented or to be invented with dice or with any other instrument, engine or device in the nature of dice having one or more figures or numbers thereon (1739), roulet or roly-poly (1744), and all lotteries (except Art Union lotteries), *rouge et noir*, *baccarat-banque* (1884), *chemin de fer* (1895), and all games at cards which are not games of mere skill. The definition of unlawful game does not include whist played for a prize not subscribed to by the players, but it does include playing cards for money in licensed premises; even in the private room of the licensee or with private friends during closing

hours.

The first attack on lotteries was in 1698, against lotteries “by dice, lots, cards, balls or any other numbers or figures or in any other way whatsoever.” An act of 1721 prohibited lotteries which under the name of sales distributed prizes in money, advowsons, land, jewels, &c., by lots, tickets, numbers or figures. Acts of 1722, 1733 and 1823 prohibited any sale of tickets, receipts, chances or numbers in foreign lotteries. The games of cards already referred to as unlawful were in 1738 declared to be “games or lotteries by cards or dice,” and in 1802 the definition of lottery was extended to include “little-goes and any game or lottery not authorized by parliament, drawn by dice, lots, cards, balls, or by numbers or figures or by any other way, contrivance or device whatsoever.” This wide definition reaches raffles and sweepstakes on races. The advertisement of foreign or illegal lotteries is forbidden by acts of 1836 and 1844. In 1846 art unions were exempted from the scope of the Lottery Acts. Attempts have been made to suppress the sale in England of foreign lottery tickets, but the task is difficult, as the post-office distributes the advertisements, although, under the Revenue Act 1898, the Customs treat as prohibited goods advertisements or notices as to foreign lotteries. More success has been obtained in putting down various devices by newspapers and shopkeepers to attract customers by instituting “missing word competitions” and “racing coupon competitions”; by automatic machines which give speculative chances in addition to the article obtained for the coin inserted; by distribution of prizes by lot or chance to customers; by holding sweepstakes at public-houses, by putting coins in sweetmeats to tempt street urchins by cupidity to indigestion; or by gratuitous distribution of medals giving a chance of a prize from a newspaper. An absolutely gratuitous distribution of chances seems not to be within the acts, but a commercial distribution is, even if individuals who benefit do not pay for their chance.

As already stated, the keeping of a gaming-house was at common law punishable only if a public nuisance were created. The act of 1541 imposes penalties on persons maintaining houses for unlawful games. Originally licences could be obtained for such houses, but these were abolished in 1555 (2 & 3 Phil. and Mar.). In 1698 lotteries were declared public nuisances, and in 1802 the same measure was meted out to lotteries known as little-goes. Special penalties are provided for those who set up lotteries or any unlawful game with cards or dice, &c. (1738, 1739, 1744). In 1751 inhabitants of a parish were enabled to insist on the prosecution of gaming-houses. The act of 1802 imposed severe penalties on persons publicly or privately keeping places for any lottery. This statute hits at the deliberate or habitual use of a place for the prohibited purpose, and does not touch isolated or incidental uses on a single occasion, *e.g.* at a bazaar or show; but under an act of 1823 the sale of lottery tickets is in itself an offence. The Gaming Act 1845 facilitates the search of suspected gaming-houses and the proof that they are such. It provides that, to prove any house to be a common gaming-house, it “shall be sufficient to show that it is kept or used for playing therein at any unlawful game, and that a bank is kept there by one or more of the players exclusively of the others, or that the chances of any game played therein are not alike favourable to all the players, including among the players the banker or other person by whom the game is managed, or against whom the other players stake, play or bet.” Gambling, it will be noticed, is still in this definition connected with some kind of game. The act also provides that proof that the gaming was for money shall not be required, and that the presence of cards, dice and other instruments of gaming shall be prima-facie evidence that the house was used as a common gaming-house. The most recent statute dealing with gaming-houses is of 1854, which provides summary remedies against the keeper and makes further provisions to facilitate conviction. It may be added that the Gaming Act 1845 makes winning money by cheating at any game or wager punishable in the same way as obtaining money by false pretences. At the present time proceedings for keeping gaming-houses in the sense in which that word is commonly understood are comparatively rare, and are usually against foreigners. The statutes hit both public and private gaming-houses (see the Park Club case, *Jenks* v. *Turpin*, 1884, 13 Q.B.D. 505, the leading case on unlawful games). The proprietor and the person who keeps the bank at an unlawful game are both within the statute: the players are not, but the act of Henry VIII. is so far alive that they can be put under recognizance not to frequent gaming-houses. Under the Licensing Act 1872 penalties are incurred by licensed victuallers who suffer any gaming or unlawful game to be played on their premises. A single instance of playing an unlawful game for money in a private house is not within the statutes (*R.* v. *Davies*, 1897, 2 Q.B. 199).

In England, so far as the general public is concerned, gaming at cards is to a large extent superseded by betting on sports and pastimes, or speculation by means of lotteries or like devices. The legislation against betting *eo nomine* began in 1853. In the Betting Act 1853 it is described as a kind of gaming of late sprung up to the injury and demoralization of improvident persons by the opening of places called betting houses and offices, and the receiving of money *in advance* by the owners or occupiers or their agents on promises to pay money on events or horse races and like contingencies. This act strikes at ready money

betting as distinguished from betting on credit ("on the nod"). It was avowedly framed to hit houses open to all and sundry as distinguished from private betting clubs such as Tattersall's. The act seeks to punish persons who keep a house, office, room or other place for the purpose (*inter alia*) of any person betting with persons "resorting thereto" or of receiving deposits in consideration of bets on contingencies relating to horse-races or other races, fights, games, sports or exercises. The act especially excepts persons who receive or hold prizes or stakes to be paid to the winner of a race or lawful sport, game or exercise, or to the owner of a horse engaged in a race (s. 6). Besides the penalties incurred by keeping such places, the keeper is liable to repay to depositors the sums deposited (s. 5).

By the Licensing Act 1872 penalties are incurred by licensed persons who allow their houses to be used in contravention of the Betting Act 1853. There has been a great deal of litigation as to the meaning and scope of this enactment, and a keen contest between the police and the Anti-gambling League (which has been very active in the matter) and the betting confraternity, in which much ingenuity has been shown by the votaries of sport in devising means for evading the terms of the enactment. The consequent crop of legal decisions shows a considerable divergence of judicial opinion. The House of Lords has held that the Tattersall's enclosure or betting ring on a racecourse is not a "place" within the statute; and members of a bona-fide club who bet with each other in the club are not subject to the penalties of the act. But the word "place" has been held to include a public-house bar, an archway, a small plot of waste ground, and a bookmaker's stand, and even a bookmaker's big umbrella, and it is difficult to extract from the judges any clear indication of the nature of the "places" to which the act applies. The act is construed as applying only to ready-money betting, *i.e.* when the stake is deposited with the bookmaker, and only to places used for betting with persons physically resorting thereto; so that bets by letter, telegram or telephone do not fall within its penalties. The arm of the law has been found long enough to punish as thieves "welshers," who receive and make off with deposits on bets which they never mean to pay if they lose. The act of 1853 makes it an offence to publish advertisements showing that a house is kept for betting. It was supplemented in 1874 by an act imposing penalties on persons advertising as to betting. But this has been read as applying to bets falling within the act of 1853, and it does not prohibit the publication of betting news or sporting tips in newspapers. A few newspapers do not publish these aids to ruin, and in some public libraries the betting news is obliterated, as it attracts crowds of undesirable readers. The act of 1853 has been to a great extent effectual against betting houses, and has driven some of them to Holland and other places. But it has been deemed expedient to legislate against betting in the streets, which has been found too attractive to the British workman.

Street betting.

By the Metropolitan Streets Acts 1867 any three or more persons assembled together in any part of any street in the city of London or county of London for the purpose of betting and deemed to be obstructing the street, may be arrested without warrant by a constable and fined a sum not exceeding £5. The Vagrancy Act 1873 (36 & 37 Vict. c. 38) provides that "Every person playing or betting by way of wagering or gaming on any street, road, highway or other open and public place, or in any open place to which the public have, or are permitted to have, access, at or with any table or instrument of gaming, or any coin, card, token or other article used as an instrument or means of gaming, at any game or pretended game of chance, shall be deemed a rogue and vagabond." This act amended a prior act of 1868, passed to repress the practice of playing pitch and toss in the streets, which had become a public nuisance in the colliery districts. The powers of making by-laws for the peace, order and good government of their districts, possessed by municipal boroughs—and since 1888 by county councils—and extended in 1899 to the new London boroughs, have in certain cases been exercised by making by-laws forbidding any person to "frequent or use any street or other public place, on behalf either of himself or any other person, for the purpose of bookmaking, or betting, or wagering, or agreeing to bet or wager with any person, or paying, or receiving or settling bets." This and similar by-laws have been held valid, but were found inadequate, and by the Street Betting Act 1906 (6 Edw. VII. c. 43), passed by the efforts of the late Lord Davey, it is made an offence for any person to frequent or loiter in a street or public place on behalf of himself or of any other person for the purpose of bookmaking or betting or wagering or agreeing to bet or wager or paying or receiving or settling bets. The punishment for a first offence is fine up to £10, for a second fine up to £20, and the punishment is still higher in the case of a third or subsequent offence, or where the accused while committing the offence has any betting transaction with a person under the age of sixteen. The act does not apply to ground used for a course for horse-racing or adjacent thereto on days on which races take place; but the expression public place includes a public park, garden or sea-beach, and any unenclosed ground to which the public for the time have unrestricted access, and enclosed places other than public parks or gardens to which the public have a restricted right of access with or without payment, if the owners or persons controlling the place

exhibit conspicuously a notice prohibiting betting therein. A constable may arrest without warrant persons offending and seize all books, papers, cards and other articles relating to betting found in their possession, and these articles may be forfeited on conviction. Besides the above provision against betting with infants the Betting and Loans (Infants) Act 1892, passed at the instance of the late Lord Herschell, makes it a misdemeanour to send, with a view to profit, to any one known by the sender to be an infant, a document inviting him to enter into a betting or wagering transaction. The act is intended to protect lads at school and college from temptation by bookmakers.

Wagering.

We must now turn from the public law with respect to gaming to the treatment of bets and wagers from the point of view of their obligation on the individuals who lose them. A wager may be defined as "a promise to give money or money's worth upon the determination or ascertainment of an uncertain event" (Anson, *Law of Contract*, 11th ed., p. 206). The event may be uncertain because it has not happened or because its happening is not ascertained; but to make the bargain a wager the determination of the event must be the sole condition of the bargain. According to the view taken in England of the common law, bets or wagers were legally enforceable, subject to certain rules dictated by considerations of public policy, *e.g.* that they did not lead to immorality or breach of the peace, or expose a third person to ridicule.[1] The courts were constantly called upon to enforce wagers and constantly exercised their ingenuity to discover excuses for refusing. A writer on the law of contracts[2] discovers here the origin of that principle of "public policy" which plays so important a part in English law. Wagering contracts were rejected because the contingencies on which they depended tended to create interests hostile to the common weal. A bet on the life of the emperor Napoleon was declared void because it gave one of the parties an interest in keeping the king's enemy alive, and also because it gave the other an interest in compassing his death by unlawful means. A bet as to the amount of the hop-duty was held to be against public policy, because it tended to expose the condition of the king's revenue to all the world. A bet between two hackney coachmen, as to which of them should be selected by a gentleman for a particular journey, was void because it tended to expose the customer to their importunities. When no such subtlety could be invented, the law, however reluctantly, was compelled to enforce the fulfilment of a wager. Actions on wagers were not favoured by the judges; and though a judge could not refuse to try such an action, he could, and often did, postpone it until after the decision of more important cases.

Parliament gradually intervened to confine the common law within narrower limits, both in commercial and non-commercial wagers, and both by general and temporary enactments. An example of the latter was 7 Anne c. 16 (1710), avoiding all wagers and securities relating to the then war with France. The earliest general enactment was 16 Car. II. c. 7 (1665), prohibiting the recovery of a sum exceeding £100 lost in games or pastimes, or in betting on the sides or hands of the players, and avoiding securities for money so lost. 9 Anne c. 19 avoided securities for such wagers for any amount, even in the hands of bona-fide holders for value without notice, and enabled the loser of £10 or upwards to sue for and recover the money he had lost within three months of the loss. Contracts of insurance by way of gaming and wagering were declared void, in the case of marine risks in 1746, and in the case of other risks in 1774. It was not until 1845 that a general rule was made excluding wagers from the courts. Section 18 of the Gaming Act 1845 (passed after a parliamentary inquiry in 1844 as to gaming) enacted "that all contracts or agreements, whether by parole or in writing, by way of gaming or wagering shall be null and void, and that no suit shall be brought or maintained in any court of law or equity for recovering any sum of money or valuable thing alleged to be won upon any wager, or which shall have been deposited in the hands of any person to abide the event on which any wager shall have been made; provided always that this enactment shall not be deemed to apply to any subscription or contribution, or agreement to subscribe or contribute, for or towards any plate, prize or sum of money to be awarded to the winner or winners of any lawful game, sport, pastime or exercise."

The construction put on this enactment enabled turf commission agents to recover from their principals bets made and paid for them. But the Gaming Act 1892 rendered null and void any promise, express or implied, to repay to any person any sum of money paid by him under, or in respect of, any contract or agreement rendered null and void by the Gaming Act 1845, or to pay any sum of money by way of commission, fee, reward, or otherwise in respect of any such contract or agreement, or of any services in relation thereto or in connexion therewith, and provided that no action should be brought or maintained to recover any such sum. By the combined effect of these two enactments the recovery by the winner from the loser or stakeholder of bets or of stakes on games falling within s. 18 of the Gaming Act 1845 is absolutely barred; but persons who have deposited money to abide the

event of a wager are not debarred from crying off and recovering their stake before the event is decided, or even after the decision of the event and before the stake is paid over to the winner;[3] and a man who pays a bet for a friend, or a turf commission agent or other agent who pays a bet for a principal, has now no legal means of recovering the money, unless some actual deceit was used to induce him to pay in ignorance that it was a bet. But a person who has received a bet on account of another can still, it would seem, be compelled to pay it over, and the business of a betting man is treated as so far lawful that income-tax is charged on its profits, and actions between parties in such a business for the taking of partnership accounts have been entertained.

The effect of these enactments on speculative dealings in shares or other commodities calls for special consideration. It seems to be correct to define a wagering contract as one in which two persons, having opposite opinions touching the issue of an event (past or future), of which they are uncertain, mutually agree that on the determination of the event one shall win, and the other shall pay over a sum of money, or other stake, neither party having any other interest in the event than the sum or stake to be won or lost. This definition does not strike at contracts in "futures," under which the contractors are bound to give or take delivery at a date fixed of commodities not in existence at the date of the contract. Nor are such contracts rendered void because they are entered into for purposes of speculation; in fact, their legality is expressly recognized by the Sale of Goods Act 1893. Contracts of insurance are void if made by way of gaming or wagering on events in which the assured has no interest present or prospective whether the matter be life or fire risks (1774) or maritime risks (Marine Insurance Act 1906). An act known as Sir John Barnard's Act (7 Geo. II. c. 8, entitled "An act to prevent the infamous practice of stock jobbing") prohibited contracts for liberty to accept or refuse any public stocks or securities and wagers relating to public stocks, but this act was repealed in 1860, and contracts to buy or sell stocks and shares are not now void because entered into by way of speculation and not for purposes of investment. The only limitation on such contracts is that contained in Leeman's Act (30 & 31 Vict. c. 29) as to contracts for the sale of shares in joint-stock banking companies. But a transaction in any commodity, though in form commercial, falls within the Gaming Acts if in substance the transaction is a mere wager on the price of the commodity at a date fixed by the contract. It does not matter whether the dealing is in stocks or in cotton, nor whether it is entered into on the Stock Exchange, or on any produce exchange, or elsewhere; nor is it conclusive in favour of the validity of the bargain that it purports to bind the parties to take or deliver the article dealt in. The courts are entitled to examine into the true nature of the transaction; and where the substantial intention of the parties is merely to gamble in differences, to make what is called "a time bargain," the fact that it is carried out by a series of contracts, regular and valid in form, will not be sufficient to exclude the application of the Gaming Acts.

In very many cases transactions with "outside stockbrokers" or "bucket shops" have been held to be mere wagers, although the contracts purported to give "put" or "call" options to demand delivery or acceptance of the stocks dealt with; and the cover deposited by the "client" has been treated as a mere security for performance of the bargain, and recoverable if sued for in time, *i.e.* before it is used for the purpose for which it is deposited. There was not up to 1909 any authoritative decision as to the application of the Gaming Act 1892 to transactions on the London Stock Exchange through a stockbroker who is a member of "the House"; but the same principle appears to be applicable where the facts of the particular deal clearly indicate that the intention was to make a mere time bargain, or to pay or receive differences only. The form, however, of all bargains on the Stock Exchange is calculated and intended to preclude people from setting up a gaming act defence: as each contract entitles the holder to call for delivery or acceptance of the stock named therein. In the event of the bankruptcy of a person involved in speculations, the bankruptcy officials exclude from proof against the estate all claims founded on any dealing in the nature of a wager; and on the same principle the bankrupt's trustee cannot recover sums won by the bankrupt by gaming transactions, but unexhausted "cover" on uncompleted transactions may be recovered back.

Gambling debts.

Besides the enactments which prevent the recovery of bets or wagers by action there has also been a good deal of legislation dealing with securities given in respect of "gambling debts." The earliest (1665) dealt with persons playing at games otherwise than for ready money and losing £100 or more on credit, and not only prohibited the winner from recovering the overplus but subjected him to penalties for winning it. An act of 1710 (9 Anne c. 19) declared utterly void all notes, bills, bonds, judgments, mortgages or other securities where the consideration is for money or valuable security won by gaming at cards, stocks or other games, or by betting on the sides or hands of the gamesters, or for reimbursing money knowingly advanced for

such gaming or betting. This act draws a distinction between gaming and other bets or wagers. Under this act the securities were void even in the hands of innocent transferees. In 1841 the law was altered, declaring such securities not void but made upon an "illegal" consideration. The effect of the change is to enable an innocent transferee for value, of a bill, note or cheque, to recover on a security worthless in the hands of the original taker (see s. 30 of the Bills of Exchange Act 1882), but to put on him the burden of proving that he is a bona fide holder for value. In the case of a negotiable security given for a wager not within the acts of 1710 or 1841 (*e.g.* a bet on a contested election), but within the act of 1845, a third person holding it would be presumed to be a holder for value and on the person prima facie liable under the security falls the burden of proving that no consideration was given for it. It has been decided after considerable divergence of judicial opinion that an action will not lie in England in favour of the drawee against the drawer of a cheque drawn at Algiers on an English bank, partly for losses at baccarat, and partly for money borrowed to continue playing the game. The ground of decision was in substance that the Gaming Acts of 1845 and 1892 as the *lex fori* prohibit the English courts from enforcing gaming debts wherever incurred (*Moulis* v. *Owen*, 1907, 1 K.B. 746).

Scotland.—A Scots act of 1621 c. 14 (said still to be in force) forbids playing at cards or dice in any common house of hostelry, and directs that sums over 100 marks won on any one day at carding or dicing or at wagers on horse races should be at once sent to the treasurer of the kirk session. The Lottery Acts, except that of 1698, apply to Scotland; and the Betting House Act 1853 was extended to Scotland in 1874. The Street Betting Act 1906 extends to Scotland, and gaming houses can be suppressed under the Burgh Police Act 1892, and street betting, lotteries or gaming under that of 1903.

The Scots courts refuse to try actions on wagers, as being *sponsiones ludicrae*, unbecoming the dignity of the courts. 9 Anne c. 19 and 5 & 6 Will. IV. c. 41 extend to Scotland, but the weight of judicial opinion is that the Gaming Act 1845 does not.

Ireland.—The British Acts against lotteries were extended to Ireland in 1780, and the general law as to gaming is the same in both countries.

British Possessions.—Certain of the earlier imperial acts are in force in British possessions, *e.g.* the act of 9 Anne c. 19, which is in force in Ontario subject to amendments made in 1902. In the Straits Settlements, Jamaica and British Guiana there are ordinances directed against gambling and lotteries, and particularly against forms of gambling introduced by the Chinese. Under these ordinances the money paid for a lottery ticket is recoverable by law. In the Transvaal betting houses were suppressed by proclamation (No. 33) soon after the annexation. An invention known in France as the *pari mutuel*, and in Australia as the totalizator, is allowed to be used on race-courses in most of the states (but not in New South Wales). In Queensland, South Australia, Tasmania and Western Australia the state levies a duty on the takings of the machine. In Tasmania the balance of the money retained by the stewards of the course less the tax must be applied solely for improving the course or promoting horse-racing. In Victoria under an act of 1901 the promoters of sports may by advertisement duly posted make betting on the ground illegal.

Egypt.—By law No. 10 of 1905 all lotteries are prohibited with certain exceptions, and it is made illegal to hawk the tickets or offer them for sale or to bring illegal lotteries in any way to the notice of the public. The authorized lotteries are those for charitable purposes, *e.g.* those of the benevolent societies of the various foreign communities.

United States.—In the United States many of the states make gaming a penal offence when the bet is upon an election, or a horse race, or a game of hazard. Betting contracts and securities given upon a bet are often made void, and this may destroy a gaming note in the hands of an innocent purchaser for value. The subject lies outside of the province of the federal government. By the legislation of some states the loser may recover his money if he sue within a limited time, as he might have done in England under 9 Anne c. 19.

AUTHORITIES.—Brandt on *Games* (1872); Oliphant, *Law of Horses, &c.* (6th ed. by Lloyd, 1908); Schwabe on the *Stock Exchange* (1905); Melsheimer on the *Stock Exchange* (4th ed., 1905); Coldridge and Hawksford, *The Law of Gambling* (1895); Stutfield, *Betting* (3rd ed., 1901).

(W. F. C.)

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1 Leake on *Contracts* (4th ed.), p. 529.

2 Pollock, *Contracts* (7th ed.), p. 313.

3 *Burge* v. *Ashby*, 1900, 1 Q.B. 744.

GAMUT (from the Greek letter *gamma*, used as a musical symbol, and *ut*, the first syllable of the medieval hymn *Sanctus Johannes*), a term in music used to mean generally the whole compass or range of notes possessed by an instrument or voice. Historically, however, the sense has developed from its stricter musical meaning of a scale (the recognized musical scale of any period), originating in the medieval "great scale," of which the invention has usually been ascribed to Guido of Arezzo (*q.v.*) in the 11th century. The whole question is somewhat obscure, but, in the evolution of musical notation out of the classical alphabetical system, the invention of the medieval gamut is more properly assigned to Hucbald (d. 930). In his system of scales the semitone was always between the 2nd and 3rd of a tetrachord, as G, A, ♭ B, C, so the ♮ B and ♯ F of the second octave were in false relation to the ♭ B and ♮F of the first two tetrachords. To this scale of four notes, G, A, ♭ B, C, were subsequently added a note below and a note above, which made the hexachord with the semitone between the 3rd and 4th both up and down, as F, G, A, ♭ B, C, D. It was at a much later date that the 7th, our leading note, was admitted into a key, and for this the first two letters of the last line of the above-named hymn, "Sanctus Johannes," would have been used, save for the notion that as the note Mi was at a semitone below Fa, the same vowel should be heard at a semitone below the upper Ut, and the syllable Si was substituted for Sa. Long afterwards the syllable Ut was replaced by Do in Italy, but it is still retained in France; and in these two countries, with whatever others employ their nomenclature, the original Ut and the substituted Do stand for the sound defined by the letter C in English and German terminology. The literal musical alphabet thus accords with the syllabic:

A	B	C	D	E	F	G
La,	Si,	Ut or Do,	Re,	Mi,	Fa,	Sol.

In Germany a remnant of Greek use survives. A was originally followed in the scale by the semitone above, as the classical Mesē was followed by Paramesē, and this note, namely ♭ B, is still called B in German, English ♮ B (French and Italian Si) being represented by the letter H. The gamut which, whenever instituted, did not pass out of use until the 19th century, regarded the hexachord and not the octachord, employed both letters and syllables, made the former invariable while changing the latter according to key relationship, and acknowledged only the three keys of G, C and F; it took its name from having the Greek letter gamma with Ut for its lowest keynote, though the Latin letters with the corresponding syllables were applied to all the other notes.

GANDAK, a river of northern India. It rises in the Nepal-Himalayas, flows south-west until it reaches British territory, where it forms the boundary between the United Provinces and Bengal for a considerable portion of its course, and falls into the Ganges opposite Patna. It is a snow-fed stream, and the surrounding country in the plains, lying at a lower level than its banks, is endangered by its floods. The river is accordingly enclosed by protective embankments.

The Little Gandak rises in the Nepal hills, enters Gorakhpur district about 8 m. west of the Gandak, and joins the Gogra just within the Saran district of Bengal.

The Burhi (or old) Gandak also rises in the Nepal hills, and follows a course roughly parallel to and east of that of the Gandak, of which it represents an old channel, passing Muzaffarpur, and joining the Ganges nearly opposite to Moughjr. Its principal tributary is the Baghmati, which rises in the hills N. of Kathmandu, flows in a southerly direction through Tirhut, and joins the Burhi Gandak close to Rusera.

GANDAMAK, a village of Afghanistan, 35 m. from Jalalabad on the road to Kabul. On the retreat from Kabul of General Elphinstone's army in 1842, a hill near Gandamak was the scene of the massacre of the last survivors of the force, twenty officers and forty-five British

soldiers. It is also notable for the treaty of Gandamak, which was signed here in 1879 with Yakub Khan. (See AFGHANISTAN.)

GANDERSHEIM, a town of Germany in the duchy of Brunswick, in the deep valley of the Gande, 48 m. S.W. of Brunswick, on the railway Böissum-Holzminden. Pop. (1905) 2847. It has two Protestant churches of which the convent church (*Stiftskirche*) contains the tombs of famous abbesses, a palace (now used as law courts) and the famous abbey (now occupied by provincial government offices). There are manufactures of linen, cigars, beet-root sugar and beer.

The abbey of Gandersheim was founded by Duke Ludolf of Saxony, who removed here in 856 the nuns who had been shortly before established at Brunshausen. His own daughter Hathumoda was the first abbess, who was succeeded on her death by her sister Gerberga. Under Gerberga's government Louis III. granted a privilege, by which the office of abbess was to continue in the ducal family of Saxony as long as any member was found competent and willing to accept the same. Otto III. gave the abbey a market, a right of toll and a mint; and after the bishop of Hildesheim and the archbishop of Mainz had long contested with each other about its supervision, Pope Innocent III. declared it altogether independent of both. The abbey was ultimately recognized as holding directly of the Empire, and the abbess had a vote in the imperial diet. The conventual estates were of great extent, and among the feudatories who could be summoned to the court of the abbess were the elector of Hanover and the king of Prussia. Protestantism was introduced in 1568, and Magdalena, the last Roman Catholic abbess, died in 1589; but Protestant abbesses were appointed to the foundation, and continued to enjoy their imperial privileges till 1803, when Gandersheim was incorporated with Brunswick. The last abbess, Augusta Dorothea of Brunswick, was a princess of the ducal house, and kept her rank till her death. The memory of Gandersheim will long be preserved by its literary memorials. Hroswitha, the famous Latin poet, was a member of the sisterhood in the 9th century; and the rhyming chronicle of Eberhard of Gandersheim ranks as in all probability the earliest historical work composed in low German.

The Chronicle, which contains an account of the first period of the monastery, is edited by L. Wieland in the *Monumenta Germ. historica* (1877), and has been the object of a special study by Paul Hasse (Göttingen, 1872). See also "Agii vita Hathumodae abbatissae Gandershemensis primae," in J.G. von Eckhart's *Veterum monumentorum quaternio* (Leipzig, 1720); and Hase, *Mittelalterliche Baudenkmäler Niedersachsens* (1870).

GANDHARVA, in Hindu mythology, the term used to denote (1) in the Rig-Veda usually a minor deity; (2) in later writings a class of divine beings. As a unity Gandharva has no special attributes but many duties, and is in close relation with the great gods. Thus he is director of the sun's horses; he is guardian of soma, the sacred liquor, and therefore is regarded as the heavenly physician, soma being a panacea. He is servant of Agni the god of light and of Varuna the divine judge. He is omnipresent: in the heavens, in the air and in the waters. He is the keeper of heaven's secrets and acts as messenger between gods and men. He is gorgeously clothed and carries shining weapons. For wife he has the spirit of the clouds and waters, Apsaras, and by her became father of the first mortals, Yama and Yami. He is the tutelary deity of women and presides over marriage ceremonies. In their collective capacity the Gandharva share the duties allotted to the single deity. They live in the house of Indra and with their wives, the Apsaras, beguile the time by singing, acting and dancing. Sometimes they are represented as numbering twelve, sometimes twenty-seven, or they are innumerable. In Hindu law a Gandharva marriage is one contracted by mutual consent and without formality.

GANDÍA, a seaport of eastern Spain, in the province of Valencia; on the Gandía-Alcóy and Alcira-Denia railways. Pop. (1900) 10,026. Gandía is on the left bank of the river Alcóy or Sérpis, which waters one of the richest and most populous plains of Valencia and enters the Mediterranean Sea at the small harbour of Gandía (*El Grao*), 3 m. N.E. The chief ancient buildings of Gandía are the Gothic church, the college, founded by San Francisco de Borgia, director-general of the order of Jesus (1510-1572), and the palace of the dukes of Gandía—a title held in the 15th and 16th centuries by members of the princely house of Borgia or Borja. A Jesuit convent, the theatre, schools and the palace of the dukes of Osuna, are modern. Besides its manufactures of leather, silk, velvet and ribbons, Gandía has a thriving export trade in fruit, and imports coal, guano, timber and flour. In 1904, 400 vessels, of 200,000 tons, entered the harbour.

GANDO, a sultanate of British West Africa, included in the protectorate of Nigeria, situated on the left bank of the Niger above Borgu. The sultanate was established, c. 1819, on the death of Othman Dan Fodio, the founder of the Fula empire, and its area and importance varied considerably during the 19th century, several of the Fula emirates being regarded as tributaries, while Gando itself was more or less dependent on Sokoto. Gando in the middle of the century included both banks of the Niger at least as far N.W. as Say. The districts outside the British protectorate now belong to France. Since 1884 Gando has been in treaty relations with the British, and in 1903 the part assigned to the British sphere by agreement with France came definitely under the control of the administration in Nigeria. Gando now forms the sub-province of the double province of Sokoto. The emir was appointed under British authority after the conquest of Sokoto in 1903. Since that date the province has been organized for administration on the same system as the rest of the protectorate of Northern Nigeria. Provincial and native courts of justice have been established, roads have been opened, the slave trade has been abolished, and the country assessed under the new scheme for taxation. British garrisons are stationed at Jegga and Ambrusa. The chief town is Gando, situated on the Sokoto, the first considerable affluent of the Niger from the east, about 60 m. S.W. of the town of Sokoto.

GANESA, or GANESH, in Hindu mythology, the god of wisdom and prudence, always represented with an elephant’s head possibly to indicate his sagacity. He is the son of Siva and Parvati. He is among the most popular of Indian deities, and almost every act, religious or social, in a Hindu’s life begins with an invocation to him, as do most books. He typifies not the wisdom of knowledge but that worldly wisdom which results in financial success, and thus he is particularly the god of the Hindu shopkeeper. In his divine aspect Ganesa is ruler over the hosts of heaven, the spirits which come and go to do Indra’s will.

GANGES (GANGA), a great river of northern India, formed by the drainage of the southern ranges of the Himalayas. This mighty stream, which in its lower course supplies the river system of Bengal, rises in the Garhwal state, and falls into the Bay of Bengal after a course of 1500 m. It issues, under the name of the Bhagirathi, from an ice cave at the foot of a Himalayan snow-bed near Gangotri, 10,300 ft. above the level of the sea.

> During its passage through the southern spurs of the Himalayas it receives the Jahnavi from the north-west, and subsequently the Alaknanda, after which the united stream takes the name of the Ganges. Deo Prayag, their point of junction, is a celebrated place of pilgrimage, as is also Gangotri, the source of the parent stream. At Sukhi it pierces through the Himalayas, and turns south-west to Hardwar, also a place of great sanctity. It proceeds by a tortuous course through the districts of Dehra Dun, Saharanpur, Muzaffarnagar,

Bulandshahr and Farukhabad, in which last district it receives the Ramganga. Thus far the Ganges has been little more than a series of broad shoals, long deep pools and rapids, except, of course, during the melting of the snows and throughout the rainy season. At Allahabad, however, it receives the Jumna, a mighty sister stream, which takes its rise also in the Himalayas to the west of the sources of the Ganges. The combined river winds eastwards by south-east through the United Provinces, receiving the Gumti and the Gogra. The point of junction with both the Gumti and the Gogra has more or less pretension to sanctity. But the tongue of land at Allahabad, where the Jumna and the Ganges join, is the true Prayag, *the* place of pilgrimage, to which hundreds of thousands of devout Hindus repair to wash away their sins in the sacred river. It is here that the great festival called the Magh mela is held.

Shortly after passing the holy city of Benares the Ganges enters Behar, and after receiving an important tributary, the Sone from the south, passes Patna, and obtains another accession to its volume from the Gandak, which rises in Nepal. Farther to the east it receives the Kusi, and then, skirting the Rajmahal hills, turns sharply to the southward, passing near the site of the ruined city of Gaur. By this time it has approached to within 240 m., as the crow flies, from the sea. About 20 m. farther on it begins to branch out over the level country, and this spot marks the commencement of the delta, 220 m. in a straight line, or 300 by the windings of the river, from the Bay of Bengal. The main channel takes the name of the Padma or Padda, and proceeds in a south-easterly direction, past Pabna to Goalanda, above which it is joined by the Jamuna or main stream of the Brahmaputra. The vast confluence of waters rushes towards the sea, receiving further additions from the hill country on the east, and forming a broad estuary known under the name of the Meghna, which enters the Bay of Bengal near Noakhali. This estuary, however, is only the largest and most easterly of a great number of mouths or channels. The most westerly is the Hugli, which receives the waters of a number of distributary channels that start from the parent Ganges above Murshidabad. Between the Hugli on the west and the Meghna on the east lies the delta. The upper angle of it consists of rich and fertile districts, such as Murshidabad, Nadia, Jessore and the 24 Parganas. But towards its southern base, resting on the sea, the country sinks into a series of great swamps, intercepted by a network of innumerable channels. This wild waste is known as the Sundarbans, from the *sundari* tree, which grows in abundance in the seaboard tracts.

The most important channel of the Ganges for commerce is the Hugli, on which stands Calcutta, about 90 m. from the mouth. Beyond this city the navigation is conducted by native craft,—the modern facilities for traffic by rail and the increasing shoals in the river having put an end to the previous steamer communication, which plied until about 1860 as high up as Allahabad. Below Calcutta important boat routes through the delta connect the Hugli with the eastern branches of the river, for both native craft and steamers.

The Ganges is essentially a river of great cities: Calcutta, Monghyr, Patna, Benares and Allahabad all lie on its course below its junction with the Jumna; and the ancient capitals, Agra and Delhi, are on the Jumna, higher up. The catchment basin of the Ganges is bounded on the N. by a length of about 700 m. of the Himalayan range, on the S. by the Vindhya mountains, and on the E. by the ranges which separate Bengal from Burma. The vast river basin thus enclosed embraces 432,480 sq. m. According to the latest calculations, the length of the main stream of the Ganges is 1540 m., or with its longest affluent, 1680; breadth at true entrance into the sea, 20 m.; breadth of channel in dry season, 1¼ to 2¼ m.; depth in dry season, 30 ft.; flood discharge, 1,800,000 cub. ft. per second; ordinary discharge, 207,000 cub. ft.; longest duration of flood, about 40 days. The average fall from Allahabad to Benares is 6 in. per mile; from Benares to Calcutta, between 4 and 5 in.; from Calcutta to the sea, 1 to 2 in. Great changes take place from time to time in the river-bed, which alter the face of the country. Extensive islands are thrown up, and attach themselves to the mainland, while the river deserts its old bed and seeks a new channel, it may be many miles off. Such changes are so rapid and on so vast a scale, and the corroding power of the current on the bank so irresistible, that in Lower Bengal it is considered perilous to build any structure of a large or permanent character on its margin. Many decayed or ruined cities attest the changes in the river-bed in ancient times; and within our own times the main channel which formerly passed Rajmahal has turned away from it, and left the town high and dry, 7 m. from the bank.

The Ganges is crossed by six railway bridges on its course as far as Benares; and another, at Sara in Eastern Bengal, has been sanctioned.

The Upper Ganges Canal and the Lower Ganges Canal are the two principal systems of perennial irrigation in the United Provinces. The Ganges canal was opened by Lord Dalhousie in 1854, and irrigates 978,000 acres. The Lower Ganges canal, an extension of the original canal, has been in operation since 1878 and irrigates 830,000 acres. The two canals, together with the eastern Jumna, command the greater portion of the Doab lying between

the Ganges and the Jumna, above Allahabad. Navigation in either is insignificant.

(T. H. H.*)

GANGOTRI, a celebrated place of Hindu pilgrimage, among the Himalaya Mountains. It is situated in the native state of Garhwal in the United Provinces, on the Bhagirathi, the chief head-stream of the Ganges, which is here not above 15 or 20 yds. broad, with a moderate current, and not in general above 3 ft. deep. The course of the river runs N. by E.; and on the bank near Gangotri there is a small temple about 20 ft. high, in which are images representing Ganga, Bhagirathi and other figures of mythology. It dates from the early part of the 18th century. The bed of the river adjoining the temple is divided off by the Brahmans into three basins, where the pilgrims bathe. One of these portions is dedicated to Brahma, another to Vishnu and the third to Siva. The pilgrimage to Gangotri is considered efficacious in washing away the sins of the devotee, and ensuring him eternal happiness in the world to come. The water taken from this sacred spot is exported by pilgrims to India and sold at a high price. The elevation of the temple above the sea is 10,319 ft.

GANGPUR, a tributary state of Orissa, Bengal, included until 1905 among the Chota Nagpur States. It is bounded N. by Ranchi district, E. by the Singhbhum district, S. by Sambalpur and Bamra, and W. by Raigarh in the Central Provinces. The country is for the most part an undulating plain, broken by detached ranges of hills, one of which, the Mahavira range, possesses a very remarkable appearance, springing abruptly from the plain in an irregular wall of tilted and disrupted rock, with two flanking peaks. The rivers are the Ib and the Brahmani, formed here by the union of the Sankh and the South Koel, both navigable by canoes. The Ib was formerly famous on account of diamonds found in its bed, and its sands are still washed for gold. One of the largest coalfields in India extends into the state, and iron ore is also found. Jungle products—lac, silk cocoons, catechu and resin, which are exported; wild animals—bisons, buffaloes, tigers, leopards, hyenas, wolves, jackals, wild dogs and many sorts of deer. Area, 2492 sq. m.; pop. (1901) 238,896; estimated revenue, £16,000.

GANGRENE (from Gr. γάγγραινα, an eating sore, from γραίνειν, to gnaw), a synonym in medicine for mortification (*q.v.*), or a local death in the animal body due to interruption of the circulation by various causes.

GANILH, CHARLES (1758-1836), French economist and politician, was born at Allanche in Cantal on the 6th of January 1758. He was educated for the profession of law and practised as *avocat*. During the troubled period which culminated in the taking of the Bastille on the 14th of July 1789, he came prominently forward in public affairs, and was one of the seven members of the permanent Committee of Public Safety which sat at the hôtel de ville. He was imprisoned during the Reign of Terror, and was only released by the counter-revolution of the 9th Thermidor. During the first consulate he was called to the tribunate, but was excluded in 1802. In 1815 he was elected deputy for Cantal, and finally left the Chamber on its dissolution in 1823. He died in 1836. Ganilh is best known as the most vigorous defender of the mercantile school in opposition to the views of Adam Smith and the

English economists.

His works, though interesting from the clearness and precision with which these peculiar opinions are presented, do not now possess much value for the student of political economy. He wrote *Essai politique sur le revenue des peuples de l'antiquité, du moyen âge, &c.* (1808); *Des systèmes d'économie politique* (1809); *Théorie d'économie politique* (1815); *Dictionnaire analytique de l'économie politique* (1826).

GANJAM, a district of British India, in the extreme north-east of the Madras Presidency. It has an area of 8372 sq. m. Much of the district is exceedingly mountainous and rocky, but is interspersed with open valleys and fertile plains. Pleasant groves of trees in the plains give to the scenery a greener appearance than is usually met with in the districts to the south. The mountainous tract known as the Maliyas, or chain of the Eastern Ghats, has an average height of about 2000 ft.—its principal peaks being Singharaj (4976 ft.), Mahendragiri (4923) and Devagiri (4535). The hilly region forms the agency of Ganjam, with an area of 3483 sq. m. and a population (in 1901) of 321,114, mostly wild backward tribes, incapable of being governed under ordinary conditions and therefore ruled by an agent of the governor with special powers. The chief rivers are the Rushikulya, the Vamsadhara and the Languliya. The sea and river fisheries afford a livelihood to a considerable section of the population. The hilly region abounds in forests consisting principally of *sal*, with satin-wood, ebony and sandal-wood in smaller quantities.

Ganjam formed part of the ancient kingdom of Kalinga. Its early history is involved in obscurity, and it was not till after the Gajapati dynasty ascended the throne of Orissa that this tract became even nominally a part of their dominions. Owing to the nature of the country the rising Mahommedan power was long kept at bay; and it was not till nearly a century after the first invasion of Orissa that a Mahommedan governor was sent to govern the Chicacole Circars, which included the present district of Ganjam. In 1753 Chicacole, with the Northern Circars, were made over to the French by Salabat Jang for the maintenance of his French auxiliaries. In 1759 Masulipatam was taken by an English force sent from Bengal, and the French were compelled to abandon Ganjam and their other factories in the north. In 1765 the Northern Circars (including Ganjam) were granted to the English by imperial firman, and in August 1768 an English factory was founded at Ganjam, protected by a fort. The present district of Ganjam was constituted in 1802. In the earlier years of British rule considerable difficulty was experienced in the administration of the district; and on more than one occasion the refractory large landholders had to be coerced by means of regular troops. In 1816 Ganjam was overrun by the Pindaris; and in 1836 occurred the Gumsur campaign, when the British first came into contact with the aboriginal Kondhs, the suppression of whose practice of human sacrifice was successfully accomplished. A petty rising of a section of the Kondhs occurred in 1865, which was, however, suppressed without the aid of regular troops.

In 1901 the pop. of the district was 2,010,256, showing an increase of 20% in the decade. There are two systems of government irrigation: (1) the Rushikulya project, and (2) the Ganjam minor rivers system. The principal crops are rice, other food grains, pulse, oil seeds and a little sugar-cane and cotton. Salt is evaporated, as a government monopoly, along the coast. Sugar is refined, according to German methods, at Aska, where rum also is produced. A considerable trade is conducted at the ports of Gopalpur and Calingapatam, which are only open roadsteads. The district is traversed throughout by the East Coast railway (Bengal-Nagpur system), which was opened from Calcutta to Madras in 1900. There are colleges at Berhampore and Parlakimedi. The headquarters station is Berhampore; the town of Ganjam occupied this position till 1815, when it was found unhealthy, and its importance has since declined.

GANNAL, JEAN NICOLAS (1791-1852), French chemist, was born at Sarre-Louis on the 28th of July 1791. In 1808 he entered the medical department of the French army, and

witnessed the retreat from Moscow in 1812. After the downfall of the empire he worked at the École Polytechnique in Paris and subsequently at the Faculty of Sciences as assistant to L.J. Thénard. His contributions to technical chemistry included a method of refining borax, the introduction of elastic rollers formed of gelatin and sugar for use in printing, and processes for manufacturing glue and gelatin, lint, white lead, &c. The Institute awarded him a Montyon prize in 1827 for his advocacy of chlorine as a remedy in pulmonary phthisis, and again in 1835 for his discovery of the efficacy of solutions of aluminium acetate and chloride for preserving anatomical preparations. In the latter part of his life he turned his attention to embalmment, his method depending on the injection of solutions of aluminium salts into the arteries. He died at Paris in January 1852. His son Felix, born in 1829, also devoted himself to the question of the disposal of the dead, among his publications being *Mort réelle et mort apparente* (1868), *Inhumation et crémation* (1876), and *Les Cimetières* (1885), a work on the history and law of burial, of which only one volume appeared.

GANNET (O.E. *ganot*) or Solan Goose,[1] the *Pelecanus bassanus* of Linnaeus and the *Sula bassana* of modern ornithologists, a large sea-fowl long known as a numerous visitor, for the purpose of breeding, to the Bass Rock at the entrance of the Firth of Forth, and to certain other islands off the coast of Britain, of which four are in Scottish waters—namely, Ailsa Craig, at the mouth of the Firth of Clyde; the group known collectively as St Kilda; Suleskerry, some 40 m. north-east of the Butt of Lewis; and the Stack and Skerry, about the same distance westward of Stromness. It appears also to have two stations off the coast of Ireland, the Skellig Islands and the Stags of Broadhaven, and it resorts besides to Lundy Island in the Bristol Channel—its only English breeding-place. Farther to the northward its settlements are Myggenaes, the most westerly of the Faeroes, and various small islands off the coast of Iceland, of which the Vestmannaeyjar, the Reykjanes Fuglaskér and Grimsey are the chief. On the western side of the Atlantic it appears to have but five stations, one in the Bay of Fundy, and four rocks in the Gulf of St Lawrence. On all these seventeen places the bird arrives about the end of March or in April and departs in autumn when its young are ready to fly; but even during the breeding-season many of the adults may be seen on their fishing excursions at a vast distance from their home, while at other times of the year their range is greater still, for they not only frequent the North Sea and the English Channel, but stray to the Baltic, and, in winter, extend their flight to the Madeiras, while the members of the species of American birth traverse the ocean from the shores of Greenland to the Gulf of Mexico.

Gannet, or Solan Goose.

Apparently as bulky as a goose, and with longer wings and tail, the gannet weighs considerably less. The plumage of the adult is white, tinged on the head and neck with buff, while the outer edge and principal quills of the wings are black, and some bare spaces round the eyes and on the throat reveal a dark blue skin. The first plumage of the young is of a deep brown above, but paler beneath, and each feather is tipped with a triangular white spot. The nest is a shallow depression, either on the ground itself or on a pile of turf, grass and seaweed—which last is often conveyed from a great distance. The single egg it contains has a white shell of the same chalky character as a cormorant's. The young are hatched blind and naked, but the slate-coloured skin with which their body is covered is soon clothed with white down, replaced in due time by true feathers of the dark colour already mentioned. The mature plumage is believed not to be attained for some three years. Towards the end of summer the majority of gannets, both old and young, leave the neighbourhood of their breeding-place, and, betaking themselves to the open sea, follow the shoals of herrings and other fishes (the presence of which they are most useful in indicating to fishermen) to a great distance from land. Their prey is almost invariably captured by plunging upon it from a height, and a company of gannets fishing presents a curious and interesting spectacle. Flying in a line, each bird, when it comes over the shoal, closes its wings and dashes perpendicularly into the waves, whence it emerges after a few seconds, and, shaking the water from its feathers, mounts in a wide curve, and orderly takes its place in the rear of the string, to repeat its headlong plunge so soon as it again finds itself above its prey.[2]

Structurally the gannet presents many points worthy of note, such as its closed nostrils, its aborted tongue, and its toes all connected by a web—characters which it possesses in common with most of the other members of the group of birds (*Steganopodes*) to which it belongs. But more remarkable still is the system of subcutaneous air-cells, some of large size, pervading almost the whole surface of the body, communicating with the lungs, and capable of being inflated or emptied at the will of the bird. This peculiarity has attracted the attention of several writers—Montagu, Sir R. Owen (*Proc. Zool. Soc.*, 1831, p. 90), and Macgillivray.

In the southern hemisphere the gannet is represented by two nearly allied but somewhat smaller forms—one, *Sula capensis*, inhabiting the coast of South Africa, and the other, *S. serrator*, the Australian seas. Both much resemble the northern bird, but the former seems

to have a permanently black tail, and the latter a tail the four middle feathers of which are blackish-brown with white shafts.

Apparently inseparable from the gannets generically are the smaller birds well known to sailors as boobies, from the extraordinary stupidity they commonly display. They differ, however, in having no median stripe of bare skin down the front of the throat; they almost invariably breed upon trees and are inhabitants of warmer climates. One of them, *S. cyanops*, when adult has much of the aspect of a gannet, but *S. piscator* is readily distinguishable by its red legs, and *S. leucogaster* by its upper plumage and neck of deep brown. These three are widely distributed within the tropics, and are in some places exceedingly abundant. The fourth, *S. variegata*, which seems to preserve throughout its life the spotted suit characteristic of the immature *S. bassana*, has a much more limited range, being as yet only known from the coast of Peru, where it is one of the birds which contribute to the formation of guano.

(A. N.)

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1 The phrase *ganotes bæð* (gannet's bath), a periphrasis for the sea, occurs in the *Anglo-Saxon Chronicle*, in reference to events which took place A.D. 975, as pointed out by Prof. Cunningham, whose learned treatise on this bird (*Ibis*, 1866, p. 1) nearly exhausts all that can be said of its history and habits. A few pages further on (p. 13) this writer remarks:—"The name gannet is intimately connected with our modern English gander, both words being modifications of the ancient British 'gan' or 'gans,' which is the same word as the modern German 'Gans,' which in its turn corresponds with the old High German 'Kans,' the Greek χήν, the Latin *anser*, and the Sanskrit 'hansa,' all of which possess the same signification, viz. a goose. The origin of the names solan or soland, sulan, sula and haf-sula, which are evidently all closely related, is not so obvious. Martin [*Voy. St Kilda*] informs us that 'some imagine that the word solan comes from the Irish souler, corrupted and adapted to the Scottish language, *qui oculis irretortis e longinquo respiciat praedam*.' The earlier writers in general derive the word from the Latin *solea*, in consequence of the bird's supposed habit of hatching its egg with its foot; and in a note intercalated into Ray's description of the solan goose in the edition of his Itineraries published by the Ray Society, and edited by Dr Lankester, we are told, though no authority for the statement is given, that 'the gannet, *Sula alba*, should be written solent goose, *i.e.* a channel goose.'" Hereon an editorial note remarks that this last statement appears to have been a suggestion of Yarrell's, and that it seems at least as possible that the "Solent" took its name from the bird.

2 The large number of gannets, and the vast quantity of fish they take, has been frequently animadverted upon, but the computations on this last point are perhaps fallacious. It seems to be certain that in former days fishes, and herrings in particular, were at least as plentiful as now, if not more so, notwithstanding that gannets were more numerous. Those frequenting the Bass were reckoned by Macgillivray at 20,000 in 1831, while in 1869 they were computed at 12,000, showing a decrease of two-fifths in 38 years. On Ailsa in 1869 there were supposed to be as many as on the Bass, but their number was estimated at 10,000 in 1877 (*Report on the Herring Fisheries of Scotland*, 1878, pp. xxv. and 171),—being a diminution of one-sixth in eight years, or nearly twice as great as on the Bass.

GANODONTA (so named from the presence of bands of enamel on the teeth), a group of specialized North American Lower and Middle Eocene mammals of uncertain affinity. The group includes *Hemiganus*, *Psittacotherium* and *Conoryctes* from the Puerco, *Calamodon* and *Hemiganus* from the Wasatch, and *Stylinodon* from the Bridger Eocene. With the exception of *Conoryctes*, in which it is longer, the skull is short and suggests affinity to the sloths, as does what little is known of the limb-bones. The dentition, too, is of a type which might well be considered ancestral to that of the Edentata. For instance, the molars when first developed have tritubercular summits, but these soon become worn away, leaving tall columnar crowns, with a subcircular surface of dentine exposed at the summit of each. Moreover, while the earlier types have a comparatively full series of teeth, all of which are rooted and invested with enamel, in the later forms the incisors are lost, the cheek-teeth never develop roots but grow continuously throughout life. These and other features induced Dr J.L. Wortman to regard the Ganodonta as an ancestral suborder of Edentata; but this view is not accepted by Prof. W.B. Scott. Teeth provisionally assigned to *Calamodon* have been obtained from the Lower Tertiary deposits of Switzerland.

See J.L. Wortman, "The Ganodonta and their Relationship to the Edentata," *Bull. Amer. Mus.* vol. ix. p. 59 (1897); W.B. Scott, "Mammalia of the Santa Cruz Beds, Edentata," *Rep.*

Princeton Exped. to Patagonia, vol. v. (1903-1904).

(R. L.*)

GANS, EDUARD (1797-1839), German jurist, was born at Berlin on the 22nd of March 1797, of prosperous Jewish parents. He studied law first at Berlin, then at Göttingen, and finally at Heidelberg, where he attended Hegel's lectures, and became thoroughly imbued with the principles of the Hegelian philosophy. In 1820, after taking his doctor's degree, he returned to Berlin as lecturer on law. In 1825 he turned Christian, and the following year was appointed extraordinary, and in 1828 ordinary, professor in the Berlin faculty of law. At this period the historical school of jurisprudence was coming to the front, and Gans, predisposed owing to his Hegelian tendencies to treat law historically, applied the method to one special branch—the right of succession. His great work, *Erbrecht in weltgeschichtlicher Entwicklung* (1824, 1825, 1829 and 1835), is of permanent value, not only for its extensive survey of facts, but for the admirable manner in which the general theory of the slow evolution of legal principles is presented. In 1830, and again in 1835, Gans visited Paris, and formed an intimate acquaintance with the leaders of literary culture and criticism there. The liberality of his views, especially on political matters, drew upon Gans the displeasure of the Prussian government, and his course of lectures on the history of the last fifty years (published as *Vorlesungen über d. Geschichte d. letzten fünfzig Jahre*, Leipzig, 1833-1834) was prohibited. He died at Berlin on the 5th of May 1839. In addition to the works above mentioned, there may be noted the treatise on the fundamental laws of property (*Über die Grundlage des Besitzes*, Berlin, 1829), a portion of a systematic work on the Roman civil law (*System des römischen Civil-Rechts*, 1827), and a collection of his miscellaneous writings (*Vermischte Schriften*, 1832). Gans edited the *Philosophie der Geschichte* in Hegel's *Werke*, and contributed an admirable preface.

See *Revue des deux mondes* (Dec. 1839).

GÄNSBACHER, JOHANN BAPTIST (1778-1844), Austrian musical composer, was born in 1778 at Sterzing in Tirol. His father, a schoolmaster and teacher of music, undertook his son's early education, which the boy continued under various masters till 1802, when he became the pupil of the celebrated Abbé G.J. Vogler. To his connexion with this artist and with his fellow-pupils, more perhaps than to his own merits, Gänsbacher's permanent place in the history of music is due; for it was during his second stay with Vogler, then (1810) living at Darmstadt, that he became acquainted with Weber and Meyerbeer, and the close friendship which sprang up among the three young musicians, and was dissolved by death only, has become celebrated in the history of their art. But Gänsbacher was himself by no means without merit. He creditably filled the responsible and difficult post of director of the music at St Stephen's cathedral, Vienna, from 1823 till his death (July 13, 1844); and his compositions show high gifts and accomplishment. They consist chiefly of church music, 17 masses, besides litanies, motets, offertories, &c., being amongst the number. He also wrote several sonatas, a symphony, and one or two minor compositions of a dramatic kind.

GANTÉ, a cloth made from cotton or tow warp and jute weft. It is largely used for bags for sugar and similar material, and has the appearance of a fine hessian cloth.

GANYMEDE, in Greek mythology, son of Tros, king of Dardania, and Callirrhoë. He was the most beautiful of mortals, and was carried off by the gods (in the later story by Zeus himself, or by Zeus in the form of an eagle) to Olympus to serve as cup-bearer (Apollodorus iii. 12; Virgil, *Aeneid*, v. 254; Ovid, *Metam.* x. 255). By way of compensation, Zeus presented his father with a team of immortal horses (or a golden vine). Ganymede was afterwards regarded as the genius of the fountains of the Nile, the life-giving and fertilizing river, and identified by astronomers with the Aquarius of the zodiac. Thus the divinity that distributed drink to the gods in heaven became the genius who presided over the due supply of water on earth. When pederasty became common in Greece, an attempt was made to justify it and invest it with dignity by referring to the rape of the beautiful boy by Zeus; in Crete, where the love of boys was reduced to a system, Minos, the primitive ruler and law-giver, was said to have been the ravisher of Ganymede. Thus the name which once denoted the good genius who bestowed the precious gift of water upon man was adopted to this use in vulgar Latin under the form *Catamitus*. Ganymede being carried off by the eagle was the subject of a bronze group by the Athenian sculptor Leochares, imitated in a marble statuette in the Vatican. E. Veckenstedt (*Ganymedes*, Libau, 1881) endeavours to prove that Ganymede is the genius of intoxicating drink (μέθυ, mead, for which he postulates a form μῆδος), whose original home was Phrygia.

See article by P. Weizsäcker in Roscher's *Lexikon der Mythologie*. In the article Greek Art, fig. 53 (Pl. I.) gives an illustration of Ganymede borne aloft by an eagle.

GAO, Gao-Gao, or Garo, a town of French West Africa, in the Upper Senegal and Niger colony, on the left bank of the Niger, 400 m. by river below Timbuktu. Pop. about 5000. The present town dates from the French occupation in 1900; of the ancient city there are scanty ruins, the chief being a truncated pyramid, the remains of the tomb (16th century) of Mahommed Askia, the Songhoi conqueror, and those of the great mosque. According to tradition a city stood on this spot in very ancient times and its inhabitants are said to have had intercourse with the Egyptians. It is known, however, that the city of which the French settlement is the successor was founded by the Songhoi, probably in the 7th or 8th century, and became the capital of their empire. Garo (Ga-rho) appears to have been the correct name of the Songhoi city, though it was also known as Gogo and Kuku (Kaougha)[1]. In the 12th century Idrisi describes Kuku as a populous unwalled town devoted to commerce and industry; it is possible, however, that Idrisi is referring not to Gao but to another town somewhat to the south—at that period the middle course of the Niger had many prosperous towns along its banks. In the 14th century Gao was conquered by the king of Melle, and its great mosque was built (*c.* 1325) by the Melle sovereign Kunkur Musa on his return from a pilgrimage to Mecca. In the 15th century the Songhoi regained power and Gao attained its greatest prosperity in the reign of Askia. It did not enjoy the commercial importance of Jenné nor the intellectual supremacy of Timbuktu, but was the political centre of the western Sudan for a long period. On the break up of the Songhoi power the city declined in importance. It became subject in 1590 to the *Ruma* of Timbuktu, from whom it was wrested in 1770 by the Tuareg, the last named surrendering possession to the French. The first European to reach Gao was Mungo Park (1805); he was followed in 1851 by Heinrich Barth, and in 1896 by the French naval lieutenant Hourst. Gao is now the headquarters of a military district. A caravan route leads from it to Kano and Bornu. From Gao upwards the Niger is navigable for over 1000 m.

See Timbuktu. For the Gao region of the Niger see an article by F. Dubois in *L'Afrique française* (January 1909).

1 There was another city called Kaoka or Gaoga east of Lake Chad in the country now known as Bagirmi. It was the seat of the Bulala dynasty, an offshoot of the royal family of Kanem, whose rule in the 15th century extended from the Shari to Darfur. The existence of the state was first mentioned by Leo Africanus. To the Bornuese it was known as Bulala or Kuka Bulala, a name which persists as that of a district in French Congo (see Bornu). The similarity of the name Gaoga to that of the Songhoi capital has given rise to much confusion.

GAOL, or JAIL, a prison (*q.v.*). The two forms of the word are due to the parallel dual forms in Old Central and Norman French respectively, *jaiole* or *jaole*, and *gaiole* or *gayolle*. The common origin is the med. Lat. *gabiola*, a diminutive formed from *cavea*, a hollow, a den, from which the English "cave" is derived. The form "gaol" still commonly survives in English, and is in official usage, *e.g.* "gaol-delivery," but the common pronunciation of both words, "jail," shows the real surviving word.

GAON (Heb. for "Excellency," plural *Geonim*), the title given to the heads of the two Jewish academies in Babylonia, Sura and Pumbeditha. Though the name is far older, it is chiefly applied to Rabbis who lived between the close of the Talmud and the transference of the centre of Judaism from Asia to Europe—*i.e.* from the end of the 6th to the middle of the 11th century A.D. The Geonim were required to do homage to the Exilarchs (see EXILARCH) but were otherwise independent. They exercised wide authority and were appealed to in settlement of the social and religious affairs of the diaspora. To them must be assigned the arrangement of the main lines of the present Synagogue liturgy. Their chief literary activity took the form of Answers to Questions—a form which was extensively used in later centuries. The most noted of the Geonim, who will be found treated under their respective names, were Aḥai, Amram, Ṣemach, Saadiah, Sherira and Hai. Hai Gaon died in 1038, closing the period of the Geonim after an activity of four and a half centuries.

A full list of the Geonim is given in tabular form in the *Jewish Encyclopaedia*, vol. v. p. 571.

(I. A.)

GAP, the capital of the French department of the Hautes Alpes. Pop. (1906) town, 6888; commune, 10,823. It is built at a height of 2418 ft. on the right bank of the Luye (an affluent of the Durance), in an agreeable position, and is dominated afar by snowy peaks on the N.E. The little city has the look of a Provençal town, being white. The 17th-century cathedral church has been entirely reconstructed (1866-1905). In the prefecture is the tomb of the constable de Lesdiguières (1543-1626), dating from about 1613, and due to a Lorraine sculptor, Jacob Richier. The same building contains various scientific and archaeological collections, as well as the very rich archives, which include many MSS. from the monastery of Durbon, &c. There are a few small manufactories of purely local importance. Gap is connected by railway with Briançon (51½ m.) and with Grenoble (85½ m.), while from the railway junction of Veynes (16½ m. W. of Gap) it is 122 m. by rail to Marseilles. The episcopal see of Gap, now in the ecclesiastical province of Aix en Provence, is first certainly mentioned in the 6th century, and in 1791 was enlarged by the annexation of that of Embrun (then suppressed).

Gap is the *Vapincum* of the Romans, and was founded by Augustus about 14 B.C. It long formed part of Provence, but in 1232 most of the region passed by marriage to the dauphins of Viennois. The town itself, however, remained under the rule of the bishops until 1512, when it was annexed to the crown of France. The bishops continued to bear the title of count of Gap until the Revolution. The town was sacked by the Huguenots in 1567 and 1577, and by the duke of Savoy in 1692. It was the birthplace of the reformer Guillaume Farel (1489-1565), who first preached his doctrines there about 1561-1562, but then took refuge in Switzerland.

See J. Roman, *Histoire de la ville de Gap* (Gap, 1892).

(W. A. B. C.)

GAPAN, a town of the province of Nueva Ecija, Luzon, Philippine Islands, 3 m. E. of San

Isidro, the capital. Pop. (1903) 11,278. It is situated in a rich rice-growing region, and extensive forests in its vicinity contain fine hardwoods. Its climate is comparatively cool and healthy. The principal native dialects spoken are Tagalog and Pampangan. Gapan is the oldest town of the province.

GARARISH (Kararish), a semi-nomadic tribe of Semitic origin, dwelling along the right bank of the Nile from Wādi Halfa to Merawi. Many members of the tribe are agriculturists, others act as guides or transport drivers. They declare themselves kinsfolk of the Ababda, but they are more Arab than Beja.

GARASHANIN, ILIYA (1812-1874), Servian statesman, was the son of a Servian peasant, who made money by exporting cattle and pigs to Austria and by his intelligence and wealth attained to a certain influence in the country. He wanted to give his son as good an education as possible, and therefore sent him to Hungary to learn first in a Greek and then in a German school. Highly gifted, and having passed through a regular although somewhat short school training, the young Iliya very quickly came to the front. In 1836 Prince Milosh appointed him a colonel and commander of the then just organized regular army of Servia. In 1842 he was called to the position of assistant to the home minister, and from that time until his retirement from public life in 1867 he was repeatedly minister of home affairs, distinguishing himself by the energy and justice of his administration. But he rendered far greater services to his country as minister for foreign affairs. He was the first Servian statesman who had a political programme, and who worked to replace the Russian protectorate over Servia by the joint protectorate of all the great powers of Europe. As minister for foreign affairs in 1853 he was decidedly opposed to Servia joining Russia in war against Turkey and the western powers. His anti-Russian views resulted in Prince Menshikov, while on his mission in Constantinople, 1853, peremptorily demanding from the prince of Servia (Alexander Karageorgevich) his dismissal. But although dismissed, his personal influence in the country secured the neutrality of Servia during the Crimean War. He enjoyed esteem in France, and it was due to him that France proposed to the peace conference of Paris (1856) that the old constitution, granted to Servia by Turkey as suzerain and Russia as protector in 1839, should be replaced by a more modern and liberal constitution, framed by a European international commission. But the agreement of the powers was not secured. Garashanin induced Prince Alexander Karageorgevich to convoke a national assembly, which had not been called to meet for ten years. The assembly was convoked for St Andrew’s Day 1858, but its first act was to dethrone Prince Alexander and to recall the old Prince Milosh Obrenovich. When after the death of his father Milosh (in 1860) Prince Michael ascended the throne, he entrusted the premiership and foreign affairs to Iliya Garashanin. The result of their policy was that Servia was given a new, although somewhat conservative, constitution, and that she obtained, without war, the evacuation of all the fortresses garrisoned by the Turkish troops on the Servian territory, including the fortress of Belgrade (1867). Garashanin was preparing a general rising of the Balkan nations against the Turkish rule, and had entered into confidential arrangements with the Rumanians, Bosnians, Albanians, Bulgarians and Greeks, and more especially with Montenegro. But the execution of his plans was frustrated by his sudden resignation (at the end of 1867), and more especially by the assassination of Prince Michael a few months later (the 10th of June 1868). Although he was a Conservative in politics, and as such often in conflict with the leader of the Liberal movement, Yovan Ristich, he certainly was one of the ablest statesmen whom Servia had in the 19th century.

(C. Mɪ.)

GARAT, DOMINIQUE JOSEPH (1740-1833), French writer and politician, was born at Bayonne on the 8th of September 1749. After receiving a good education under the direction of a relation who was a curé, and having been an advocate at Bordeaux, he came to Paris, where he obtained introductions to the most distinguished writers of the time, and became a contributor to the *Encyclopédie méthodique* and the *Mercure de France*. He gained considerable reputation by an éloge on Michel de L'Hôpital in 1778, and was afterwards three times crowned by the Academy for éloges on Suger, Montausier and Fontenelle. In 1785 he was named professor of history at the *Lycée*, where his lectures enjoyed an equal popularity with those of G.F. Laharpe on literature. Being chosen a deputy to the states-general in 1789, he rendered important service to the popular cause by his narrative of the proceedings of the Assembly contributed to the *Journal de Paris*. Possessing strongly optimist views, a mild and irresolute character, and indefinite and changeable convictions, he played a somewhat undignified part in the great political events of the time, and became a pliant tool in carrying out the designs of others. Danton had him named minister of justice in 1792, and in this capacity had entrusted to him what he called the *commission affreuse* of communicating to Louis XVI. his sentence of death. In 1793 he became minister of the interior. In this capacity he proved himself quite inefficient. Though himself uncorrupt, he winked at the most scandalous corruption in his subordinates, and in spite of the admirably organized detective service, which kept him accurately informed of every movement in the capital, he entirely failed to maintain order, which might easily have been done by a moderate display of firmness. At last, disgusted with the excesses which he had been unable to control, he resigned (August 15, 1793). On the 2nd of October he was arrested for Girondist sympathies but soon released, and he escaped further molestation owing to the friendship of Barras and, more especially, of Robespierre, whose literary *amour-propre* he had been careful to flatter. On the 9th Thermidor, however, he took sides against Robespierre, and on the 12th of September 1794 he was named by the Convention as a member of the executive committee of public instruction. In 1798 he was appointed ambassador to Naples, and in the following year he became a member, then president, of the Council of the Ancients. Alter the revolution of the 18th Brumaire he was chosen a senator by Napoleon and created a count. During the Hundred Days he was a member of the chamber of representatives. In 1803 he was chosen a member of the Institute of France, but after the restoration of Louis XVIII. his name was, in 1816, deleted from the list of members. After the revolution of 1830 he was named a member of the new Academy of Moral and Political Science. He died at Ustaritz near Bayonne, April 25, 1833. His writings are characterized by elegance, grace and variety of style, and by the highest kind of rhetorical eloquence; but his grasp of his subject is superficial, and as his criticisms have no root in fixed and philosophical principles they are not unfrequently whimsical and inconsistent. He must not be confounded with his elder brother Dominique (1735-1799), who was also a deputy to the states-general.

The works of Garat include, besides those already mentioned, *Considérations sur la Révolution Française* (Paris, 1792); *Mémoires sur la Révolution, ou exposé de ma conduite* (1795); *Mémoires sur la vie de M. Suard, sur ses écrits, et sur le XVIII^e^ siècle* (1820); éloges on Joubert, Kléber and Desaix; several notices of distinguished persons; and a large number of articles in periodicals. Valuable materials for the history of Garat's tenure of the ministry, notably the police reports of Dutard, are given in W.A. Schmidt's *Tableaux de la Révolution Française* (3 vols., Leipzig, 1867-1870).

GARAT, PIERRE-JEAN (1764-1823), French singer, nephew of Dominique Joseph Garat, was born in Bordeaux on the 25th of April 1764. Gifted with a voice of exceptional timbre and compass he devoted himself, from an early age, to the cultivation of his musical talents. On account of his manifesting a distaste for the legal profession, for which his father wished him to study, he was deprived of his allowance, but through the patronage of a friend he obtained the office of secretary to Comte d'Artois, and was afterwards engaged to give musical lessons to the queen of France. At the beginning of the Revolution he accompanied Rode to England, where the two musicians appeared together in concerts. He returned to Paris in 1794. After the Revolution he became a professional singer, and on account of a song which he had composed in reference to the misfortunes of the royal family he was thrown into prison. On regaining his liberty he went to Hamburg, where he at once achieved extraordinary success; and by his subsequent appearances in Paris, and his visits to Italy,

Spain, Germany and Russia, he made for himself a reputation as a singer unequalled by any other of his own time. He was a keen partisan of Gluck in opposition to Handel. On the institution of the Conservatoire de Musique he became its professor of singing. He also composed a number of songs, many of which have considerable merit. He died on the 1st of March 1823 in Paris.

GARAY, JÁNOS (1812-1853), Hungarian poet and author, was born on the 10th of October 1812, at Szegszárd, in the county of Tolna. From 1823 to 1828 he studied at Fünfkirchen, and subsequently, in 1829, at the university of Pest. In 1834 he brought out an heroic poem, in hexameters, under the title *Csatár*. After this he issued in quick succession various historical dramas, among which the most successful were *Arbócz, Országh Ilona* and *Báthori Erzsébet*,—the first two published at Pest in 1837 and the last in 1840. Garay was an energetic journalist, and in 1838 he removed to Pressburg, where he edited the political journal *Hirnök* (Herald). He returned to Pest in 1839, when he was elected a corresponding member of the Hungarian Academy of Sciences. In 1842 he was admitted into the Kisfaludy Society, of which he became second secretary. Garay enriched Hungarian literature with numerous lyrical poems, ballads and tales. The first collection of his poems was published at Pest in 1843; and his prose tales appeared in 1845, under the title of *Tollrajzok* (Sketches with the Pen). His historical ballads and legends, styled *Arpádok* (Pest, 1847, 2nd ed. 1848), showed him to be a master in the art of ballad-writing. Some of his lyrical poems also are excellent, as, for example, *Balatoni Kagylók* (Shells from the Balaton Lake) (Pest, 1848). His legend *Bosnyák Zsófia* (Pest, 1847), and his poetical romance *Frangepán Kristófné* (Christopher Frangepan's Wife) (Pest, 1846), gained the prize of the Kisfaludy Society. His last and most famous work was an historical poem in twelve cantos, with the title *Szent László* (Saint Ladislaus) (Eger, 1852, 2nd ed., Pest, 1853, 3rd ed. 1863). Garay was professor of Hungarian language and literature to the university of Pest in 1848-1849. After about four years' illness he died on the 5th of November 1853, in great want. A collective edition of his poems was published at Pest the year after his death by F. Ney (2nd ed. 1860), and several of his poems were translated by Kertbeny.

See *Garay János Összes költeményei* (2nd ed., Pest, 1860); and *Dichtungen von Johann Garay* (2nd ed., Vienna, 1856).

GARBLE (a word derived from the Arab. *gharbala*, to sift, and related to *ghirbal*, a sieve; the Arabic words are of foreign origin, probably from the Lat. *cribrum*, a sieve), originally a medieval commercial term in the Mediterranean ports, meaning to sort out, or to sift merchandize, such as corn, spices, &c., in order to separate what was good from the refuse or waste; hence to select the best of anything for retention. Similarly a "garbler" was an official who was appointed to sort out, or test the work of those who had already sorted, the spices or drugs offered for sale in the London markets. In this original sense the word is now obsolete, but by inversion, or rather perversion, "garble" now means to sort out or select, chiefly from books or other literary works, or from public speeches, some portion which twists, mutilates, or renders ineffective the meaning of the author or speaker.

GARÇÃO, PEDRO ANTONIO JOAQUIM CORRÊA (1724-1772), Portuguese lyric poet, was the son of Philippe Corrêa da Serra, a *fidalgo* of the royal house who held an important post in the foreign office; his mother was of French descent. The poet's health was frail, and after going through a Jesuit school in Lisbon and learning English, French and Italian at home, he proceeded in 1742 to the university of Coimbra with a view to a legal career. He took his degree in 1748, and two years later was created a knight of the Order of Christ. In

1751 his marriage with D. Maria Salema brought him a rich dower which enabled him to live in ease and cultivate letters; but in later years a law-suit reduced him to poverty. From 1760 to 1762 he edited the *Lisbon Gazette*. In 1756, in conjunction with Cruz e Silva and others, Garção founded the *Arcadia Lusitana* to reform the prevailing bad taste in literature, identified with *Seicentismo*, which delighted in conceits, windy words and rhetorical phrases. The *Arcadia* fulfilled its mission to some extent, but it lacked creative power, became dogmatic, and ultimately died of inanition. Garção was the chief contributor to its proceedings, bearing the name of "Corydon Erimantheo," and his orations and dissertations, with many of his lyrics, were pronounced and read at its meetings. He lived much in the society of the English residents in Lisbon, and he is supposed to have conceived a passion for an English married lady which completely absorbed him and contributed to his ruin. In the midst of his literary activity and growing fame, he was arrested on the night of the 9th of April 1771, and committed to prison by Pombal, whose displeasure he had incurred by his independence of character. The immediate cause of his incarceration would appear to have been his connexion with a love intrigue between a young friend of his and the daughter of a Colonel Elsden, but he was never brought to trial, and the matter must remain in doubt. After much solicitation, his wife obtained from the king an order for her husband's release on the 10th of November 1772, but it came too late. Broken by infirmities and the hardships of prison life, Garção expired that very day in the Limoeiro, at the age of forty-seven.

Taking Horace as his model, and aided by sound judgment, scholarship and wide reading, Garção set out to raise and purify the standard of poetical taste, and his verses are characterized by a classical simplicity of form and expression. His sonnets *ad sodales* show a charming personality; his vigorous and elegant odes and epistles are sententious in tone and reveal an inspired poet and a man chastened by suffering. His two comedies in hendecasyllables, the *Theatro Novo* (played in January 1766) and the *Assemblêa*, are excellent satires on the social life of the capital; and in the *Cantata de Dido*, included in the latter piece, the spirit of Greek art is allied to perfection of form, making this composition perhaps the gem of Portuguese 18th century poetry.

Garção wrote little and spent much time on the *labor limae*. His works were published posthumously in 1778, and the most complete and accessible edition is that of J.A. de Azevedo Castro (Rome, 1888). An English version of the *Cantata de Dido* appeared in the Academy (January 19th, 1895). See Innocencio da Silva, *Diccionario bibliographico Portuguez*, vol. vi. pp. 386-393, and vol. xvii. pp. 182-184; also Dr Theophilo Braga, *A Arcadia Lusitana* (Oporto, 1899).

(E. Pr.)

GARCIA (DEL POPOLO VICENTO), MANOEL (1775-1832), Spanish singer and composer, was born in Seville on the 22nd of January 1775. He became a chorister at the cathedral of Seville, and studied music under the best masters of that city. At seventeen he made his début on the stage at Cadiz, in an operetta, in which were included songs of his own composition. Soon afterwards he appeared at Madrid in the twofold capacity of singer and composer. His reputation being established, he proceeded to Paris, where he appeared for the first time, in 1808, in Paer's opera *Griselda*. Here also he was received with great applause, his style of singing being especially appreciated. This he further improved by careful study of the Italian method in Italy itself, where he continued his successes. His opera *Il Califo di Bagdad* was favourably received at Naples in 1812, but his chief successes were again due to his perfection as a vocalist. His opera *La Morte di Tasso* was produced in 1821 in Paris, where it was followed in 1823 by his *Il Fazzoletto*. In 1824 he went to London, and thence proceeded to America (1825) with a company of artistes, amongst whom were his son Manoel and his daughter Maria, better known under her subsequent name of Malibran. In New York was produced his opera *La Figlia dell' aria* in 1827. He extended his artistic tour as far as Mexico, and was on the point of returning to Europe in order to retire from public life when he was robbed of his well-earned wealth by brigands on his way to Vera Cruz. Settled again in Paris in 1829, he soon retired from the stage, and devoted himself exclusively to teaching. He died in Paris on the 2nd of June 1832. His method of teaching was famous, and some of the most celebrated singers of the early part of the century were amongst his pupils. He also wrote an excellent book on the art of singing called *Metodo di canto*, of which the essence was subsequently incorporated by his son Manoel in his admirable *Traité complet de l'art du chant* (1847). His operas have not

survived their day. He wrote nearly forty in all, but with the exception of those quoted, and *El Poeta calculista*, produced when he was thirty, none are remarkable. Besides the children already mentioned, his daughter Paulina, Madame Viardot (1821-1910), worthily continued the tradition for the best singing with which his name had become associated.

His son, MANOEL GARCIA (1805-1906), who celebrated his hundredth birthday in London on the 17th of March 1905, was born at Madrid, and after his father's death devoted himself to teaching. He was a professor at the Paris Conservatoire from 1830 to 1848, from that time to 1895 was a professor at the Royal Academy of Music in London. He became famous for his invention of the laryngoscope about 1850, apart from his position as the greatest representative of the old "*bel canto*" style of singing.

GARCÍA DE LA HUERTA, VICENTE ANTONIO (1734-1787), Spanish dramatist, was born at Zafra on the 9th of March 1734, and was educated at Salamanca. At Madrid he soon attracted attention by his literary arrogance and handsome person; and at an early age became chief of the National Library, a post from which he was dismissed owing to the intrigues of his numerous enemies. The publication of his unsatisfactory collection of Spanish plays entitled *Theatro Hespanol* (1785-1786) exposed him to severe censures, which appear to have affected his reason. He died at Madrid on the 12th of March 1787, without carrying into effect his avowed intention of reviving the national drama. His *Agamemnón vengado* derives from Sophocles, his *Jaire* is translated from Voltaire, and even his once famous *Raquel*, though Spanish in subject, is classic in form.

GARCÍA DE PAREDES, DIEGO (1466-1534), Spanish soldier and duellist, was a native of Trujillo in Estremadura, Spain. He never commanded an army or rose to the position of a general, but he was a notable figure in the wars of the end of the 15th and beginning of the 16th century, when personal prowess had still a considerable share in deciding the result of actions. His native town and its district, which lie between Talavera and Madrid, produced many of the most noted *conquistadores* of America, including the Pizarro family. Diego himself served in his youth in the war of Granada. His strength, daring and activity fitted him to shine in operations largely composed of night marches, escalades, surprises and hand-to-hand combats. The main scene of his achievements was in Italy, and he betook himself to it—on his own showing—not in search of glory, but because he had killed a relation of his own, Ruy Sanchez de Vargas, in a street fight arising out of a quarrel about a horse. He fled to Rome, then under the rule of the Borgias. Diego was a distant relation to the cardinal of Santa Cruz (Carvajal), a favourite with Pope Alexander VI., who was in conflict with the barons of the Romagna and took Diego into his service. He remained a soldier of the pope till he killed a man in a personal quarrel and found it necessary to pass over to the enemy. Now he became acquainted with the Colonnas, who appreciated his services. The wars between Ferdinand V. of Aragon (the Catholic king) and Louis XII. gave him a more creditable opening. The Spanish general Gonsalvo de Córdoba, who knew his value, employed him and trusted him; and he took part in all the wars of Italy on the frontier of Navarre, and once against the Turks on the Danube, till 1530. His countrymen made him the hero of many Münchausen-like stories of personal prowess. It was said that he held a bridge single-handed against 200 Frenchmen, that he stopped the wheel of a water-mill, and so forth. In the "Brief Summary" of his life and deeds attributed to him, and printed at the end of the *Chronicle of the Great Captain*, published in 1584 at Alcalá de Henares, he lays no claim to having done more than was open to a very athletic man. He was killed at Bologna in 1534 by a fall while engaged in a jumping-match with some of the younger officers of the army. His body was carried to his native town Trujillo, and buried in the church of Santa Maria Mayor in 1545.

GARCÍA GUTIÉRREZ, ANTONIO (1812-1884), Spanish dramatist, was born at Chiclana (Cadiz) on the 5th of July 1812, and studied medicine in his native town. In 1832 he removed to Madrid, and earned a scanty living by translating plays of Scribe and the elder Dumas; despairing of success, he was on the point of enlisting when he suddenly sprang into fame as the author of *El Trovador*, which was played for the first time on the 1st of March 1836. García Gutiérrez never surpassed this first effort, which placed him among the leaders of the romantic movement in Spain, and which became known all over Europe through Verdi's music. His next great success was *Simón Bocanegra* (1843), but, as his plays were not lucrative, he emigrated to Spanish America, working as a journalist in Cuba and Mexico till 1850, when he returned to Spain. The best works of his later period are a *zarzuela* entitled *El Grumete* (1853), *La Venganza catalana* (1864) and *Juan Lorenzo* (1865). He became head of the archaeological museum at Madrid, and died there on the 6th of August 1884. His *Poesías* (1840) and another volume of lyrics, entitled *Luz y tinieblas* (1842), are unimportant; but the brilliant versification of his plays, and his power of analysing feminine emotions, give him a foremost place among the Spanish dramatists of the 19th century.

GARD, a department in the south of France, consisting of part of the old province of Languedoc. Pop. (1906) 421,166. Area 2270 sq. m. It is bounded N. by the departments of Lozère and Ardèche, E. by the Rhone, which separates it from Vaucluse and Bouches-du-Rhône, S. by the Mediterranean, S.W. by Hérault and W. by Aveyron. Gard is divided into three sharply-defined regions. Its north-western districts are occupied by the range of the Cévennes, which on the frontier of Lozère attain a height of 5120 ft. The whole of this region is celebrated for its fruitful valleys, its gorges, its beautiful streams, its pastures, and the chestnut, mulberry and other fruit trees with which the mountains are often clothed to their summits. The Garrigues, a dry, hilly region of limestone, which lends itself to the cultivation of cereals, the vine and olive, stretches from the foot of the Cévennes over the centre of the department, covering about half its area. The southern portion, which extends to the sea, and was probably at one time covered by it, is a low plain with numerous lakes and marshes. Though unhealthy, it is prosperous, and comprises the best arable land and vineyards in Gard.

Besides the Rhone, which bounds the department on the E., and the Ardèche, the lower course of which forms part of its boundary on the N., the principal rivers are the Cèze, Gard, Vidourle and Hérault. The most northern of these is the Cèze, which rises in the Cévennes, and after a course of about 50 m. in an E.S.E. direction falls into the Rhone above Roquemaure. The Gard, or Gardon, from which the department takes its name, is also an affluent of the Rhone, and, rising in the Cévennes from several sources, traverses the centre of the department, having a length of about 60 m. In the upper part of its course it flows through a succession of deep mountain gorges, and from the melting of the snows on the Cévennes is subject to inundations, which often cause great damage. Its waters not infrequently rise 18 or 20 ft. in a few hours, and its bed is sometimes increased in width to nearly a mile. Near Remoulins it is crossed by a celebrated Roman aqueduct—the Pont du Gard (see AQUEDUCT). The Vidourle flows in a S.S.E. direction from its source near Le Vigan, and after a course of about 50 m. falls into the sea. Below Sommières it forms the western boundary of the department. The Hérault has its source and part of its course in the west of Gard. The Canal de Beaucaire extends from the Rhone at Beaucaire to Aigues-Mortes, which communicates with the Mediterranean at Grau-du-Roi by means of the Grand-Roubine canal.

The climate is warm in the south-east, colder in the north-west; it is rather changeable, and rain-storms are common. The cold and violent north-west wind known as the mistral is its worst drawback. Les Fumades (near Allègre) and Euzet have mineral springs. The chief grain crops are wheat and oats. Rye, barley and potatoes are also grown. Gard is famed for its cattle, its breed of small horses, and its sheep, the wool of which is of a very fine quality. In the rearing of silk-worms it ranks first among French departments. The principal fruit trees are the olive, mulberry and chestnut. The vine is extensively cultivated and yields excellent red and white wines. The department is rich in minerals, and the mines of coal, iron, lignite, asphalt, zinc, lead and copper, which are for the most part situated in the neighbourhoods of Alais and La Grand'-Combe, constitute one of the chief sources of its wealth. Great quantities of salt are obtained from the salt marshes along the coast. The quarries of building and other stone employ a considerable number of workmen. The

fisheries are productive. The manufactures are extensive, and include those of silk, of which Alais is the chief centre, cotton and woollen fabrics, hosiery, ironware, hats (Anduze), liquorice, gloves, paper, leather, earthenware and glass. There are also breweries and distilleries, and important metallurgical works, the chief of which are those of Bessèges. The exports of Gard include coal, lignite, coke, asphalt, building-stone, iron, steel, silk, hosiery, wine, olives, grapes and truffles.

The department is served by the Paris-Lyon railway. It is divided into the arrondissements of Nîmes, Alais, Uzès and Le Vigan, with 40 cantons and 351 communes. The chief town is Nîmes, which is the seat of a bishopric of the province of Avignon and of a court of appeal. Gard belongs to the 15th military region, which has its headquarters at Marseilles, and to the académie (educational division) of Montpellier. Nîmes, Alais, Uzès, Aigues-Mortes, Beaucaire, Saint-Gilles, Bessèges, La Grand'-Combe and Villeneuve-lès-Avignon are the principal places. Opposite the manufacturing town of Pont-St-Esprit the Rhone is crossed by a fine medieval bridge more than 1000 yds. long built by the Pontiff brethren. Le Vigan, an ancient town with several old houses, carries on silk-spinning.

GARDA, LAKE OF (the *Lacus Benacus* of the Romans), the most easterly and the most extensive of the great Lombard lakes, being only surpassed in the Alpine region by those of Geneva and Constance. Save the extreme northern extremity (Riva, which was secured from Venice by Tirol in 1517), the whole lake is Italian, being divided between the provinces of Verona and Brescia. Its broad basin orographically represents the southern portion of the valley of the Adige, though that river now flows through a narrow trench which is separated from the lake by the long narrow ridge of the Monte Baldo (7277 ft.). Nowadays the lake is fed by the Sarca, that flows in at its north end from the glaciers of the Adamello, while at the southern extremity of the lake the Mincio flows out, on its way to join the Po. The area of the lake is about 143 sq. m., its length is 32¼ m., its greatest breadth is about 10 m., the height of its surface above sea-level is 216 ft. and the greatest depth yet measured is 1916 ft. Its upper or northern end is narrow, but between Garda (E.) and Salò (W.) the lake expands gradually into a nearly circular basin, which at the southern extremity is divided into two parts by the long low promontory of Sermione, that projects from the southern shore between Peschiera and Desenzano. Owing to this conformation the lake is much exposed to sudden and violent winds, which Virgil alludes to in his well-known line (*Georg*. ii. line 160): *fluctibus et fremitu assurgens, Benace, marino*. The most dangerous of these winds is the *Borea* or *Suer*, that sweeps down from the north as through a funnel. In the southern portion of the lake the *Vinessa*, an E.S.E. wind, is most dreaded. The *Ora* is a regular wind coming from the east which, on reaching the lake, blows from S. to N. The steep grey limestone crags of Monte Baldo, on the eastern side of the lake, contrast strongly with the rich vegetation on the western and southern shores. The portion of the western shore that extends from Gargnano to Salò is the most sheltered and warmest part of the region, so that not merely does it resemble one continuous garden (producing lemons, figs, mulberries, olives, &c.), but is frequented in winter, and has been given the name of the *Riviera Benacense*. The lovely promontory of Sermione, at the southern end of the lake, has also an extremely luxuriant vegetation, while it contains many remains of buildings of Roman and later date, having been the Sirmio of Catullus, who resided here and celebrated its beauties in many of his poems. In 1827 a boat with paddles set in motion by horses was put on the lake, but the first steamer dates only from 1844. At the south end of the lake, E. and W. respectively of the promontory of Sermione, are the towns of Peschiera (14¼ m. by rail from Verona on the east) and of Desenzano (17½ m. by rail from Brescia on the west), which are 8¾ m. distant from each other. On the west shore of the lake are Salò, Toscolano, Gargnano and Limone, while the rugged east shore can boast only of Bardolino and Garda. At the northern tip of the lake, and in Tirol, is Riva, the most considerable town on the lake, and 15½ m. by rail from the Mori station on the main Brenner line.

(W. A. B. C.)

GARDANE, CLAUDE MATTHIEU, COUNT (1766-1818), French general and diplomatist, was born on the 30th of January 1766. He entered the army and rose rapidly during the revolutionary wars, becoming captain in 1793. In May 1799 he distinguished himself by saving a division of the French army which was about to be crushed by the Russians at the battle of Bassignana, and was named at once brigadier-general by Moreau. He incurred Napoleon's displeasure for an omission of duty shortly before the battle of Marengo (June 14th, 1800), but in 1805 was appointed to be aide-de-camp of the emperor. His chief distinction, however, was to be won in the diplomatic sphere. In the spring of 1807, when Russia and Prussia were at war with France, and the emperor Alexander I. of Russia was also engaged in hostilities with Persia, the court of Teheran sent a mission to the French emperor, then at the castle of Finkenstein in the east of Prussia, with a view to the conclusion of a Franco-Persian alliance. This was signed on the 4th of May 1807, at that castle; and Napoleon designed Gardane as special envoy for the cementing of that alliance. The secret instructions which he drew up for Gardane, and signed on the 30th of May, are of interest as showing the strong oriental trend of the emperor's policy. France was to guarantee the integrity of Persia, to recognize that Georgia (then being invaded by the Russians) belonged to the shah, and was to make all possible efforts for restoring that territory to him. She was also to furnish to the shah arms, officers and workmen, in the number and to the amount demanded by him. Napoleon on his side required Persia to declare war against Great Britain, to expel all Britons from her territory, and to come to an understanding with the Afghans with a view to a joint Franco-Perso-Afghan invasion of India. Gardane, whose family was well known in the Levant, had a long and dangerous journey overland, but was cordially received at Teheran in December 1807. The conclusion of the Franco-Russian treaty at Tilsit in July 1807 rendered the mission abortive. Persia longed only for help against Russia and had no desire, when all hope of that was past, to attack India. The shah, however, promised to expel Britons and to grant to France a commercial treaty. For a time French influence completely replaced that of England at Teheran, and the mission of Sir John Malcolm to that court was not allowed to proceed. Finally, however, Gardane saw that nothing much was to be hoped for in the changed situation of European affairs, and abruptly left the country (April 1809). This conduct was not wholly approved by Napoleon, but he named him count and in 1810 attached him to Masséna's army in Portugal. There, during the disastrous retreat from Santarem to Almeida, he suffered a check which brought him into disfavour. The rest of his career calls for no notice. He died in 1818. The report which he sent to Champagny (dated April 23rd, 1809) on the state of Persia and the prospects of a successful invasion of India is of great interest. He admitted the difficulties of this enterprise, but thought that a force of picked French troops, aided by Persians and Afghans, might under favourable conditions penetrate into India by way of Kandahar, or through Sind, especially if the British were distracted by maritime attacks from Mauritius.

See Count Alfred de Gardane, *Mission du général Gardane en Perse* (Paris, 1865); and P.A.L. de Driault, *La Politique orientale de Napoléon: Sébastiani et Gardane* (Paris, 1904).

(J. HL. R.)

GARDELEGEN, a town of Germany, in Prussian Saxony, on the right bank of the Milde, 20 m. W. from Stendal, on the main line of railway Berlin-Hanover. Pop. (1905) 8193. It has a Roman Catholic and three Evangelical churches, a hospital, founded in 1285, and a high-grade school. There are considerable manufactures, notably agricultural machinery and buttons, and its beer has a great repute. Gardelegen was founded in the 10th century, and was for a long time the seat of a line of counts. It suffered considerably in the Thirty Years' War, and in 1775 was burned by the French. On the neighbouring heath Margrave Louis I. of Brandenburg gained, in 1343, a victory over Otto the Mild of Brunswick.

GARDEN (from O. Fr. *gardin*, mod. Fr. *jardin*; this, like our words "garth," a paddock attached to a building, and "yard," comes from a Teutonic word for an enclosure which appears in Gothic as *gards* and O.H. Ger. *gart*, cf. Dutch *gaarde* and Ger. *garten*), the

ground enclosed and cultivated for the growth of fruit, flowers or vegetables (see HORTICULTURE). The word is also used for grounds laid out ornamentally, used as places of public entertainment. Such were the famous Ranelagh and Vauxhall Gardens in London; it is similarly used in zoological gardens, and as a name in towns for squares, terraces or streets. From the fact that Epicurus (*q.v.*) taught in the gardens at Athens, the disciples of his school of philosophy were known as οἱ ἀπὸ τῶν κήπων (so Diog. Laërtius x. 10); and Cicero (*De finibus* v. 1. 3, and elsewhere) speaks of the *Horti Epicuri*. Thus as the "Academy" refers to the Platonic and the "Porch" (στοά) to the Stoic school, so the "Garden" is the name given to the Epicurean school of philosophy. Apollodorus was known as κηποτύραννος, the tyrant of the garden.

GARDENIA, in botany, a genus of the natural order Rubiaceae, containing about sixty species of evergreen trees and shrubs, natives of the warmer parts of the old world. Several are grown in stoves or greenhouses for their handsome, sweet-scented white flowers. The flowers are developed singly at the end of a branch or in the leaf-axils, and are funnel- or salver-shaped with a long tube. The double forms of *Gardenia florida* (a native of China) and *G. radicans* (a native of Japan) are amongst the most beautiful and highly perfumed of any in cultivation. Gardenias are grown chiefly for cut flowers, and are readily propagated by cuttings. They require plenty of heat and moisture in the growing season, and must be kept free from insects such as the mealy bug, green fly, red spider and scale-insect.

GARDINER, JAMES (1688-1745), Scottish soldier, was born at Carriden in Linlithgowshire, on the 11th of January 1688. At the age of fourteen he entered a Scottish regiment in the Dutch service, and was afterwards present at the battle of Ramillies, where he was wounded. He subsequently served in different cavalry regiments, and in 1730 was advanced to the rank of lieutenant-colonel, and in 1743 to that of colonel. He fell at the battle of Prestonpans, the 21st of September 1745. The circumstances of his death are described in Sir Walter Scott's *Waverley*. In his early years he was distinguished for his recklessness and profligacy, but in 1719 a supernatural vision, as he regarded it, led to his conversion, and from that time he lived a life of great devoutness and of thorough consistency with his Christian profession. Dr Alexander Carlyle of Inveresk, author of an autobiography, says that he was "very ostentatious" about his conversion—speaks of him as weak, and plainly thinks there was a great deal of delusion in Col. Gardiner's account of his sins.

His life was written by Dr Philip Doddridge and has been often reprinted.

GARDINER, SAMUEL RAWSON (1829-1902), English historian, son of Rawson Boddam Gardiner, was born near Alresford, Hants, on the 4th of March 1829. He was educated at Winchester and Christ Church, Oxford, where he obtained a first class in *literae humaniores*. He was subsequently elected to fellowships at All Souls (1884) and Merton (1892). For some years he was professor of modern history at King's College, London, and devoted his life to historical work. He is the historian of the Puritan revolution, and has written its history in a series of volumes, originally published under different titles, beginning with the accession of James I.; the seventeenth (the third volume of the *History of the Commonwealth and Protectorate*) appeared in 1901. This was completed in two volumes by C.H. Firth as *The Last Years of the Protectorate* (1909). The series is *History of England from the Accession of James I. to the Outbreak of the Civil War*, 1603-1642 (10 vols.); *History of the Great Civil War*, 1642-1649 (4 vols.); and *History of the Commonwealth and Protectorate, 1649-1660*. His treatment is exhaustive and philosophical, taking in, along with political and

constitutional history, the changes in religion, thought and sentiment during his period, their causes and their tendencies. Of the original authorities on which his work is founded many of great value exist only in manuscript, and his researches in public and private collections of manuscripts at home, and in the archives of Simancas, Venice, Rome, Brussels and Paris, were indefatigable and fruitful. His accuracy is universally acknowledged. He was perhaps drawn to the Puritan period by the fact of his descent from Cromwell and Ireton, but he has certainly written of it with no other purpose than to set forth the truth. In his judgments of men and their actions he is unbiassed, and his appreciations of character exhibit a remarkable fineness of perception and a broad sympathy. Among many proofs of these qualities it will be enough to refer to what he says of the characters of James I., Bacon, Laud, Strafford and Cromwell. On constitutional matters he writes with an insight to be attained only by the study of political philosophy, discussing in a masterly fashion the dreams of idealists and the schemes of government proposed by statesmen. Throughout his work he gives a prominent place to everything which illustrates human progress in moral and religious, as well as political conceptions, and specially to the rise and development of the idea of religious toleration, finding his authorities not only in the words and actions of men of mark, but in the writings of more or less obscure pamphleteers, whose essays indicate currents in the tide of public opinion. His record of the relations between England and other states proves his thorough knowledge of contemporary European history, and is rendered specially valuable by his researches among manuscript sources which have enabled him to expound for the first time some intricate pieces of diplomacy.

Gardiner's work is long and minute; the fifty-seven years which it covers are a period of exceptional importance in many directions, and the actions and characters of the principal persons in it demand careful analysis. He is perhaps apt to attach an exaggerated importance to some of the authorities which he was the first to bring to light, to see a general tendency in what may only be the expression of an individual eccentricity, to rely too much on ambassadors' reports which may have been written for some special end, to enter too fully into the details of diplomatic correspondence. In any case the length of his work is not the result of verbiage or repetitions. His style is clear, absolutely unadorned, and somewhat lacking in force; he appeals constantly to the intellect rather than to the emotions, and is seldom picturesque, though in describing a few famous scenes, such as the execution of Charles I., he writes with pathos and dignity. The minuteness of his narrative detracts from its interest; though his arrangement is generally good, here and there the reader finds the thread of a subject broken by the intrusion of incidents not immediately connected with it, and does not pick it up again without an effort. And Gardiner has the defects of his supreme qualities, of his fairness and critical ability as a judge of character; his work lacks enthusiasm, and leaves the reader cold and unmoved. Yet, apart from its sterling excellence, it is not without beauties, for it is marked by loftiness of thought, a love of purity and truth, and refinement in taste and feeling. He wrote other books, mostly on the same period, but his great history is that by which his name will live. It is a worthy result of a life of unremitting labour, a splendid monument of historical scholarship. His position as an historian was formally acknowledged: in 1862 he was given a civil list pension of £150 per annum, "in recognition of his valuable contributions to the history of England"; he was honorary D.C.L. of Oxford, LL.D. of Edinburgh, and Ph.D. of Göttingen, and honorary student of Christ Church, Oxford; and in 1894 he declined the appointment of regius professor of modern history at Oxford, lest its duties should interfere with the accomplishment of his history. He died on the 24th of February 1902.

Among the more noteworthy of Gardiner's separate works are: *Prince Charles and the Spanish Marriage* (2 vols., London, 1869); *Constitutional Documents of the Puritan Revolution, 1625-1660* (1st ed., Oxford, 1889; 2nd ed., Oxford, 1899); *Oliver Cromwell* (London, 1901); *What Gunpowder Plot was* (London, 1897); *Outline of English History* (1st ed., London, 1887; 2nd ed., London, 1896); and *Student's History of England* (2 vols., 1st ed., London, 1890-1891; 2nd ed., London, 1891-1892). He edited collections of papers for the Camden Society, and from 1891 was editor of the *English Historical Review*.

(W. Hu.)

GARDINER, STEPHEN (*c.* 1493-1555), English bishop and lord chancellor, was a native of Bury St Edmunds. The date of his birth as commonly given, 1483, seems to be about ten years too early, and surmises which have passed current that he was some one's illegitimate

child are of no authority. His father is now known to have been John Gardiner, a substantial cloth merchant of the town where he was born (see his will, printed in *Proceedings of the Suffolk Archaeological Institute*, i. 329), who took care to give him a good education. In 1511 he, being then a lad, met Erasmus at Paris (Nichols's *Epistles of Erasmus*, ii. 12, 13). But he had probably already been to Cambridge, where he studied at Trinity Hall and greatly distinguished himself in the classics, especially in Greek. He afterwards devoted himself to the canon and civil law, in which subjects he attained so great a proficiency that no one could dispute his pre-eminence. He received the degree of doctor of civil law in 1520, and of canon law in the following year.

Ere long his abilities attracted the notice of Cardinal Wolsey, who made him his secretary, and in this capacity he is said to have been with him at More Park in Hertfordshire, when the conclusion of the celebrated treaty of the More brought Henry VIII. and the French ambassadors thither. It is stated, and with great probability, that this was the occasion on which he was first introduced to the king's notice, but he does not appear to have been actively engaged in Henry's service till three years later. In that of Wolsey he undoubtedly acquired a very intimate knowledge of foreign politics, and in 1527 he and Sir Thomas More were named commissioners on the part of England in arranging a treaty with the French ambassadors for the support of an army in Italy against the emperor. That year he accompanied Wolsey on his important diplomatic mission to France, the splendour and magnificence of which are so graphically described by Cavendish. Among the imposing train who went with the cardinal—including, as it did, several noblemen and privy councillors—Gardiner alone seems to have been acquainted with the real heart of the matter which made this embassy a thing of such peculiar moment. Henry was then particularly anxious to cement his alliance with Francis I., and gain his co-operation as far as possible in the object on which he had secretly set his heart—a divorce from Catherine of Aragon. In the course of his progress through France he received orders from Henry to send back his secretary Gardiner, or, as he was called at court, Master Stevens, for fresh instructions; to which he was obliged to reply that he positively could not spare him as he was the only instrument he had in advancing the king's "secret matter." Next year Gardiner, still in the service of Wolsey, was sent by him to Italy along with Edward Fox, provost of King's College, Cambridge, to promote the same business with the pope. His despatches on this occasion are still extant, and whatever we may think of the cause on which he was engaged, they certainly give a wonderful impression of the zeal and ability with which he discharged his functions. Here his perfect familiarity with the canon law gave him a great advantage. He was instructed to procure from the pope a decretal commission, laying down principles of law by which Wolsey and Campeggio might hear and determine the cause without appeal. The demand, though supported by plausible pretexts, was not only unusual but clearly inadmissible. Clement VII. was then at Orvieto, and had just recently escaped from captivity at St Angelo at the hands of the imperialists. But fear of offending the emperor could not have induced him to refuse a really legitimate request from a king like Henry. He naturally referred the question to the cardinals about him; with whom Gardiner held long arguments, enforced, it would seem, by not a little browbeating of the College. What was to be thought, he said, of a spiritual guide, who either could not or would not show the wanderer his way? The king and lords of England would be driven to think that God had taken away from the Holy See the key of knowledge, and that pontifical laws which were not clear to the pope himself might as well be committed to the flames.

This ingenious pleading, however, did not serve, and he was obliged to be content with a general commission for Campeggio and Wolsey to try the cause in England. This, as Wolsey saw, was quite inadequate for the purpose in view; and he again instructed Gardiner, while thanking the pope for the commission actually granted, to press him once more by very urgent pleas, to send the desired decretal on, even if the latter was only to be shown to the king and himself and then destroyed. Otherwise, he wrote, he would lose his credit with the king, who might even be tempted to throw off his allegiance to Rome altogether. At last the pope—to his own bitter regret afterwards—gave what was desired on the express conditions named, that Campeggio was to show it to the king and Wolsey and no one else, and then destroy it, the two legates holding their court under the general commission. After obtaining this Gardiner returned home; but early in the following year, 1529, when proceedings were delayed on information of the brief in Spain, he was sent once more to Rome. This time, however, his efforts were unavailing. The pope would make no further concessions, and would not even promise not to revoke the cause to Rome, as he did very shortly after.

Gardiner's services, however, were fully appreciated. He was appointed the king's secretary. He had been already some years archdeacon of Taunton, and the archdeaconry of Norfolk was added to it in March 1529, which two years later he resigned for that of

Leicester. In 1530 he was sent to Cambridge to procure the decision of the university as to the unlawfulness of marriage with a deceased brother's wife, in accordance with the new plan devised for settling the question without the pope's intervention. In this he succeeded, though not without a good deal of artifice, more creditable to his ingenuity than to his virtue. In November 1531 the king rewarded him for his services with the bishopric of Winchester, vacant by Wolsey's death. The promotion was unexpected, and was accompanied by expressions from the king which made it still more honourable, as showing that if he had been in some things too subservient, it was from no abject, self-seeking policy of his own. Gardiner had, in fact, ere this remonstrated boldly with his sovereign on some points, and Henry now reminded him of the fact. "I have often *squared* with you, Gardiner," he said familiarly, "but I love you never the worse, as the bishopric I give will convince you." In 1532, nevertheless, he excited some displeasure in the king by the part he took in the preparation of the famous "Answer of the Ordinaries" to the complaints brought against them in the House of Commons. On this subject he wrote a very manly letter to the king in his own defence.

His next important action was not so creditable; for he was, not exactly, as is often said, one of Cranmer's assessors, but, according to Cranmer's own expression, "assistant" to him as counsel for the king, when the archbishop, in the absence of Queen Catherine, pronounced her marriage with Henry null and void on the 23rd of May 1533. Immediately afterwards he was sent over to Marseilles, where an interview between the pope and Francis I. took place in September, of which event Henry stood in great suspicion, as Francis was ostensibly his most cordial ally, and had hitherto maintained the justice of his cause in the matter of the divorce. It was at this interview that Bonner intimated the appeal of Henry VIII. to a general council in case the pope should venture to proceed to sentence against him. This appeal, and also one on behalf of Cranmer presented with it, were of Gardiner's drawing up. In 1535 he and other bishops were called upon to vindicate the king's new title of "Supreme Head of the Church of England." The result was his celebrated treatise *De vera obedientia*, the ablest, certainly, of all the vindications of royal supremacy. In the same year he had an unpleasant dispute with Cranmer about the visitation of his diocese. He was also employed to answer the pope's brief threatening to deprive Henry of his kingdom.

During the next few years he was engaged in various embassies in France and Germany. He was indeed so much abroad that he had little influence upon the king's councils. But in 1539 he took part in the enactment of the severe statute of the Six Articles, which led to the resignation of Bishops Latimer and Shaxton and the persecution of the Protestant party. In 1540, on the death of Cromwell, earl of Essex, he was elected chancellor of the university of Cambridge. A few years later he attempted, in concert with others, to fasten a charge of heresy upon Archbishop Cranmer in connexion with the Act of the Six Articles; and but for the personal intervention of the king he would probably have succeeded. He was, in fact, though he had supported the royal supremacy, a thorough opponent of the Reformation in a doctrinal point of view, and it was suspected that he even repented his advocacy of the royal supremacy. He certainly had not approved of Henry's general treatment of the church, especially during the ascendancy of Cromwell, and he was frequently visited with storms of royal indignation, which he schooled himself to bear with patience. In 1544 a relation of his own, named German Gardiner, whom he employed as his secretary, was put to death for treason in reference to the king's supremacy, and his enemies insinuated to the king that he himself was of his secretary's way of thinking. But in truth the king had need of him quite as much as he had of Cranmer; for it was Gardiner, who even under royal supremacy, was anxious to prove that England had not fallen away from the faith, while Cranmer's authority as primate was necessary to upholding that supremacy. Thus Gardiner and the archbishop maintained opposite sides of the king's church policy; and though Gardiner was encouraged by the king to put up articles against the archbishop himself for heresy, the archbishop could always rely on the king's protection in the end. Heresy was gaining ground in high places, especially after the king's marriage with Catherine Parr; and there seems to be some truth in the story that the queen herself was nearly committed for it at one time, when Gardiner, with the king's approbation, censured some of her expressions in conversation. In fact, just after her marriage, four men of the Court were condemned at Windsor and three of them were burned. The fourth, who was the musician Marbeck, was pardoned by Gardiner's procurement.

Great as Gardiner's influence had been with Henry VIII., his name was omitted at the last in the king's will, though Henry was believed to have intended making him one of his executors. Under Edward VI. he was completely opposed to the policy of the dominant party both in ecclesiastical and in civil matters. The religious changes he objected to both on

principle and on the ground of their being moved during the king's minority, and he resisted Cranmer's project of a general visitation. His remonstrances, however, were met by his own committal to the Fleet, and the visitation of his diocese was held during his imprisonment. Though soon afterwards released, it was not long before he was called before the council, and, refusing to give them satisfaction on some points, was thrown into the Tower, where he continued during the whole remainder of the reign, a period slightly over five years. During this time he in vain demanded his liberty, and to be called before parliament as a peer of the realm. His bishopric was taken from him and given to Dr Poynet, a chaplain of Cranmer's who had not long before been made bishop of Rochester. At the accession of Queen Mary, the duke of Norfolk and other state prisoners of high rank were in the Tower along with him; but the queen, on her first entry into London, set them all at liberty. Gardiner was restored to his bishopric and appointed lord chancellor, and he set the crown on the queen's head at her coronation. He also opened her first parliament and for some time was her leading councillor.

He was now called upon, in advanced life, to undo not a little of the work in which he had been instrumental in his earlier years—to vindicate the legitimacy of the queen's birth and the lawfulness of her mother's marriage, to restore the old religion, and to recant what he himself had written touching the royal supremacy. It is said that he wrote a formal *Palinodia* or retractation of his book *De vera obedientia*, but it does not seem to be now extant; and the reference is probably to his sermon on Advent Sunday 1554, after Cardinal Pole had absolved the kingdom from schism. As chancellor he had the onerous task of negotiating the queen's marriage treaty with Philip, to which he shared the general repugnance, though he could not oppose her will. In executing it, however, he took care to make the terms as advantageous for England as possible, with express provision that the Spaniards should in nowise be allowed to interfere in the government of the country. After the coming of Cardinal Pole, and the reconciliation of the realm to the see of Rome, he still remained in high favour. How far he was responsible for the persecutions which afterwards arose is a debated question. He no doubt approved of the act, which passed the House of Lords while he presided there as chancellor, for the revival of the heresy laws. Neither is there any doubt that he sat in judgment on Bishop Hooper, and on several other preachers whom he condemned, not exactly to the flames, but to be degraded from the priesthood. The natural consequence of this, indeed, was that when they declined, even as laymen, to be reconciled to the Church, they were handed over to the secular power to be burned. Gardiner, however, undoubtedly did his best to persuade them to save themselves by a course which he conscientiously followed himself; nor does it appear that, when placed on a commission along with a number of other bishops to administer a severe law, he could very well have acted otherwise than he did. In his own diocese no victim of the persecution is known to have suffered till after his death; and, much as he was already maligned by opponents, there are strong evidences that his natural disposition was humane and generous. In May 1553 he went over to Calais as one of the English commissioners to promote peace with France; but their efforts were ineffectual. In October 1555 he again opened parliament as lord chancellor, but towards the end of the month he fell ill and grew rapidly worse till the 12th of November, when he died over sixty years of age.

Perhaps no celebrated character of that age has been the subject of so much ill-merited abuse at the hands of popular historians. That his virtue was not equal to every trial must be admitted, but that he was anything like the morose and narrow-minded bigot he is commonly represented there is nothing whatever to show. He has been called ambitious, turbulent, crafty, abject, vindictive, bloodthirsty and a good many other things besides, not quite in keeping with each other; in addition to which it is roundly asserted by Bishop Burnet that he was despised alike by Henry and by Mary, both of whom made use of him as a tool. How such a mean and abject character submitted to remain five years in prison rather than change his principles is not very clearly explained; and as to his being despised, we have seen already that neither Henry nor Mary considered him by any means despicable. The truth is, there is not a single divine or statesman of that day whose course throughout was so thoroughly consistent. He was no friend to the Reformation, it is true, but he was at least a conscientious opponent. In doctrine he adhered to the old faith from first to last, while as a question of church policy, the only matter for consideration with him was whether the new laws and ordinances were constitutionally justifiable.

His merits as a theologian it is unnecessary to discuss; it is as a statesman and a lawyer that he stands conspicuous. But his learning even in divinity was far from commonplace. The part that he was allowed to take in the drawing up of doctrinal formularies in Henry VIII.'s time is not clear; but at a later date he was the author of various tracts in defence of the Real Presence against Cranmer, some of which, being written in prison, were published

abroad under a feigned name. Controversial writings also passed between him and Bucer, with whom he had several interviews in Germany, when he was there as Henry VIII.'s ambassador.

He was a friend of learning in every form, and took great interest especially in promoting the study of Greek at Cambridge. He was, however, opposed to the new method of pronouncing the language introduced by Sir John Cheke, and wrote letters to him and Sir Thomas Smith upon the subject, in which, according to Ascham, his opponents showed themselves the better critics, but he the superior genius. In his own household he loved to take in young university men of promise; and many whom he thus encouraged became distinguished in after life as bishops, ambassadors and secretaries of state. His house, indeed, was spoken of by Leland as the seat of eloquence and the special abode of the muses.

He lies buried in his own cathedral at Winchester, where his effigy is still to be seen.

(J. GA.)

GARDINER, a city of Kennebec county, Maine, U.S.A., at the confluence of Cobbosseecontee river with the Kennebec, 6 m. below Augusta. Pop. (1890) 5491; (1900) 5501 (537 foreign-born); (1910) 5311. It is served by the Maine Central railway. The site of the city is only a few feet above sea-level, and the Kennebec is navigable for large vessels to this point; the water of the Cobbosseecontee, falling about 130 ft. in a mile, furnishes the city with good power for its manufactures (chiefly paper, machine-shop products, and shoes). The city exports considerable quantities of lumber and ice. Gardiner was founded in 1760 by Dr Sylvester Gardiner (1707-1786), and for a time the settlement was called Gardinerston; in 1779, when it was incorporated as a town, the founder being then a Tory, it was renamed Pittston. But in 1803, when that part of Pittston which lay on the W. bank of the Kennebec was incorporated as a separate town and new life was given to it by the grandson of the founder, the present name was adopted. Gardiner was chartered as a city in 1849. The town of Pittston, on the E. bank of the Kennebec, had a population of 1177 in 1900.

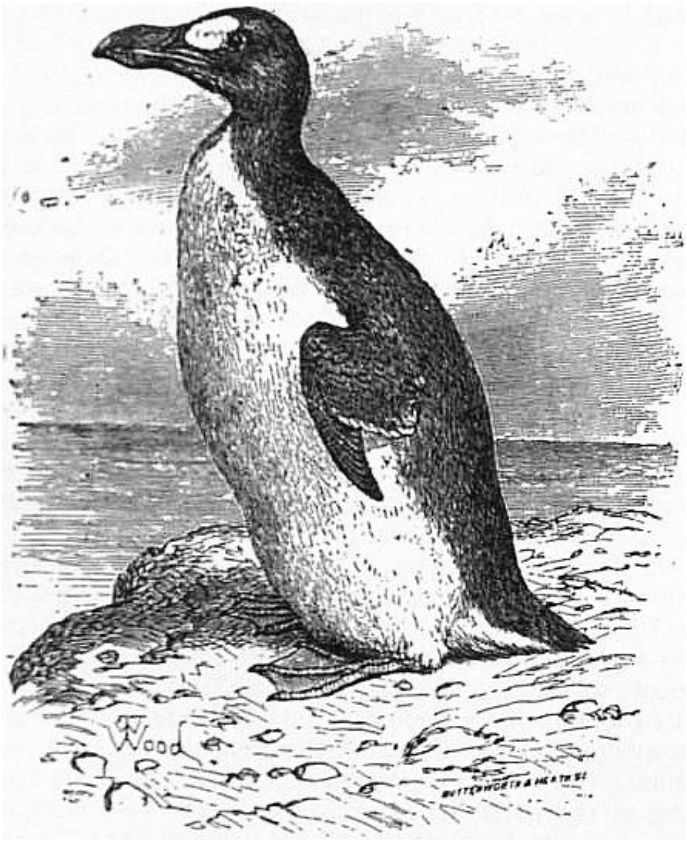
GARDNER, PERCY (1846-), English classical archaeologist, was born in London, and was educated at the City of London school and Christ's College, Cambridge (fellow, 1872). He was Disney professor of archaeology at Cambridge from 1880 to 1887, and was then appointed professor of classical archaeology at Oxford, where he had a stimulating influence on the study of ancient, and particularly Greek, art. He also became prominent as an historical critic on Biblical subjects. Among his works are: *Types of Greek Coins* (1883); *A Numismatic Commentary on Pausanias* (with F. Imhoof-Blumer, 1887); *New Chapters in Greek History* (1892), an account of excavations in Greece and Asia Minor; *Manual of Greek Antiquities* (with F.B. Jevons, 2nd ed. 1898); *Grammar of Greek Art* (1905); *Exploratio Evangelica* (1899), on the origin of Christian belief; *A Historic View of the New Testament* (1901); *Growth of Christianity* (1907).

His brother, ERNEST ARTHUR GARDNER (1862-), educated at the City of London school and Caius College, Cambridge (fellow, 1885), is also well known as an archaeologist. From 1887 to 1895 he was director of the British School of Archaeology at Athens, and later became professor of archaeology at University College, London. His publications include: *Introduction to Greek Epigraphy* (1887); *Ancient Athens* (1902); *Handbook of Greek Sculpture* (1905); *Six Greek Sculptors* (1910). He was elected first Public Orator of London University in 1910.

GARDNER, a township of Worcester county, Massachusetts, U.S.A. Pop. (1890) 8424; (1900) 10,813, of whom 3449 were foreign-born; (1910 census) 14,699. The township is traversed by the Boston & Maine railway. It has an area of 21.4 sq. m. of hill country, well watered with streams and ponds, and includes the villages of Gardner (15 m. by rail W. of Fitchburg), South Gardner and West Gardner. In the township are the state colony for the insane, the Henry Heywood memorial hospital, and the Levi Heywood memorial library (opened in 1886), a memorial to Levi Heywood (1800-1882), a prominent local manufacturer of chairs, who invented various kinds of chair-making machinery. By far the principal industry of the township (dating from 1805) is the manufacture of chairs, the township having in 1905 the largest chair factory in the world; among the other manufactures are toys, baby-carriages, silver-ware and oil stoves. In 1905 the total factory product of the township was valued at $5,019,019, the furniture product alone amounting to $4,267,064, or 85.2% of the total. Gardner, formed from parts of Ashburnham, Templeton, Westminster and Winchenden, was incorporated in 1785, and was named in honour of Col. Thomas Gardner (1724-1775), a patriot leader of Massachusetts, who was mortally wounded in the battle of Bunker Hill.

See W.D. Herrick, *History of the Town of Gardner* (Gardner, 1878), covering the years 1785-1878.

GARE-FOWL[1] (Icelandic, *Geirfugl*; Gaelic, *Gearbhul*), the anglicized form of the Hebridean name of a large sea-bird now considered extinct, formerly a visitor to certain remote Scottish islands, the Great Auk of most English book-writers, and the *Alca impennis* of Linnaeus. In size it was hardly less than a tame goose, and in appearance it much resembled its smaller and surviving relative the razor-bill (*Alca torda*); but the glossy black of its head was varied by a large patch of white occupying nearly all the space between the eye and the bill, in place of the razor-bill's thin white line, while the bill itself bore eight or more deep transverse grooves instead of the smaller number and the ivory-like mark possessed by the species last named. Otherwise the coloration was similar in both, and there is satisfactory evidence that the gare-fowl's winter-plumage differed from that of the breeding-season just as is ordinarily the case in other members of the family *Alcidae* to which it belongs. The most striking characteristic of the gare-fowl, however, was the comparatively abortive condition of its wings, the distal portions of which, though the bird was just about twice the linear dimensions of the razor-bill, were almost exactly of the same size as in that species—proving, if more direct evidence were wanting, its inability to fly.



Gare-Fowl, or Great Auk.

The most prevalent misconception concerning the gare-fowl is one which has been repeated so often, and in books of such generally good repute and wide dispersal, that a successful refutation seems almost hopeless. This is the notion that it was a bird possessing a very high northern range, and consequently to be looked for by Arctic explorers. How this error arose would take too long to tell, but the fact remains indisputable that, setting aside general assertions resting on no evidence worthy of attention, there is but a single record deserving any credit at all of a single example of the species having been observed within the Arctic Circle, and this, according to Prof. Reinhardt, who had the best means of ascertaining the truth, is open to grave doubt.[2] It is clear that the older ornithologists let their imagination get the better of their knowledge or their judgment, and their statements have been blindly repeated by most of their successors. Another error which, if not so widely spread, is at least as serious, since Sir R. Owen unhappily gave it countenance, is that this bird "has not been specially hunted down like the dodo and dinornis, but by degrees has become more scarce." If any reliance can be placed upon the testimony of former observers, the first part of this statement is absolutely untrue. Of the dodo all we know is that it flourished in Mauritius, its only abode, at the time the island was discovered, and that some 200 years later it had ceased to exist—the mode of its extinction being open to conjecture, and a strong suspicion existing that though indirectly due to man's acts it was accomplished by his thoughtless agents (*Phil. Trans.*, 1869, p. 354). The extinction of the *Dinornis* lies beyond the range of recorded history. Supposing it even to have taken place at the very latest period as yet suggested—and there is much to be urged in favour of such a supposition—little but oral tradition remains to tell us how its extirpation was effected. That it existed after New Zealand was inhabited by man is indeed certain, and there is nothing extraordinary in the proved fact that the early settlers (of whatever race they were) killed and ate moas. But evidence that the whole population of those birds was done to death by man, however likely it may seem, is wholly wanting. The contrary is the case with the gare-fowl. In Iceland there is the testimony of a score of witnesses, taken down from their lips by one of the most careful naturalists who ever lived, John Wolley, that the latest survivors of the species were caught and killed by expeditions expressly organized with the view of supplying the demands of caterers to the various museums of Europe. In like manner the fact is incontestable that its breeding-stations in the western part of the Atlantic were for three centuries regularly visited and devastated with the combined objects of furnishing food or bait to the fishermen from very early days, and its final extinction, according to Sir Richard Bonnycastle (*Newfoundland in 1842*, i. p. 232), was owing to "the ruthless trade in its eggs and skin." There is no doubt that one of the chief stations of this species in Icelandic waters disappeared through volcanic action, and that the destruction of the old Geirfuglaskér drove some at least of the birds which frequented it to a rock nearer the

mainland, where they were exposed to danger from which they had in their former abode been comparatively free; yet on this rock (Eldey = fire-island) they were "specially hunted down" whenever opportunity offered, until the stock there was wholly extirpated in 1844.

A third misapprehension is that entertained by John Gould in his *Birds of Great Britain*, where he says that "formerly this bird was plentiful in all the northern parts of the British Islands, particularly the Orkneys and the Hebrides. At the commencement of the 19th century, however, its fate appears to have been sealed; for though it doubtless existed, and probably bred, up to the year 1830, its numbers annually diminished until they became so few that the species could not hold its own." Now of the Orkneys, we know that George Low, who died in 1795, says in his posthumously-published *Fauna Orcadensis* that he could not find it was ever seen there; and on Bullock's visit in 1812 he was told, says Montagu (*Orn. Dict. App.*), that one male only had made its appearance for a long time. This bird he saw and unsuccessfully hunted, but it was killed soon after his departure, while its mate had been killed just before his arrival, and none have been seen there since. As to the Hebrides, St Kilda is the only locality recorded for it, and the last example known to have been obtained there, or in its neighbourhood, was that given to Fleming (*Edinb. Phil. Journ.* x. p. 96) in 1821 or 1822, having been some time before captured by Mr Maclellan of Glass. That the gare-fowl was not plentiful in either group of islands is sufficiently obvious, as also is the impossibility of its continuing to breed "up to the year 1830."

But mistakes like these are not confined to British authors. As on the death of an ancient hero myths gathered round his memory as quickly as clouds round the setting sun, so have stories, probable as well as impossible, accumulated over the true history of this species, and it behoves the conscientious naturalist to exercise more than common caution in sifting the truth from the large mass of error. Americans have asserted that the specimen which belonged to Audubon (now at Vassar College) was obtained by him on the banks of Newfoundland, though there is Macgillivray's distinct statement (*Brit. Birds*, v. p. 359) that Audubon procured it in London. The account given by Degland (*Orn. Europ.* ii. p. 529) in 1849, and repeated in the last edition of his work by M. Gerbe, of its extinction in Orkney, is so manifestly absurd that it deserves to be quoted in full: "Il se trouvait en assez grand nombre il y a une quinzaine d'années aux Orcades; mais le ministre presbytérien dans le Mainland, en offrant une forte prime aux personnes qui lui apportaient cet oiseau, a été cause de sa destruction sur ces îles." The same author claims the species as a visitor to the shores of France on the testimony of Hardy (*Annuaire normand*, 1841, p. 298), which he grievously misquotes both in his own work and in another place (*Naumannia*, 1855, p. 423), thereby misleading an anonymous English writer (*Nat. Hist. Rev.*, 1865, p. 475) and numerous German readers.

John Milne in 1875 visited Funk Island, one of the former resorts of the gare-fowl, or "penguin," as it was there called, in the Newfoundland seas, a place where bones had before been obtained by Stuvitz, and natural mummies so lately as 1863 and 1864. Landing on this rock at the risk of his life, he brought off a rich cargo of its remains, belonging to no fewer than fifty birds, some of them in size exceeding any that had before been known. His collection was subsequently dispersed, most of the specimens finding their way into various public museums.

A literature by no means inconsiderable has grown up respecting the gare-fowl. Neglecting works of general bearing, few of which are without many inaccuracies, the following treatises may be especially mentioned:—J.J.S. Steenstrup, "Et Bidrag til Geirfuglens Naturhistorie og saerligt til Kundskaben om dens tidligere Udbredningskreds," *Naturh. Foren. Vidensk. Meddelelser* (Copenhagen, 1855), p. 33; E. Charlton, "On the Great Auk," *Trans. Tyneside Nat. Field Club*, iv. p. 111; "Abstract of Mr J. Wolley's Researches in Iceland respecting the Gare-fowl," *Ibis* (1861), p. 374; W. Preyer, "*Über Plautus impennis*," *Journ. für Orn.* (1862), pp. 110, 337; K.E. von Baer, "Über das Aussterben der Tierarten in physiologischer und nicht physiologischer Hinsicht," *Bull. de l'Acad. Imp. de St-Pétersb.* vi. p. 513; R. Owen, "Description of the Skeleton of the Great Auk," *Trans. Zool. Soc.* v. p. 317; "The Gare-fowl and its Historians," *Nat. Hist. Rev.* v. p. 467; J.H. Gurney, jun., "On the Great Auk," *Zoologist* (2nd ser.), pp. 1442, 1639; H. Reeks, "Great Auk in Newfoundland," &c., *op. cit.* p. 1854; V. Fatio, "Sur l'Alca impennis," *Bull. Soc. Orn. Suisse*, ii. pp. 1, 80, 147; "On existing Remains of the Gare-fowl," *Ibis* (1870), p. 256; J. Milne, "Relics of the Great Auk," *Field* (27th of March, 3rd and 10th of April 1875). Lastly, reference cannot be omitted to the happy exercise of poetic fancy with which Charles Kingsley was enabled to introduce the chief facts of the gare-fowl's extinction (derived from one of the above-named papers) into his charming *Water Babies*.

(A. N.)

1 The name first appears, and in this form, in the *Account of Hirta* (St Kilda) *and Rona, &c.*, by the lord register, Sir George M'Kenzie, of Tarbat, printed by Pinkerton in his *Collection of Voyages and Travels* (iii. p. 730), and then in Sibbald's *Scotia illustrata* (1684). Martin soon after, in his *Voyage to St Kilda*, spelt it "Gairfowl." Sir R. Owen adopted the form "garfowl," without, as would seem, any precedent authority.

2 The specimen is in the Museum of Copenhagen; the doubt lies as to the locality where it was obtained, whether at Disco, which is within, or at the Fiskernäs, which is without, the Arctic Circle.

GARFIELD, JAMES ABRAM (1831-1881), twentieth president of the United States, was born on the 19th of November 1831 in a log cabin in the little frontier town of Orange, Cuyahoga county, Ohio. His early years were spent in the performance of such labour as fell to the lot of every farmer's son in the new states, and in the acquisition of such education as could be had in the district schools held for a few weeks each winter. But life on a farm was not to his liking, and at sixteen he left home and set off to make a living in some other way. A book of stories of adventure on the sea, which he read over and over again when a boy, had filled him with a longing for a seafaring life. He decided, therefore, to become a sailor, and, in 1848, tramping across the country to Cleveland, Ohio, he sought employment from the captain of a lake schooner. But the captain drove him from the deck, and, wandering on in search of work, he fell in with a canal boatman who engaged him. During some months young Garfield served as bowsman, deck-hand and driver of a canal boat. An attack of the ague sent him home, and on recovery, having resolved to attend a high school and fit himself to become a teacher, he passed the next four years in a hard struggle with poverty and in an earnest effort to secure an education, studying for a short time in the Geauga Seminary at Chester, Ohio. He worked as a teacher, a carpenter and a farmer; studied for a time at the Western Reserve Eclectic Institute at Hiram, Ohio, which afterward became Hiram College, and finally entered Williams College. On graduation, in 1856, Garfield became professor of ancient languages and literature in the Eclectic Institute at Hiram, and within a year had risen to the presidency of the institution.

Soon afterwards he entered political life. In the early days of the Republican party, when the shameful scenes of the Kansas struggle were exciting the whole country, and during the campaigns of 1857 and 1858, he became known as an effective speaker and ardent anti-slavery man. His reward for his services was election in 1859 to the Ohio Senate as the member from Portage and Summit counties. When the "cotton states" seceded, Garfield appeared as a warm supporter of vigorous measures. He was one of the six Ohio senators who voted against the proposed amendment to the Federal Constitution (Feb. 28th, 1861) forbidding any constitutional amendment which should give Congress the power to abolish or interfere with slavery in any state; he upheld the right of the government to coerce seceded states; defended the "Million War Bill" appropriating a million dollars for the state's military expenses; and when the call came for 75,000 troops, he moved that Ohio furnish 20,000 soldiers and three millions of dollars as her share. He had just been admitted to the bar, but on the outbreak of war he at once offered his services to the governor, and became lieutenant-colonel and then colonel of the 42nd Ohio Volunteers, recruited largely from among his former students. He served in Kentucky, was promoted to the rank of brigadier-general of volunteers early in 1862; took part in the second day's fighting at the battle of Shiloh, served as chief of staff under Rosecrans in the Army of the Cumberland in 1863, fought at Chickamauga, and was made a major-general of volunteers for gallantry in that battle. In 1862 he was elected a member of Congress from the Ashtabula district of Ohio, and, resigning his military commission, took his seat in the House of Representatives in December 1863. In Congress he joined the radical wing of the Republican party, advocated the confiscation of Confederate property, approved and defended the Wade-Davis manifesto denouncing the tameness of Lincoln, and was soon recognized as a hard worker and ready speaker. Capacity for work brought him places on important committees—he was chairman successively of the committee on military affairs, the committee on banking and currency, and the committee on appropriations,—and his ability as a speaker enabled him to achieve distinction on the floor of the House and to rise to leadership. Between 1863 and 1873 Garfield delivered speeches of importance on "The Constitutional Amendment to abolish Slavery," "The Freedman's Bureau," "The Reconstruction of the Rebel States," "The Public Debt and Specie Payments," "Reconstruction," "The Currency," "Taxation of United States

Bonds," "Enforcing the 14th Amendment," "National Aid to Education," and "the Right to Originate Revenue Bills." The year 1874 was one of disaster to the Republican party. The greenback issue, the troubles growing out of reconstruction in the South, the Crédit Mobilier and the "Salary Grab," disgusted thousands of independent voters and sent a wave of Democracy over the country. Garfield himself was accused of corruption in connexion with the Crédit Mobilier scandal, but the charge was never proved. A Republican convention in his district demanded his resignation, and re-election seemed impossible; but he defended himself in two pamphlets, "Increase of Salaries" and "Review of the Transactions of the Crédit Mobilier Company," made a village-to-village canvass, and was victorious. In 1876 Garfield for the eighth time was chosen to represent his district; and afterwards as one of the two representatives of the Republicans in the House, he was a member of the Electoral Commission which decided the dispute regarding the presidential election of 1876. When, in 1877, James G. Blaine was made a senator from Maine, the leadership of the House of Representatives passed to Garfield, and he became the Republican candidate for speaker. But the Democrats had a majority in the House, and he was defeated. Hayes, the new president, having chosen John Sherman to be his secretary of the treasury, an effort was made to send Garfield to the United States Senate in Sherman's place. But the president needed his services in the House, and he was not elected to the Senate until 1880.

The time had now come (1880) when the Republican party must nominate a candidate for the presidency. General Grant had served two terms (1869-1877), and the unwritten law of custom condemned his being given another. But the "bosses" of the Republican party in three great States—New York, Pennsylvania and Illinois—were determined that he should be renominated. These men and their followers were known as the "stalwarts." Opposed to them were two other factions, one supporting James G. Blaine, of Maine, and the other John Sherman, of Ohio. When the convention met and the balloting began, the contest along these factional lines started in earnest. For eight-and-twenty ballots no change of any consequence was noticeable. Though votes were often cast for ten names, there were but two real candidates before the convention, Grant and Blaine. That the partisans of neither would yield in favour of the other was certain. That the choice therefore rested with the supporters of the minor candidates was manifest, and with the cry "Anything to beat Grant!" an effort was made to find some man on whom the opposition could unite. Such a man was Garfield. His long term of service in the House, his leadership of his party on its floor, his candidacy for the speakership, and his recent election to the United States Senate, marked him out as the available man. Between the casting of the first and the thirty-third ballot, Garfield, who was the leader of Sherman's adherents in the convention, had sometimes received one or two votes and at other times none. On the thirty-fourth he received seventeen, on the next fifty, and on the next almost the entire vote hitherto cast for Blaine and Sherman, and was declared nominated. During the campaign Garfield was subject to violent personal abuse; the fact that he was alleged to have received $329 from the Crédit Mobilier as a dividend on stock led his opponents to raise the campaign cry of "329," and this number was placarded in the streets of the cities and printed in flaring type in partisan newspapers. The forged "Morey letter," in which he was made to appear as opposed to the exclusion of the Chinese, was widely circulated and injured his candidacy in the West. That the charges against Garfield were not generally credited, however, is shown by the fact that he received 214 electoral votes to his opponent's 155. He was inaugurated on the 4th of March 1881.

Unfortunately, the new president was unequal to the task of composing the differences in his party. For his secretary of state he chose James G. Blaine, the bitterest political enemy of Senator Roscoe Conkling (*q.v.*), the leader of the New York "stalwarts." Without consulting the New York senators, Garfield appointed William H. Robertson, another political enemy of Conkling's, to the desirable post of Collector of the Port of New York, and thereby destroyed all prospects of party harmony. On the 2nd of July, while on his way to attend the commencement exercises at Williams College, the new president was shot in a Washington railway station by a disappointed office-seeker named Charles J. Guiteau, whose mind had no doubt been somewhat influenced by the abuse lavished upon the president by his party opponents; and on the 19th of September 1881, he died at Elberon, New Jersey, whither he had been removed on the 6th. He was buried in Cleveland, Ohio, where in 1890 a monument was erected by popular subscription to his memory.

In 1858 Garfield had married Miss Lucretia Rudolph, by whom he had seven children. His son, Harry Augustus Garfield (b. 1863) graduated at Williams College in 1885, practised law in Cleveland, Ohio, in 1888-1903, was professor of politics at Princeton University in 1903-1908, and in 1908 became president of Williams College. Another son, James Rudolph Garfield (b. 1865), also graduated at Williams College in 1885 and practised law in Cleveland; he was

a Republican member of the Ohio Senate in 1896-1899, was commissioner of corporations, Department of Commerce and Labour, in 1903-1907, attracting wide attention by his reports on certain large industrial organizations, and was secretary of the interior (1907-1909) in the cabinet of President Roosevelt.

President Garfield's writings, edited by Burke A. Hinsdale, were published at Boston, in two volumes, in 1882.

(J. B. McM.)

GAR-FISH, the name given to a genus of fishes (*Belone*) found in nearly all the temperate and tropical seas, and readily recognized by their long, slender, compressed and silvery body, and by their jaws being produced into a long, pointed, bony and sharply-toothed beak. About fifty species are known from different parts of the globe, some attaining to a length of 4 or 5 ft. One species is common on the British coasts, and is well known by the names of "long-nose," "green-bone," &c. The last name is given to those fishes on account of the peculiar green colour of their bones, which deters many people from eating them, although their flesh is well flavoured and perfectly wholesome. The skipper (*Scomberesox*) and half-beak (*Hemirhamphus*), in which the lower jaw only is prolonged, are fishes nearly akin to the gar-pikes.

GARGANEY[1] (North-Italian, *Garganello*), or Summer-Teal, the *Anas querquedula* and *A. circia* of Linnaeus (who made, as did Willughby and Ray, two species out of one), and the type of Stephens's genus *Querquedula*. This bird is one of the smallest of the *Anatidae*, and has gained its common English name from being almost exclusively a summer-visitant to England where nowadays it only regularly resorts to breed in some of the East-Norfolk Broads, though possibly at one time it was found at the same season throughout the great Fen-district. Slightly larger than the common teal (*A. crecca*), the male is readily distinguished therefrom by its peculiarly-coloured head, the sides of which are nutmeg-brown, closely freckled with short whitish streaks, while a conspicuous white curved line descends backwards from the eyes. The upper wing-coverts are bluish grey, the scapulars black with a white shaft-stripe, and the wing-spot (*speculum*) greyish green bordered above and below by white. The female closely resembles the hen teal, but possesses no wing-spot. In Ireland or Scotland the garganey is very rare, and though it is recorded from Iceland, more satisfactory evidence of its occurrence there is needed. It has not a high northern range, and its appearance in Norway and Sweden is casual. Though it breeds in many parts of Europe, in none can it be said to be common; but it ranges far to the eastward in Asia—even to Formosa, according to Swinhoe—and yearly visits India in winter in enormous numbers. Those that breed in Norfolk arrive somewhat late in spring and make their nests in the vast reed-beds which border the Broads—a situation rarely or never chosen by the teal. The labyrinth or bony enlargement of the trachea in the male garganey differs in form from that described in any other drake, being more oval and placed nearly in the median line of the windpipe, instead of on one side, as is usually the case.

1 The word was introduced by Willughby from Gesner (*Orn.*, lib. iii. p. 127), but, though generally adopted by authors, seems never to have become other than a book-name in English, the bird being invariably known in the parts of this island where it is indigenous as "summer-teal."

GARGANO, MONTE (anc. *Garganus Mons*), a massive mountainous peninsula projecting E. from the N. coast of Apulia, Italy, and belonging geologically to the opposite Dalmatian coast; it was indeed separated from the rest of Italy by an arm of the sea as late as the

Tertiary period. The highest point (Monte Calvo) is 3465 ft. above sea-level. The oak forests for which it was renowned in Roman times have entirely disappeared.

GARGOYLE, or GURGOYLE (from the Fr. *gargouille*, originally the throat or gullet, cf. Lat. *gurgulio*, *gula*, and similar words derived from root *gar*, to swallow, the word representing the gurgling sound of water; Ital. *doccia di grande*; Ger. *Ausguss*), in architecture, the carved termination to a spout which conveys away the water from the gutters. Gargoyles are mostly grotesque figures. The term is applied more especially to medieval work, but throughout all ages some means of throwing the water off the roofs, when not conveyed in gutters, has been adopted, and in Egypt there are gargoyles to eject the water used in the washing of the sacred vessels which would seem to have been done on the flat roofs of the temples. In Greek temples the water from the roof passed through the mouths of lions whose heads were carved or modelled in the marble or terra-cotta cymatium of the cornice. At Pompeii large numbers of terra-cotta gargoyles have been found which were modelled in the shape of various animals.

GARHWAL, or GURWAL. 1. A district of British India, in the Kumaon division of the United Provinces. It has an area of 5629 sq. m., and consists almost entirely of rugged mountain ranges running in all directions, and separated by narrow valleys which in some cases become deep gorges or ravines. The only level portion of the district is a narrow strip of waterless forest between the southern slopes of the hills and the fertile plains of Rohilkhand. The highest mountains are in the north, the principal peaks being Nanda Devi (25,661 ft.), Kamet (25,413), Trisul (23,382), Badrinath (23,210), Dunagiri (23,181) and Kedarnath (22,853). The Alaknanda, one of the main sources of the Ganges, receives with its affluents the whole drainage of the district. At Devaprayag the Alaknanda joins the Bhagirathi, and thenceforward the united streams bear the name of the Ganges. Cultivation is principally confined to the immediate vicinity of the rivers, which are employed for purposes of irrigation. Garhwal originally consisted of 52 petty chieftainships, each chief with his own independent fortress (*garh*). Nearly 500 years ago, one of these chiefs, Ajai Pál, reduced all the minor principalities under his own sway, and founded the Garhwal kingdom. He and his ancestors ruled over Garhwal and the adjacent state of Tehri, in an uninterrupted line till 1803, when the Gurkhas invaded Kumaon and Garhwal, driving the Garhwal chief into the plains. For twelve years the Gurkhas ruled the country with a rod of iron, until a series of encroachments by them on British territory led to the war with Nepal in 1814. At the termination of the campaign, Garhwal and Kumaon were converted into British districts, while the Tehri principality was restored to a son of the former chief. Since annexation, Garhwal has rapidly advanced in material prosperity. Pop. (1901) 429,900. Two battalions of the Indian army (the 39th Garhwal Rifles) are recruited in the district, which also contains the military cantonment of Lansdowne. Grain and coarse cloth are exported, and salt, borax, live-stock and wool are imported, the trade with Tibet being considerable. The administrative headquarters are at the village of Pauri, but Srinagar is the largest place. This is an important mart, as is also Kotdwara, the terminus of a branch of the Oudh and Rohilkhand railway from Najibabad.

2. A native state, also known as Tehri, after its capital; area 4180 sq. m.; pop. (1901) 268,885. It adjoins the district mentioned above, and its topographical features are similar. It contains the sources of both the Ganges and the Jumna, which are visited by thousands of Hindu pilgrims. The gross revenue is about £28,000, of which nearly half is derived from forests. No tribute is paid to the British government.

GARIBALDI, GIUSEPPE (1807-1882), Italian patriot, was born at Nice on the 4th of July 1807. As a youth he fled from home to escape a clerical education, but afterwards joined his father in the coasting trade. After joining the “Giovine Italia” he entered the Sardinian navy, and, with a number of companions on board the frigate “Euridice,” plotted to seize the vessel and occupy the arsenal of Genoa at the moment when Mazzini’s Savoy expedition should enter Piedmont. The plot being discovered, Garibaldi fled, but was condemned to death by default on the 3rd of June 1834. Escaping to South America in 1836, he was given letters of marque by the state of Rio Grande do Sul, which had revolted against Brazil. After a series of victorious engagements he was taken prisoner and subjected to severe torture, which dislocated his limbs. Regaining liberty, he renewed the war against Brazil, and took Porto Allegro. During the campaign he met his wife, Anita, who became his inseparable companion and mother of three children, Anita, Ricciotti and Menotti. Passing into the service of Uruguay, he was sent to Corrientes with a small flotilla to oppose Rosas’s forces, but was overtaken by Admiral Brown, against whose fleet he fought for three days. When his ammunition was exhausted he burned his ships and escaped. Returning to Montevideo, he formed the Italian Legion, with which he won the battles of Cerro and Sant’ Antonio in the spring of 1846, and assured the freedom of Uruguay. Refusing all honours and recompense, he prepared to return to Italy upon receiving news of the incipient revolutionary movement. In October 1847 he wrote to Pius IX., offering his services to the Church, whose cause he for a moment believed to be that of national liberty.

Landing at Nice on the 24th of June 1848, he placed his sword at the disposal of Charles Albert, and, after various difficulties with the Piedmontese war office, formed a volunteer army 3000 strong, but shortly after taking the field was obliged, by the defeat of Custozza, to flee to Switzerland. Proceeding thence to Rome, he was entrusted by the Roman republic with the defence of San Pancrazio against the French, where he gained the victory of the 30th of April 1849, remaining all day in the saddle, although wounded in the side at the beginning of the fight. From the 3rd of May until the 30th of May he was continuously engaged against the Bourbon troops at Palestrina, Velletri and elsewhere, dispersing an army of 20,000 men with 3000 volunteers. After the fall of Rome he left the city at the head of 4000 volunteers, with the idea of joining the defenders of Venice, and started on that wonderful retreat through central Italy pursued by the armies of France, Austria, Spain and Naples. By his consummate generalship and the matchless endurance of his men the pursuers were evaded and San Marino reached, though with a sadly diminished force. Garibaldi and a few followers, including his devoted wife Anita, after vainly attempting to reach Venice, where the tricolor still floated, took refuge in the pine forests of Ravenna; the Austrians were seeking him in all directions, and most of his legionaries were captured and shot. Anita died near Comacchio, and he himself fled across the peninsula, being assisted by all classes of the people, to Tuscany, whence he escaped to Piedmont and ultimately to America. At New York, in order to earn a living, he became first a chandler, and afterwards a trading skipper, returning to Italy in 1854 with a small fortune, and purchasing the island of Caprera, on which he built the house thenceforth his home. On the outbreak of war in 1859 he was placed in command of the Alpine infantry, defeating the Austrians at Casale on the 8th of May, crossing the Ticino on the 23rd of May, and, after a series of victorious fights, liberating Alpine territory as far as the frontier of Tirol. When about to enter Austrian territory proper his advance was, however, checked by the armistice of Villafranca.

Returning to Como to wed the countess Raimondi, by whom he had been aided during the campaign, he was apprised, immediately after the wedding, of certain circumstances which caused him at once to abandon that lady and to start for central Italy. Forbidden to invade the Romagna, he returned indignantly to Caprera, where with Crispi and Bertani he planned the invasion of Sicily. Assured by Sir James Hudson of the sympathy of England, he began active preparations for the expedition to Marsala. At the last moment he hesitated, but Crispi succeeded in persuading him to sail from Genoa on the 5th of May 1860 with two vessels carrying a volunteer corps of 1070 strong. Calling at Talamone to embark arms and money, he reached Marsala on the 11th of May, and landed under the protection of the British vessels “Intrepid” and “Argus.” On the 12th of May the dictatorship of Garibaldi was proclaimed at Salemi, on the 15th of May the Neapolitan troops were routed at Calatafimi, on the 25th of May Palermo was taken, and on the 6th of June 20,000 Neapolitan regulars, supported by nine frigates and protected by two forts, were compelled to capitulate. Once established at Palermo, Garibaldi organized an army to liberate Naples and march upon Rome, a plan opposed by the emissaries of Cavour, who desired the immediate annexation of Sicily to the Italian kingdom. Expelling Lafarina and driving out Depretis, who represented Cavour, Garibaldi routed the Neapolitans at Milazzo on the 20th of July. Messina fell on the 20th of July, but Garibaldi, instead of crossing to Calabria, secretly departed for Aranci Bay

in Sardinia, where Bertani was fitting out an expedition against the papal states. Cavour, however, obliged the expedition to sail for Palermo. Returning to Messina, Garibaldi found a letter from Victor Emmanuel II. dissuading him from invading the kingdom of Naples. Garibaldi replied asking “permission to disobey.” Next day he crossed the Strait, won the battle of Reggio on the 21st of August, accepted the capitulation of 9000 Neapolitan troops at San Giovanni and of 11,000 more at Soveria. The march upon Naples became a triumphal progress, which the wiles of Francesco II. were powerless to arrest. On the 7th of September Garibaldi entered Naples, while Francesco fled to Gaeta. On the 1st of October he routed the remnant of the Bourbon army 40,000 strong on the Volturno. Meanwhile the Italian troops had occupied the Marches, Umbria and the Abruzzi, a battalion of Bersaglieri reaching the Volturno in time to take part in the battle. Their presence put an end to the plan for the invasion of the papal states, and Garibaldi unwillingly issued a decree for the *plébiscite* which was to sanction the incorporation of the Two Sicilies in the Italian realm. On the 7th of November Garibaldi accompanied Victor Emmanuel during his solemn entry into Naples, and on the morrow returned to Caprera, after disbanding his volunteers and recommending their enrolment in the regular army.

Indignation at the cession of Nice to France and at the neglect of his followers by the Italian government induced him to return to political life. Elected deputy in 1861, his anger against Cavour found violent expression. Bixio attempted to reconcile them, but the publication by Cialdini of a letter against Garibaldi provoked a hostility which, but for the intervention of the king, would have led to a duel between Cialdini and Garibaldi. Returning to Caprera, Garibaldi awaited events. Cavour’s successor, Ricasoli, enrolled the Garibaldians in the regular army; Rattazzi, who succeeded Ricasoli, urged Garibaldi to undertake an expedition in aid of the Hungarians, but Garibaldi, finding his followers ill-disposed towards the idea, decided to turn his arms against Rome. On the 29th of June 1862 he landed at Palermo and gathered an army under the banner “Roma o morte.” Rattazzi, frightened at the prospect of an attack upon Rome, proclaimed a state of siege in Sicily, sent the fleet to Messina, and instructed Cialdini to oppose Garibaldi. Circumventing the Italian troops, Garibaldi entered Catania, crossed to Melito with 3000 men on the 25th of August, but was taken prisoner and wounded by Cialdini’s forces at Aspromonte on the 27th of August. Liberated by an amnesty, Garibaldi returned once more to Caprera amidst general sympathy.

In the spring of 1864 he went to London, where he was accorded an enthusiastic reception and given the freedom of the city. From England he returned again to Caprera. On the outbreak of war in 1866 he assumed command of a volunteer army and, after the defeat of the Italian troops at Custozza, took the offensive in order to cover Brescia. On the 3rd of July he defeated the Austrians at Monte Saello, on the 7th at Lodrone, on the 10th at Darso, on the 16th at Condino, on the 19th at Ampola, on the 21st at Bezzecca, but, when on the point of attacking Trent, he was ordered by General Lamarmora to retire. His famous reply “Obbedisco” (“I obey”) has often been cited as a classical example of military obedience to a command destructive of a successful leader’s hopes, but documents now published (cf. *Corriere della sera*, 9th of August 1906) prove beyond doubt that Garibaldi had for some days known that the order to evacuate the Trentino would shortly reach him. The order arrived on the 9th of August, whereas Crispi had been sent as early as the 16th of July to warn Garibaldi that, owing to Prussian opposition, Austria would not cede the Trentino to Italy, and that the evacuation was inevitable. Hence Garibaldi’s laconic reply. From the Trentino he returned to Caprera to mature his designs against Rome, which had been evacuated by the French in pursuance of the Franco-Italian convention of the 15th of September 1864. Gathering volunteers in the autumn of 1867, he prepared to enter papal territory, but was arrested at Sinalunga by the Italian government and conducted to Caprera. Eluding the surveillance of the Italian cruisers, he returned to Florence, and, with the complicity of the second Rattazzi cabinet, entered Roman territory at Passo Corese on the 23rd of October. Two days later he took Monterotondo, but on the 2nd of November his forces were dispersed at Mentana by French and papal troops. Recrossing the Italian frontier, he was arrested at Figline and taken back to Caprera, where he eked out his slender resources by writing several romances. In 1870 he formed a fresh volunteer corps and went to the aid of France, defeating the German troops at Chatillon, Autun and Dijon. Elected a member of the Versailles assembly, he resigned his mandate in anger at French insults, and withdrew to Caprera until, in 1874, he was elected deputy for Rome. Popular enthusiasm induced the Conservative Minghetti cabinet to propose that a sum of £40,000 with an annual pension of £2000 be conferred upon him as a recompense for his services, but the proposal, though adopted by parliament (27th May 1875), was indignantly refused by Garibaldi. Upon the advent of the Left to power, however, he accepted both gift and

pension, and worked energetically upon the scheme for the Tiber embankment to prevent the flooding of Rome. At the same time he succeeded in obtaining the annulment of his marriage with the countess Raimondi (with whom he had never lived) and contracted another marriage with the mother of his children, Clelia and Manlio. In 1880 he went to Milan for the inauguration of the Mentana monument, and in 1882 visited Naples and Palermo, but was prevented by illness from being present at the 600th anniversary of the Sicilian Vespers. On the 2nd of June 1882 his death at Caprera plunged Italy into mourning.

See Garibaldi, *Epistolario*, ed. E.E. Ximenes (2 vols., Milan, 1885), and *Memorie autografiche* (11th ed., Florence, 1902; Eng. translation by A. Werner, with supplement by J.W. Mario in vol. iii. of 1888 ed.); Giuseppe Guerzoni, *Garibaldi* (2 vols., Florence, 1882); Jessie White Mario, *Garibaldi e i suoi tempi* (Milan, 1884); G.M. Trevelyan, *Garibaldi's Defence of the Roman Republic* (London, 1907), which contains an excellent sketch of Garibaldi's early career, of the events leading up to the proclamation of the Roman Republic, and a picturesque, detailed and authoritative account of the defence of Rome and of Garibaldi's flight, with a very full bibliography; also Trevelyan's *Garibaldi and the Thousand* (1909).

(H. W. S.)

GARIN LE LOHERAIN, French epic hero. The 12th century *chanson de geste* of Garin le Loherain is one of the fiercest and most sanguinary narratives left by the *trouvères*. This local cycle of Lorraine, which is completed by Hervis de Metz, Girbers de Metz, Anséis, fils de Girbert and Yon, is obviously based on history, and the failure absolutely to identify the events recorded does not deprive the poems of their value as a picture of the savage feudal wars of the 11th and 12th centuries. The episodes are evolved naturally and the usual devices adopted by the *trouvères* to reconcile their inconsistencies are absent. Nevertheless no satisfactory historical explanation of the story has yet been offered. It has been suggested by a recent critic (F. Settegast, *Quellenstudien zur gallo-romanischen Epik*, 1904) that these poems resume historical traditions going back to the Vandal irruption of 408 and the battle fought by the Romans and the West Goths against the Huns in 451. The cycle relates three wars against hosts of heathen invaders. In the first of these Charles Martel and his faithful vassal Hervis of Metz fight by an extraordinary anachronism against the Vandals, who have destroyed Reims and besieged other cities. They are defeated in a great battle near Troyes. In the second Hervis is besieged in Metz by the "Hongres." He sends first for help to Pippin, who defers his assistance by the advice of the traitor Hardré. Hervis then transfers his allegiance to Anséis of Cologne, by whose help the invaders are repulsed, though Hervis himself is slain. In the third Thierry, king of Moriane[1] sends to Pippin for help against four Saracen kings. He is delivered by a Frankish host, but falls in the battle. Hervis of Metz was the son of a citizen to whom the duke of Lorraine had married his daughter Aelis, and his sons Garin and Begue are the heroes of the *chanson* which gives its name to the cycle. The dying king Thierry had desired that his daughter Blanchefleur should marry Garin, but when Garin prefers his suit at the court of Pippin, Fromont of Bordeaux puts himself forward as his rival and Hardré, Fromont's father, is slain by Garin. The rest of the poem is taken up with the war that ensues between the Lorrainers and the men of Bordeaux. They finally submit their differences to the king, only to begin their disputes once more. Blanchefleur becomes the wife of Pippin, while Garin remains her faithful servant. One of the most famous passages of the poem is the assassination of Begue by a nephew of Fromont, and Garin, after laying waste his enemy's territory, is himself slain. The remaining songs continue the feud between the two families. According to Paulin Paris, the family of Bordeaux represents the early dukes of Aquitaine, the last of whom, Waifar (745-768) was dispossessed and slain by Pippin the Short, king of the Franks; but the *trouvères* had in mind no doubt the wars which marked the end of the Carolingian dynasty.

See *Li Romans de Garin le Loherain*, ed. P. Paris (Paris, 1833); *Hist. litt. de la France*, vol. xxii. (1852); J.M. Ludlow, *Popular Epics of the Middle Ages* (London and Cambridge, 1865); F. Lot, *Études d'histoire du moyen âge* (Paris, 1896); F. Settegast, *Quellenstudien zur gallo-romanischen Epik* (Leipzig, 1904). A complete edition of the cycle was undertaken by E. Stengel, the first volume of which, *Hervis de Mes* (Gesellschaft für roman. Lit., Dresden), appeared in 1903.

1 *i.e.* Maurienne, now a district and diocese (St Jean de Maurienne) of Savoy.

GARLAND, JOHN (fl. 1202-1252), Latin grammarian, known as Johannes Garlandius, or, more commonly, Johannes de Garlandia, was born in England, though most of his life was spent in France. John Bale in his *Catalogus*, and John Pits, following Bale, placed him among the writers of the 11th century. The main facts of his life, however, are stated in a long poem *De triumphis ecclesiae* contained in Cotton MS. Claudius A x in the British Museum, and edited by Thomas Wright for the Roxburghe Club in 1856. Garland narrates the history of his time from the point of view of the victories gained by the church over heretics at home and infidels abroad. He studied at Oxford under a certain John of London, whom it is difficult to distinguish from others of the same name; but he must have been in Paris in or before 1202, for he mentions as one of his teachers Alain de Lisle, who died in that year or the next. Garland was one of the professors chosen in 1229 for the new university of Toulouse, and remained in the south during the Albigensian crusade, of which he gives a detailed account in books iv.-vi. In 1232 or 1233 the hatred of the people made further residence in Toulouse unsafe for the professors of the university, who had been installed by the Catholic party. Garland was one of the first to fly, and the rest of his life was spent in Paris, where he finished his poem in 1252. Garland's grammatical works were much used in England, and were often printed by Richard Pynson and Wynkyn de Worde. He was also a voluminous Latin poet. Works on mathematics and music have also been assigned to him, but the ascription may have arisen from confusion of his works with those of Gerlandus, a canon of Besançon in the 12th century. The treatise on alchemy, *Compendium alchimiae*, often printed under his name, was by a 14th-century writer named Martin Ortolan, or Lortholain.

The best known of his poems beside the "De Triumphis Ecclesiae" is "Epithalamium beatae Mariae Virginis," contained in the same MS. Among his other works are his "Dictionarius," a Latin vocabulary, printed by T. Wright in the *Library of National Antiquities* (vol. i., 1857); *Compendium totius grammatices ...*, printed at Deventer, 1489; two metrical treatises, entitled *Synonyma* and *Equivoca*, frequently printed at the close of the 15th century.

For further bibliographical information see the British Museum catalogue; J.A. Fabricius, *Bibliotheca Latina mediae et infimae aetatis ...*, vol. iii. (1754); G. Brunet, *Manuel du libraire, &c.* See also *Histoire litt. de la France*, vols. viii., xxi., xxiii. and xxx.; the prefaces to the editions by T. Wright mentioned above; P. Meyer, *La Chanson de la croisade contre les Albigeois*, vol. ii. pp. xxi-xxiii. (Paris, 1875); Dr A. Scheler, *Lexicographie latine du XII^e^ et du XIII^e^ siècles* (Leipzig, 1867); the article by C.L. Kingsford in the *Dict. Nat. Biog.*, giving a list also of the works on alchemy, mathematics and music, rightly or wrongly ascribed to him; J.E. Sandys, *Hist. of Class. Schol.* i. (1906) 549.

(E. G.)

GARLIC (O. Eng. *gárleác*, *i.e.* "spear-leek"; Gr. σκόροδον; Lat. *allium*; Ital. *aglio*; Fr. *ail*; Ger. *Knoblauch*), *Allium sativum*, a bulbous perennial plant of the natural order Liliaceae, indigenous apparently to south-west Siberia. It has long, narrow, flat, obscurely keeled leaves, a deciduous spathe, and a globose umbel of whitish flowers, among which are small bulbils. The bulb, which is the only part eaten, has membranous scales, in the axils of which are 10 or 12 cloves, or smaller bulbs. From these new bulbs can be procured by planting out in February or March. The bulbs are best preserved hung in a dry place. If of fair size, twenty of them weigh about 1 lb. To prevent the plant from running to leaf, Pliny (*Nat. Hist.* xix. 34) advises to bend the stalk downward and cover with earth; seeding, he observes, may be prevented by twisting the stalk.

Garlic is cultivated in the same manner as the shallot (*q.v.*). It is stated to have been grown in England before the year 1548. The percentage composition of the bulbs is given by E. Solly (*Trans. Hort. Soc. Lond.*, new ser., iii. p. 60) as water 84.09, organic matter 13.38, and inorganic matter 1.53—that of the leaves being water 87.14, organic matter 11.27 and inorganic matter 1.59. The bulb has a strong and characteristic odour and an acrid taste, and yields an offensively smelling oil, essence of garlic, identical with allyl sulphide $(C_3H_5)_2S$ (see Hofmann and Cahours, *Journ. Chem. Soc.* x. p. 320). This, when garlic has been eaten,

is evolved by the excretory organs, the activity of which it promotes. From the earliest times garlic has been used as an article of diet. It formed part of the food of the Israelites in Egypt (Numb. xi. 5) and of the labourers employed by Cheops in the construction of his pyramid, and is still grown in Egypt, where, however, the Syrian is the kind most esteemed (see Rawlinson's *Herodotus*, ii. 125). It was largely consumed by the ancient Greek and Roman soldiers, sailors and rural classes (cf. Virg. *Ecl*. ii. 11), and, as Pliny tells us (*N.H.* xix. 32), by the African peasantry. Galen eulogizes it as the rustic's *theriac* (see F. Adams's *Paulus Aegineta*, p. 99), and Alexander Neckam, a writer of the 12th century (see Wright's edition of his works, p. 473, 1863), recommends it as a palliative of the heat of the sun in field labour. "The people in places where the simoon is frequent," says Mountstuart Elphinstone (*An Account of the Kingdom of Caubul*, p. 140, 1815), "eat garlic, and rub their lips and noses with it, when they go out in the heat of the summer, to prevent their suffering by the simoon." "O dura messorum ilia," exclaims Horace (*Epod*. iii.), as he records his detestation of the popular esculent, to smell of which was accounted a sign of vulgarity (cf. Shakespeare, *Coriol*. iv. 6, and *Meas. for Meas.* iii. 2). In England garlic is seldom used except as a seasoning, but in the southern countries of Europe it is a common ingredient in dishes, and is largely consumed by the agricultural population. Garlic was placed by the ancient Greeks on the piles of stones at cross-roads, as a supper for Hecate (Theophrastus, *Characters*, Δεισιδαιμονίας); and according to Pliny garlic and onions were invocated as deities by the Egyptians at the taking of oaths. The inhabitants of Pelusium in lower Egypt, who worshipped the onion, are said to have held both it and garlic in aversion as food. Garlic possesses stimulant and stomachic properties, and was of old, as still sometimes now, employed as a medicinal remedy. Pliny (*N.H.* xx. 23) gives an exceedingly long list of complaints in which it was considered beneficial. Dr T. Sydenham valued it as an application in confluent smallpox, and, says Cullen (*Mat. Med.* ii. p. 174, 1789), found some dropsies cured by it alone. In the United States the bulb is given in doses of ½-2 drachms in cases of bronchiectasis and phthisis pulmonalis. Garlic may also be prescribed as an extract consisting of the inspissated juice, in doses of 5-10 grains, and as the *syrupus allii aceticus*, in doses of 1-4 drachms. This last preparation has recently been much extolled in the treatment of pulmonary tuberculosis or phthisis.

The wild "crow garlic" and "field garlic" of Britain are the species *Allium vineale* and *A. oleraceum* respectively.

GARNET, or Garnett, **HENRY** (1555-1606), English Jesuit, son of Brian Garnett, a schoolmaster at Nottingham, was educated at Winchester and afterwards studied law in London. Having become a Roman Catholic, he went to Italy, joined the Society of Jesus in 1575, and acquired under Bellarmine and others a reputation for varied learning. In 1586 he joined the mission in England, becoming superior of the province on the imprisonment of William Weston in the following year. In the dispute between the Jesuits and the secular clergy known as the "Wisbech Stirs" (1595-1596) he zealously supported Weston in his resistance to any compromise with the civil government. His antagonism to the secular clergy was also shown later, when in 1603 he, with other Jesuits, was the means of betraying to the government the "Bye Plot," contrived by William Watson, a secular priest. In 1598 he was professed of the four vows.

Garnet supervised the Jesuit mission for eighteen years with conspicuous success. His life was one of concealment and disguises; a price was put on his head; but he was fearless and indefatigable in carrying on his propaganda and in ministering to the scattered Catholics, even in their prisons. The result was that he gained many converts, while the number of Jesuits in England increased during his tenure of office from three to forty. It is, however, in connexion with the Gunpowder Plot that he is best remembered. His part in this, for which he suffered death, needs discussion in greater detail.

In 1602 Garnet received briefs from Pope Clement VIII. directing that no person unfavourable to the Catholic religion should be allowed to succeed to the throne. About the same time he was consulted by Catesby, Tresham and Winter, all afterwards involved in the Gunpowder Plot, on the subject of the mission to be sent to Spain to induce Philip III. to invade England. According to his own statement he disapproved, but he gave Winter a recommendation to Father Creswell, an influential person at Madrid. Moreover, in May 1605 he gave introductions to Guy Fawkes when he went to Flanders, and to Sir Edmund

Baynham when he went to Rome (see Gunpowder Plot). The preparations for the plot had now been actively going forward since the beginning of 1604, and on the 9th of June 1605 Garnet was asked by Catesby whether it was lawful to enter upon any undertaking which should involve the destruction of the innocent together with the guilty, to which Garnet answered in the affirmative, giving as an illustration the fate of persons besieged in a town in time of war. Afterwards, feeling alarmed, according to his own accounts, he admonished Catesby against intending the death of "not only innocents but friends and necessary persons for a commonwealth," and showed him a letter from the pope forbidding rebellion. According to Sir Everard Digby, however, Garnet, when asked the meaning of the brief, replied "that they were not (meaning the priests) to undertake or procure stirs, but yet they would not hinder any, neither was it the pope's mind they should, that should be undertaken for Catholic good.... This answer, with Mr Catesby's proceedings with him and me, gave me absolute belief that the matter in general was approved, though every particular was not known." Both men were endeavouring to exculpate themselves, and therefore both statements are subject to suspicion. A few days later, according to Garnet, the Jesuit, Oswald Tesemond, known as Greenway, informed him of the whole plot "by way of confession," when, as he declares, he expressed horror at the design and urged Greenway to do his utmost to prevent its execution. Subsequently, after his trial, Garnet said he "could not certainly affirm" that Greenway intended to relate the matter to him in confession.

Garnet's conduct in now keeping the plot a secret has been a matter of considerable controversy not only between Roman Catholics and Protestants, but amongst Roman Catholic writers themselves. Father Martin del Rio, a Jesuit, writing in 1600, discusses the exact case of the revelation of a plot in confession. Almost all the learned doctors, he says, declare that the confessor may reveal it, but he adds, "the contrary opinion is the safer and better doctrine, and more consistent with religion and with the reverence due to the holy rite of confession." According to Bellarmine, Garnet's zealous friend and defender, "If the person confessing be concealed, it is lawful for a priest to break the seal of confession in order to avert a great calamity"; but he justifies Garnet's silence by insisting that it was not lawful to disclose a treasonable secret to a heretical king. According to Garnet's own opinion a priest cognizant of treason against the state "is bound to find all lawful means to discover it *salvo sigillo confessionis*." In this connexion it is worth pointing out that Garnet had not thought it his duty to disclose the treasonable intrigue with the king of Spain in 1602, though there was no pretence in this case that he was restricted by the seal of confession, and his inactivity now tells greatly in his disfavour; for, allowing even that he was bound by confessional secrecy from taking action on Greenway's information, he had still Catesby's earlier revelations to act upon. He appears to have taken no steps whatever to prevent the crime, beyond writing to Rome in vague terms that "he feared some particular desperate courses," which aroused no suspicions in that quarter. At the same time he wrote to Father Parsons on the 4th of September that "as far as he could now see the minds of the Catholics were quieted."

His movements immediately prior to the attempt were certainly suspicious. In September, shortly before the expected meeting of parliament on the 3rd of October, Garnet organized a pilgrimage to St Winifred's Well in Flintshire, which started from Gothurst (now Gayhurst), Sir Everard Digby's house in Buckinghamshire, included Rokewood, and stopped at the houses of John Grant and Robert Winter, three others of the conspirators. During the pilgrimage Garnet asked for the prayers of the company "for some good success for the Catholic cause at the beginning of parliament." After his return he went on the 29th of October to Coughton in Warwickshire, near which place it had been settled the conspirators were to assemble after the explosion. On the 6th of November, Bates, Catesby's servant and one of the conspirators, brought him a letter with the news of the failure of the plot and desiring advice. On the 30th Garnet addressed a letter to the government in which he protested his innocence with the most solemn oaths, "as one who hopeth for everlasting salvation."

It was not till the 4th of December, however, that Garnet and Greenway were, by the confession of Bates, implicated in the plot; and on the same day Garnet removed from Coughton to Hindlip Hall, near Worcester, a house furnished with cleverly-contrived hiding-places for the use of the proscribed priests. Here he remained some time in concealment in company with another priest, Oldcorne *alias* Hall, but at last on the 30th of January 1606, unable to bear the close confinement any longer, they surrendered and were taken up to London, being well treated during the journey by Salisbury's express orders. He was examined by the council on the 13th of February and frequently questioned during the following days, but refused to incriminate himself, and a threat to inflict torture had no effect upon his resolution. Subsequently Garnet and Oldcorne having been placed in

adjoining rooms and enabled to communicate with one another, their conversations were overheard on several separate occasions and considerable information obtained. Garnet at first denied all speech with Oldcorne, but subsequently on the 8th of March confessed his connexion with the plot. He was tried at the Guildhall on the 28th.

Garnet was clearly guilty of misprision of treason, *i.e.* of having concealed his knowledge of the crime, an offence which exposed him to perpetual imprisonment and forfeiture of his property; for the law of England took no account of religious scruples or professional etiquette when they permit the execution of a preventable crime. Strangely enough, however, the government passed over the incriminating conversation with Greenway, and relied entirely on the strong circumstantial evidence to support the charge of high treason against the prisoner. The trial was not conducted in a manner which would be permitted in more modern days. The rules of evidence which now govern the procedure in criminal cases did not then exist, and Garnet's trial, like many others, was influenced by the political situation, the case against him being supported by general political accusations against the Jesuits as a body, and with evidence of their complicity in former plots against the government. The prisoner himself deeply prejudiced his cause by his numerous false statements, and still more by his adherence to the doctrine of equivocation. Garnet, it is true, claimed to limit the justification of equivocation to cases "of necessary defence from injustice and wrong or of the obtaining some good of great importance when there is no danger of harm to others," and he could justify his conduct in lying to the council by their own conduct towards him, which included treacherous eavesdropping and fraud, and also threats of torture. Moreover, the attempt of the counsel for the crown to force the prisoner to incriminate himself was opposed to the whole spirit and tradition of the law of England. He was declared guilty, and it is probable, in spite of the irregularity and unjudicial character of his trial, that substantial justice was done by his conviction. His execution took place on the 3rd of May 1606, Garnet acknowledging himself justly condemned for his concealment of the plot, but maintaining to the last that he had never approved it. The king, who had shown him favour throughout and who had forbidden his being tortured, directed that he should be hanged till he was quite dead and that the usual frightful cruelties should be omitted.

Soon after his death the story of the miracle of "Garnet's Straw" was circulated all over Europe, according to which a blood-stained straw from the scene of execution which came into the hands of one John Wilkinson, a young and fervent Roman Catholic, who was present, developed Garnet's likeness. In consequence of the credence which the story obtained, Archbishop Bancroft was commissioned by the privy council to discover and punish the impostors. Garnet's name was included in the list of the 353 Roman Catholic martyrs sent to Rome from England in 1880, and in the 2nd appendix of the Menology of England and Wales compiled by order of the cardinal archbishop and the bishops of the province of Westminster by R. Stanton in 1887, where he is styled "a martyr whose cause is deferred for future investigation." The passage in *Macbeth* (Act II. Scene iii.) on equivocators no doubt refers especially to Garnet. His *aliases* were Farmer, Marchant, Whalley, Darcey Meaze, Phillips, Humphreys, Roberts, Fulgeham, Allen. Garnet was the author of a letter on the Martyrdom of Godfrey Maurice, *alias* John Jones, in Diego Yepres's *Historia particular de la persecucion de Inglaterra* (1599); a *Treatise of Schism*, a MS. treatise in reply to *A Protestant Dialogue between a Gentleman and a Physician*; a translation of the *Stemma Christi* with supplements (1622); a treatise on the Rosary; a Treatise of Christian Renovation or Birth (1616).

AUTHORITIES.—Of the great number of works embodying the controversy on the question of Garnet's guilt the following may be mentioned, in order of date: *A True and Perfect Relation of the whole Proceedings against ... Garnet a Jesuit and his Confederates* (1606, repr. 1679), the official account, but incomplete and inaccurate; *Apologia pro Henrico Garneto* (1610), by the Jesuit L'Heureux, under the pseudonym Eudaemon-Joannes, and Dr Robert Abbot's reply, *Antilogia versus Apologiam Eudaemon-Joannes*, in which the whole subject is well treated; Henry More, *Hist. Provinciae Anglicanae Societatis* (1660); D. Jardine, *Gunpowder Plot* (1857); J. Morris, S.J., *Condition of the Catholics under James I.* (1872), containing Father Gerard's narrative; J.H. Pollen, *Father Henry Garnet and the Gunpowder Plot* (1888); S.R. Gardiner, *What Gunpowder Plot was* (1897), in reply to John Gerard, S.J., *What was the Gunpowder Plot?* (1897); J. Gerard, *Contributions towards a Life of Father Henry Garnet* (1898). See also *State Trials II.*, and *Cal. of State Papers Dom.*, (1603-1610). The original documents are preserved in the *Gunpowder Plot Book* at the Record Office.

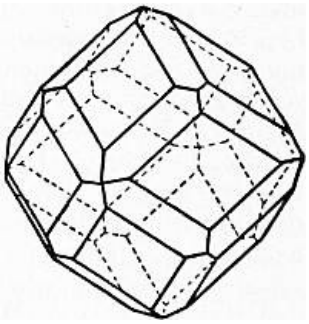
GARNET, a name applied to a group of closely-related minerals, many of which are used as gem-stones. The name probably comes from the Lat. *granaticus*, a stone so named from its resemblance to the pulp of the pomegranate in colour, or to its seeds in shape; or possibly from *granum*, "cochineal," in allusion to the colour of the stone. The garnet was included, with other red stones, by Theophrastus, under the name of ἄνθραξ, while the common garnet seems to have been his ἀνθράκιον. Pliny groups several stones, including garnet, under the term *carbunculus*. The modern carbuncle is a deep red garnet (almandine) cut *en cabochon*, or with a smooth convex surface, frequently hollowed out at the back, in consequence of the depth of colour, and sometimes enlivened with a foil (see ALMANDINE). The Hebrew word *nophek*, translated ἄνθραξ in the Septuagint, seems to have been the garnet or carbuncle, whilst *bareketh* (σμάραγδος of the Septuagint), though also rendered "carbuncle," was probably either beryl or, in the opinion of Professor Flinders Petrie, rock-crystal. Garnets were used as beads in ancient Egypt. Though not extensively employed by the Greeks as a material for engraved gems, it was much used for this purpose by the Romans of the Empire. Flat polished slabs of garnet are found inlaid in mosaic work in Anglo-Saxon and Merovingian jewelry, the material used being almandine, or "precious garnet."

Garnets vary considerably in chemical composition, but the variation is limited within a certain range. All are orthosilicates, conformable to the general formula $R''_3R'''_2(SiO_4)_3$, where R″ = Ca, Mg, Fe, Mn, and R‴ = Al, Fe, Cr. Although there are many kinds of garnet they may be reduced to the following six types, which may occur intermixed isomorphously: —

1. Calcium-aluminium garnet (*Grossularite*), $Ca_3Al_2Si_3O_{12}$.
2. Calcium-ferric garnet (*Andradite*), $Ca_3Fe_2Si_3O_{12}$.
3. Calcium-chromium garnet (*Uvarovite*), $Ca_3Cr_2Si_3O_{12}$.
4. Magnesium-aluminium garnet (*Pyrope*), $Mg_3Al_2Si_3O_{12}$.
5. Ferrous-aluminium garnet (*Almandine*), $Fe_3Al_2Si_3O_{12}$.
6. Manganous-aluminium garnet (*Spessartine*), $Mn_3Al_2Si_3O_{12}$.

These are frequently called respectively:—(1) Lime-alumina garnet; (2) lime-iron garnet; (3) lime-chrome garnet; (4) magnesia-alumina garnet; (5) iron-alumina garnet; (6) manganese-alumina garnet.

The types are usually modified by isomorphous replacement of some of their elements.



All garnets crystallize in the cubic system, usually in rhombic dodecahedra or in icositetrahedra, or in a combination of the two forms (see fig.). Octahedra and cubes are rare, but the six-faced octahedron occurs in some of the combinations. Cleavage obtains parallel to the dodecahedron, but is imperfect. The hardness varies according to composition from 6.5 to 7.5, and the specific gravity in like manner has a wide range, varying from 3.4 in the calcium-aluminium garnets to 4.3 in the ferrous-aluminium species. Sir Arthur H. Church found that many garnets when fused yielded a product of lower density than the original mineral. The colour is typically red, but may be brown, yellow, green or even black, while some garnets are colourless. Being cubic the garnets are normally singly refracting, but anomalies frequently occur, leading some authorities to doubt whether the mineral is really cubic. The refractive power of garnet is high, so that in microscopic sections, viewed by transmitted light, the mineral stands out in relief.

Garnets are very widely distributed, occurring in crystalline schists, gneiss, granite, metamorphic limestone, serpentine, and occasionally in volcanic rocks. With omphacite and smaragdite, garnet forms the peculiar rock called eclogite. The garnets used for industrial purposes are usually found loose in detrital deposits, weathered from the parent rock, though in some important workings the rock is quarried. The garnets employed as gem-stones are described under their respective headings (see ALMANDINE, CINNAMON STONE, DEMANTOID and PYROPE). Most of the minerals noticed in this article are of scientific rather than commercial interest.

Grossularite or "gooseberry-stone," is typically a brownish-green garnet from Siberia, known also as wiluite (a name applied also to vesuvianite, *q.v.*), from the river Wilui where it occurs. It is related to hessonite, or cinnamon-stone. A Mexican variety occurs in rose-pink

dodecahedra. Romanzovite is a brown garnet, of grossularia-type, from Finland, taking its name from Count Romanzov. Andradite was named by J.D. Dana after B.J. d'Andrada e Silva, who described, in 1800, one of its varieties allochroite, a Norwegian garnet, so named from its variable colour. This species includes most of the common garnet occurring in granular and compact masses, sometimes forming garnet rock. To andradite may be referred melanite, a black garnet well known from the volcanic tuffs near Rome, used occasionally in the 18th century for mourning jewelry. Another black garnet, in small crystals from the Pyrenees, is called pyreneite. Under andradite may also be placed topazolite, a honey-yellow garnet, rather like topaz, from Piedmont; colophonite, a brown resin-like garnet, with which certain kinds of idocrase have been confused; aplome, a green garnet from Saxony and Siberia; and jelletite, a green Swiss garnet named after the Rev. J.H. Jellet. Here also may be placed the green Siberian mineral termed demantoid (*q.v.*), sometimes improperly called olivine by jewellers. Uvarovite, named after a Russian minister, Count S.S. Uvarov, is a rare green garnet from Siberia and Canada, but though of fine colour is never found in crystals large enough for gem-stones. Spessartite, or spessartine, named after Spessart, a German locality, is a fine aurora-red garnet, cut for jewelry when sufficiently clear, and rather resembling cinnamon-stone. It is found in Ceylon, and notably in the mica-mines in Amelia county, Virginia, United States. A beautiful rose-red garnet, forming a fine gem-stone, occurs in gravels in Macon county, N.C., and has been described by W.E. Hidden and Dr J.H. Pratt under the name of rhodolite. It seems related to both almandine and pyrope, and shows the absorption-spectrum of almandine. The Bohemian garnets largely used in jewelry belong to the species pyrope (*q.v.*).

Garnets are not only cut as gems, but are used for the bearings of pivots in watches, and are in much request for abrasive purposes. Garnet paper is largely used, especially in America, in place of sandpaper for smoothing woodwork and for scouring leather in the boot-trade. As an abrasive agent it is worked at several localities in the United States, especially in New York State, along the borders of the Adirondacks, where it occurs in limestone and in gneiss. Much of the garnet used as an abrasive is coarse almandine. Common garnet, where abundant, has sometimes been used as a fluxing agent in metallurgical operations. Garnet has been formed artificially, and is known as a furnace-product.

It may be noted that the name of white garnet has been given to the mineral leucite, which occurs, like garnet, crystallized in icositetrahedra.

(F. W. R.*)

GARNETT, RICHARD (1835-1906), English librarian and author, son of the learned philologist Rev. Richard Garnett (1789-1850), priest-vicar of Lichfield cathedral and afterwards keeper of printed books at the British Museum, who came of a Yorkshire family, was born at Lichfield on the 27th of February 1835. His father was really the pioneer of modern philological research in England; his articles in the *Quarterly Review* (1835, 1836) on English lexicography and dialects, and on the Celtic question, and his essays in the *Transactions* of the Philological Society (reprinted 1859), were invaluable to the later study of the English language. The son, who thus owed much to his parentage, was educated at home and at a private school, and in 1851, just after his father's death, entered the British Museum as an assistant in the library. In 1875 he rose to be superintendent of the reading-room, and from 1890 to 1899, when he retired, he was keeper of the printed books. In 1883 he was given the degree of LL.D. at Edinburgh, an honour repeated by other universities, and in 1895 he was made a C.B.

His long connexion with the British Museum library, and the value of his services there, made him a well-known figure in the literary world, and he published much original work in both prose and verse. His chief publications in book-form were: in verse, *Primula* (1858), *Io in Egypt* (1859), *Idylls and Epigrams* (1869, republished in 1892 as *A Chaplet from the Greek Anthology*), *The Queen and other Poems* (1902), *Collected Poems* (1893); in prose, biographies of Carlyle (1887), Emerson (1887), Milton (1890), Edward Gibbon Wakefield (1898); a volume of remarkably original and fanciful tales, *The Twilight of the Gods* (1888); a tragedy, *Iphigenia in Delphi* (1890); *A Short History of Italian Literature* (1898); *Essays in Librarianship and Bibliophily* (1899); *Essays of an Ex-librarian* (1901). He was an extensive contributor to the *Encyclopaedia Britannica* and the *Dictionary of National Biography*, editor of the *International Library of Famous Literature*, and co-editor, with E. Gosse, of the elaborate *English Literature: an illustrated Record*. So multifarious was his output, however,

in contributions to reviews, &c., and as translator or editor, that this list represents only a small part of his published work. He was a member of numerous learned literary societies, British and foreign. His facility as an expositor, and his gift for lucid and acute generalization, together with his eminence as a bibliophile, gave his work an authority which was universally recognized, though it sometimes suffered from his relying too much on his memory and his power of generalizing—remarkable as both usually were—in cases requiring greater precision of statement in matters of detail. But as an interpreter, whether of biography or *belles lettres*, who brought an unusually wide range of book-learning, in its best sense, interestingly and comprehensibly before a large public, and at the same time acceptably to the canons of careful scholarship, Dr Garnett's writing was always characterized by clearness, common sense and sympathetic appreciation. His official career at the British Museum marked an epoch in the management of the library, in the history of which his place is second only to that of Panizzi. Besides introducing the "sliding press" in 1887 he was responsible for reviving the publication of the general catalogue, the printing of which, interrupted in 1841, was resumed under him in 1880, and gradually completed. The antipodes of a Dryasdust, his human interest in books made him an ideal librarian, and his courtesy and helpfulness were outstanding features in a personality of singular charm. The whole bookish world looked on him as a friend. Among his "hobbies" was a study of astrology, to which, without associating his name with it in public, he devoted prolonged inquiry. Under the pseudonym of "A.G. Trent" he published in 1880 an article (in the *University Magazine*) on "The Soul and the Stars"—quoted in Wilde and Dodson's *Natal Astrology*. He satisfied himself that there was more truth in the old astrology than modern criticism supposed, and he had intended to publish a further monograph on the subject, but the intention was frustrated by the ill-health which led up to his death on the 13th of April 1906. He married (1863) an Irish wife, Olivia Narney Singleton (d. 1903), and had a family of six children; his son Edward (b. 1868) being a well-known literary man, whose wife translated Turgeneff's works into English.

(H. Ch.)

GARNIER, CLÉMENT JOSEPH (1813-1881), French economist, was born at Beuil (Alpes maritimes) on the 3rd of October 1813. Coming to Paris he studied at the École de Commerce, of which he eventually became secretary and finally a professor. In 1842 he founded with Gilbert-Urbain Guillaumin (1801-1864) the Société d'Économie politique, becoming its secretary, a post which he held till his death; and in 1846 he organized the Association pour la Liberté des Échanges. He also helped to establish and edited for many years the *Journal des économistes* and the *Annuaire de l'économie politique*. Of the school of *laissez faire*, he was engaged during his whole life in the advancement of the science of political economy, and in the improvement of French commercial education. In 1873 he became a member of the Institute, and in 1876 a senator for the department in which he was born. He died at Paris on the 25th of September 1881. Of his writings, the following are the more important: *Traité d'économie politique* (1845), *Richard Cobden et la Ligue* (1846), *Traité des finances* (1862), and *Principes du population* (1857).

GARNIER, GERMAIN, Marquis (1754-1821), French politician and economist, was born at Auxerre on the 8th of November 1754. He was educated for the law, and obtained when young the office of *procureur* to the Châtelet in Paris. On the calling of the states-general he was elected as one of the *députés suppléants* of the city of Paris, and in 1791 administrator of the department of Paris. After the 10th of August 1792 he withdrew to the Pays de Vaud, and did not return to France till 1795. In public life, however, he seems to have been singularly fortunate. In 1797 he was on the list of candidates for the Directory; in 1800 he was prefect of Seine-et-Oise; and in 1804 he was made senator and in 1808 a count. After the Restoration he obtained a peerage, and on the return of Louis XVIII., after the Hundred Days, he became minister of state and member of privy council, and in 1817 was created a marquis. He died at Paris on the 4th of October 1821. At court he was, when young, noted

for his facile power of writing society verse, but his literary reputation depends rather on his later works on political economy, especially his admirable translation, with notes and introduction, of Smith's *Wealth of Nations* (1805) and his *Histoire de la monnaie* (2 vols., 1819), which contains much sound and well-arranged material. His *Abrégé des principes de l'écon. polit.* (1796) is a very clear and instructive manual. The valuable *Description géographique, physique, et politique du département de Seine-et-Oise* (1802) was drawn up from his instructions. Other works are *De la propriété* (1792) and *Histoire des banques d'escompte* (1806).

GARNIER, JEAN LOUIS CHARLES (1825-1898), French architect, was born in Paris on the 6th of November 1825. He was educated in a primary school, and it was intended that he should pursue his father's craft, that of a wheelwright. His mother, however, having heard that with a little previous study he might enter an architect's office and eventually become a measuring surveyor (*vérificateur*), and earn as much as six francs a day, and foreseeing that in consequence of his delicate health he would be unfit to work at the forge, sent him to learn drawing and mathematics at the Petite École de Dessin, in the rue de Médecine, the cradle of so many of the great artists of France. His progress was such as to justify his being sent first into an architect's office and then to the well-known atelier of Lebas, where he began his studies in preparation for the examination of the École des Beaux Arts, which he passed in 1842, at the age of seventeen. Shortly after his admission it became necessary that he should support himself, and accordingly he worked during the day in various architects' offices, among them in that of M. Viollet-le-Duc, and confined his studies for the École to the evening. In 1848 he carried off, at the early age of twenty-three, the Grand Prix de Rome, and with his comrades in sculpture, engraving and music, set off for the Villa de Medicis. His principal works were the measured drawings of the Forum of Trajan and the temple of Vesta in Rome, and the temple of Serapis at Pozzuoli. In the fifth year of his travelling studentship he went to Athens and measured the temple at Aegina, subsequently working out a complete restoration of it, with its polychromatic decoration, which was published as a monograph in 1877. The elaborate set of drawings which he was commissioned by the duc de Luynes to make of the tombs of the house of Anjou were not published, owing to the death of his patron; and since Garnier's death they have been given to the library of the École des Beaux Arts, along with other drawings he made in Italy. On his return to Paris in 1853 he was appointed surveyor to one or two government buildings, with a very moderate salary, so that the commission given him by M. Victor Baltard to make two water-colour drawings of the Hôtel de Ville, to be placed in the album presented to Queen Victoria in 1855, on the occasion of her visit to Paris, proved very acceptable. These two drawings are now in the library at Windsor.

In 1860 came, at last, Garnier's chance: a competition was announced for a design for a new imperial academy of music, and out of 163 competitors Garnier was one of five selected for a second competition, in which, by unanimous vote, he carried off the first prize, and the execution of the design was placed in his hands. Begun in 1861, but delayed in its completion by the Franco-German War, it was not till 1875 that the structure of the present Grand Opera House of Paris was finished, at a cost of about 35,000,000 francs (£1,420,000). During the war the building was utilized as the municipal storehouse of provisions. The staircase and the magnificent hall are the finest portion of the interior, and alike in conception and realization have never been approached. Of Garnier's other works, the most remarkable are the Casino at Monte Carlo, the Bischoffsheim villa at Bordighera, the Hôtel du Cercle de la Librairie in Paris; and, among tombs, those of the musicians Bizet, Offenbach, Massé and Duprato. In 1874 he was elected a member of the Institute of France, and after passing through the grades of chevalier, officer and commander of the Legion of Honour, received in 1895 the rank of grand officer, a high distinction that had never before been granted to an architect. Charles Garnier's reputation was not confined to France; it was recognized by all the countries of Europe, and in England he received, in 1886, the royal gold medal of the Royal Institute of Architects, given by Queen Victoria. Besides his monograph on the temple of Aegina, he wrote several works, of which *Le Nouvel Opéra de Paris* is the most valuable. For the International Exhibition of 1889 he designed the buildings illustrating the "History of the House" in all periods, and a work on this subject was afterwards published by him in conjunction with M. Ammann. Not the least of his claims to the gratitude of his country were the services which he rendered on the various art juries

appointed by the state, the Institute of France, and the École des Beaux-Arts, services which in France are rendered in an honorary capacity. Garnier died on the 3rd of August 1898.

(R. P. S.)

GARNIER, MARIE JOSEPH FRANÇOIS [Francis] (1839-1873), French officer and explorer, was born at St Étienne on the 25th of July 1839. He entered the navy, and after voyaging in Brazilian waters and the Pacific he obtained a post on the staff of Admiral Charner, who from 1860 to 1862 was campaigning in Cochin-China. After some time spent in France he returned to the East, and in 1862 he was appointed inspector of the natives in Cochin-China, and entrusted with the administration of Cho-lon, a suburb of Saigon. It was at his suggestion that the marquis de Chasseloup-Laubat determined to send a mission to explore the valley of the Mekong, but as Garnier was not considered old enough to be put in command, the chief authority was entrusted to Captain Doudart de Lagrée. In the course of the expedition—to quote the words of Sir Roderick Murchison addressed to the youthful traveller when, in 1870, he was presented with the Victoria Medal of the Royal Geographical Society of London—from Kratie in Cambodia to Shanghai 5392 m. were traversed, and of these 3625 m., chiefly of country unknown to European geography, were surveyed with care, and the positions fixed by astronomical observations, nearly the whole of the observations being taken by Garnier himself. Volunteering to lead a detachment to Talifu, the capital of Sultan Suleiman, the sovereign of the Mahommedan rebels in Yunnan, he successfully carried out the more than adventurous enterprise. When shortly afterwards Lagrée died, Garnier naturally assumed the command of the expedition, and he conducted it in safety to the Yang-tsze-Kiang, and thus to the Chinese coast. On his return to France he was received with enthusiasm. The preparation of his narrative was interrupted by the Franco-German War, and during the siege of Paris he served as principal staff officer to the admiral in command of the eighth “sector.” His experiences during the siege were published anonymously in the feuilleton of *Le Temps*, and appeared separately as *Le Siège de Paris, journal d’un officier de marine* (1871). Returning to Cochin-China he found the political circumstances of the country unfavourable to further exploration, and accordingly he went to China, and in 1873 followed the upper course of the Yang-tsze-Kiang to the waterfalls. He was next commissioned by Admiral Dupré, governor of Cochin-China, to found a French protectorate or a new colony in Tongking. On the 20th of November 1873 he took Hanoi, the capital of Tongking, and on the 21st of December he was slain in fight with the Black Flags. His chief fame rests on the fact that he originated the idea of exploring the Mekong, and carried out the larger portion of the work.

The narrative of the principal expedition appeared in 1873, as *Voyage d’exploration en Indo-Chine effectué pendant les années 1866, 1867 et 1868, publié sous la direction de M. Francis Garnier, avec le concours de M. Delaporte et de MM. Joubert et Thorel* (2 vols.). An account of the Yang-tsze-Kiang from Garnier’s pen is given in the *Bulletin de la Soc. de Géog.* (1874). His *Chronique royale du Cambodje*, was reprinted from the *Journal Asiatique* in 1872. See *Ocean Highways* (1874) for a memoir by Colonel Yule; and Hugh Clifford, *Further India*, in the Story of Exploration series (1904).

GARNIER, ROBERT (*c.* 1545-*c.* 1600), French tragic poet, was born at Ferté Bernard (Le Maine) in 1545. He published his first work while still a law-student at Toulouse, where he won a prize (1565) in the *jeux floraux*. It was a collection of lyrical pieces, now lost, entitled *Plaintes amoureuses de Robert Garnier* (1565). After some practice at the Parisian bar, he became conseiller du roi au siège présidial et sénéchaussée of Le Maine, his native district, and later lieutenant-général criminel. His friend Lacroix du Maine says that he enjoyed a great reputation as an orator. He was a distinguished magistrate, of considerable weight in his native province, who gave his leisure to literature, and whose merits as a poet were fully recognized by his own generation. He died at Le Mans probably in 1599 or 1600.

In his early plays he was a close follower of the school of dramatists who were inspired by the study of Seneca. In these productions there is little that is strictly dramatic except the

form. A tragedy was a series of rhetorical speeches relieved by a lyric chorus. His pieces in this manner are *Porcie* (published 1568, acted at the hôtel de Bourgogne in 1573), *Cornélie* and *Hippolyte* (both acted in 1573 and printed in 1574). In *Porcie* the deaths of Cassius, Brutus and Portia are each the subject of an eloquent recital, but the action is confined to the death of the nurse, who alone is allowed to die on the stage. His next group of tragedies —*Marc-Antoine* (1578), *La Troade* (1579), *Antigone* (acted and printed 1580)—shows an advance on the theatre of Étienne Jodelle and Jacques Grévin, and on his own early plays, in so much that the rhetorical element is accompanied by abundance of action, though this is accomplished by the plan of joining together two virtually independent pieces in the same way.

In 1582 and 1583 he produced his two masterpieces *Bradamante* and *Les Juives*. In *Bradamante*, which alone of his plays has no chorus, he cut himself adrift from Senecan models, and sought his subject in Ariosto, the result being what came to be known later as a tragi-comedy. The dramatic and romantic story becomes a real drama in Garnier's hands, though even there the lovers, Bradamante and Roger, never meet on the stage. The contest in the mind of Roger supplies a genuine dramatic interest in the manner of Corneille. *Les Juives* is the pathetic story of the barbarous vengeance of Nebuchadnezzar on the Jewish king Zedekiah and his children. The Jewish women lamenting the fate of their children take a principal part in this tragedy, which, although almost entirely elegiac in conception, is singularly well designed, and gains unity by the personality of the prophet. M. Faguet says that of all French tragedies of the 16th and 17th centuries it is, with *Athalie*, the best constructed with regard to the requirements of the stage. Actual representation is continually in the mind of the author; his drama is, in fact, visually conceived.

Garnier must be regarded as the greatest French tragic poet of his century and the precursor of the great achievements of the next.

The best edition of his works is by Wendelin Foerster (Heilbronn, 4 vols., 1882-1883). A detailed criticism of his works is to be found in Émile Faguet, *La Tragédie française au XVI^{e} siècle* (1883, pp. 183-307).

GARNIER-PAGÈS, ÉTIENNE JOSEPH LOUIS (1801-1841), French politician, was born at Marseilles on the 27th of December 1801. Soon after his birth his father Jean François Garnier, a naval surgeon, died, and his mother married Simon Pagès, a college professor, by whom she had a son. The boys were brought up together, and took the double name Garnier-Pagès. Étienne found employment first in a commercial house in Marseilles, and then in an insurance office in Paris. In 1825 he began to study law, and made some mark as an advocate. A keen opponent of the Restoration, he joined various democratic societies, notably the *Aide-toi, le ciel t'aidera*, an organization for purifying the elections. He took part in the revolution of July 1830; became secretary of the *Aide-toi, le ciel t'aidera*, whose propaganda he brought into line with his anti-monarchical ideas; and in 1831 was sent from Isère to the chamber of deputies. He was concerned in the preparation of the *Compte rendu* of 1832, and advocated universal suffrage. He was an eloquent speaker, and his sound knowledge of business and finance gave him a marked influence among all parties in the chamber. He died in Paris on the 23rd of June 1841.

His half-brother, Louis Antoine Garnier-Pagès (1803-1878), fought on the barricades during the revolution of July 1830, and after Étienne's death was elected to the chamber of deputies (1842). He was a keen promoter of reform, and was a leading spirit in the affair of the reform banquet fixed for the 22nd of February 1848. He was a member of the provisional government of 1848, and was named mayor of Paris. On the 5th of March 1848 he was made minister of finance, and incurred great unpopularity by the imposition of additional taxes. He was a member of the Constituent Assembly and of the Executive Commission. Under the Empire he was conspicuous in the republican opposition and opposed the war with Prussia, and after the fall of Napoleon III. became a member of the Government of National Defence. Unsuccessful at the elections for the National Assembly (the 8th of February 1871), he retired into private life, and died in Paris on the 31st of October 1878. He wrote *Histoire de la révolution de 1848* (1860-1862); *Histoire de la commission exécutive* (1869-1872); and *L'Opposition et l'empire* (1872).

GARNISH, a word meaning to fit out, equip, furnish, now particularly used of decoration or ornament. It is formed from the O. Fr. *garnisant* or *guarnissant*, participle of *garnir*, *guarnir*, to furnish, equip. This is of Teutonic origin, the base being represented in O. Eng. *warnian*, to take warning, beware, and Ger. *warnen*, to warn, Eng. *warn*; the original sense would be to guard against, fortify, hence equip or fit out. The meaning of "warn" is seen in the law term "garnishee," a person who owes money to or holds money belonging to another and is "warned" by order of the court not to pay it to his immediate creditor but to a third person who has obtained final judgment against that creditor. (See ATTACHMENT; EXECUTION; BANKRUPTCY.)

GARO HILLS, a district of British India, in the hills division of Eastern Bengal and Assam. It takes its name from the Garos, a tribe of doubtful ethnical affinities and peculiar customs, by whom it is almost entirely inhabited. The Garos are probably a section of the great Bodo tribe, which at one time occupied a large part of Assam. According to the census of 1901 they numbered 128,117. In the 18th century they are mentioned as being frequently in conflict with the inhabitants of the plains below their hills, and in 1790 the British government first tried to reduce them. No permanent success was achieved. In 1852 raids by the Garos were followed by a blockade of the hills, but in 1856 they were again in revolt. Again a repressive expedition was despatched in 1861, but in 1866 there was a further raid. A British officer was now posted among the hills; this step was effective; in 1869 the district was constituted, and though in 1871 an outrage was committed against a native on the survey staff, there was little opposition when an expedition was sent in 1872-1873 to bring the whole district into submission, and there were thereafter no further disturbances.

The district consists of the last spurs of the Assam hills, which here run down almost to the bank of the Brahmaputra, where that river debouches upon the plain of Bengal and takes its great sweep to the south. The administrative headquarters are at Tura. The area of the district is 3140 sq. m. In 1901 the population was 138,274, showing an increase of 14% in the decade. The American missionaries maintain a small training school for teachers. The public buildings at Tura were entirely destroyed by the earthquake of June 12, 1897, and the roads in the district were greatly damaged by subsidence and fissures. Coal in large quantities and petroleum are known to exist. The chief exports are cotton, timber and forest products. Trade is small, though the natives, according to their own standard, are prosperous. They are fair agriculturists. Communications within the district are by cart-roads, bridle-paths and native tracks.

GARONNE (Lat. *Garumna*), a river of south-western France, rising in the Maladetta group of the Pyrenees, and flowing in a wide curve to the Atlantic Ocean. It is formed by two torrents, one of which has a subterranean course of 2½ m., disappearing in the sink known as the Trou du Taureau ("bull's hole") and reappearing at the Goueil de Jouéou. After a course of 30 m. in Spanish territory, during which it flows through the fine gorge called the Vallée d'Aran, the Garonne enters France in the department of Haute Garonne through the narrow defile of the Pont du Roi, and at once becomes navigable for rafts. At Montréjeau it receives on the left the Neste, and encountering at this point the vast plateau of Lannemezan is forced to turn abruptly east, flowing in a wide curve to Toulouse. At Saint Martory it gives off the irrigation canal of that name. At this point the Garonne enters a fertile plain, and supplies the motive power to several mills. It is joined on the right by various streams fed by the snows of the Pyrenees. Such are the Salat, at whose confluence river navigation proper begins, and the Arize and the Ariège (both names signifying "river"). From Toulouse the Garonne flows to the north-west, now skirting the northern border of the

plateau of Lannemezan which here drains into it, the principal streams being the Save, the Gers and the Baïse. On its right hand the Garonne is swelled by its two chief tributaries, the Tarn, near Moissac, and the Lot, below Agen; farther down it is joined by the Drot (or Dropt), and on the left by the Ciron. Between Toulouse and Castets, 33½ m. above Bordeaux, and the highest point to which ordinary spring-tides ascend, the river is accompanied at a distance of from a ½ to 3 m. by the so-called "lateral canal" of the Garonne, constructed in 1838-1856. This canal is about 120 m. long, or 133 m. including its branches, one of which runs off at right angles to Montauban on the Tarn. From Toulouse to Agen the main canal follows the right bank of the Garonne, crossing the Tarn on an aqueduct at Moissac, while another magnificent aqueduct of twenty-three arches carries it at Agen from the right to the left bank of the river. It has a fall of 420 ft. and over fifty locks, and is navigable for vessels having the maximum dimensions of 98½ ft. length, 19 ft. breadth and 6½ ft. draught. The carrying trade upon it is chiefly in agricultural produce and provisions, building materials, wood and industrial products. At Toulouse the canal connects with the Canal du Midi, which runs to the Mediterranean. After passing Castets the Garonne begins to widen out considerably, and from being 160 yds. broad at Agen increases to about 650 yds. at Bordeaux, its great commercial port. From here it flows with ever increasing width between two flat shores to the Bec d'Ambès (15½ m.), where, after a course of 357 m., it unites with the Dordogne to form the vast estuary known as the Gironde. The triangular peninsula lying between these two great tidal rivers is called Entre-deux-mers ("between two seas") and is famous for its wines. The drainage area of the Garonne is nearly 33,000 sq. m. Floods are of common occurrence, and descend very suddenly. The most disastrous occurred in 1875, 1856 and in 1770, when the flood level at Castets attained the record height of 42½ ft. above low-water mark.

GARRET (from the O. Fr. *garite*, modern *guérite*, a watch-tower, connected ultimately with "guard" and "ward"), properly a small look-out tower built on a wall, and hence the name given to a room on the top storey of a building, the sloping ceiling of which is formed by the roof.

GARRETT, JOÃO BAPTISTA DA SILVA LEITÃO DE ALMEIDA, Visconde de Almeida-Garrett (1799-1854), perhaps the greatest Portuguese poet since Camoens, was of Irish descent. Born in Oporto, his parents moved to the Quinta do Castello at Gaya when he was five years old. The French invasion of Portugal drove the family to the Azores, and Garrett made his first studies at Angra, beginning to versify at an early age under the influence of his uncle, a poet of the school of Bocage. Going to the university of Coimbra in 1816, he soon earned notoriety by the precocity of his talents and his fervent Liberalism, and there he gained his first oratorical and literary successes. His tragedy *Lucrecia* was played there in February 1819, and during this period he also wrote *Merope* as well as a great part of *Cato*, all these plays belonging to the so-called classical school. Leaving Coimbra with a law degree, he proceeded to Lisbon, and on the 11th of November 1822 married D. Luiza Midosi; but the alliance proved unhappy and a formal separation took place in 1839.

The reactionary movement against the Radical revolution of 1820 reached its height in 1823, and Garrett had to leave Portugal by order of the Absolutist ministry then in power, and went to England. He became acquainted with the masterpieces of the English and German romantic movements during his stay abroad.

Imbued with the spirit of nationality, he wrote in 1824 at Havre the poem "Camões," which destroyed the influence of the worn-out classical and Arcadian rhymers, and in the following year composed the patriotic poem "D. Branca," or "The Conquest of the Algarve." He was permitted to return to Portugal in 1826, and thereupon devoted himself to journalism. With the publication of *O Portuguez*, he raised the tone of the press, exhibiting an elevation of ideas and moderation of language then unknown in political controversy, and he introduced the "feuilleton." But his defence of Liberal principles brought him three

months' imprisonment, and when D. Miguel was proclaimed absolute king on the 3rd of May 1828, Garrett had again to leave the country. In London, where he sought refuge, he continued his adhesion to romanticism by publishing *Adozinda* and *Bernal-Francez*, expansions of old folk-poems, which met with the warmest praise from Southey and were translated by Adamson. He spent the next three years in and about Birmingham, Warwick and London, engaged in writing poetry and political pamphlets, and by these and by his periodicals he did much to unite the Portuguese *émigrés* and to keep up their spirit amid their sufferings in a foreign land. Learning that an expedition was being organized in France for the liberation of Portugal, Garrett raised funds and joined the forces under D. Pedro as a volunteer. Sailing in February 1832, he disembarked at Terceira, whence he passed to S. Miguel, then the seat of the Liberal government. Here he became a co-operator with the statesman Mousinho da Silveira, and assisted him in drafting those laws which were to revolutionize the whole framework of Portuguese society, this important work being done far from books and without pecuniary reward. In his spare time he wrote some of the beautiful lyrics afterwards collected into *Flores sem Fructo*. He took part in the expedition that landed at the Mindello on the 8th of July 1832, and in the occupation of Oporto. Early in the siege he sketched out, under the influence of Walter Scott, the historical romance *Arco de Sant' Anna*, descriptive of the city in the reign of D. Pedro I.; and, in addition, he organized the Home and Foreign offices under the marquis of Palmella, drafted many important royal decrees, and prepared the criminal and commercial codes. In the following November he was despatched as secretary to the marquis on a diplomatic mission to foreign courts, which involved him in much personal hardship. In the next year the capture of Lisbon enabled him to return home, and he was charged to prepare a scheme for the reform of public instruction.

In 1834-1835 he served as consul-general and chargé d'affaires at Brussels, representing Portugal with distinction under most difficult circumstances, for which he received no thanks and little pay. When he got back, the government employed him to draw up a proposal for the construction of a national theatre and for a conservatoire of dramatic art, of which he became the head. He instituted prizes for the best plays, himself revising nearly all that were produced, and a school of dramatists and actors arose under his influence. To give them models, he proceeded to write a series of prose dramas, choosing his subjects from Portuguese history. He began in 1838 with the *Auto de Gil Vicente*, considering that the first step towards the recreation of the Portuguese drama was to revive the memory of its founder, and he followed this up in 1842 by the *Alfageme de Santarem*, dealing with the Holy Constable, and in 1843 by *Frei Luiz de Sousa*, one of the few great tragedies of the 19th century, a work as intensely national as *The Lusiads*. The story, which in part is historically true, and has the merit of being simple, like the action, is briefly as follows. D. João de Portugal, who was supposed to have died at the battle of Alcacer, returns, years afterwards, to find his wife married to Manoel de Sousa and the mother of a daughter by him, named Maria. Thereupon the pair separate and enter religion, and Manoel becomes the famous chronicler, Frei Luiz de Sousa (*q.v.*). The characters live and move, especially Telmo, the old servant, who would never believe in the death of his former master D. João, and the consumptive child Maria, who helps Telmo to create the atmosphere of impending disaster; while the episodes, particularly those of the return of D. João and the death of Maria, are full of power, and the language is Portuguese of the best.

Entering parliament in 1837, Garrett soon made his mark as an orator. In that year he delivered many notable discourses in defence of liberal ideas. He also brought in a literary copyright bill, which, when it became law in 1851, served as a precedent for similar legislation in England and Prussia. In 1840 he made his famous speech known as *Porto Pyreu*, in which he skilfully turned the well-known anecdote of the "mad Athenian" against his opponents. While attending with assiduity to his duties as a deputy, he wrote, about this time, the drama *D. Filippa de Vilhena*, founded on an incident in the revolution of 1640, for representation by the pupils of the conservatoire, and the session of 1841 saw another of his oratorical triumphs in his speech against the law of tithes. In July 1843 an excursion to Santarem resulted in his prose masterpiece *Viagens na minha terra*, at once a novel and a miscellany of literary, political and philosophic criticism, written without plan or method, easy, jovial and epigrammatic. He took no part in the civil war that followed the revolution of Maria da Fonte, but continued his literary labours, producing in 1848 the comedy *A Sobrinha do Marquez*, dealing with the times of Pombal, and in 1849 an historical memoir on Mousinho da Silveira. He spent much of the year 1850 in finishing his *Romanceiro*, a collection of folk-poetry of which he was the first to perceive the value; and in June 1851 he was created a viscount. In the following December he drew up the additional act to the constitutional charter, and his draft was approved by the ministers at a cabinet meeting in

his house. Further, he initiated the *Conselho Ultramarino*; and the *Law of the Misericordias*, with its preamble, published in 1852, was entirely from his pen. In the same year he became for a short time minister of foreign affairs. In 1853 he brought out *Folhas Cahidas*, a collection of short poems ablaze with passion and exquisite in form, of which his friend Herculano said: "if Camoens had written love verses at Garrett's age, he could not have equalled him." His final literary work was a novel, *Helena*, which he left unfinished, and on the 10th of February 1854 he made his last notable speech in the House. He died on the 9th of December 1854, and on the 3rd of May 1903 his remains were translated to the national pantheon, the Jeronymos at Belem, where they rest near to those of Camoens. As poet, novelist, journalist, orator and dramatist, he deserves the remark of Rebello da Silva: "Garrett was not a man of letters only but an entire literature in himself."

Besides his strong religious faith, Garrett was endowed with a deep sensibility, a creative imagination, rare taste and a singular capacity for sympathy. Thus, though a learned man and an able jurist, he was bound to be first and always an artist. His artistic temperament explains his many-sided activity, his expansive kindliness, his seductive charm, especially for women, his patriotism, his aristocratic pretensions, his huge vanity and dandyism, and the ingenuousness that absolves him from many faults in an irregular life. From his rich artistic nature sprang his profound, sincere, sensual and melancholy lyrics, the variety and perfection of his scenic creations, the splendour of his eloquence, the truth of his comic vein, the elegance of his lighter compositions. Two books stand out in bold relief from among his writings: *Folhas Cahidas*, and that tragedy of fatality and pity, *Frei Luiz de Sousa*, with its gallery of noble figures incarnating the truest realism in an almost perfect prose form. The complete collection of his works comprises twenty-four volumes and there are several editions.

AUTHORITIES.—Gomes de Amorim, *Garrett, memorias biographicas* (3 vols., Lisbon, 1881-1888); D. Romero Ortiz, *La Litteratura Portuguesa en el siglo XIX* (Madrid, 1869), pp. 165-221; Dr Theophilo Braga, *Garrett e o romantismo* (Oporto, 1904), and *Garrett e os dramas romanticos* (Oporto, 1905), with a full bibliography; Innocencio da Silva, *Diccionario bibliographico Portuguez*, vol. iii. pp. 309-316, and vol. x. pp. 180-185. See *Revue encyclopédique Larousse*, No. 284, for a bibliography of the foreign translations of Garrett. *Frei Luiz de Sousa* was translated by Edgar Prestage under the title *Brother Luiz de Sousa* (London, 1909).

(E. PR.)

GARRETTING, properly Galletting, a term in architecture for the process in which the "gallets" or small splinters of stone are inserted in the joints of coarse masonry to protect the mortar joints; they are stuck in while the mortar is wet.

GARRICK, DAVID (1717-1779), English actor and theatrical manager, was descended from a good French Protestant family named Garric or Garrique of Bordeaux, which had settled in England on the revocation of the Edict of Nantes. His father, Captain Peter Garrick, who had married Arabella Clough, the daughter of a vicar choral of Lichfield cathedral, was on a recruiting expedition when his famous third son was born at Hereford on the 19th of February 1717. Captain Garrick, who had made his home at Lichfield, where he had a large family, in 1731 rejoined his regiment at Gibraltar. This kept him absent from home for many years, during which letters were written to him by "little Davy," acquainting him with the doings at Lichfield. When the boy was about eleven years old he paid a short visit to Lisbon where his uncle David had settled as a wine merchant. On his father's return from Gibraltar, David, who had previously been educated at the grammar school of Lichfield, was, largely by the advice of Gilbert Walmesley, registrar of the ecclesiastical court, sent with his brother George to the "academy" at Edial, just opened in June or July 1736 by Samuel Johnson, the senior by seven years of David, who was then nineteen. This seminary was, however, closed in about six months, and on the 2nd of March 1736/7 both Johnson and Garrick left Lichfield for London—Johnson, as he afterwards said, "with twopence halfpenny

in his pocket," and Garrick "with three-halfpence in his." Johnson, whose chief asset was the MS. tragedy of *Irene*, was at first the host of his former pupil, who, however, before the end of the year took up his residence at Rochester with John Colson (afterwards Lucasian professor at Cambridge). Captain Garrick died about a month after David's arrival in London. Soon afterwards, his uncle, the wine merchant at Lisbon, having left David a sum of £1000, he and his brother entered into partnership as wine merchants in London and Lichfield, David taking up the London business. The concern was not prosperous—though Samuel Foote's assertion that he had known Garrick with three quarts of vinegar in the cellar calling himself a wine merchant need not be taken literally—and before the end of 1741 he had spent nearly half of his capital.

His passion for the stage completely engrossed him; he tried his hand both at dramatic criticism and at dramatic authorship. His first dramatic piece, *Lethe*, or *Aesop in the Shades*, which he was thirty-seven years later to read from a splendidly bound transcript to King George III. and Queen Charlotte, was played at Drury Lane on the 15th of April 1740; and he became a well-known frequenter of theatrical circles. His first appearance on the stage was made in March 1741, *incognito*, as harlequin at Goodman's Fields, Yates, who was ill, having allowed him to take his place during a few scenes of the pantomime entitled *Harlequin Student*, or *The Fall of Pantomime with the Restoration of the Drama*. Garrick subsequently accompanied a party of players from the same theatre to Ipswich, where he played his first part as an actor under the name of Lyddal, in the character of Aboan (in Southerne's *Oroonoko*). His success in this and other parts determined his future career. On the 19th of October 1741 he made his appearance at Goodman's Fields as Richard III. and gained the most enthusiastic applause. Among the audience was Macklin, whose performance of Shylock, early in the same year, had pointed the way along which Garrick was so rapidly to pass in triumph. On the morrow the latter wrote to his brother at Lichfield, proposing to make arrangements for his withdrawal from the partnership, which, after much distressful complaint on the part of his family, met by him with the utmost consideration, were ultimately carried into effect. Meanwhile, each night had added to his popularity on the stage. The town, as Gray (who, like Horace Walpole, at first held out against the *furore*) declared, was "horn-mad" about him. Before his Richard had exhausted its original effect, he won new applause as Aboan, and soon afterwards as Lear and as Pierre in Otway's *Venice Preserved*, as well as in several comic characters (including that of Bayes). Glover 476
("Leonidas") attended every performance; the duke of Argyll, Lords Cobham and Lyttelton, Pitt, and several other members of parliament testified their admiration. Within the first six months of his theatrical career he acted in eighteen characters of all kinds, and from the 2nd of December he appeared in his own name. Pope went to see him three times during his first performances, and pronounced that "that young man never had his equal as an actor, and he will never have a rival." Before next spring he had supped with "the great Mr Murray, counsellor," and was engaged to do so with Mr Pope through Murray's introduction, while he was dining with Halifax, Sandwich and Chesterfield. "There was a dozen dukes of a night at Goodman's Fields," writes Horace Walpole. Garrick's farce of *The Lying Valet*, in which he performed the part of Sharp, was at this time brought out with so much success that he ventured to send a copy to his brother.

His fortune was now made, and while the managers of Covent Garden and Drury Lane resorted to the law to make Giffard, the manager of Goodman's Fields, close his little theatre, Garrick was engaged by Fleetwood for Drury Lane for the season of 1742. In June of that year he went over to Dublin, where he found the same homage paid to his talents as he had received from his own countrymen. He was accompanied by Margaret (Peg) Woffington, of whom he had been for some time a fervent admirer. (His claim to the authorship of the song to Lovely Peggy is still *sub judice*. There remains some obscurity as to the end of their liaison.) From September 1742 to April 1745 he played at Drury Lane, after which he again went over to Dublin. Here he remained during the whole season, as joint-manager with Sheridan, in the direction and profits of the Theatre Royal in Smock Alley. In 1746-1747 he fulfilled a short engagement with Rich at Covent Garden, his last series of performances under a management not his own. With the close of that season Fleetwood's patent for the management of Drury Lane expired, and Garrick, in conjunction with Lacy, purchased the property of the theatre, together with the renewal of the patent; contributing £8000 as two-thirds of the purchase-money. In September 1747 it was opened with a strong company of actors, Johnson's prologue being spoken by Garrick, while the epilogue, written by him, was spoken by Mrs Woffington. The negotiations involved Garrick in a bitter quarrel with Macklin, who appears to have had a real grievance in the matter. Garrick took no part himself till his performance of Archer in the *Beaux' Stratagem*, a month after the opening. For a time at least "the drama's patrons" were content with the higher entertainment

furnished them; in the end Garrick had to “please” them, like most other managers, by gratifying their love of show. Garrick was surrounded by many players of eminence, and he had the art, as he was told by Mrs Clive, “of contradicting the proverb that one cannot make bricks without straw, by doing what is infinitely more difficult, making actors and actresses without genius.” He had to encounter very serious opposition from the old actors whom he had distanced, and with the younger actors and actresses he was involved in frequent quarrels. But to none of them or their fellows did he, so far as it appears, show that jealousy of real merit from which so many great actors have been unable to remain free. For the present he was able to hold his own against all competition. The naturalness of his acting fascinated those who, like Partridge in *Tom Jones*, listened to nature’s voice, and justified the preference of more conscious critics. To be “pleased with nature” was, as Churchill wrote, in the *Rosciad* (1761),[1] to be pleased with Garrick. For the stately declamation, the sonorous, and beyond a doubt impressive, chant of Quin and his fellows, Garrick substituted rapid changes of passion and humour in both voice and gesture, which held his audiences spellbound. “It seemed,” wrote Richard Cumberland, “as if a whole century had been stepped over in the passage of a single scene; old things were done away, and a new order at once brought forward, bright and luminous, and clearly destined to dispel the barbarisms of a tasteless age, too long superstitiously devoted to the illusions of imposing declamation.” Garrick’s French descent and his education may have contributed to give him the vivacity and versatility which distinguished him as an actor; and nature had given him an eye, if not a stature, to command, and a mimic power of wonderful variety. The list of his characters in tragedy, comedy and farce is large, and would be extraordinary for a modern actor of high rank; it includes not less than seventeen Shakespearian parts. As a manager, though he committed some grievous blunders, he did good service to the theatre and signally advanced the popularity of Shakespeare’s plays, of which not less than twenty-four were produced at Drury Lane under his management. Many of these were not pure Shakespeare; and he is credited with the addition of a dying speech to the text of *Macbeth*. On the other hand, Tate Wilkinson says that Garrick’s production of *Hamlet* in 1773 was well received at Drury Lane even by the galleries, “though without their favourite acquaintances the gravediggers.” Among his published adaptations are an opera, *The Fairies* (from *Midsummer Night’s Dream*) (1755); an opera *The Tempest* (1756); *Catherine and Petruchio* (1758); *Florizel and Perdita* (1762). But not every generation has the same notions of the way in which Shakespeare is best honoured. Few sins of omission can be charged against Garrick as a manager, but he refused Home’s *Douglas*, and made the wrong choice between *False Delicacy* and *The Good Natur’d Man*. For the rest, he purified the stage of much of its grossness, and introduced a relative correctness of costume and decoration unknown before. To the study of English dramatic literature he rendered an important service by bequeathing his then unrivalled collection of plays to the British Museum.

After escaping from the chains of his passion for the beautiful but reckless Mrs Woffington, Garrick had in 1749 married Mademoiselle Violette (Eva Maria Veigel), a German lady who had attracted admiration at Florence or at Vienna as a dancer, and had come to England early in 1746, where her modest grace and the rumours which surrounded her created a *furore*, and where she found enthusiastic patrons in the earl and countess of Burlington. Garrick, who called her “the best of women and wives,” lived most happily with her in his villa at Hampton, acquired by him in 1754, whither he was glad to escape from his house in Southampton Street. To this period belongs Garrick’s quarrel with Barry, the only actor who even temporarily rivalled him in the favour of the public. In 1763 Garrick and his wife visited Paris, where they were cordially received and made the acquaintance of Diderot and others at the house of the baron d’Holbach. It was about this time that Grimm extolled Garrick as the first and only actor who came up to the demands of his imagination; and it was in a reply to a pamphlet occasioned by Garrick’s visit that Diderot first gave expression to the views expounded in his *Paradoxe sur le comédien*. After some months spent in Italy, where Garrick fell seriously ill, they returned to Paris in the autumn of 1764 and made more friends, reaching London in April 1765. Their union was childless, and Mrs Garrick survived her husband until 1822. Her portrait by Hogarth is at Windsor Castle.

Garrick practically ceased to act in 1766, but he continued the management of Drury Lane, and in 1769 organized the Shakespeare celebrations at Stratford-on-Avon, an undertaking which ended in dismal failure, though he composed an “Ode upon dedicating a building and erecting a Statue to Shakespeare” on the occasion. (See, *inter alia, Garrick’s Vagary, or England Run Mad; with particulars of the Stratford Jubilee*, 1769.) Of his best supporters on the stage, Mrs Cibber, with whom he had been reconciled, died in 1766, and Mrs (Kitty) Clive retired in 1769; but Garrick contrived to maintain the success of his theatre. He sold his share in the property in 1776 for £35,000, and took leave of the stage by

playing a round of his favourite characters—Hamlet, Lear, Richard and Benedick, among Shakespearian parts; Lusignan in *Zara*, Aaron Hill's adaptation of Voltaire's *Zaire*; and Kitely in his own adaptation of Ben Jonson's *Every Man in his Humour*; Archer in Farquhar's *Beaux' Stratagem*; Abel Drugger in Ben Jonson's *Alchemist*; Sir John Brute in Vanbrugh's *Provoked Wife*; Leon in Fletcher's *Rule a Wife and have a Wife*. He ended the series, as Tate Wilkinson says, "in full glory" with "the youthful Don Felix" in Mrs Centlivre's *Wonder* on the 10th of June 1776. He died in London on the 20th of January 1779. He was buried in Westminster Abbey at the foot of Shakespeare's statue with imposing solemnities. An elegy on his death was published by William Tasker, poet and physiognomist, in the same year.

In person, Garrick was a little below middle height; in his later years he seems to have inclined to stoutness. The extraordinary mobility of his whole person, and his power of as it were transforming himself at will, are attested by many anecdotes and descriptions, but the piercing power of his eye must have been his most irresistible feature.

Johnson, of whose various and often merely churlish remarks on Garrick and his doings many are scattered through the pages of Boswell, spoke warmly of the elegance and sprightliness of his friend's conversation, as well as of his liberality and kindness of heart; while to the great actor's art he paid the exquisite tribute of describing Garrick's sudden death as having "eclipsed the gaiety of nations, and impoverished the public stock of harmless pleasure." But the most discriminating character of Garrick, slightly tinged with satire, is that drawn by Goldsmith in his poem of *Retaliation*. Beyond a doubt he was not without a certain moral timidity contrasting strangely with his eager temperament and alertness of intellect; but, though he was not cast in a heroic mould, he must have been one of the most amiable of men. Garrick was often happy in his epigrams and occasional verse, including his numerous prologues and epilogues. He had the good taste to recognize, and the spirit to make public his recognition of, the excellence of Gray's odes at a time when they were either ridiculed or neglected. His dramatic pieces, *The Lying Valet*, adapted from Motteux's *Novelty Lethe* (1740), *The Guardian*, *Linco's Travels* (1767), *Miss in her Teens* (1747), *Irish Widow*, &c., and his alterations and adaptations of old plays, which together fill four volumes, evinced his knowledge of stage effect and his appreciation of lively dialogue and action; but he cannot be said to have added one new or original character to the drama. He was joint author with Colman of *The Clandestine Marriage* (1766), in which he is said to have written his famous part of Lord Ogleby. The excellent farce, *High Life below Stairs*, appears to have been wrongly attributed to Garrick, and to be by James Townley. His *Dramatic Works* (1798) fill three, his *Poetic* (1735) two volumes.

Garrick's *Private Correspondence* (published in 1831-1832 with a short memoir by Boaden, in 2 vols. 4to), which includes his extensive *Foreign Correspondence* with distinguished French men and women, and the notices of him in the memoirs of Cumberland, Hannah More and Madame D'Arblay, and above all in Boswell's *Life of Johnson*, bear testimony to his many attractive qualities as a companion and to his fidelity as a friend.

BIBLIOGRAPHY.—A collection of unprinted Garrick letters is in the Forster library at South Kensington. A list of publications of all kinds for and against Garrick will be found in R. Lowe's *Bibliographical History of English Theatrical Literature* (1887). The earlier biographies of Garrick are by Arthur Murphy (2 vols., 1801) and by the bookseller Tom Davies (2 vols., 4th ed., 1805), the latter a work of some merit, but occasionally inaccurate and confused as to dates; and a searching if not altogether sympathetic survey of his verses is furnished by Joseph Knight's valuable Life (1894). A memoir of Garrick is included in a volume of French *Memoirs of Mlle Clairon and others*, published by Levain (H.L. Cain) at Paris in 1846; and an Italian *Biografia di Davide Garrick* was published by C. Blasis at Milan in 1840. Mr Percy Fitzgerald's *Life* (2 vols., 1868; new edition, 1899) is full and spirited, and has been reprinted, with additions, among Sir Theodore Martin's *Monographs* (1906). A delightful essay on Garrick appeared in the *Quarterly Review* (July 1868), directing attention to the admirable criticisms of Garrick's acting in 1775 in the letters of G.C. Lichtenberg (*Verm. Schriften*, iii., Göttingen, 1801). See also for a very valuable survey of Garrick's labours as an actor, with a bibliography, C. Gaehde, *David Garrick als Shakespeare-Darsteller*, &c. (Berlin, 1904). Mrs Parsons' *Garrick, and his Circle* and *Some unpublished Correspondence of David Garrick*, ed. G.P. Baker (Boston, Mass., 1907), are interesting additions to the literature of the subject. There is also a Life by James Smyth, *David Garrick* (1887). T.W. Robertson's play *David Garrick*, first acted by Sothern, and later associated with Sir Charles Wyndham, is of course mere fiction.

As to the portraits of Garrick, see W.T. Lawrence in The *Connoisseur* (April 1905). That by Gainsborough at Stratford-on-Avon was preferred by Mrs Garrick to all others. Several remain from the hand of Hogarth, including the famous picture of Garrick as Richard III. The

portraits by Reynolds include the celebrated “Garrick between Tragedy and Comedy.” Zoffany’s are portraits in character. Roubiliac’s statue of Shakespeare, for which Garrick sat, and for which he paid the sculptor three hundred guineas, was originally placed in a small temple at Hampton, and is now in the entrance hall at the British Museum.

(R. Ca.; A. W. W.)

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1 In the subsequent *Apology addressed to the Critical Reviewers*, Churchill revenged himself for the slight which he supposed Garrick to have put upon him, by some spiteful lines, which, however, Garrick requited by good-humoured kindness.

GARRISON, WILLIAM LLOYD (1805-1879), the American anti-slavery leader, was born in Newburyport, Massachusetts, U.S.A., on the 10th of December 1805. His parents were from the British province of New Brunswick. The father, Abijah, a sea-captain, went away from home when William was a child, and it is not known whether he died at sea or on land. The mother, whose maiden name was Lloyd, is said to have been a woman of high character, charming in person and eminent for piety. She died in 1823. William had a taste for books, and made the most of his limited opportunities. His mother first set him to learn the trade of a shoemaker, first at Newburyport, and then, after 1815, at Baltimore, Maryland, and, when she found that this did not suit him, let him try his hand at cabinet-making (at Haverhill, Mass.). But this pleased him no better. In October 1818, when he was in his fourteenth year, he was made more than content by being indentured to Ephraim W. Allen, proprietor of the Newburyport *Herald*, to learn the trade of a printer. He soon became an expert compositor, and after a time began to write anonymously for the *Herald*. His communications won the commendation of the editor, who had not at first the slightest suspicion that he was the author. He also wrote for other papers with equal success. A series of political essays, written by him for the Salem *Gazette*, was copied by a prominent Philadelphia journal, the editor of which attributed them to the Hon. Timothy Pickering, a distinguished statesman of Massachusetts. His skill as a printer won for him the position of foreman, while his ability as a writer was so marked that the editor of the *Herald*, when temporarily called away from his post, left the paper in his charge.

The printing-office was for him, what it has been for many another poor boy, no mean substitute for the academy and for the college. He was full of enthusiasm for liberty; the struggle of the Greeks to throw off the Turkish yoke enlisted his warmest sympathy, and at one time he seriously thought of entering the West Point Academy and fitting himself for a soldier’s career. His apprenticeship ended in 1826, when he began the publication of a new paper (actually the old one under a new name), the *Free Press*, in his native place. The paper, whose motto was “Our Country, our Whole Country, and nothing but our Country,” was full of spirit and intellectual force, but Newburyport was a sleepy place and the enterprise failed. Garrison then went to Boston, where, after working for a time as a journeyman printer, he became the editor of the *National Philanthropist*, the first journal established in America to promote the cause of total abstinence from intoxicating liquors. His work in this paper was highly appreciated by the friends of temperance, but a change in the proprietorship led to his withdrawal before the end of the year. In 1828 he was induced to establish the *Journal of the Times* at Bennington, Vermont, to support the re-election of John Quincy Adams to the presidency of the United States. The new paper, though attractive in many ways, and full of force and fire, was too far ahead of public sentiment on moral questions to win a large support. In Boston he had met Benjamin Lundy (*q.v.*), who had for years been preaching the abolition of slavery. Garrison had been deeply moved by Lundy’s appeals, and after going to Vermont he showed the deepest interest in the slavery question. Lundy was then publishing in Baltimore a small monthly paper, entitled *The Genius of Universal Emancipation*, and he resolved to go to Bennington and invite Garrison to join him in the editorship. With this object in view he walked from Boston to Bennington, through the frost and snow of a New England winter, a distance of 125 m. His mission was successful. Garrison was deeply impressed by the good Quaker’s zeal and devotion, and he resolved to join him and devote himself thereafter to the work of abolishing slavery.

In pursuance of this plan he went to Baltimore in the autumn of 1829, and thenceforth the *Genius* was published weekly, under the joint editorship of the two men. It was understood, however, that Garrison would do most of the editorial work, while Lundy would spend most of his time in lecturing and procuring subscribers. On one point the two editors differed

radically, Lundy being the advocate of gradual and Garrison of immediate emancipation. The former was possessed with the idea that the negroes, on being emancipated, must be colonized somewhere beyond the limits of the United States; the latter held that they should be emancipated on the soil of the country, with all the rights of freemen. In view of this difference it was agreed that each should speak on his own individual responsibility in the paper, appending his initial to each of his articles for the information of the reader. It deserves mention here that Garrison was then in utter ignorance of the change previously wrought in the opinions of English abolitionists by Elizabeth Heyrick's pamphlet in favour of immediate, in distinction from gradual emancipation. The sinfulness of slavery being admitted, the duty of immediate emancipation to his clear ethical instinct was perfectly manifest. He saw that it would be idle to expose and denounce the evils of slavery, while responsibility for the system was placed upon former generations, and the duty of abolishing it transferred to an indefinite future. His demand for immediate emancipation fell like a tocsin upon the ears of slaveholders. For general talk about the evils of slavery they cared little, but this assertion that every slave was entitled to instant freedom filled them with alarm and roused them to anger, for they saw that, if the conscience of the nation were to respond to the proposition, the system must inevitably fall. The *Genius*, now that it had become a vehicle for this dangerous doctrine, was a paper to be feared and intensely hated. Baltimore was then one of the centres of the domestic slave trade, and upon this traffic Garrison heaped the strongest denunciations. A vessel owned in Newburyport having taken a cargo of slaves from Baltimore to New Orleans, he characterized the transaction as an act of "domestic piracy," and avowed his purpose to "cover with thick infamy" those engaged therein. He was thereupon prosecuted for libel by the owner of the vessel, fined $50, mulcted in costs, and, in default of payment, committed to gaol. His imprisonment created much excitement, and in some quarters, in spite of the pro-slavery spirit of the time, was a subject of indignant comment in public as well as private. The excitement was fed by the publication of two or three striking sonnets, instinct with the spirit of liberty, which Garrison inscribed on the walls of his cell. One of these, *Freedom of Mind*, is remarkable for freshness of thought and terseness of expression.

John G. Whittier, the Quaker poet, interceded with Henry Clay to pay Garrison's fine and thus release him from prison. To the credit of the slaveholding statesman it must be said that he responded favourably, but before he had time for the requisite preliminaries Arthur Tappan, a philanthropic merchant of New York, contributed the necessary sum and set the prisoner free after an incarceration of seven weeks. The partnership between Garrison and Lundy was then dissolved by mutual consent, and the former resolved to establish a paper of his own, in which, upon his sole responsibility, he could advocate the doctrine of immediate emancipation and oppose the scheme of African colonization. He was sure, after his experiences at Baltimore, that a movement against slavery resting upon any less radical foundation than this would be ineffectual. He first proposed to establish his paper at Washington, in the midst of slavery, but on returning to New England and observing the state of public opinion there, he came to the conclusion that little could be done at the South while the non-slaveholding North was lending her influence, through political, commercial, religious and social channels, for the sustenance of slavery. He determined, therefore, to publish his paper in Boston, and, having issued his prospectus, set himself to the task of awakening an interest in the subject by means of lectures in some of the principal cities and towns of the North. It was an up-hill work. Contempt for the negro and indifference to his wrongs were almost universal. In Boston, then a great cotton mart, he tried in vain to procure a church or vestry for the delivery of his lectures, and thereupon announced in one of the daily journals that if some suitable place was not promptly offered he would speak on the common. A body of infidels under the leadership of Abner Kneeland (1774-1844), who had previously been in turn a Baptist minister and the editor of a Universalist magazine, proffered him the use of their small hall; and, no other place being accessible, he accepted it gratefully, and delivered therein (in October 1830) three lectures, in which he unfolded his principles and plans. He visited privately many of the leading citizens of the city, statesmen, divines and merchants, and besought them to take the lead in a national movement against slavery; but they all with one consent made excuse, some of them listening to his plea with manifest impatience. He was disappointed, but not disheartened. His conviction of the righteousness of his cause, of the evils and dangers of slavery, and of the absolute necessity of the contemplated movement, was intensified by opposition, and he resolved to go forward, trusting in God for success.

On the 1st of January 1831, without a dollar of capital, and without a single subscriber, he and his partner Isaac Knapp (1804-1843) issued the first number of the *Liberator*, avowing their "determination to print it as long as they could subsist on bread and water, or their

hands obtain employment." Its motto was, "Our country is the world—our countrymen are mankind"; and the editor, in his address to the public, uttered the words which have become memorable as embodying the whole purpose and spirit of his life: "I am in earnest—I will not equivocate—I will not excuse—I will not retreat a single inch—and I will be heard." Help came but slowly. For many months Garrison and his brave partner, who died long before the end of the conflict, made their bed on the floor of the room, "dark, unfurnished and mean," in which they printed their paper, and where Mayor Harrison Gray Otis of Boston, in compliance with the request of Governor Robert Y. Hayne of South Carolina, "ferreted them out" in "an obscure hole," "their only visible auxiliary a negro boy." But the paper founded under such inauspicious circumstances exerted a mighty influence, and lived to record not only President Lincoln's proclamation of emancipation, but the adoption of an amendment to the constitution of the United States for ever prohibiting slavery. It was the beginning and the nucleus of an agitation that eventually pervaded and filled every part of the country. Other newspapers were afterwards established upon the same principles; anti-slavery societies, founded upon the doctrine of immediate emancipation, sprang up on every hand; the agitation was carried into political parties, into the press, and into legislative and ecclesiastical assemblies; until in 1861 the Southern states, taking alarm from the election of a president known to be at heart opposed to slavery though pledged to enforce all the constitutional safeguards of the system, seceded from the Union and set up a separate government.

Garrison sought the abolition of slavery by moral means alone. He knew that the national government had no power over the system in any state, though it could abolish it at the national capital, and prohibit it in the territories. He thought it should bring its moral influence to bear in favour of abolition; but neither he nor his associates ever asked Congress to exercise any unconstitutional power. His idea was to combine the moral influence of the North, and pour it through every open channel upon the South. To this end he made his appeal to the Northern churches and pulpits, beseeching them to bring the power of Christianity to bear against the slave system, and to advocate the rights of the slaves to immediate and unconditional freedom. He was a man of peace, hating war not less than he did slavery; but he warned his countrymen that if they refused to abolish slavery by moral power a retributive war must sooner or later ensue. The conflict was irrepressible. Slavery must be overthrown, if not by peaceful means, then in blood. The first society organized under Garrison's auspices, and in accordance with his principles, was the New England Anti-Slavery Society, which adopted its constitution in January 1832. In the spring of this year Garrison issued his *Thoughts on African Colonization*, in which he showed by ample citations from official documents that the American Colonization Society was organized in the interest of slavery, and that in offering itself to the people of the North as a practical remedy for that system it was guilty of deception. His book, aided by others taking substantially the same view, smote the society with a paralysis from which it never recovered. Agents of the American Colonization Society in England having succeeded in deceiving leading Abolitionists there as to its character and tendency, Garrison was deputed by the New England Anti-Slavery Society to visit England for the purpose of counteracting their influence. He went in the spring of 1833, when he was but twenty-seven years of age, and was received with great cordiality by British Abolitionists, some of whom had heard of his bold assaults upon American slavery, and had seen a few numbers of the *Liberator*. The struggle for emancipation in the West Indies was then at the point of culmination; the leaders of the cause, from all parts of the kingdom, were assembled in London, and Garrison was at once admitted to their councils and treated with distinguished consideration. He took home with him a "protest" against the American Colonization Society, signed by Wilberforce, Zachary Macaulay, Samuel Gurney, William Evans, S. Lushington, T. Fowell Buxton, James Cropper, Daniel O'Connell and others, in which they declared their deliberate judgment that "its precepts were delusive," and "its real effects of the most dangerous nature." He also received assurances of the cordial sympathy of British Abolitionists with him in his efforts to abolish American slavery. He gained a hearing before a large popular assembly in London, and won the confidence of those whom he addressed by his evident earnestness, sincerity and ability.

Garrison's visit to England enraged the pro-slavery people and press of the United States at the outset, and when he returned home in September with the "protest" against the Colonization Society, and announced that he had engaged the services of George Thompson as a lecturer against American slavery, there were fresh outbursts of rage on every hand. The American Anti-Slavery Society was organized in December of that year (1833), putting forth a masterly declaration of its principles and purposes from the pen of Garrison. This added fresh fuel to the public excitement, and when Thompson came over in the next spring,

the hostility to the cause began to manifest itself in mobs organized to suppress the discussion of the slavery question. Now began what Harriet Martineau called “the martyr age in America.” In the autumn of 1835 Thompson was compelled, in order to save his life, to embark secretly for England. Just before his departure the announcement that he would address the Woman’s Anti-Slavery Society of Boston created “a mob of gentlemen of property and standing,” from which, if he had been present, he could hardly have escaped with his life. The whole city was in an uproar. Garrison, almost denuded of his clothing, was dragged through the streets with a rope by infuriated men. He was rescued with great difficulty, and consigned to the gaol for safety, until he could be secretly removed from the city.

Anti-slavery societies were greatly multiplied throughout the North, and many men of influence, both in the church and in the state, were won to the cause. Garrison, true to his original purpose, never faltered or turned back. The Abolitionists of the United States were a united body until 1839-1840, when divisions sprang up among them. Garrison countenanced the activity of women in the cause, even to the extent of allowing them to vote and speak in the anti-slavery societies, and appointing them as lecturing agents; moreover, he believed in the political equality of the sexes, to which a strong party was opposed upon social and religious grounds. Then there were some who thought Garrison dealt too severely with the churches and pulpits for their complicity with slavery, and who accused him of a want of religious orthodoxy; indeed, according to the standards of his time he was decidedly heterodox, though he had an intensely religious nature and was far from being an infidel, as he was often charged with being. He was, moreover, not only a non-resistant but also an opponent of all political systems based on force. “As to the governments of this world,” he said, “whatever their titles or forms we shall endeavour to prove that in their essential elements, as at present administered, they are all anti-Christ; that they can never by human wisdom be brought into conformity with the will of God; that they cannot be maintained except by naval and military power to carry them into effect; that all their penal enactments, being a dead letter without any army to carry them into effect, are virtually written in human blood; and that the followers of Jesus should instinctively shun their stations of honor, power, and emolument—at the same time ‘submitting to every ordinance of man for the Lord’s sake’ and offering no physical resistance to any of their mandates, however unjust or tyrannical.” These views were very distasteful to many, who, moreover, felt that Garrison greatly injured abolitionism by causing it to be associated in men’s minds with these unpopular views on other subjects. The dissentients from his opinions determined to form an anti-slavery political party, while he believed in working by moral rather than political party instrumentalities. These differences led to the organization of a new National Anti-Slavery Society in 1840, and to the formation of the “Liberty Party” (*q.v.*) in politics. (See Birney, James G.) The two societies sent their delegates to the World’s Anti-Slavery Convention in London in 1840, and Garrison refused to take his seat in that body, because the women delegates from the United States were excluded. The discussions of the next few years served to make clearer than before the practical workings of the constitution of the United States as a shield and support of slavery; and Garrison, after a long and painful reflection, came to the conclusion that its pro-slavery clauses were immoral, and that it was therefore wrong to take an oath for its support. The Southern states had greatly enlarged representation in Congress on account of their slaves, and the national government was constitutionally bound to assist in the capture of fugitive slaves, and to suppress every attempt on their part to gain their freedom by force. In view of these provisions, Garrison, adopting a bold scriptural figure of speech, denounced the constitution as “a covenant with death and an agreement with hell,” and chose as his motto, “No union with slaveholders.”

One class of Abolitionists sought to evade the difficulty by strained interpretations of the clauses referred to, while others, admitting that they were immoral, felt themselves obliged, notwithstanding, to support the constitution in order to avoid what they thought would be still greater evils. The American Anti-Slavery Society, of which Garrison was the president from 1843 to the day of emancipation, was during all this period the nucleus of an intense and powerful moral agitation, which was greatly valued by many of the most faithful workers in the field of politics, who respected Garrison for his fidelity to his convictions. On the other hand, he always had the highest respect for every earnest and faithful opponent of slavery, however far their special views might differ. When in 1861 the Southern states seceded from the Union and took up arms against it, he saw clearly that slavery would perish in the struggle, that the constitution would be purged of its pro-slavery clauses, and that the Union henceforth would rest upon the sure foundations of liberty, justice and equality to all men. He therefore ceased from that hour to advocate disunion, and devoted himself to the task of preparing the way for and hastening on the inevitable event. His services at this period were

recognized and honoured by President Lincoln and others in authority, and the whole country knew that the agitation which made the abolition of slavery feasible and necessary was largely due to his uncompromising spirit and indomitable courage.

In 1865 at the close of the war, he declared that, slavery being abolished, his career as an abolitionist was ended. He counselled a dissolution of the American Anti-Slavery Society, insisting that it had become *functus officiis*, and that whatever needed to be done for the protection of the freedmen could best be accomplished by new associations formed for that purpose. The *Liberator* was discontinued at the end of the same year, after an existence of thirty-five years. He visited England for the second time in 1846, and again in 1867, when he was received with distinguished honours, public as well as private. In 1877, when he was there for the last time, he declined every form of public recognition. He died in New York on the 24th of May 1879, in the seventy-fourth year of his age, and was buried in Boston, after a most impressive funeral service, four days later. In 1843 a small volume of his *Sonnets and other Poems* was published, and in 1852 appeared a volume of *Selections from his Writings and Speeches*. His wife, Helen Eliza Benson, died in 1876. Four sons and one daughter survived them.

Garrison's son, William Lloyd Garrison (1838-1909), was a prominent advocate of the single tax, free trade, woman's suffrage, and of the repeal of the Chinese Exclusion Act, and an opponent of imperialism; another son, Wendell Phillips Garrison (1840-1907), was literary editor of the New York *Nation* from 1865 to 1906.

> The above article, with certain modifications, reproduces the account given in the 9th edition of this work by Oliver Johnson (reprinted from his *Garrison: an Outline of his Life*, New York, 1879). The writer (1809-1889) was a prominent Abolitionist, editor, and an intimate friend of Garrison; he edited the *Liberator* during Garrison's absence in England in 1833, and later was an editor or an associate editor of various journals, including, after the Civil War, the New York *Tribune* and the New York *Evening Post*. He also published an excellent brief biography in *William Lloyd Garrison and his Times* (Boston, 1880).
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> The great authority on the life of Garrison is the thorough and candid work of his sons, W.P. and F.J. Garrison, *William Lloyd Garrison 1805-1879: The Story of his Life told by his Children* (4 vols., New York, 1885-1889), which is indispensable for the student of the anti-slavery struggle in America. Goldwin Smith's *The Moral Crusader: a Biographical Essay on William Lloyd Garrison* (New York, 1892) is a brilliant sketch.

GARRISON, originally a term for stores or supplies, also a defence or protection, now confined in meaning to a body of troops stationed in a town or fortress for the purpose of defence. In form the word is derived from O. Fr. *garison*, modern *guérison*, from *guérir*, to furnish with stores, to preserve, but in its later meaning it has been confused with the Fr. *garnison*, the regular word for troops stationed for purposes of defence. In English "garnison" was used till the 16th century, when "garrison" took its place. In the British army "garrison troops," especially "garrison artillery," are troops trained and employed for garrison work as distinct from field operations.

GARROTE (Spanish for "cudgel"), an appliance used in Spain and Portugal for the execution of criminals condemned to death. The criminal is conducted to the place of execution (which is public) on horseback or in a cart, wearing a black tunic, and is attended by a procession of priests, &c. He is seated on a scaffold fastened to an upright post by an iron collar (the garrote), and a knob worked by a screw or lever dislocates his spinal column, or a small blade severs the spinal column at the base of the brain. (See Capital Punishment.) Originally a stout cord or bandage was tied round the neck of the criminal, who was seated in a chair fixed to a post. Between the cord and the neck a stick was inserted (hence the name) and twisted till strangulation ensued.

"Garrotting" is the name given in England to a form of robbery with violence which

became rather common in the winter of 1862-1863. The thief came up behind his victim, threw a cord over his head, and tightened it nearly to strangulation point, while robbing him. An act of 1863, imposing the penalty of flogging in addition to penal servitude for this offence, had the effect of stopping garrotting almost entirely. At any rate, the practice was checked; and, though the opponents of any sort of flogging refuse to admit that this was due to the penalty, that view has always been taken by the English judges who had experience of such cases.

GARRUCHA, a seaport of south-eastern Spain, in the province of Almeria; on the Mediterranean Sea and on the right bank of the river Antas. Pop. (1900) 4461. The harbour of Garrucha, which is defended by an ancient castle, affords shelter to large ships, and is the natural outlet for the commerce of a thriving agricultural and mining district. Despite its small size and the want of railway communication, Garrucha has thus a considerable trade in lead, silver, copper, iron, esparto grass, fruit, &c. Besides sea-going ships, many small coasters enter in ballast, and clear with valuable cargoes. In 1902, 135 vessels of 390,000 tons entered the harbour, the majority being British or Spanish; and in the same year the value of the exports reached £478,000, and that of the imports £128,000. Both imports and exports trebled their value in the ten years 1892-1902.

GARSTON, a seaport in the Widnes parliamentary division of Lancashire, England, on the Mersey, 6 m. S.E. of Liverpool. Pop. (1891) 13,444; (1901) 17,289. The docks, belonging to the London & North Western railway company, employ most of the working population. There is about a mile of quayage, with special machinery for the shipping of coal, which forms the chief article of export.

GARTH, SIR SAMUEL (1661-1719), English physician and poet, was born of a good Yorkshire family in 1661. He entered Peterhouse, Cambridge, in 1676, graduating B.A. in 1679 and M.A. in 1684. He took his M.D. and became a member of the College of Physicians in 1691. In 1697 he delivered the Harveian oration, in which he advocated a scheme dating from some ten years back for providing dispensaries for the relief of the sick poor, as a protection against the greed of the apothecaries. In 1699 he published a mock-heroic poem, *The Dispensary*, in six cantos, which had an instant success, passing through three editions within a year. In this he ridiculed the apothecaries and their allies among the physicians. The poem has little interest at the present day, except as a proof that the heroic couplet was written with smoothness and polish before the days of Pope. Garth was a member of the Kit-Kat Club, and became the leading physician of the Whigs, as Radcliffe was of the Tories. In 1714 he was knighted by George I. and he died on the 18th of January 1719. He wrote little besides his best-known work *The Dispensary* and *Claremont*, a moral epistle in verse. He made a Latin oration (1700) in praise of Dryden and translated the *Life of Otho* in the fifth volume of Dryden's Plutarch. In 1717 he edited a translation of Ovid's *Metamorphoses*, himself supplying the fourteenth and part of the fifteenth book.

GARTOK, a trade-market of Tibet, situated on the bank of the Indus on the road between Shigatse and Leh, to the east of Simla. In accordance with the Tibet treaty of 1904, Gartok,

together with Yatung and Gyantse, was thrown open to British trade. On the return of the column from Lhasa in that year Gartok was visited by a party under Captain Ryder, who found only a few dozen people in winter quarters, their houses being in the midst of a bare plain. In summer, however, all the trade between Tibet and Ladakh passes through this place.

GARY, a city of Lake county, Indiana, U.S.A., at the southern end of Lake Michigan, about 25 m. S.E. of Chicago, Ill. Pop. (1910 census) 16,802. Gary is served by the Baltimore & Ohio, the Lake Shore & Michigan Southern, the Michigan Central, the Pennsylvania, the Wabash, and (for freight only) the Chicago, Lake Shore & Eastern, and the Indiana Harbor Belt railways, and by several steamship lines plying the Great Lakes. There are about 21 sq. m. within the municipal limits, but the city lies chiefly within a tract of about 8000 acres composed at the time of its settlement mainly of sand dunes and swamps intersected from east to west by the Grand Calumet and the Little Calumet rivers, small streams respectively about 1 and 3 m. S. of the lake shore. In 1906 the United States Steel Corporation bought this tract to establish on it a great industrial community, as direct water connexion with the Lake Superior ore region was possible, and it was comparatively accessible to West Virginia coal and Michigan limestone, with unusual railroad facilities. The Steel Corporation began the actual building of the town in June 1906, the first step being the installation of an elaborate system of sewers, and of mains and conduits, for the distribution of water, gas and electricity. The water-supply is taken from the lake at a point 2 m. offshore by means of a tunnel. These public utilities the Steel Corporation controls, and it has built about 500 dwellings, two hotels, a bank, and its own plant. A small patch of land, now within the limits of the city, has been from the beginning in the hands of private owners, but the remainder of the lots (except those already sold) are owned by the Steel Corporation, and are sold under certain restrictions intended to prevent real estate speculation, to guarantee bona fide improvement of the property, and to restrict the sale of intoxicating drinks. Between the Grand Calumet river (which has been dredged out into a canal) and the lake lies the plant of the Steel Corporation, covering about 1200 acres. All the machinery in this great plant is driven by electricity from generators whose motive power is supplied by the combustion of gases from the blast furnaces. From the same sources is also supplied the electricity for lighting the city. The rail mill is operated by three-phase induction motors of from 2000 to 6000 horse-power capacity. The city was chartered in 1906 and was named in honour of Elbert Henry Gary (b. 1846), chairman of the board of directors and chairman of the finance committee of the United States Steel Corporation.

GAS, a general term for one of the three states of aggregation of matter; also more specifically applied to coal-gas, the gaseous product formed in the destructive distillation of coal or other carbonaceous matter (see below, section *Gas Manufacture*; for gas engines see the separate heading Gas Engine).

The Gaseous State.—Matter is studied under three physical phases—solids, liquids and gases, the latter two being sometimes grouped as “fluids.” The study of the physical properties of fluids in general constitutes the science of hydromechanics, and their applications in the arts is termed hydraulics; the special science dealing with the physical properties of gases is named pneumatics.

The gaseous fluid with which we have chiefly to do is our atmosphere. Though practically invisible, it appeals in its properties to other of our senses, so that the evidences of its presence are manifold. Thus we feel it in its motion as wind, and observe the dynamical effects of this motion in the quiver of the leaf or the motion of a sailing ship. It offers resistance to the passage of bodies through it, destroying their motion and transforming their energy—as is betrayed to our hearing in the whiz of the rifle bullet, to our sight in the flash of the meteor.

The practically obvious distinction between solids and fluids may be stated in dynamical

language thus:—solids can sustain a longitudinal pressure without being supported by a lateral pressure; fluids cannot. Hence any region of space enclosed by a rigid boundary can be easily filled with a fluid, which then takes the form of the bounding surface at every point of it. But here we distinguish between fluids according as they are gases or liquids. The gas will always completely fill the region, however small the quantity put in. Remove any portion and the remainder will expand so as to fill the whole space again. On the other hand, it requires a definite quantity of liquid to fill the region. Remove any portion and a part of the space will be left unoccupied by liquid. Part of the liquid surface is then otherwise conditioned than by the form of the wall or bounding surface of the region; and if the portion of the wall not in contact with the liquid is removed the form and quantity of the liquid are in no way affected. Hence a liquid can be kept in an open vessel; a gas cannot so be. To quote the differentia of Sir Oliver Lodge: "A solid has volume and shape; a liquid has volume, but no shape; a gas has neither volume nor shape."

It is necessary to distinguish between a gas and a "vapour." The latter possesses the physical property stated above which distinguishes a gas from a fluid, but it differs from a gas by being readily condensible to a liquid, either by lowering the temperature or moderately increasing the pressure. The study of the effects of pressure and temperature on many gases led to the introduction of the term "permanent gases" to denote gases which were apparently not liquefiable. The list included hydrogen, nitrogen and oxygen; but with improved methods these gases have been liquefied and even solidified, thus rendering the term meaningless (see Liquid Gases). The term "perfect gas" is applied to an imaginary substance in which there is no frictional retardation of molecular motion; or, in other words, the time during which any molecule is influenced by other molecules is infinitesimally small compared with the time during which it traverses its mean free path. It serves as a means of research, more particularly in mathematical investigations, the simple laws thus deduced being subsequently modified by introducing assumptions in order to co-ordinate actual experiences.

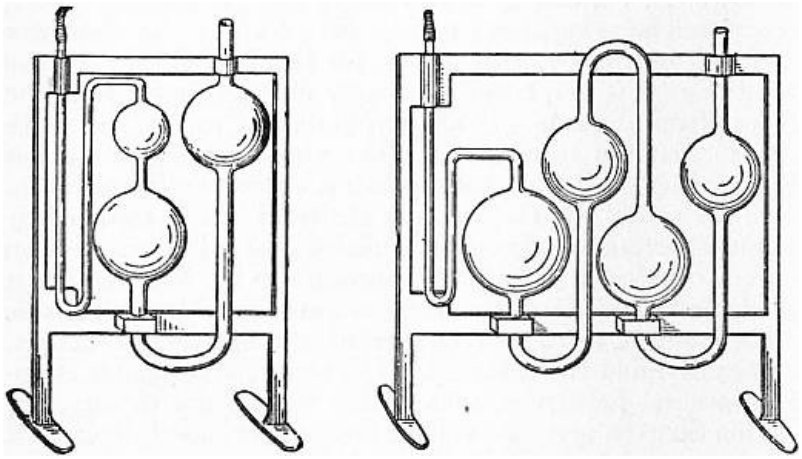
The gaseous state was well known to the ancients; for instance, in Greek cosmology, "air" (πνεῦμα) was one of the fundamental elements. The alchemists used such terms as *spiritus*, *flatus*, *halitus*, *aura*, *emanatio nubila*, &c., words implying a "wind" or "breath." The word "gas" was invented by J.B. van Helmont in his *Ortus medicinae*, posthumously published in 1648, in the course of his description of the gas now known as carbon dioxide. He found that charcoal on burning yielded a "spirit," which he named *spiritus sylvestris* on account of its supposed untamable nature ("Gas sylvestre sive incoërcibile, quod in corpus cogi non potest visibile"); and he invented the word "gas" in the expression: "... this spirit, hitherto unknown, ... I call by a new name *gas*" ("hunc spiritum, incognitum hactenus, novo nomine *gas* voco"). The word was suggested by the Gr. χάος, chaos, for he also writes: "I have called this spirit *gas*, it being scarcely distinguishable from the Chaos of the ancients" ("halitum illum *Gas* vocavi, non longe a Chao veterum secretum"). The view that the word was suggested by the Dutch *geest*, spirit, is consequently erroneous. Until the end of the 18th century the word "air," qualified by certain adjectives, was in common use for most of the gases known—a custom due in considerable measure to the important part which common air played in chemical and physical investigations.

The study of gases may be divided into two main branches: the physical and the chemical. The former investigates essentially general properties, such as the weight and density, the relation between pressure, volume and temperature (piezometric and thermometric properties), calorimetric properties, diffusion, viscosity, electrical and thermal conductivity, &c., and generally properties independent of composition. These subjects are discussed in the articles Density; Thermometry; Calorimetry; Diffusion; Conduction of Heat; and Condensation of Gases. The latter has for its province the preparation, collection and identification of gases, and the volume relations in which they combine; in general it deals with specific properties. The historical development of the chemistry of gases—pneumatic chemistry—is treated in the article Chemistry; the technical analysis of gaseous mixtures is treated below under *Gas Analysis*. Connecting the experimental study of the physical and chemical properties is the immense theoretical edifice termed the kinetic theory of gases. This subject, which is discussed in the article Molecule, has for its purpose (1) the derivation of a physical structure of a gas which will agree with the experimental observations of the diverse physical properties, and (2) a correlation of the physical properties and chemical composition.

Gas Analysis.—The term "gas analysis" is given to that branch of analytical chemistry which has for its object the quantitative determination of the components of a gaseous mixture. The chief applications are found in the analysis of flue gases (in which much

information is gained as to the completeness and efficiency of combustion), and of coal gas (where it is necessary to have a product of a definite composition within certain limits). There are, in addition, many other branches of chemical technology in which the methods are employed. In general, volumetric methods are used, *i.e.* a component is absorbed by a suitable reagent and the diminution in volume noted, or it is absorbed in water and the amount determined by titration with a standard solution. Exact analysis is difficult and tedious, and consequently the laboratory methods are not employed in technology, where time is an important factor and moderate accuracy is all that is necessary. In this article an outline of the technical practice will be given.

The apparatus consists of (1) a measuring vessel, and (2) a series of absorption pipettes. A convenient form of measuring vessel is that devised by W. Hempel. It consists of two vertical tubes provided with feet and connected at the bottom by flexible rubber tubing. One tube, called the “measuring tube,” is provided with a capillary stopcock at the top and graduated downwards; the other tube, called the “level tube,” is plain and open. To use the apparatus, the measuring tube is completely filled with water by pouring water into both tubes, raising the level tube until water overflows at the stopcock, which is then turned. The test gas is brought to the stopcock, by means of a fine tube which has been previously filled with water or in which the air has been displaced by running the gas through. By opening the stopcock and lowering the level tube any desired quantity of the gas can be aspirated over. In cases where a large quantity of gas, *i.e.* sufficient for several tests, is to be collected, the measuring tube is replaced by a large bottle.



(By permission of Messrs Baird & Tatlock.)

FIG. 1. FIG. 2.

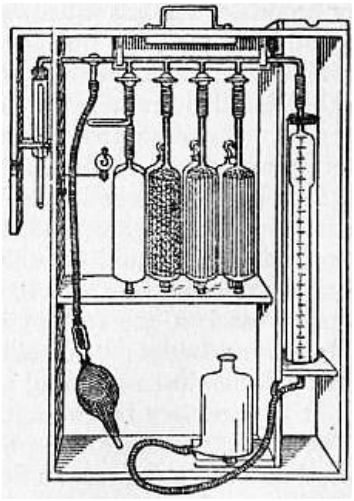
The volume of the gas in the measuring tube is determined by bringing the water in both tubes to the same level, and reading the graduation on the tube, avoiding parallax and the other errors associated with recording the coincidence of a graduation with a meniscus. The temperature and atmospheric pressure are simultaneously noted. If the tests be carried out rapidly, the temperature and pressure may be assumed to be constant, and any diminution in volume due to the absorption of a constituent may be readily expressed as a percentage. If, however, the temperature and pressure vary, the volumes are reduced to 0° and 760 mm. by means of the formula $V_0 = V(P - p)/(1 + .00366t)760$, in which V is the observed volume, P the barometric pressure, p the vapour tension of water at the temperature t of the experiment. This reduction is facilitated by the use of tables.

Some common forms of absorption pipettes are shown in figs. 1 and 2. The simpler form consists of two bulbs connected at the bottom by a wide tube. The lower bulb is provided with a smaller bulb bearing a capillary through which the gas is led to the apparatus, the higher bulb has a wider outlet tube. The arrangement is mounted vertically on a stand. Sometimes the small bulb on the left is omitted. The form of the pipette varies with the nature of the absorbing material. For solutions which remain permanent in air the two-bulbed form suffices; in other cases a composite pipette (fig. 2) is employed, in which the absorbent is protected by a second pipette containing water. In the case of solid reagents, *e.g.* phosphorus, the absorbing bulb has a tubulure at the bottom. To use a pipette, the absorbing liquid is brought to the outlet of the capillary by tilting or by squeezing a rubber ball fixed to the wide end, and the liquid is maintained there by closing with a clip. The capillary is connected with the measuring tube by a fine tube previously filled with water. The clip is removed, the stopcock opened, and the level tube of the measuring apparatus raised, so that the gas passes into the first bulb. There it is allowed to remain, the pipette

being shaken from time to time. It is then run back into the measuring tube by lowering the level tube, the stopcock is closed, and the volume noted. The operation is repeated until there is no further absorption.

The choice of absorbents and the order in which the gases are to be estimated is strictly limited. Confining ourselves to cases where titration methods are not employed, the general order is as follows: carbon dioxide, olefines, oxygen, carbon monoxide, hydrogen, methane and nitrogen (by difference). This scheme is particularly applicable to coal-gas. Carbon dioxide is absorbed by a potash solution containing one part of potash to between two and three of water; the stronger solution absorbs about 40 volumes of the gas. The olefines—ethylene, &c.—are generally absorbed by a very strong sulphuric acid prepared by adding sulphur trioxide to sulphuric acid to form a mixture which solidifies when slightly cooled. Bromine water is also employed. Oxygen is absorbed by stick phosphorus contained in a tubulated pipette filled with water. The temperature must be above 18°; and the absorption is prevented by ammonia, olefines, alcohol, and some other substances. An alkaline solution of pyrogallol is also used; this solution rapidly absorbs oxygen, becoming black in colour, and it is necessary to prepare the solution immediately before use. Carbon monoxide is absorbed by a solution of cuprous chloride in hydrochloric acid or, better, in ammonia. When small in amount, it is better to estimate as carbon dioxide by burning with oxygen and absorbing in potash; when large in amount, the bulk is absorbed in ammoniacal cuprous chloride and the residue burned. Hydrogen may be estimated by absorption by heated palladium contained in a capillary through which the gas is passed, or by exploding (under reduced pressure) with an excess of oxygen, and measuring the diminution in volume, two-thirds of which is the volume of hydrogen. The explosion method is unsatisfactory when the gas is contained over water, and is improved by using mercury. Methane cannot be burnt in this way even when there is much hydrogen present, and several other methods have been proposed, such as mixing with air and aspirating over copper oxide heated to redness, or mixing with oxygen and burning in a platinum tube heated to redness, the carbon dioxide formed being estimated by absorption in potash. Gases soluble in water, such as ammonia, hydrochloric acid, sulphuretted hydrogen, sulphur dioxide, &c., are estimated by passing a known volume of the gas through water and titrating the solution with a standard solution. Many types of absorption vessel are in use, and the standard solutions are generally such that 1 c.c. of the solution corresponds to 1 c.c. of the gas under normal conditions.

Many forms of composite gas-apparatus are in use. One of the commonest is the Orsat shown in fig. 3. The gas is measured in the graduated cylinder on the right, which is surrounded by a water jacket and provided with a levelling bottle. At the top it is connected by a capillary tube bent at right angles to a series of absorbing vessels, the connexion being effected by stopcocks. These vessels consist of two vertical cylinders joined at the bottom by a short tube. The cylinder in direct communication with the capillary is filled with glass tubes so as to expose a larger surface of the absorbing solution to the gas. The other cylinder is open to the air and serves to hold the liquid ejected from the absorbing cylinder. Any number of bulbs can be attached to the horizontal capillary; in the form illustrated there are four, the last being a hydrogen pipette in which the palladium is heated in a horizontal tube by a spirit lamp. At the end of the horizontal tube there is a three-way cock connecting with the air or an aspirator. To use the apparatus, the measuring tube is completely filled with water by raising the levelling bottle. The absorbing vessels are then about half filled with the absorbents, and, by opening the cocks and aspirating, the liquid is brought so as completely to fill the bulbs nearer the capillary. The cocks are then closed. By opening the three-way cock to the supply of the test gas and lowering the levelling bottle, any desired amount can be drawn into the measuring tube. The absorption is effected by opening the cock of an absorbing vessel and raising the levelling bottle. The same order of absorption and general directions pertaining to the use of Hempel pipettes have to be adopted.



(By permission of Messrs Baird & Tatlock.)

FIG. 3.

Although the earliest attempts at gas analysis were made by Scheele, Priestley, Cavendish, Lavoisier, Dalton, Gay-Lussac and others, the methods were first systematized by R. Bunsen, who began his researches in 1838. He embodied his results in his classical *Gasometrische Methoden* (1857, second edition 1877), a work translated into English by H. Roscoe.

Clemens Winkler contributed two works, *Anleitung zur chemischen Untersuchung der Industriegase* (1876-1877) and *Lehrbuch der technischen Gasanalyse* (2nd ed., 1892), both of which are very valuable for the commercial applications of the methods. W. Hempel's researches are given in his *Neue Methode zur Analyse der Gase* (1880) and *Gasanalytische Methoden* (1890, 3rd ed. 1900).

Gas Manufacture

1. *Illuminating Gas.*—The first practical application of gas distilled from coal as an illuminating agent is generally ascribed to William Murdoch, who between the years of 1792 and 1802 demonstrated the possibility of making gas from coal and using it as a lighting agent on a large scale. Prior to 1691, however, Dr John Clayton, dean of Kildare, filled bladders with inflammable gas obtained by the distillation of coal, and showed that on pricking the bladders and applying a light to the escaping gas it burnt with a luminous flame, and in 1726 Stephen Hales published the fact that by the distillation of 158 grains of Newcastle coal, 180 cub. in. of inflammable air would be obtained. Jean Pierre Minckelers, professor of natural philosophy in the university of Louvain, and later of chemistry and physics at Maestricht, made experiments on distilling gas from coal with the view of obtaining a permanent gas sufficiently light for filling balloons, and in 1785 experimentally lighted his lecture room with gas so obtained as a demonstration to his students, but no commercial application was made of the fact. Lord Dundonald, in 1787, whilst distilling coal for the production of tar and oil, noticed the formation of inflammable gas, and even used it for lighting the hall of Culross Abbey. It is clear from these facts that, prior to Murdoch's experiments, it was known that illuminating gas could be obtained by the destructive distillation of coal, but the experiments which he began at Redruth in 1792, and which culminated in the lighting of Messrs Boulton, Watt & Co.'s engine works at Soho, near Birmingham, in 1802, undoubtedly demonstrated the practical possibility of making the gas on a large scale, and burning it in such a way as to make coal-gas the most important of the artificial illuminants. An impression exists in Cornwall, where Murdoch's early experiments were made, that it was a millwright named Hornblower who first suggested the process of making gas to Murdoch, but, as has been shown, the fact that illuminating gas could be obtained from coal by distillation was known a century before Murdoch made his experiments, and the most that can be claimed for him is that he made the first successful application of it on a practical scale.

Historical.

In 1799 a Frenchman named Philippe Lebon took out a patent in Paris for making an illuminating gas from wood, and gave an exhibition of it in 1802, which excited a considerable amount of attention on the European continent. It was seen by a German, F.A. Winsor, who made Lebon an offer for his secret process for Germany. This offer was, however, declined, and Winsor returned to Frankfort determined to find out how the gas could be made. Having quickly succeeded in discovering this, he in 1803 exhibited before the reigning duke of Brunswick a series of experiments with lighting gas made from wood and from coal. Looking upon London as a promising field for enterprise, he came over to England, and at the commencement of 1804 took the Lyceum theatre, where he gave demonstrations of his process. He then proceeded to float a company, and in 1807 the first public street gas lighting took place in Pall Mall, whilst in 1809 he applied to parliament to incorporate the National Heat and Light Company with a capital of half a million sterling. This application was opposed by Murdoch on the ground of his priority in invention, and the bill was thrown out, but coming to parliament for a second time in 1810, Winsor succeeded in getting it passed in a very much curtailed form, and, a charter being granted later in 1812, the company was called the Chartered Gas Light and Coke Company, and was the direct forerunner of the present London Gas Light and Coke Company. During this period Frederick C. Accum (1769-1838), Dr W. Henry and S. Clegg did so much by their writings and by the improvements they introduced in the manufacture, distribution and burning of coal gas, that their names have become inseparably connected with the subject.

In 1813 Westminster Bridge, and in the following year the streets of Westminster, were lighted with gas, and in 1816 it became common in London. After this so rapid was the progress of this new mode of illumination that in the course of a few years it was adopted by all the principal towns in the United Kingdom for lighting streets as well as shops and public edifices. In private houses it found its way more slowly, partly from an apprehension of danger attending its use, and partly from the discomfort which was experienced in many cases through the gas being distributed without purification, and to the careless and imperfect manner in which the service pipes were first fitted. It was during the last four decades of the

The growth of gas lighting.

19th century that the greatest advance was made, this period having been marked not only by many improvements in the manufacture of illuminating gas, but by a complete revolution in the methods of utilizing it for the production of light. In 1875 the London Argand, giving a duty of 3.2 candles illuminating power per cubic foot of ordinary 16 candle gas, was looked upon as the most perfect burner of the day, and little hope was entertained that any burner capable of universal adoption would surpass it in its power of developing light from the combustion of coal gas; but the close of the century found the incandescent mantle and the atmospheric burner yielding six times the light that was given by the Argand for the consumption of an equal volume of gas, and to-day, by supplying gas at an increased pressure, a light of ten times the power may be obtained. Since the advent of the incandescent mantle, the efficiency of which is dependent upon the heating power of the gas more than on its illuminating power, the manufacture of coal gas has undergone considerable modifications.

Coals used for gas-making.

Coal, the raw material from which the gas is produced by a process of destructive distillation, varies very widely in composition (see COAL), and it is only the class of coals rich in hydrogen, known as bituminous coal, that can with advantage be utilized in gas manufacture. Coals of this character are obtained in England from the Newcastle and Durham field, South Yorkshire, Derbyshire and Barnsley districts, and an idea of their ultimate composition may be derived from the following table:—

	Carbon.	Hydrogen	Sulphur.	Nitrogen	Oxygen.	Ash.	Moisture.
Newcastle gas coal	82.16	4.83	1.00	1.23	6.82	3.20	0.76
Durham gas coal	84.34	5.30	0.73	1.73	4.29	2.42	1.14
South Yorkshire silkstone	80.46	5.09	1.66	1.67	6.79	3.30	1.03
Derbyshire silkstone	76.96	5.04	2.39	1.77	6.92	3.28	3.64
Barnsley gas coal	75.64	4.94	2.84	1.65	7.25	4.28	3.40

Our knowledge of the composition of coal is limited to the total amount of carbon, hydrogen, nitrogen, oxygen and foreign materials which it contains; and at present we know practically but little of the way in which these bodies are combined. This being so, the ordinary analysis of a coal affords but little indication of its value for gas-making purposes, which can only be really satisfactorily arrived at by extended use on a practical scale. Bituminous coal, however, may be looked upon as containing carbon and also simple hydrocarbons, such as some of the higher members of the paraffin series, and likewise organic bodies containing carbon, hydrogen, nitrogen, oxygen and sulphur.

Destructive distillation of coal.

On submitting a complex substance of this character to destructive distillation, it will be found that the yield and quality of the products will vary very considerably with the temperature existing in the retorts, with the size of the charge of coal used, with its distribution in the retort, with the length of time the distillation has been going on, and with an infinity of other factors of a more or less complex nature. If bituminous coal is distilled at a low temperature, the tar is found to contain considerable quantities of light paraffin oils; and there is no doubt that paraffin hydrocarbons are present in the original coal. These paraffins, under the influence of heat, split up into simpler members of the same series and into olefines; and if we imagine the action in its simplest form, we should have the gases, as they were evolved, consisting of (say) ethane and ethylene. These have now to pass down the heated retort on their way to the ascension pipe, and the contact with the heated sides of the retort, and the baking from the radiant heat in the retort, set up an infinity of changes. Ethane, when heated to this degree, splits up into ethylene and hydrogen, whilst ethylene decomposes to methane and acetylene, and the acetylene at once polymerizes to benzene, styrolene, retene, &c. A portion also condenses, and at the same time loses some hydrogen, becoming naphthalene; and the compounds so formed by interactions amongst themselves build up the remainder of the hydrocarbons present in the coal tar, whilst the organic substances containing oxygen in the coal break down, and cause the formation of the phenols in the tar.

There is very little doubt that the general course of the decompositions follows these lines; but any such simple explanation of the actions taking place is rendered impossible by the fact that, instead of the breaking-down of the hydrocarbons being completed in the coal, and only secondary reactions taking place in the retort, in practice the hydrocarbons to a great extent leave the coal as the vapours of condensible hydrocarbons, and the breaking down of these to such simple gaseous compounds as ethylene is proceeding in the retort at the same time as the breaking up of the ethylene already formed into acetylene and methane, and the polymerization of the former into higher compounds. Starting with a solid hydrocarbon of

definite composition, it would be theoretically possible to decompose it entirely into carbon, hydrogen, ethylene and methane, and, by rapidly removing these from the heating zone before any secondary actions took place, to prevent formation of tar. But any such ideal is hopeless in practice, as the coal is not a definite compound, and it is impossible to subject it to a fixed temperature.

If the retorts are at a temperature of 1000° C. when the charge of coal is put in, the temperature of the distillation will vary from about 800° C. close to the walls, to about 400° C. in the centre of the coal; and in the same way, in the space above the coal, the products which come in contact with the sides of the retort are heated to 1000° C., whilst the gas near the coal is probably heated to only 600° C. Moreover, the gases and vapours in the retort are subjected to a period of heating which varies widely with the distance from the mouth of the retort of the coal that is undergoing carbonization. The gas developed by the coal near the mouth of the retort is quickly washed out into the ascension pipe by the push of the gas behind, and the period for which it has been exposed to the radiant heat from the walls of the retort is practically nil; whilst the gas evolved in the portion of the retort farthest from the mouthpiece has only its own rate of evolution to drive it forward, and has to traverse the longest run possible in the retort, exposed during the whole of that period to radiant heat and to contact with the highly heated surface of the retort itself. Hence we find that the tar is formed of two distinct sets of products, the first due to incomplete decomposition and the second to secondary reactions due to the products of the decomposition being kept too long in the zone of heat.

Effect of temperature in the retort.

Of the first class, the light paraffin oils and pitch may be taken as examples; whilst benzene, naphthalene and retort carbon represent the second. The formation of the second class of bodies is a great loss to the gas manufacturer, as, with the exception of the trace of benzene carried with the gas as vapour, these products are not only useless in the gas, but one of them, naphthalene, is a serious trouble, because any trace carried forward by the gas condenses with sudden changes of temperature, and causes obstructions in the service pipes, whilst their presence in the tar means the loss of a very large proportion of the illuminating constituents of the gas. Moreover, these secondary products cannot be successfully reduced, by further heating, to simpler hydrocarbons of any high illuminating value, and such bodies as naphthalene and anthracene have so great a stability that, when once formed, they resist any efforts again to decompose them by heat, short of the temperature which breaks them up into methane, carbon and hydrogen.

The ammonia is derived from the nitrogen present in the coal combining with hydrogen during destructive distillation, the nitrogen becoming distributed amongst all three classes of products. The following table will give an approximate idea of the proportions which go to each:—

	Per cent.
Nitrogen as ammonia	14.50
Nitrogen as cyanogen	1.56
Nitrogen free in gas and combined in tar	35.26
Nitrogen remaining in coke	48.68
	100.00

The effect produced by alteration in the temperature of the retort upon the composition of both gas and tar is very marked. As the temperature is raised, the yield of gas from a given weight of coal increases; but with the increase of volume there is a marked decrease in the illuminating value of the gas evolved. Lewis T. Wright found, in a series of experiments, that, when four portions of the same coal were distilled at temperatures ranging from a dull red heat to the highest temperature attainable in an iron retort, he obtained the following results as to yield and illuminating power:—

Temperature.	Cubic ft. of Gas per ton.	Illuminating Power, Candles.	Total Candles per ton.
1. Dull red	8,250	20.5	33.950
2. Hotter	9,693	17.8	34.510
3. ”	10,821	16.7	36.140
4. Bright orange	12,006	15.6	37.460

Composition of the Gas.

	1. Per cent.	2. Per cent.	4. Per cent.
Hydrogen	38.09	43.77	48.02
Marsh gas	42.72	34.50	30.70
Olefines	7.55	5.83	4.51
Carbon monoxide	8.72	12.50	13.96
Nitrogen	2.92	3.40	2.81
	100.00	100.00	100.00

The gas analysis of No. 3 was lost, but the illuminating power shows that it was intermediate in composition between Nos. 2 and 4. From this it will be seen that, with the increase of temperature, the hydrocarbons—the olefines and marsh gas series—gradually break up, depositing carbon in the crown of the retort, and liberating hydrogen, the percentage of which steadily increases with the rise of temperature.

The tar formed is affected to an even greater extent than the gas by alterations in the temperature at which the destructive distillation takes place. The lower the temperature, the smaller will be the volume of gas produced, and the lighter the specific gravity of the tar, whilst with increase of temperature, the volume of gas rapidly rises, and so does the specific gravity of the tar. Working with a caking coal Wright obtained the following results:—

Yield of Gas per ton, Cub. ft.	Specific Gravity of Tar.
6,600	1.086
7,200	1.120
8,900	1.140
10,162	1.154
11,700	1.206

Analysis of the tar showed that the increase of the specific gravity was due to the increase in the quantity of pitch, which rose from 28.89 to 64.08% in the residuals; whilst the ammonia, naphtha and light oils steadily fell in quantity, the creosote and anthracene oils doing the same, but to a smaller extent. Naphthalene also begins to show in quantity in the tar as soon as the yield of gas reaches 10,000 cub. ft. per ton of coal carbonized.

In spite of these variations, however, the products in their main characteristics will remain the same. They may be divided into—(*a*) Solids, such as the coke and retort carbon; (*b*) liquids, consisting of the tar and ammoniacal liquor; and (*c*) gases, consisting of the unpurified coal gas. The proportions in which the products are approximately obtained from a ton of gas coal have been given as follows:—

10,000 cub. ft. of gas	=	380	lb. =	17.0	per cent.
10 gallons of tar	=	115	” =	5.1	”
Gas liquor[1]	=	177	” =	7.9	”
Coke	=	1568	” =	70.0	”
		2240		100.0	

Solid products.

The chief solid residue, coke, is not absolutely pure carbon, as it contains the mineral non-volatile constituents which remain behind as ash when the original coal is burnt, and which, to a great extent, existed in the sap that filled the cells of the plant from which the coal was formed. The retort carbon formed as a dense deposit on the crown of the retort by the action of the high temperature on the hydrocarbons is, however, carbon in a very pure form, and, on account of its density, is largely used for electrical purposes.

Liquid products.

The liquid products of the destructive distillation of coal are tar and ammoniacal liquor. Tar derived from ordinary bituminous coal is a black, somewhat viscid liquid, varying in specific gravity from 1.1 to 1.2. The ultimate composition of tar made in the London Gas Works is approximately as follows:—

Carbon	77.53
Hydrogen	6.33
Nitrogen	1.03
Sulphur	0.61

Oxygen	14.50
	100.00

These elements in tar are built up into an enormous number of compounds (see COAL TAR), and its value as a by-product may be gathered from the fact that on fractional distillation it yields—(1) benzene and its homologues, from which aniline, the source of most of the coal-tar colours, can be derived; (2) carbolic acid, from which picric acid, used as a dye, a powerful explosive, and to give the bitter flavour to some kinds of beer, is made, also many most valuable disinfectants; (3) naphthalene, used for disinfecting, and also as the "Albo-carbon" employed in an enriching burner for gas; (4) pitch, extensively used in path-making, from which such bodies as anthracene and saccharin can be extracted.

The second liquid product of the destructive distillation of coal is the ammoniacal or gas liquor, which consists of water containing ammonia salts in solution, partly condensed from the hot gas, and partly added to wash the gas in the scrubbers. It contains, as its principal constituents, ammonia, partly combined with carbonic acid and sulphuretted hydrogen to form compounds which are decomposed on boiling, with evolution of ammonia gas, and partly combined with stronger acids to form compounds which require to be acted upon by a strong alkali before the ammonia contained in them can be liberated. The ammonia in the first class of compounds is technically spoken of as "free"; that present in the latter as "fixed." The following analysis by L.T. Wright will give an idea of the relative quantities in which these compounds exist in the liquor:—

		Grammes per litre.
Free	Ammonium sulphide	3.03
	Ammonium carbonate	39.16
	Ammonium chloride	14.23
Fixed	Ammonium thiocyanate	1.80
	Ammonium sulphate	0.19
	Ammonium thiosulphate	2.80
	Ammonium ferrocyanide	0.41

From a scientific point of view, the term "free" is absolutely incorrect, and in using it the fact must be clearly borne in mind that in this case it merely stands for ammonia, which can be liberated on simply boiling the liquor.

Gaseous products.

The gas which is obtained by the destructive distillation of coal, and which we employ as our chief illuminant, is not a definite compound, but a mechanical mixture of several gases, some of which are reduced to the lowest limit, in order to develop as fully as possible the light-giving properties of the most important constituents of the gas. The following analysis gives a fair idea of the composition of an average sample of gas made from coal, purified but without enrichment:—

Hydrogen	52.22
Unsaturated hydrocarbons	3.47
Saturated hydrocarbons	34.76
Carbon monoxide	4.23
Carbon dioxide	0.60
Nitrogen	4.23
Oxygen	0.49
	100.00

These constituents may be divided into—(*a*) light-yielding hydrocarbons, (*b*) combustible diluents and (*c*) impurities. The hydrocarbons, upon which the luminosity of the flame entirely depends, are divided in the analysis into two groups, saturated and unsaturated, according to their behaviour with a solution of bromine in potassium bromide, which has the power of absorbing those termed "unsaturated," but does not affect in diffused daylight the gaseous members of the "saturated" series of hydrocarbons. They may be separated in a similar way by concentrated sulphuric acid, which has the same absorbent effect on the one class, and not on the other. The chief unsaturated hydrocarbons present in coal gas are: ethylene, C_2H_4, butylene, C_4H_8, acetylene, C_2H_2, benzene, C_6H_6, and naphthalene, $C_{10}H_8$, and the saturated hydrocarbons consist chiefly of methane, CH_4, and ethane, C_2H_6.

The light-giving power of coal gas is undoubtedly entirely due to the hydrocarbons. The

idea held up to about 1890 was that the illuminating value depended upon the amount of ethylene present. This, however, is manifestly incorrect, as, if it were true, 4% of ethylene mixed with 96% of a combustible diluent such as hydrogen should give 16- to 17-candle gas, whereas a mixture of 10% of ethylene and 90% of hydrogen is devoid of luminosity. In 1876 M.P.E. Berthelot came to the conclusion that the illuminating value of the Paris coal gas was almost entirely due to benzene vapour. But here again another mistaken idea arose, owing to a faulty method of estimating the benzene, and there is no doubt that methane is one of the most important of the hydrocarbons present, when the gas is burnt in such a way as to evolve from it the proper illuminating power, whilst the benzene vapour, small as the quantity is, comes next in importance and the ethylene last. It is the combined action of the hydrocarbons which gives the effect, not any one of them acting alone.

The series of operations connected with the manufacture and distribution of coal gas embraces the processes of distillation, condensation, exhaustion, wet purification by washing and scrubbing, dry purification, measuring, storing and distribution to the mains whence the consumer's supply is drawn.

River.

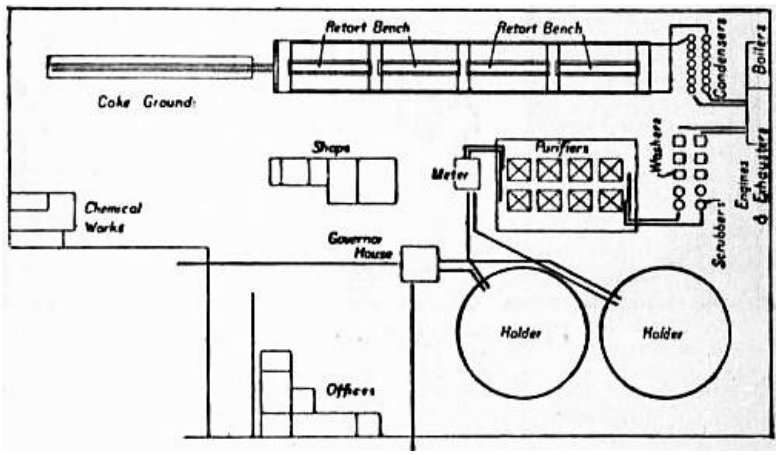


FIG. 4.—Plan of Works.

Site of gas works.

The choice of a site for a gas works is necessarily governed by local circumstances; but it is a necessity that there should be a ready means of transport available, and for this reason the works should be built upon the banks of a navigable river or canal, and should have a convenient railway siding. By this means coal may be delivered direct to the store or retort-house, and in the same way residual products may be removed. The fact that considerable area is required and that the works do not improve the neighbourhood are important conditions, and although economy of space should be considered, arrangements should be such as to allow of extension. In the case of a works whose daily make of gas exceeds four to five million cub. ft., it is usual to divide the works into units, there being an efficiency limit to the size of apparatus employed. Under these conditions the gas is dealt with in separate streams, which mix when the holder is reached. From the accompanying ground plan of a works (fig. 4) it will be possible to gain an idea of the order in which the operations in gas manufacture are carried out and the arrangement of the plant.

Retorts.

The retorts in which the coal is carbonized are almost universally made of fire-clay, and in all but small country works the old single-ended retort, which was about 9 ft. in length, has given way to a more economical construction known as doubles, double-ended, or "through" retorts. These are from 18 to 22 ft. long, and as it is found inconvenient to produce this length in one piece, they are manufactured in three sections, the jointing together of which demands great care. The two outer pieces are swelled at one end to take an iron mouthpiece. The cross sections generally employed for retorts are known as "D-shaped," "oval" and "round" (fig. 5). The "D" form is mostly adopted owing to its power of retaining its shape after long exposure to heat, and the large amount of heating surface it presents at its base. The life of this retort is about thirty working months. A cast

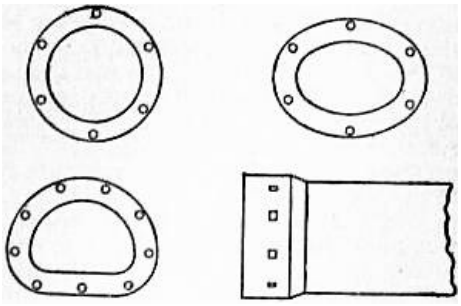


FIG. 5.—Cross Section of Retorts.

iron mouthpiece and lid is bolted to the exterior end of each retort, the mouthpiece carrying a socket end to receive the ascension pipe, through which the gas passes on leaving the retort. The retorts are heated externally and are set in an arch, the construction depending upon the number of retorts, which varies from three to twelve. The arch and its retorts is termed a bed or setting, and a row of beds constitutes a bench. It is usual to have a separate furnace for each setting, the retorts resting upon walls built transversely in the furnace.

The heating of the retorts is carried out either by the “direct firing” or by the “regenerative” system, the latter affording marked advantages over the former method, which is now becoming extinct. In the regenerative system of firing, a mixture of carbon monoxide and nitrogen is produced by passing air through incandescent gas coke in a generator placed below the bench of retorts, and the heating value of the gases so produced is increased in most cases by the admixture of a small proportion of steam with the primary air supply, the steam being decomposed by contact with the red-hot coke in the generator into water gas, a mixture of carbon monoxide and hydrogen (see FUEL: *Gaseous*). The gases so formed vary in proportion with the temperature of the generator and the amount of steam, but generally contain 32 to 38% of combustible gas, the remainder being the residual nitrogen of the air and carbon dioxide. These gases enter the combustion chamber around the retorts at a high temperature, and are there supplied with sufficient air to complete their combustion, this secondary air supply being heated by the hot products of combustion on their way to the exit flue. This method of firing results in the saving of about one-third the weight of coke used in the old form of furnace per ton of coal carbonized, and enables higher temperatures to be obtained, the heat being also more equally distributed.

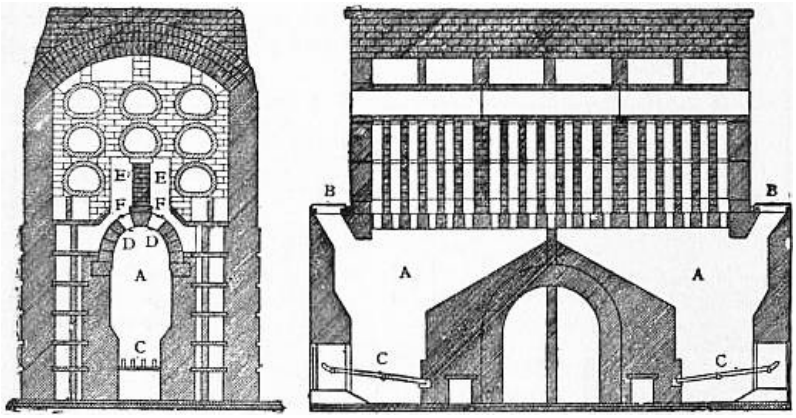


FIG. 6.—Regenerative Setting.

There are a great number of methods of applying the regenerative principle which vary only in detail. Fig. 6 gives an idea of the general arrangement. The furnace A is built of fire-brick, coke is charged at the top through the iron door B, and near the bottom are placed fire bars C, upon which the fuel lies. The primary air necessary for the partial combustion of the coke to “producer” gas enters between these bars. The gases are conducted from the furnace to the combustion chamber E through the nostrils D D, and the secondary air is admitted at the inlet F a little above, this air having been already heated by traversing the setting. Complete combustion takes place at this point with the production of intense heat, the gases on rising are baffled in order to circulate them in every direction round the retorts, and upon arriving at the top of the setting they are conducted down a hollow chamber communicating with the main flue and shaft. The amount of draft which is necessary to carry out the circulation of the gases and to draw in the adequate amount of air is regulated by dampers placed in the main flue. By analysis of the “producer” and “spent” gases this amount can be readily gauged.

Retorts are set in either the horizontal, inclined or vertical position, and the advantages of the one over the other is a question upon which almost every gas engineer has his own views.

Charging and drawing.

The introduction of labour-saving appliances into gas works has rendered the difficult work of charging and discharging horizontal retorts comparatively simple. Formerly it was the practice to carry out such operations entirely by hand, men charging the retorts either by means of shovel or hand-scoop, and the coke produced being withdrawn with hand rakes. Now, however, only the smaller gas works adhere to this system, and this work is done by machinery driven by either compressed air, hydraulic or electric power. In the first two cases a scoop, filled with coal from an overhead hopper carried by the travelling machine, is made to enter the retort and is turned over; the operation is then repeated, but this time the scoop is turned over in the opposite direction, the coal thus assuming such a position that as

much of its under surface as possible is exposed to the heated side of the retort. With “through” retorts charging machines feed the retorts at both ends, the scoop, which has a capacity of about 1½ cwt., entering and discharging its contents twice at each end, so that the total charge is about 6 cwt., which is allowed from four to six hours to distil off according to the quality of the gas required. The machines charge simultaneously at each end, so that the lids of the retorts may be shut immediately the coal enters. The charging machines travel on lines in front of the retort bench, and the power is transmitted by connexions made with flexible hose. A device of more recent introduction is an electrically-driven charging machine, in which the centrifugal force created by a fly-wheel revolving at high speed is applied to drive coal into the retort. If the velocity is sufficiently high the coal may be carried the whole length of a 20-ft. retort, the coal following banking up until an even layer is formed throughout the length of the retort.

For the purpose of discharging the coke from the retort either compressed air or hydraulic machinery is employed, a rake being made to enter the retort and withdraw the coke on returning. With this method it is necessary that the rake should enter and discharge several times before the retort is clear, and thus the use of a telescopic ram worked by hydraulic power, which pushes the coke before it and discharges it at the other end, is an advantage. As much as one-third on each ton of coal carbonized is saved by the use of machinery in the retort-house. Taking into account the original cost of such machines, and the unavoidable wear and tear upon the retorts brought about by using labour-saving appliances, and the fact that the coke-dust is very detrimental to the machinery, it is clear that the suggestion of setting the retorts at an incline in order to facilitate the work presented great inducements to the gas manager. The object aimed at in thus setting retorts is to allow gravity to play the part of charging and discharging the coal and coke, the retorts being inclined at an angle to suit the slip of the class of coal used; this angle is between 28° and 34°. The coal, previously elevated to hoppers, is dropped into the feeding chambers, which are so arranged that they can travel from end to end of the retort-house and feed the coal into the retorts. When the retort is to be charged, an iron stop or barrier is placed in the lower mouthpiece, and the door closed. The shoot is placed in the upper mouthpiece, and the stop or door, which retains the coal in the chamber, is released; the coal is then discharged into the retort, and rushing down the incline, is arrested by the barrier, and banks up, forming a continuous backing to the coal following. By experience with the class of coal used and the adjustment of the stops in the shoot, the charge can be run into the retort to form an even layer of any desired depth. For the withdrawal of the residual coke at the end of the carbonization, the lower mouthpiece door is opened, the barrier removed and the coke in the lower part of the retort is “tickled” or gently stirred with an iron rod to overcome a slight adhesion to the retort; the entire mass then readily discharges itself. Guides are placed in front of the retort to direct its course to the coke hoppers or conveyer below, and to prevent scattering of the hot material. This system shows a greater economy in the cost of carbonizing the coal, but the large outlay and the wear and tear of the mechanical appliances involved have so far prevented its very general adoption.

The vertical retort was one of the first forms experimented with by Murdoch, but owing to the difficulty of withdrawing the coke, the low illuminating power of the gas made in it, and the damage to the retort itself, due to the swelling of the charge during distillation, it was quickly abandoned. About the beginning of the 20th century, however, the experiments of Messrs Settle and Padfield at Exeter, Messrs Woodall and Duckham at Bournemouth, and Dr Bueb in Germany showed such encouraging results that the idea of the vertical retort again came to the front, and several systems were proposed and tried. The cause of the failure of Murdoch’s original vertical retort was undoubtedly that it was completely filled with coal during charging, with the result that the gas liberated from the lower portions of the retort had to pass through a deep bed of red-hot coke, which, by over-baking the gas, destroyed the illuminating hydrocarbons. There is no doubt that the question of rapidly removing the gas, as soon as it is properly formed, from the influence of the highly-heated walls of the retort and residual coke, is one of the most important in gas manufacture.

In the case of horizontal retorts the space between the top of the coal and the retort is of necessity considerable in order to permit the introduction of the scoop and rake; the gas has therefore a free channel to travel along, but has too much contact with the highly heated surface of the retort before it leaves the mouthpiece. In the case of inclined retorts this disadvantage is somewhat reduced, but with vertical retorts the ideal conditions can be more nearly approached. The heating as well as the illuminating value of the gas per unit volume is lowered by over-baking, and Dr Bueb gives the following figures as to the heating value of gas obtained from the same coal but by different methods of carbonization:—

Vertical	Retorts, 604 British thermal units per cub. ft.
Inclined	Retorts, 584 British thermal units per cub. ft.

Of the existing forms of vertical retort it remains a matter to be decided whether the coal should be charged in bulk to the retort or whether it should be introduced in small quantities at regular and short intervals; by this latter means (the characteristic feature of the Settle-Padfield process) a continuous layer of coal is in process of carbonization on the top, whilst the gas escapes without contact with the mass of red-hot coke, a considerable increase in volume and value in the gas and a much denser coke being the result.

Hydraulic main.

From the retort the gas passes by the ascension pipe to the hydraulic main (fig. 7). This is a long reservoir placed in a horizontal position and supported by columns upon the top of the retort stack, and through it is maintained a slow but constant flow of water, the level of which is kept uniform. The ascension pipe dips about 2 in. into the liquid, and so makes a seal that allows of any retort being charged singly without the risk of the gas produced from the other retorts in the bench escaping through the open retort. Coal gas, being a mixture of gases and vapours of liquids having very varying boiling points, must necessarily undergo physical changes when the temperature is lowered. Vapours of liquids of high boiling point will be condensed more quickly than those having lower boiling points, but condensation of each vapour will take place in a definite ratio with the decrease of temperature, the rate being dependent upon the boiling point of the liquid from which it is formed. The result is that from the time the gaseous mixture leaves the retort it begins to deposit condensation products owing to the decrease in temperature. Condensation takes place in the ascension pipe, in the arch piece leading to the hydraulic main, and to a still greater extent in the hydraulic main itself where the gas has to pass through water.

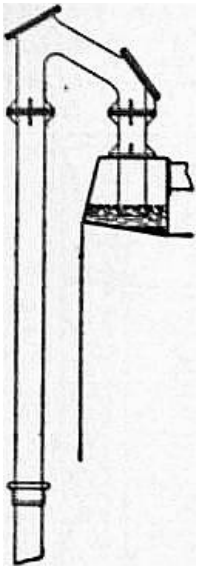


FIG. 7.—Hydraulic Main.

Ascension pipes give trouble unless they are frequently cleared by an instrument called an “auger,” whilst the arch pipe is fitted with hand holes through which it may be easily cleared in case of stoppage. The most soluble of the constituents of crude coal gas is ammonia, 780 volumes of which are soluble in one volume of water at normal temperature and pressure, and the water in the hydraulic main absorbs a considerable quantity of this compound from the gas and helps to form the ammoniacal liquor, whilst, although the liquor is well agitated by the gas bubbling through it, a partial separation of tar from liquor is effected by gravitation. The liquor is run off at a constant rate from the hydraulic main to the store tank, and the gas passes from the top of the hydraulic main to the foul main.

Condensation.

The gas as it leaves the hydraulic main is still at a temperature of from 130° to 150° F., and should now be reduced as nearly as possible to the temperature of the surrounding atmosphere. The operation of efficient condensing is not by any means as simple as might be supposed. The tar and liquor when condensed have a dissolving action on various valuable light-giving constituents of the gas, which in the ordinary way would not be deposited by the lowering of temperature, and for this reason the heavy tar, and especially that produced in the hydraulic main, should come in contact with the gas as little as possible, and condensation should take place slowly.

The main difficulty which the condenser ought to overcome and upon which its efficiency should depend is the removal of naphthalene: this compound, which is present in the gas, condenses on cooling to a solid which crystallizes out in the form of white flakes, and the trouble caused by pipe stoppages in the works as well as in the district supplied is very considerable. The higher the heat of carbonization the more naphthalene appears to be produced, and gas managers of to-day find the removal of naphthalene from the gas a difficult problem to solve. It was for some time debated as to whether naphthalene added materially to the illuminating value of the gas, and whether an endeavour should be made to carry it to the point of combustion; but it is now acknowledged that it is a troublesome impurity, and that the sooner it is extracted the better. Gas leaves the retorts saturated with naphthalene, and its capacity for holding that impurity seems to be augmented by the presence of water vapour. The condenser, by effecting the condensation of water vapour, also brings about the deposition of solid naphthalene, apart from that which naturally condenses owing to reduction of temperature.

Condensers are either air-cooled or water-cooled, or both. In the former case the gas traverses pipes exposed to the atmosphere and so placed that the resulting products of condensation may be collected at the lowest point. Water is a more efficient cooling medium

than air, owing to its high specific heat, and the degree of cooling may be more easily regulated by its use. In water-cooled condensers it is usual to arrange that the water passes through a large number of small pipes contained in a larger one through which the gas flows, and as it constantly happened that condenser pipes became choked by naphthalene, the so-called reversible condenser, in which the stream of gas may be altered from time to time and the walls of the pipes cleaned by pumping tar over them, is a decided advance.

The solubility of naphthalene by various oils has led some engineers to put in naphthalene washers, in which gas is brought into contact with a heavy tar oil or certain fractions distilled from it, the latter being previously mixed with some volatile hydrocarbon to replace in the gas those illuminating vapours which the oil dissolves out; and by fractional distillation of the washing oil the naphthalene and volatile hydrocarbons are afterwards recovered.

Exhauster.

The exhauster is practically a rotary gas pump which serves the purpose of drawing the gas from the hydraulic main through the condensers, and then forcing it through the purifying vessels to the holder. Moreover, by putting the retorts under a slight vacuum, the amount of gas produced is increased by about 12%, and is of better quality, owing to its leaving the heated retort more quickly. A horizontal compound steam-engine is usually employed to drive the exhauster.

At this point in the manufacturing process the gas has already undergone some important changes in its composition, but there yet remain impurities which must be removed, these being ammonia, sulphuretted hydrogen, carbon disulphide and carbon dioxide. Ammonia is of considerable marketable value, and even in places where the local Gas Act does not prescribe that it shall be removed, it is extracted. Sulphuretted hydrogen is a noxious impurity, and its complete removal from the gas is usually imposed by parliament. As nearly as possible all the carbon dioxide is extracted, but most gas companies are now exempt from having to purify the gas from sulphur compounds other than sulphuretted hydrogen. Cyanogen compounds also are present in the gas, and in large works, where the total quantity is sufficient, their extraction is effected for the production of either prussiate or cyanide of soda.

Atkinson Butterfield gives the composition of the gas at this point to be about

	per cent. by vol.			
Hydrogen	from	42	to	53
Methane	”	32	”	39
Carbon monoxide	”	3	”	10
Hydrocarbons—				
Gases	”	2.5	”	4.5
Light condensable vapours	”	0.5	”	1.2
Carbon dioxide	”	1.1	”	1.8
Nitrogen	”	1.0	”	5.0
Sulphuretted hydrogen	”	1.0	”	2.0
Ammonia	”	0.5	”	0.95
Cyanogen	”	0.05	”	0.12
Carbon disulphide	”	0.02	”	0.035
Naphthalene	”	0.005	”	0.015

Washers.

It happens that ammonia, being a strong base, will effect the extraction of a certain proportion of such compounds as sulphuretted hydrogen, carbon dioxide and hydrocyanic acid, and the gas is now washed with water and ammoniacal liquor. The process is termed washing or scrubbing, and is carried out in various forms of apparatus, the efficiency of which is dependent upon the amount of contact the apparatus allows between the finely divided gas and water in a unit area and the facility with which it may be cleared out. The “Livesey” washer, a well-known type, is a rectangular cast iron vessel. The gas enters in the centre, and to make its escape again it has to pass into long wrought iron inverted troughs through perforations one-twentieth of an inch in diameter. A constant flow of liquor is regulated through the washer, and the gas, in order to pass through the perforations, drives the liquor up into the troughs. The liquor foams up owing to agitation by the finely divided streams of gas, and is brought into close contact with it. Two or three of these washers are connected in series according to the quantity of gas to be dealt with.

Scrubbers.

The final washing for ammonia is effected in an apparatus termed a “scrubber,” which is a cylindrical tower packed with boards ¼ in. thick by 11 in. broad, placed on end and close together; water is caused to flow down over the surface of these boards, the object being to break up the gas as much as possible and bring it into

close contact with the water. In this wet purifying apparatus the gas is almost wholly freed from ammonia and from part of the sulphuretted hydrogen, whilst carbon dioxide and carbon disulphide are also partially extracted.

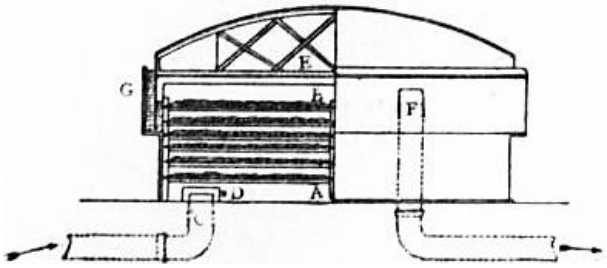


FIG. 8.—Purifier.

The final purification is carried out in rectangular vessels, known as “dry purifiers” (fig. 8). Internally, each purifier is filled with ranges of wooden trays or sieves A, made in the form of grids (fig. 9), and covered with the purifying material B to a depth of about 6 in., the number of tiers and size of purifier boxes being proportional to the quantity of gas to be purified. The gas enters at the bottom by the pipe C, the inlet being protected from any falling material by the cover D; it forces its way upwards through all the trays until, reaching the lid or cover E, it descends by the exit tube F, which leads to the next purifier. The edges of the lid dip into an external water seal or lute G, whereby the gas is prevented from escaping.

Purifiers.

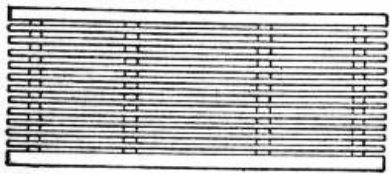


FIG. 9.—Purifier Grid.

When the gas had to be purified from carbon disulphide as well as from sulphuretted hydrogen, slaked lime was employed for the removal of carbon dioxide and the greater quantity of the sulphur compounds, whilst a catch box or purifier of oxide of iron served to remove the last traces of sulphuretted hydrogen. Not fewer than four lime purifiers were employed, and as the one which was first in the series became exhausted, *i.e.* began to show signs of allowing carbon dioxide to pass through it unabsorbed, it was filled with fresh slaked lime and made the last of the series, the one which was second becoming first, and this procedure went on continuously. This operation was necessitated by the fact that carbon dioxide has the power of breaking up the sulphur compounds formed by the lime, so that until all carbon dioxide is absorbed with the formation of calcium carbonate, the withdrawal of sulphuretted hydrogen cannot proceed, whilst since it is calcium sulphide formed by the absorption of sulphuretted hydrogen by the slaked lime that absorbs the vapour of carbon disulphide, purification from the latter can only be accomplished after the necessary calcium sulphide has been formed. The foul gas leaving the scrubbers contains, as a general average, 30 grains of sulphuretted hydrogen, 40 grains of carbon disulphide and 200 grains of carbon dioxide per 100 cub. ft. On entering the first purifier, which contains calcium thiocarbonate and other combinations of calcium and sulphur in small quantity, the sulphuretted hydrogen and disulphide vapour have practically no action upon the material, but the carbon dioxide immediately attacks the calcium thiocarbonate, forming calcium carbonate with the production of carbon disulphide vapour, which is carried over with the gas into the second box. In the connexion between the first and the second box the gas is found to contain 500 grains of sulphuretted hydrogen and 80 grains of carbon disulphide per 100 cub. ft., but no trace of carbon dioxide. In the second box the formation of calcium thiocarbonate takes place by the action of carbon disulphide upon the calcium sulphide with the liberation of sulphuretted hydrogen, which is carried over to the third purifier. The gas in the connecting pipe between the second and third purifier will be found to contain 400 grains of sulphuretted hydrogen and 20 grains of carbon disulphide. The contents of the third box, being mostly composed of slaked lime, take up sulphuretted hydrogen forming calcium sulphide, and practically remove the remaining impurities, the outlet gas showing 20 grains of sulphuretted hydrogen and 8 grains of carbon disulphide per 100 cub. ft., whilst the catch box of oxide of iron then removes all traces of sulphuretted hydrogen. It will be noticed that in the earlier stages the quantity of sulphur impurities is actually increased between the purifiers—in fact, the greater amount of sulphiding procures the ready removal of the carbon disulphide,—but it is the carbon dioxide in the gas that is the disturbing element, inasmuch as it decomposes the combinations of sulphur and calcium; consequently it is a paramount object in this system to prevent this latter impurity finding its way through the first box of the series. The finding of any traces of carbon dioxide in the gas between the first two boxes is generally the signal for a new clean purifier being put into action, and the first one shut off, emptied and recharged with fresh lime, the impregnated material being sometimes sold

for dressing certain soils.

The action of oxide of iron, which has now partly replaced the lime purification, depends on its power of combining with sulphuretted hydrogen to form sulphide of iron. Such is the affinity of the oxide for this impurity that it may contain from 50 to 60% by weight of free sulphur after revivification and still remain active. Upon removing the material from the vessel and exposing it to the atmosphere the sulphide of iron undergoes a revivifying process, the oxygen of the air displacing the sulphur from the sulphide as free sulphur, and with moisture converting the iron into hydrated oxide of iron. This revivification can be carried on a number of times until the material when dry contains about 50% of free sulphur and even occasionally 60% and over; it is then sold to manufacturers of sulphuric acid to be used in the sulphur kilns instead of pyrites (see SULPHURIC ACID).

Apart from the by-products coke, coke-breeze, tar and retort carbon, which are sold direct, gas companies are now in many cases preparing from their spent purifying material pure chemical products which are in great demand. The most important of these is sulphate of ammonia, which is used for agricultural purposes as a manure, and is obtained by passing ammonia into sulphuric acid and crystallizing out the ammonium sulphate produced. To do this, saturated ammoniacal liquor is decomposed by lime in the presence of steam, and the freed ammonia is passed into strong sulphuric acid, the saturated solution of ammonium sulphate being carefully crystallized. The market value of the salt varies, but an average figure is £12 per ton, whilst the average yield is about 24 lb of salt per ton of coal carbonized. In large works the sulphuric acid is usually manufactured on the spot from the spent oxide, so that the sulphuretted hydrogen, which in the gas is considered an undesirable impurity, plays a valuable part in the manufacture of an important by-product.

Cyanogen compounds are extracted either direct from the gas, from the spent oxide or from ammoniacal liquor, and some large gas works now produce sodium cyanide, this being one of the latest developments in the gas chemical industry.

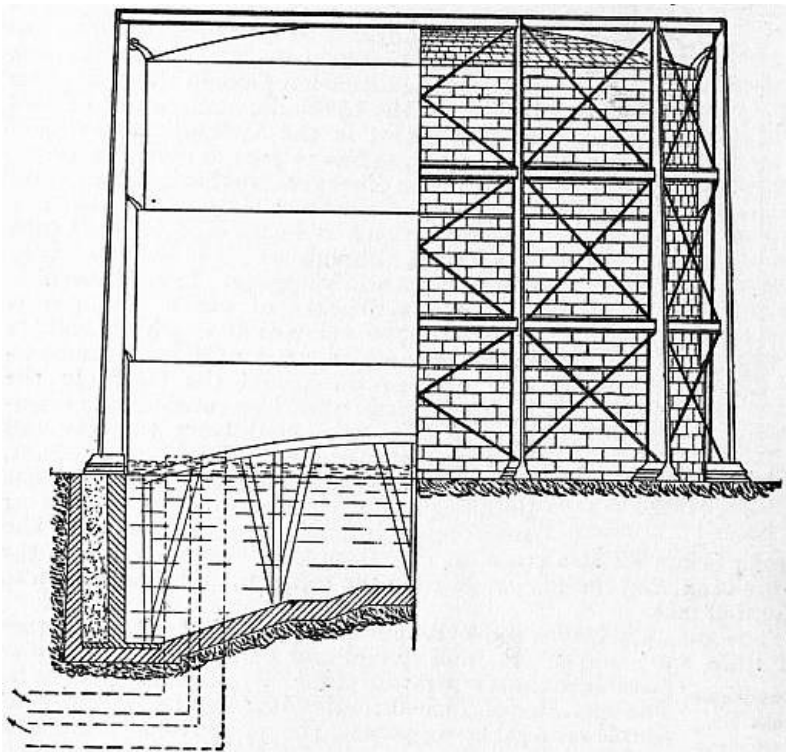


FIG. 10.—Gasholder.

Gasholder.

The purified gas now passes to a gasholder (sometimes known as a gasometer), which may be either single lift, *i.e.* a simple bell inverted in a tank of water, or may be constructed on the telescopic principle, in which case much ground space is saved, as a holder of much greater capacity can be contained in the same-sized tank. The tank for the gasholder is usually made by excavating a circular reservoir somewhat larger in diameter than the proposed holder. A banking is allowed to remain in the centre, as shown in fig. 10, which is known as the “dumpling,” this arrangement not only saving work and water, but acting as a support for the king post of a trussed holder when the holder is empty. The tank must be water-tight, and the precaution necessary to be taken in order to ensure this is dependent upon the nature of

the soil; it is usual, however, for the tanks to be lined with concrete. Where the conditions of soil are very bad, steel tanks are built above ground, but the cost of these is much greater. The holder is made of sheet iron riveted together, the thickness depending upon the size of the holder. The telescopic form consists of two or more lifts which slide in one another, and may be described as a single lift holder encircled by other cylinders of slightly larger diameter, but of about the same length. Fig. 10 shows the general construction. Gas on entering at A causes the top lift to rise; the bottom of this lift being turned up all round to form a cup, whilst the top of the next lift is turned down to form a so-called grip, the two interlock (see fig. 11), forming what is known as the hydraulic cup. Under these conditions the cup will necessarily be filled with water, and a seal will be formed, preventing the escape of gas. A guide framing is built round the holder, and guide rollers are fixed at various intervals round the grips of each lift, whilst at the bottom of the cup guide rollers are also fixed (fig. 11). In the year 1892 the largest existing gasholder was built at the East Greenwich works of the South Metropolitan Gas Company; it has six lifts, its diameter is 293 ft., and when filled with gas stands 180 ft. high. The capacity for gas is 12 million cub. ft.

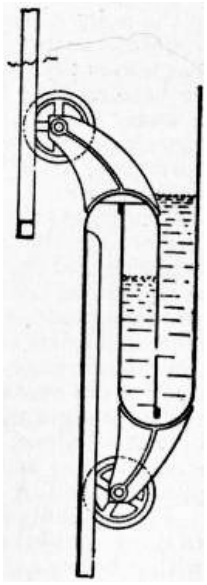


FIG. 11.—Cup and Grip.

Governor.

The governor consists usually of a bell floating in a cast iron tank partially filled with water, and is in fact a small gasholder, from the centre of which is suspended a conical valve controlling the gas inlet and closing it as the bell fills. Any deviation in pressure will cause the floating bell to be lifted or lowered, and the size of the inlet will be decreased or increased, thus regulating the flow.

Enrichment.

The fact that coal gas of an illuminating power of from 14 to 16 candles can be made from the ordinary gas coal at a fairly low rate, while every candle power added to the gas increases the cost in an enormous and rapidly growing ratio, has, from the earliest days of the gas industry, caused the attention of inventors to be turned to the enrichment of coal gas. Formerly cannel coal was used for producing a very rich gas which could be mixed with the ordinary gas, thereby enriching it, but as the supply became limited and the price prohibitive, other methods were from time to time advocated to replace its use in the enrichment of illuminating gas. These may be classified as follows:—

1. Enriching the gas by vapours and permanent gases obtained by decomposing the tar formed at the same time as the gas.

2. Mixing with the coal gas oil gas, obtained by decomposing crude oils by heat.

3. The carburetting of low-power gas by impregnating it with the vapours of volatile hydrocarbons.

4. Mixing the coal gas with water gas, which has been highly carburetted by passing it with the vapours of various hydrocarbons through superheaters in order to give permanency to the hydrocarbon gases.

Enrichment by tar.

Very many attempts have been made to utilize tar for the production and enrichment of gas, and to do this two methods may be adopted:—

(*a*) Condensing the tar in the ordinary way, and afterwards using the whole or portions of it for cracking into a permanent gas.

(*b*) Cracking the tar vapours before condensation by passing the gas and vapours through superheaters.

If the first method be adopted, the trouble which presents itself is that the tar contains a high percentage of pitch, which tends rapidly to choke and clog up all the pipes. A partly successful attempt to make use of certain portions of the liquid products of distillation of coal before condensation by the second method was the Dinsmore process, in which the coal gas and vapours which, if allowed to cool, would form tar, were made to pass through a heated chamber, and a certain proportion of otherwise condensible hydrocarbons was thus converted into permanent gases. Even with a poor class of coal it was claimed that 9800 cub. ft. of 20- to 21-candle gas could be made by this process, whereas by the ordinary process 9000 cub. ft. of 15-candle gas would have been produced. This process, although strongly advocated by the gas engineer who experimented with it, was never a commercial success. The final solution of the question of enrichment of gas by hydrocarbons derived from tar may be arrived at by a process which prevents the formation of part of the tar during the carbonization of the coal, or by the process devised by C.B. Tully and now in use at Truro, in

which tar is injected into the incandescent fuel in a water-gas generator and enriches the water gas with methane and other hydrocarbons, the resulting pitch and carbon being filtered off by the column of coke through which the gas passes.

Enrichment by oil gas.

The earliest attempts at enrichment by oil gas consisted in spraying oil upon the red hot mass in the retort during carbonization; but experience soon showed that this was not an economical method of working, and that it was far better to decompose the liquid hydrocarbon in the presence of the diluents which are to mingle with it and act as its carrier, since, if this were done, a higher temperature could be employed and more of the heavier portions of the oil converted into gas, without at the same time breaking down the gaseous hydrocarbons too much. In carburetting poor coal gas with hydrocarbons from mineral oil it must be borne in mind that, as coal is undergoing distillation, a rich gas is given off in the earlier stages, but towards the end of the operation the gas is very poor in illuminants, the methane disappearing with the other hydrocarbons, and the increase in hydrogen being very marked. Lewis T. Wright employed a coal requiring six hours for its distillation, and took samples of the gas at different periods of the time. On analysis these yielded the following results:—

Time after beginning Distillation.

	10 minutes.	1 hour 30 minutes.	3 hours 25 minutes.	5 hours 35 minutes.
Sulphuretted hydrogen	1.30	1.42	0.49	0.11
Carbon dioxide	2.21	2.09	1.49	1.50
Hydrogen	20.10	38.33	52.68	67.12
Carbon monoxide	6.19	5.66	6.21	6.12
Saturated hydrocarbons	57.38	44.03	33.54	22.58
Unsaturated ”	10.62	5.98	3.04	1.79
Nitrogen	2.20	2.47	2.55	0.78

This may be regarded as a fair example of the changes which take place in the quality of the gas during the distillation of the coal. In carburetting such a gas by injecting mineral oil into the retort, many of the products of the decomposition of the oil being vapours, it would be wasteful to do so for the first two hours, as a rich gas is being given off which has not the power of carrying in suspension a much larger quantity of hydrocarbon vapours without being supersaturated with them. Consequently, to make it carry any further quantity in a condition not easily deposited, the oil would have to be completely decomposed into permanent gases, and the temperature necessary to do this would seriously affect the quality of the gas given off by the coal. When, however, the distillation has gone on for three hours, the rich portions of coal have distilled off and the temperature of the retort has reached its highest point, and this is the best time to feed in the oil.

Undoubtedly the best process which has been proposed for the production of oil gas to be used in the enrichment of coal gas is the “Young” or “Peebles” process, which depends on the principle of washing the oil gas retorted at a moderate temperature by means of oil which is afterwards to undergo decomposition, because in this way it is freed from all condensible vapours, and only permanent gases are allowed to escape to the purifiers. In the course of this treatment considerable quantities of the ethylenes and other fixed gases are also absorbed, but no loss takes place, as these are again driven out by the heat in the subsequent retorting. The gas obtained by the Young process, when tested by itself in the burners most suited for its combustion, gives on the photometer an illuminating value averaging from 50 to 60 candle-power, but it is claimed, and quite correctly, that the enriching power of the gas is considerably greater. This is accounted for by the fact that it is impossible to construct a burner which will do justice to a gas of such illuminating power.

The fundamental objections to oil gas for the enrichment of coal gas are, first, that its manufacture is a slow process, requiring as much plant and space for retorting as coal gas; and, secondly, that although on a small scale it can be made to mix perfectly with coal gas and water gas, great difficulties are found in doing this on the large scale, because in spite of the fact that theoretically gases of such widely different specific gravities ought to form a perfect mixture by diffusion, layering of the gas is very apt to take place in the holder, and thus there is an increased liability to wide variations in the illuminating value of the gas sent out.

The wonderful carburetting power of benzol vapour is well known, a large proportion of the total illuminating power of coal gas being due to the presence of a minute trace of its vapour carried in suspension. For many years the price of benzol has been falling, owing to

Enrichment by volatile hydrocarbons. the large quantities produced in the coke ovens, and at its present price it is by far the cheapest enriching material that can be obtained. Hence at many gas-works where it is found necessary to do so it is used in various forms of carburettor, in which it is volatilized and its vapour used for enriching coal gas up to the requisite illuminating power.

One of the most generally adopted methods of enrichment now is by means of carburetted water gas mixed with poor coal gas. When steam acts upon carbon at a high temperature the resultant action may be looked upon as giving a mixture of equal volumes of hydrogen and carbon monoxide, both of which are inflammable but non-luminous gases. This water gas is then carburetted, *i.e.* rendered luminous by passing it through chambers in which oils are decomposed by heat, the mixture being made so as to give an illuminating value of 22 to 25 candles. This, mixed with the poor coal gas, brings up its illuminating value to the required limit. Coke or anthracite is heated to incandescence by an air blast in a generator lined with fire-brick, and the heated products of combustion as they leave the generator and enter the superheaters are supplied with more air, which causes the combustion of carbon monoxide present in the producer gas and heats up the fire-brick baffles with which the superheater is filled. When the necessary temperature of the fuel and superheater has been reached, the air blast is cut off, and steam is blown through the generator, forming water gas, which meets the enriching oil at the top of the first superheater, called the carburettor, and carries the vapours with it through the main superheaters, where the fixing of the hydrocarbons takes place. The chief advantage of this apparatus is that a low temperature can be used for fixing owing to the enormous surface for superheating, and thus to a great extent the deposition of carbon is avoided. This form of apparatus has been very generally adopted in Great Britain as well as in America, and practically all carburetted water-gas plants are founded upon the same set of actions. Important factors in the use of carburetted water gas for enrichment are that it can be made with enormous rapidity and with a minimum of labour; and not only is the requisite increase in illuminating power secured, but the volume of the enriched gas is increased by the bulk of carburetted water gas added, which in ordinary English practice amounts to from 25 to 50%. The public at first strongly opposed its introduction on the ground of the poisonous properties of the carbon monoxide, which is present in it to the extent of about 28 to 30%. Still when this comes to be diluted with 60 to 75% of ordinary coal gas, containing as a rule only 4 to 6% of carbon monoxide, the percentage of poisonous monoxide in the mixture falls to below 16%, which experience has shown to be a fairly safe limit.

Enrichment by carburetted water gas.

A rise in the price of oil suitable for carburetting has caused the gas industry to consider other methods by which the volume of gas obtainable from coal can be increased by admixture with blue or non-luminous water gas. In Germany, at several important gas-works, non-luminous water gas is passed into the foul main or through the retorts in the desired proportion, and the mixture of water gas and coal gas is then carburetted to the required extent by benzol vapour, a process which at the present price of oil and benzol is distinctly more economical than the use of carburetted water gas. In 1896 Karl Dellwik introduced a modification in the process of making water gas which entirely altered the whole aspect of the industry. In all the attempts to make water gas, up to that date, the incandescence of the fuel had been obtained by “blowing” so deep a bed of fuel that carbon monoxide and the residual nitrogen of the air formed the chief products, this mixture being known as “producer” gas. In the Dellwik process, however, the main point is the adjustment of the air supplied to the fuel in the generator in such a way that carbon dioxide is formed instead of carbon monoxide. Under these conditions producer gas ceases to exist as a by-product, and the gases of the blow consist merely of the incombustible products of complete combustion, carbon dioxide and nitrogen, the result being that more than three times the heat is developed for the combustion of the same amount of fuel, and nearly double the quantity of water gas can be made per pound of fuel than was before possible. The runs or times of steaming can also be continued for longer periods. The possibility of making from 60,000 to 70,000 cub. ft. of water gas per ton of coke used in the Dellwik generator as against 34,000 to 45,000 cub. ft. per ton made by previous processes reduces the price of water gas to about 3½d. per thousand, so that the economic value of using it in admixture with coal gas and then enriching the mixture by any cheap carburetting process is manifest. The universal adoption of the incandescent mantle for lighting purposes has made it evident that the illuminating value of the gas is a secondary consideration, and the whole tendency now is to do away with enrichment and produce a gas of low-candle power but good heating power at a cheap rate for fuel purposes and incandescent lighting. (See also LIGHTING: *Gas*.)

(V. B. L.)

2. *Gas for Fuel and Power*—The first gas-producers, which were built by Faber du Faur at Wasseralfingen in 1836 and by C.G.C. Bischof at Mägdesprung (both in Germany), consisted of simple perpendicular shafts of masonry contracted at the top and the bottom, with or

without a grate for the coal. Such producers, frequently strengthened by a wrought iron casing, are even now used to a great extent. Sometimes the purpose of a gas-producer is attained in a very simple manner by lowering the grate of an ordinary fireplace so much that a layer of coal 4 or 5 ft. deep is maintained in the fire. The effect of this arrangement is that the great body of coal reaches a higher temperature than in an ordinary fireplace, and this, together with the reduction of the carbon dioxide formed immediately above the grate by the red-hot coal in the upper part of the furnace, leads to the formation of carbon monoxide which later on, on the spot where the greatest heat is required, is burned into dioxide by admitting fresh air, preferably pre-heated. This simple and inexpensive arrangement has the further advantage that the producer-gas is utilized immediately after its formation, without being allowed to cool down. But it is not very well adapted to large furnaces, and especially not to those cases where all the space round the furnace is required for manipulating heavy, white-hot masses of iron, or for similar purposes. In these cases the producers are arranged outside the iron-works, glass-works, &c., in an open yard where all the manipulations of feeding them with coal, of stoking, and of removing the ashes are performed without interfering with the work inside. But care must always be taken to place the producers at such a low level that the gas has an upward tendency, in order to facilitate its passage to the furnace where it is to be burned. This purpose can be further promoted by various means. The gas-producers constructed by Messrs Siemens Brothers, from 1856 onwards, were provided with a kind of brick chimney; on the top of this there was a horizontal iron tube, continued into an iron down-draught, and only from this the underground flues were started which sent the gas into the single furnaces. This arrangement, by which the gas was cooled down by the action of the air, acted as a gas-siphon for drawing the gas out of the producer, but it has various drawbacks and has been abandoned in all modern constructions. Where the “natural draught” is not sufficient, it is aided either by blowing air under the grate or else by suction at the other end.

We shall now describe a few of the very large number of gas-producers producers constructed, selecting some of the most widely applied in practice.

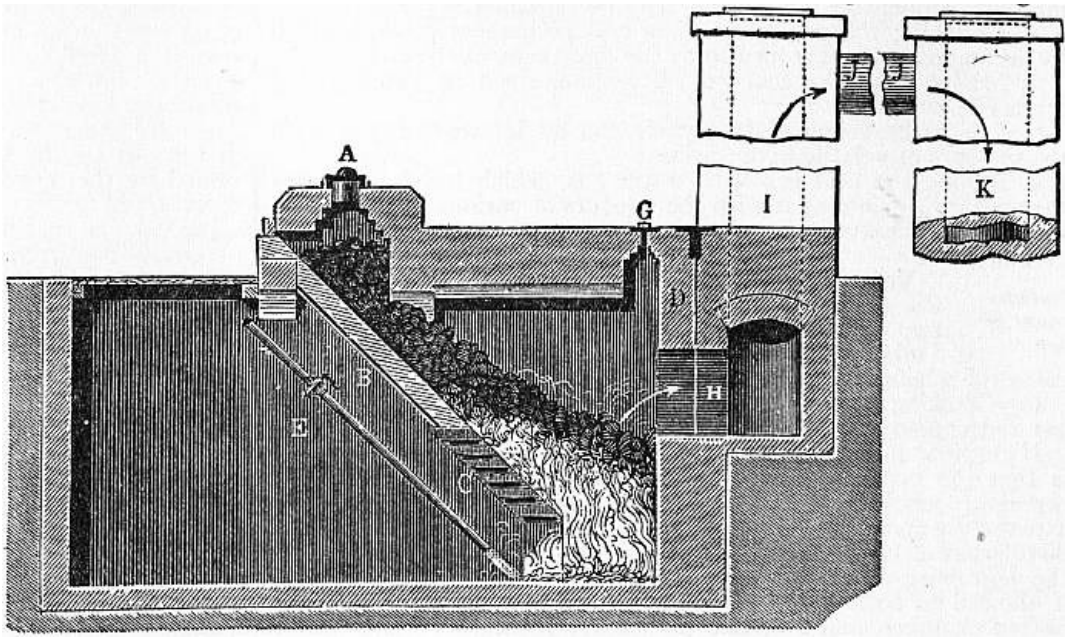


Fig. 12[2]—Siemens Producer (Sectional Elevation).

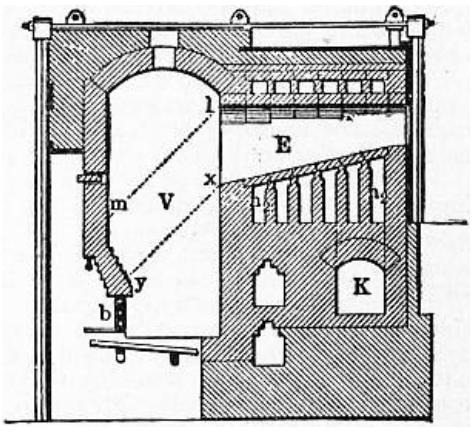
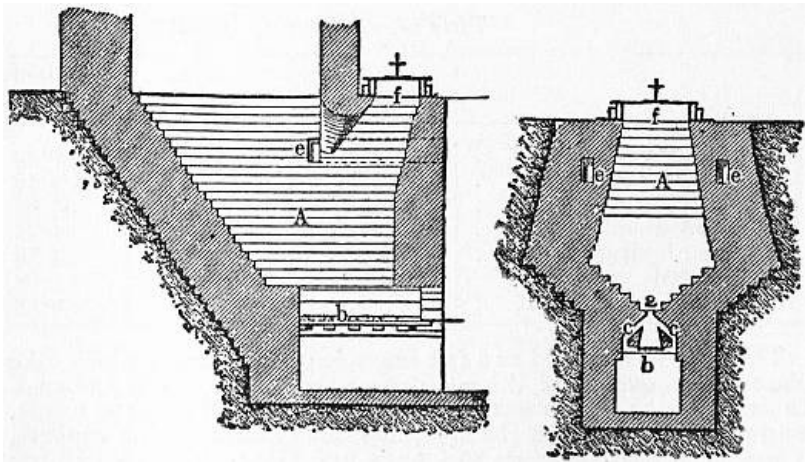


FIG. 13.—Lürmann's Producer.



FIGS. 14 and 15.—Liegel's Producer.

The Siemens Producer in its original shape, of which hundreds have been erected and many may be still at work, is shown in fig. 12. A is the charging-hole; B, the inclined front wall, consisting of a cast iron plate with fire-brick lining; C, the equally inclined "step-grate"; D, a damper by which the producer may be isolated in case of repairs; E, a water-pipe, by which the cinders at the bottom may be quenched before taking away; the steam here formed rises into the producer where it forms some "semi-water gas" (see FUEL: *Gaseous*). Openings like that shown at G serve for introducing a poker in order to clean the brickwork from adhering slags. H is the gas flue; I, the perpendicularly ascending shaft, 10 or 12 ft. high; JJ, the horizontal iron tube; K, the descending branch mentioned above, for producing a certain amount of suction by means of the gas-siphon thus formed. In the horizontal branch JJ much of the tar and flue-dust is also condensed, which is of importance where bituminous coal is employed for firing.

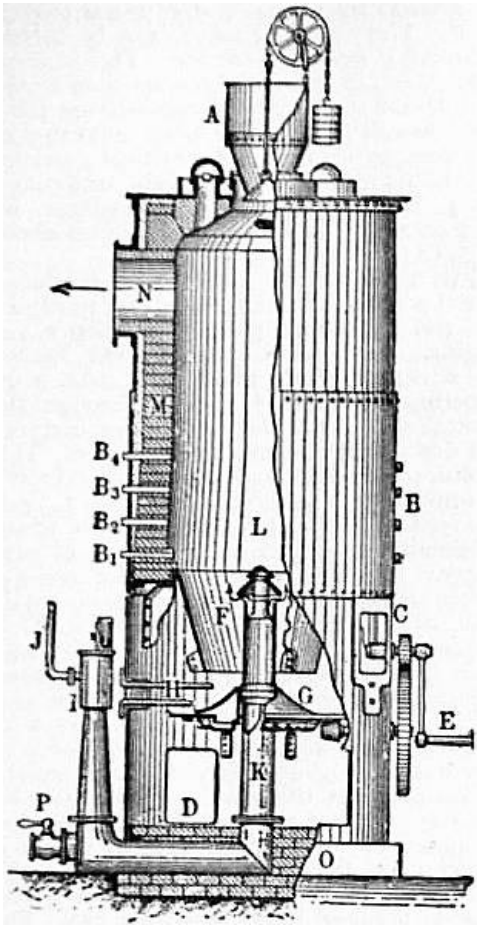


FIG. 16.—Taylor's Producer.

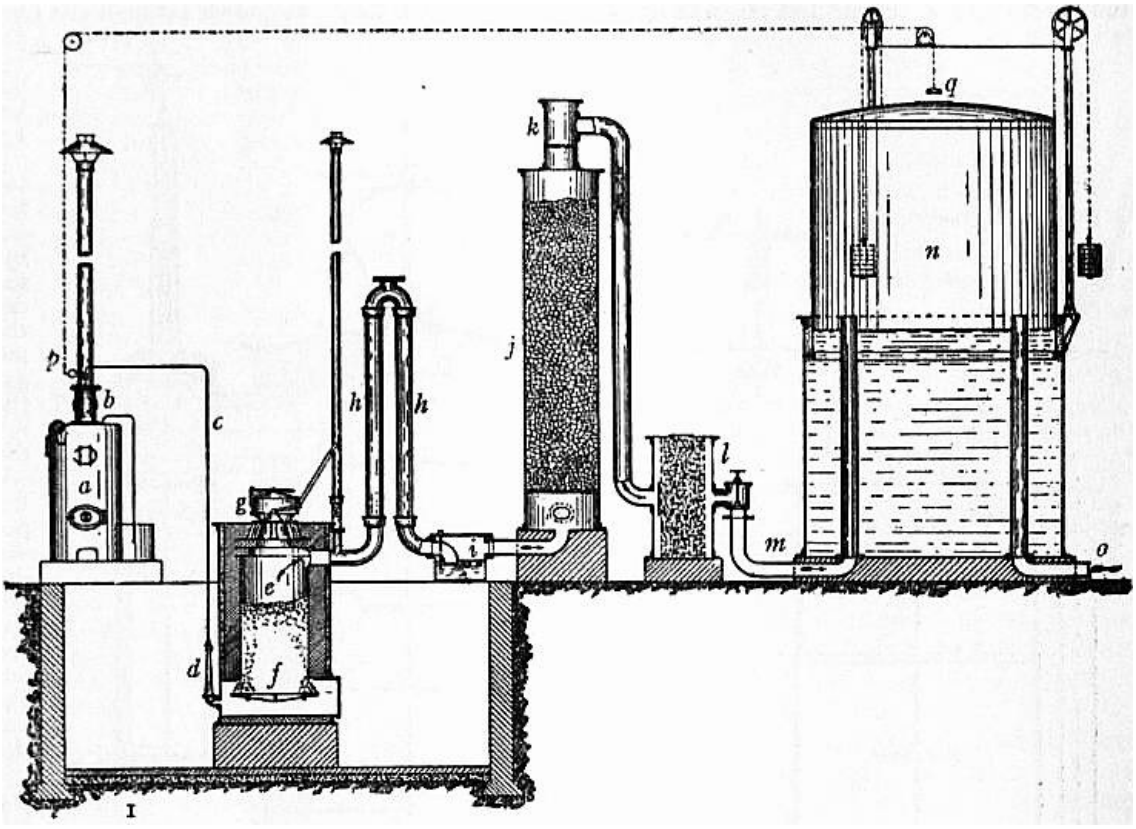


FIG. 17.—Dowson Gas Plant.

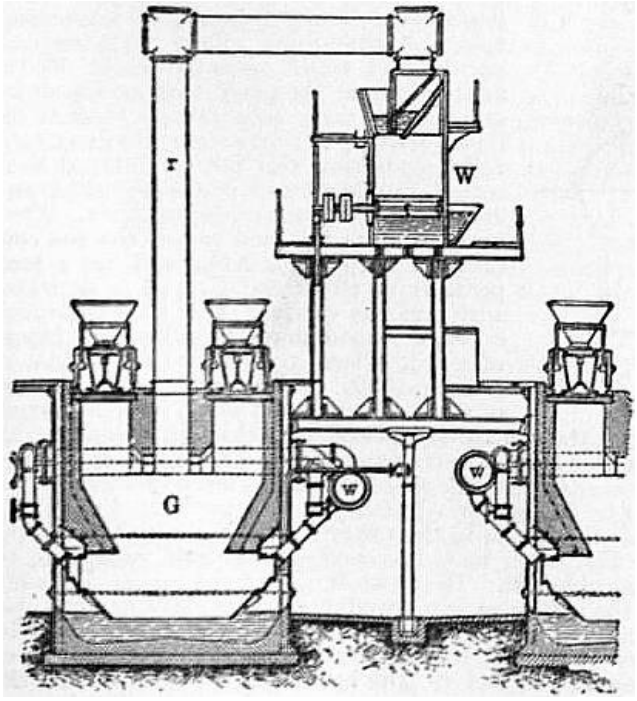


FIG. 18.—Mond Gas Plant.

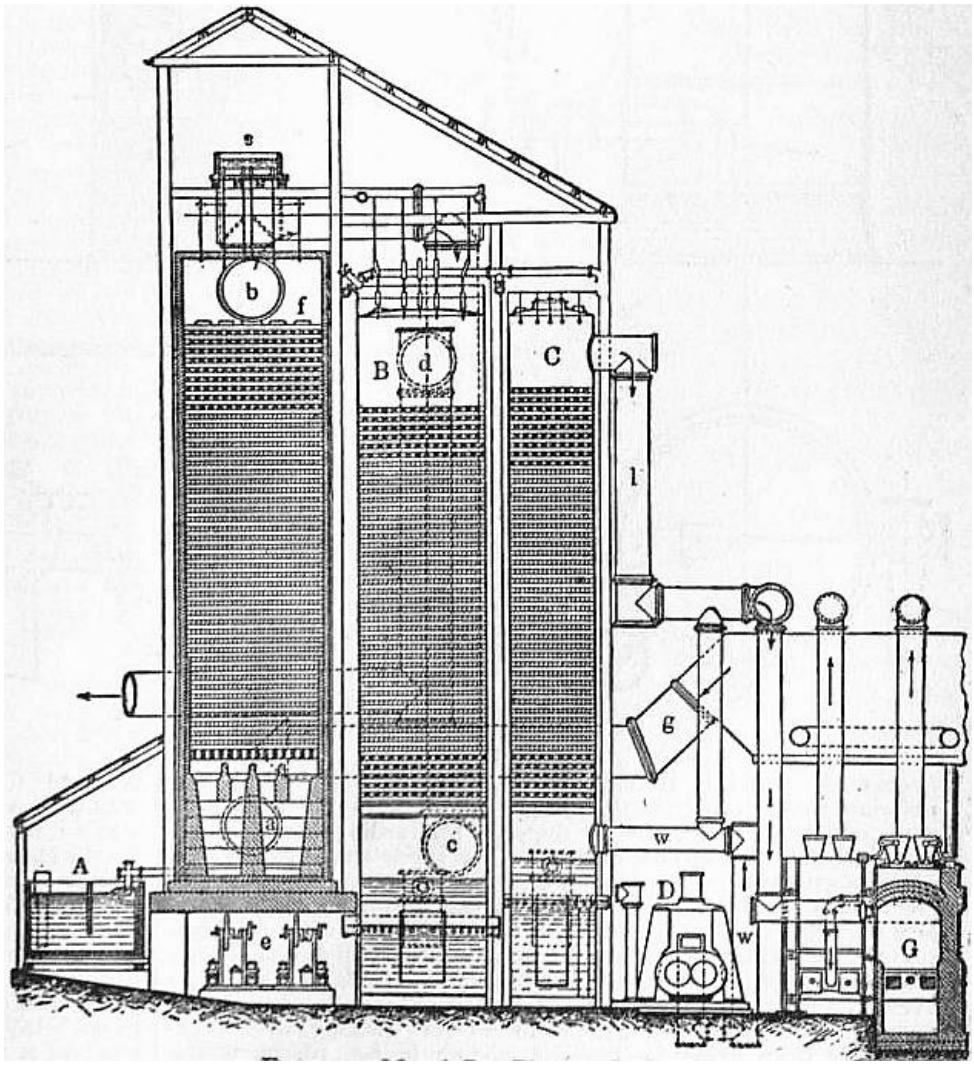


FIG. 19.—Mond Gas Plant.

This as well as most other descriptions of gas-producers, is not adapted to being worked with such coal as softens in the heat and forms cakes, impenetrable to the air and impeding the regular sinking of the charge in the producer. The fuel employed should be non-bituminous coal, anthracite or coke, or at least so much of these materials should be mixed with ordinary coal that no semi-solid cakes of the kind just described are formed. Where it is unavoidable to work with coal softening in the fire, Lürmann's producer may be employed, which is shown in fig. 13. V shows a gas-producer of the ordinary kind, which during regular work is filled with the coke formed in the horizontal retort E. The door *b* serves for removing the slags and ashes from the bottom of V, as far as they do not fall through the grate. The hot producer-gas formed in V is passed round the retort E in the flues n_2 n_2, and ultimately goes away through K to the furnace where it is to be used. The retort E is charged with ordinary bituminous coal which is submitted to destructive distillation by the heat communicated through the flues n_2 n_2 and is thus converted into coke. The gases formed during this process pass into the upper portion of V and get mixed with the producer-gas formed in the lower portion. From time to time, as the level of the coke in V goes down, some of the freshly formed coke in E is pushed into V, whereby the level of the coke in V should assume the shape shown by the dotted line *l … m*. If the level became too low, such as is shown by the dotted line *x … y*, the working of the producer would be wrong, as in this case the layer of coke at the front side would be too low, and carbon dioxide would be formed in lieu of monoxide.

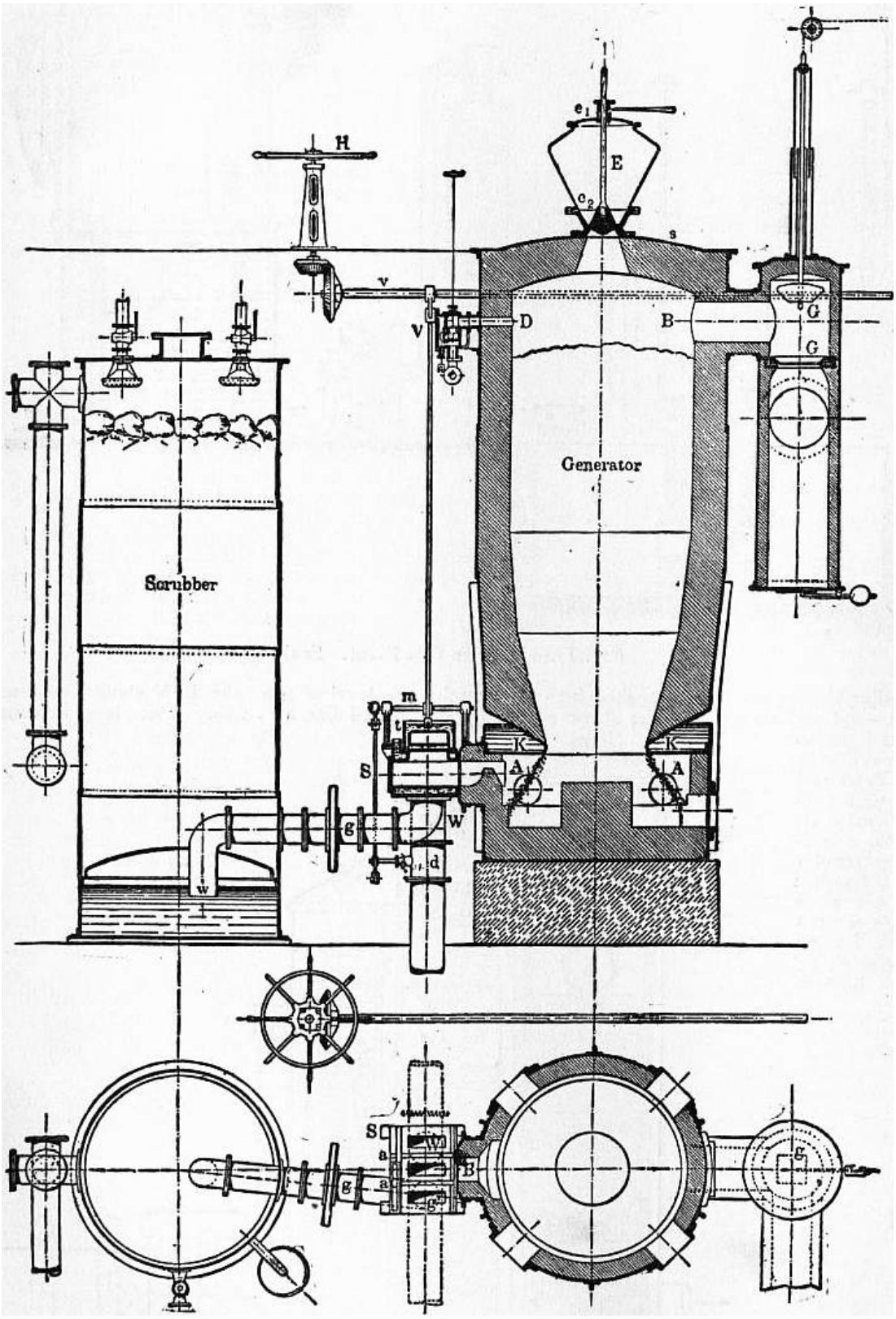


FIG. 20.—Blass' Gas Plant.

Figs. 14 and 15 show Liegel's producer, the special object of which is to deal with any fuel (coal or coke) giving a tough, pasty slag on combustion. Such slags act very prejudicially by impeding the up-draught of the air and the sinking of the fuel; nor can they be removed by falling through a grate, like ordinary coal-ashes. To obviate these drawbacks the producer A is kept at a greater heat than is otherwise usual, the air required for feeding the producer being pre-heated in the channels *e, e*. The inside shape of the producer is such that the upper, less hot portion cannot get stopped, as it widens out towards the bottom; the lower, hotter portion, where the ashes are already fluxed, is contracted to a slit a, through which the air ascends. The grate *b* retains any small pieces of fuel, but allows the liquid cinder to pass through. The lateral flues *c, c* prevent the brickwork from being melted.

One of the best-known gas-producers for working with compressed air from below is Taylor's, shown in fig. 16. A is the feeding-hopper, on the same principle as is used in blast-furnaces. L is the producer-shaft, with an iron casing B and peep-holes B_1 to B_4, passing through the brick lining M. F is the contracted part, leading to the closed ash-pit, accessible

through the doors D. An injector I, worked by means of the steam-pipe J, forces air through K into F. The circular grate G can be turned round K by means of the crank E from the outside. This is done, without interfering with the blast, in order to keep the fuel at the proper level in L, according to the indications of the burning zone, as shown through the peep-holes B_1 to B_4. The ashes collecting at the bottom are from time to time removed by the doors D. As the steam, introduced by J, is decomposed in the producer, we here obtain a “semi-water gas,” with about 27% CO and 12% H_2.

Fig. 17 shows the Dowson gas-producer, together with the arrangements for purifying the gas for the purpose of working a gas engine. *a* is a vertical steam boiler, heated by a central shaft filled with coke, with superheating tubes *b* passing through the central shaft. *c* is the steam-pipe, carrying the dry steam into the air-injector *d*. This mixture of steam and air enters into the gas-producer *e* below the fire-grate *f*. *g* is the feeding-hopper for the anthracite which is usually employed in this kind of producer. *h*, *h* are cooling-pipes for the gas where most of the undecomposed steam (say 10% of the whole employed in *d*) is condensed. *i* is a hydraulic box with water seal; *j*, a coke-scrubber; *k*, a filter; *l*, a sawdust-scrubber; *m*, inlet of gas-holder; *n*, gas-holder; *o*, outlet of same; *p*, a valve with weighted lever to regulate the admission of steam to the gas-producer; *q*, the weight which actuates the lever automatically by the rise or fall of the bell of the gas-holder. In practical work about ¾ lb. of steam is decomposed for each pound of anthracite consumed, and no more than 5% of carbon dioxide is found in the resulting gas. The latter has an average calorific power of 1732 calories per cubic metre, or 161 B.T.U. per cubic foot, at 0° and 760 mm.

The Mond plant is shown in figs. 18 and 19. The gases produced in the generators G are passed through pipes *r* into washers W, in which water is kept in violent motion by means of paddle-wheels. The spray of water removes the dust and part of the tar and ammonia from the gases, much steam being produced at the same time. This water is withdrawn from time to time and worked for the ammonia it contains. The gases, escaping from W at a temperature of about 100° C., and containing much steam, pass though *g* and *a* into a tower, fed with an acid-absorbing liquid, coming from the tank *s*, which is spread into many drops by the brick filling of the tower. This liquid is a strong solution of ammonium sulphate, containing about 2.5% free sulphuric acid which absorbs nearly all the ammonia from the gases, without dissolving much of the tarry substances. Most of the liquor arriving at the bottom, after mechanically separating the tar, is pumped back into *s*, but a portion is always withdrawn and worked for ammonium sulphate. When escaping from the acid tower, the gas contains about 0.013% NH_3, and has a temperature of about 80° C. and is saturated with aqueous vapour. It is passed through *c* into a second tower B, filled with blocks of wood, where it meets with a stream of comparatively cold water. At the bottom of this the water runs away, its temperature being 78° C.; at the top the gas passes away through *d* into the distributing main. The hot water from B, freed from tar, is pumped into a third tower C, through which cold air is forced by means of a Root’s blower by the pipe *w*. This air, after being heated to 76° C., and saturated with steam in the tower C, passes through *l* into the generator G. The water in C leaves this tower cold enough to be used in the scrubber B. Thus two-thirds of the steam originally employed in the generator is reintroduced into it, leaving only one-third to be supplied by the exhaust steam of the steam-engine. The gas-generators G have a rectangular section, 6 × 12 ft., several of them being erected in series. The introduction of the air and the removal of the ashes takes place at the narrower ends. The bottom is formed by a water-tank and the ashes are quenched here. The air enters just above the water-level, at a pressure of 4 in. The Mond gas in the dry state contains 15% carbon dioxide, 10% monoxide, 23% hydrogen, 3% hydrocarbons, 49% nitrogen. The yield of ammonium sulphate is 75 lb. from a ton of coal (slack with 11.5% ashes and 55% fixed carbon).

One of the best plants for the generation of *water-gas* is that constructed by E. Blass (fig. 20). Steam enters through the valve V at D into the generator, filled with coke, and passes away at the bottom through A. The pressure of the gas should not be such that it could get into the pipe conveying the air-blast, by which an explosive mixture would be formed. This is prevented by the water-cooled damper S, which always closes the air-blast when the gas-pipe is open and vice versa. Below the entry W of the air-blast there is a throttle valve d which is closed as soon as the damper S opens the gas canal; thus a second security against the production of a mixture of air and gas is afforded. The water-cooled ring channel K protects the bottom outlet of the generator and causes the cinders to solidify, so that they can be easily removed. But

sometimes no such cooling is effected, in which case the cinders run away in the liquid form. Below K the fuel is lying in a conical heap, leaving the ring channel A free. During the period of hot-blowing (heating-up) S is turned so that the air-blast communicates with the generator; *d* and G are open; *g* (the damper connected with the scrubber) and V are closed. During the period of gas-making G and *d* are closed, S now closes the air-blast and connects the generator with the scrubber; V is opened, and the gas passes from the scrubber into the gas-holder, the inlet *w* being under a pressure of 4 in. All these various changes in the opening of the valves and dampers are automatically performed in the proper order by means of a hand-wheel H, the shaft m resting on the standards *t* and shaft *v*. This hand-wheel has merely to be turned one way for starting the hot-blowing, and the opposite way for gas-making, to open and shut all the connexions, without any mistake being possible on the part of the attendant. The feeding-hopper E is so arranged that, when the cone e_2 opens, e_1 is shut, and vice versa, thus no more gas can escape, on feeding fresh coke into the generator, than that which is contained in E. G is the pipe through which the blowing-up gas (Siemens gas) is carried away, either into the open air (where it is at once burned) or into a pre-heater for the blast, or into some place where it can be utilized as fuel. This gas, which is made for 10 or 11 minutes, contains from 23 to 32% carbon monoxide, 7 to 1.5% carbon dioxide, 2 to 3% hydrogen, a little methane, 64 to 66% nitrogen, and has a heating value of 950 calories per cub. metre. The water-gas itself is made for 7 minutes, and has an average composition of 3.3% carbon dioxide, 44% carbon monoxide, 0.4% methane, 48.6% hydrogen, 3.7% nitrogen, and a heating value of 2970 calories per cub. metre. 1 kilogram coke yields 1.13 cub. metre water-gas and 3.13 Siemens gas. 100 parts coke (of 7000 calories) furnish 42% of their heat value as water-gas and 42% as Siemens gas.

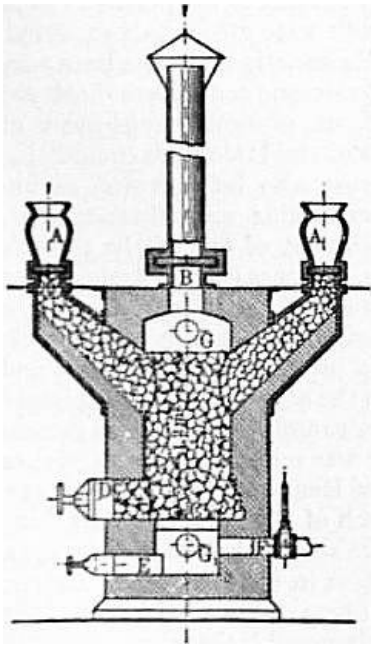


FIG. 21.—Dellwik-Fleischer Producer.

Lastly we give a section of the Dellwik-Fleischer gas-producer (fig. 21). The feeding-hoppers A are alternately charged every half-hour, so that the layer of fuel in the generator always remains 4 ft. deep. B is the chimney-damper, C the grate, D the door for removing the slags, E the ash-door, F the inlet of the air-blast, G the upper, G_1 the lower outlet for the water-gas which is removed alternately at top and bottom by means of an outside valve, steam being always admitted at the opposite end. The blowing-up generally lasts 1¾ minutes, the gas-making 8 or 10 minutes. The air-blast works under a pressure of 8 or 9 in. below the grate, or 4 to 4½ in. above the coke. The blowing-up gas contains 17 or 18% carbon dioxide and 1.5% oxygen, with mere traces of carbon monoxide. The water-gas shows 4 to 5% carbon dioxide, 40% carbon monoxide, 0.8% methane, 48 to 51% hydrogen, 4 or 5% nitrogen. About 2.5 cub. metres is obtained per kilogram of best coke.

See Mills and Rowan, *Fuel and its Application* (London, 1889); Samuel S. Wyer, *Producer-Gas and Gas-Producers*, published by the *Engineering and Mining Journal* (New York); F. Fischer, *Chemische Technologie der Brennstoffe* (1897-1901); *Gasförmige Heizstoffe*, in Stohmann and Kerl's *Handbuch der technischen Chemie*, 4th edition, iii. 642 et seq.

(G. L.)

1 Liquor condensed from gas alone, without wash water.

2 Figs. 12, 13, 14, 15, 16, 18, 19, 20, 21 of this article are from Lunge's *Coal-tar and Ammonia*, by permission of Friedr. Vieweg u. Sohn.

GASCOIGNE, GEORGE (*c.* 1535-1577), English poet, eldest son of Sir John Gascoigne of Cardington, Bedfordshire, was born probably between 1530 and 1535. He was educated at Trinity College, Cambridge, and on leaving the university is supposed to have joined the Middle Temple. He became a member of Gray's Inn in 1555. He has been identified without much show of evidence with a lawyer named Gastone who was in prison in 1548 under very discreditable circumstances. There is no doubt that his escapades were notorious, and that

he was imprisoned for debt. George Whetstone says that Sir John Gascoigne disinherited his son on account of his follies, but by his own account he was obliged to sell his patrimony to pay the debts contracted at court. He was M.P. for Bedford in 1557-1558 and 1558-1559, but when he presented himself in 1572 for election at Midhurst he was refused on the charges of being "a defamed person and noted for manslaughter," "a common Rymer and a deviser of slaunderous Pasquelles," "a notorious ruffianne," an atheist and constantly in debt. His poems, with the exception of some commendatory verses, were not published before 1572, but they were probably circulated in MS. before that date. He tells us that his friends at Gray's Inn importuned him to write on Latin themes set by them, and there two of his plays were acted. He repaired his fortunes by marrying the wealthy widow of William Breton, thus becoming step-father to the poet, Nicholas Breton. In 1568 an inquiry into the disposition of William Breton's property with a view to the protection of the children's rights was instituted before the lord mayor, but the matter was probably settled in a friendly manner, for Gascoigne continued to hold the Walthamstow estate, which he had from his wife, until his death. He sailed as a soldier of fortune to the Low Countries in 1572, and was driven by stress of weather to Brill, which luckily for him had just fallen into the hands of the Dutch. He obtained a captain's commission, and took an active part in the campaigns of the next two years, during which he acquired a profound dislike of the Dutch, and a great admiration for William of Orange, who had personally intervened on his behalf in a quarrel with his colonel, and secured him against the suspicion caused by his clandestine visits to a lady at the Hague. Taken prisoner after the evacuation of Valkenburg by the English troops, he was sent to England in the autumn of 1574. He dedicated to Lord Grey of Wilton the story of his adventures, "The Fruites of Warres" (printed in the edition of 1575) and "Gascoigne's Voyage into Hollande." In 1575 he had a share in devising the masques, published in the next year as *The Princely Pleasures at the Courte at Kenelworth*, which celebrated the queen's visit to the Earl of Leicester. At Woodstock in 1575 he delivered a prose speech before Elizabeth, and presented her with the *Pleasant Tale of Hemetes the Heremite*[1] in four languages. Most of his works were actually published during the last years of his life, after his return from the wars. He died at Bernack, near Stamford, where he was the guest of George Whetstone, on the 7th of October 1577. George Whetstone wrote a long dull poem in honour of his friend, entitled "A Remembrance of the wel-imployed life and godly end of George Gaskoigne, Esquire."

His theory of metrical composition is explained in a short critical treatise, "Certayne Notes of Instruction concerning the making of verse or ryme in English, written at the request of Master Edouardo Donati,"[2] prefixed to his *Posies* (1575). He acknowledged Chaucer as his master, and differed from the earlier poets of the school of Surrey and Wyatt chiefly in the added smoothness and sweetness of his verse. His poems were published in 1572 during his absence in Holland, surreptitiously, according to his own account, but it seems probable that the "editor" who supplied the running comment was none other than Gascoigne himself. *A hundreth Sundrie Floures bound up in one small Posie. Gathered partely (by translation) in the fyne outlandish Gardens of Euripides, Ovid, Petrarke, Ariosto and others; and partely by Invention out of our owne fruitfull Orchardes in Englande, Yelding Sundrie Savours of tragical, comical and moral discourse, bothe pleasaunt and profitable, to the well-smelling noses of learned Readers*, was followed in 1575 by an authorized edition, *The Posies of G.G. Esquire* ... (not dated).

Gascoigne had an adventurous and original mind, and was a pioneer in more than one direction. In 1576 he published *The Steele Glas*, sometimes called the earliest regular English satire. Although this poem is Elizabethan in form and manner, it is written in the spirit of *Piers Plowman*. Gascoigne begins with a comparison between the sister arts of Satire and Poetry, and under a comparison between the old-fashioned "glas of trustie steele," and the new-fangled crystal mirrors which he takes as a symbol of the "Italianate" corruption of the time, he attacks the amusements of the governing classes, the evils of absentee landlordism, the corruption of the clergy, and pleads for the restoration of the feudal ideal.[3]

His dramatic work belongs to the period of his residence at Gray's Inn, both *Jocasta* (of which Acts i. and iv. were contributed by Francis Kinwelmersh) and *Supposes* being played there in 1566. *Jocasta* was said by J.P. Collier (*Hist. of Dram. Poetry* iii. 8) to be the "first known attempt to introduce a Greek play upon the English stage," but it turns out that Gascoigne was only very indirectly acquainted with Euripides. His play is a literal version of Lodovico Dolce's *Giocasta*, which was derived probably from the *Phoenissae* in the Latin translation of R. Winter. *Supposes*,[4] a version of Ariosto's *I Suppositi*, is notable as an early and excellent adaptation of Italian comedy, and moreover, as "the earliest play in English prose acted in public or private." Udal's *Ralph Roister Doister* had been inspired directly by

Latin comedy; *Gammer Gurton's Needle* was a purely native product; but *Supposes* is the first example of the acclimatization of the Italian models that were to exercise so prolonged an influence on the English stage. A third play of Gascoigne's, *The Glasse of Government* (published in 1575), is a school drama of the "Prodigal Son" type, familiar on the continent at the time, but rare in England. It is defined by Mr C.H. Herford as an attempt "to connect *Terentian situation* with a *Christian moral* in a picture of *school life*," and it may be assumed that Gascoigne was familiar with the didactic drama of university life in vogue on the continent. The scene is laid at Antwerp, and the two prodigals meet with retribution in Geneva and Heidelberg respectively.

The Spoyle of Antwerpe, written by an eyewitness of the sack of the city in 1576, has sometimes been attributed to Gascoigne, but although a George Gascoigne was employed in that year to carry letters for Walsingham, internal evidence is against Gascoigne's authorship. A curious editorial preface by Gascoigne to Sir Humphrey Gilbert's *Discourse of a Discoverie for a new Passage to Cataia* (1576) has led to the assertion that Gascoigne printed the tract against its author's wish, but it is likely that he was really serving Gilbert, who desired the publication, but dared not avow it. The *Wyll of the Devill* ... (reprinted for private circulation by Dr F.J. Furnivall, 1871), an anti-popish tract, once attributed, on slender evidence, to Gascoigne, is almost certainly by another hand.

Gascoigne's works not already mentioned include: "G. G. in commendation of the noble Arte of Venerie," prefixed to *The Noble Art of Venerie or Hunting* (1575); *The Complaynte of Phylomene, bound up with The Steele Glas* (1576); *The Droomme of Doomes-day* (1576), a prose compilation from various authors, especially from the *De contemptu mundi sive de miseria humanae conditionis* of Pope Innocent III., printed with varying titles, earliest ed. (1470?); *A Delicate Diet for daintie mouthde droonkardes ...* (1576), a free version of St Augustine's *De ebrietate. The Posies* (1572) included *Supposes, Jocasta, A Discourse of the Adventures of Master F*[*erdinando*] *J*[*eronimi*], in imitation of an Italian novella, a partly autobiographical *Don Bartholomew of Bath*, and miscellaneous poems. Real personages, some of whom were well known at court, were supposed to be concealed under fictitious names in *The Adventures of Master F. J.*, and the poem caused considerable scandal, so that the names are disguised in the second edition. A more comprehensive collection, *The Whole Workes of G. G.* ... appeared in 1587. In 1868-1870 *The Complete Poems of G. G.* ... were edited for the Roxburghe Library by Mr W.C. Hazlitt. In his *English Reprints* Prof. E. Arber included *Certayne Notes of Instruction, The Steele Glas* and the *Complaynt of Philomene*. *The Steele Glas* was also edited for the *Library of English Literature*, by Henry Morley, vol. i. p. 184 (1889). A new edition, *The Works of George Gascoigne* (The Cambridge English Classics, 1907, &c.) is edited by Dr J.W. Cunliffe. See also *The Life and Writings of George Gascoigne*, by Prof. Felix E. Schelling (Publications of the Univ. of Pennsylvania series in Philology, vol. ii. No. 4 [1894]); C.H. Herford, *Studies in the Literary Relations of England and Germany in the Sixteenth Century*, pp. 149-164 (1886); C.H. Herford, "Gascoigne's Glasse of Government," in *Englische Studien*, vol. ix. (Halle, 1877, &c.).

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1 Printed in 1579 in a pamphlet called *The Paradoxe*, the author of which, Abraham Fleming, does not mention Gascoigne's name.

2 Reprinted in vol. ii. of J. Haslewood's *Ancient Critical Essays* (1811-1815), and in Gregory Smith's *Elizabethan Critical Essays* (1904).

3

"Againe I see, within my glasse of Steele
But foure estates, to serve each country soyle,
The King, the Knight, the Pesant, and the Priest.
The King should care for al the subjects still,
The Knight should fight, for to defend the same,
The Pesant, he shoulde labor for their ease,
And Priests shuld pray, for them and for themselves."—
(Arber's ed. p. 57.)

4 The influence of this play on the Shakespearian *Taming of the Shrew* is dealt with by Prof. A.H. Tolman in *Shakespeare's Part in the Taming of the Shrew* (Pub. of the Mod. Lang. Assoc. vol. v. No. 4, pp. 215, 216, 1890).

GASCOIGNE, SIR WILLIAM (*c.* 1350-1419), chief justice of England in the reign of

Henry IV. Both history and tradition testify to the fact that he was one of the great lawyers who in times of doubt and danger have asserted the principle that the head of the state is subject to law, and that the traditional practice of public officers, or the expressed voice of the nation in parliament, and not the will of the monarch or any part of the legislature, must guide the tribunals of the country. He was a descendant of an ancient Yorkshire family. The date of his birth is uncertain, but it appears from the year-books that he practised as an advocate in the reigns of Edward III. and Richard II. On the banishment of Henry of Lancaster Gascoigne was appointed one of his attorneys, and soon after Henry's accession to the throne was made chief justice of the court of king's bench. After the suppression of the rising in the north in 1405, Henry eagerly pressed the chief justice to pronounce sentence upon Scrope, the archbishop of York, and the earl marshal Thomas Mowbray, who had been implicated in the revolt. This he absolutely refused to do, asserting the right of the prisoners to be tried by their peers. Although both were afterwards executed, the chief justice had no part in the transaction. It has been very much doubted, however, whether Gascoigne could have displayed such independence of action without prompt punishment or removal from office following. The oft-told tale of his committing the prince of Wales to prison must also be regarded as unauthentic, though it is both picturesque and characteristic. The judge had directed the punishment of one of the prince's riotous companions, and the prince, who was present and enraged at the sentence, struck or grossly insulted the judge. Gascoigne immediately committed him to prison, using firm and forcible language, which brought him to a more reasonable mood, and secured his voluntary obedience to the sentence. The king is said to have approved of the act, but there appears to be good ground for the supposition that Gascoigne was removed from his post or resigned soon after the accession of Henry V. He died in 1419, and was buried in the parish church of Harewood in Yorkshire. Some biographies of the judge have stated that he died in 1412, but this is clearly disproved by Foss in his *Lives of the Judges*; and although it is clear that Gascoigne did not hold office long under Henry V., it is not absolutely impossible that the scene in the fifth act of the second part of Shakespeare's *Henry IV.* has some historical basis, and that the judge's resignation was voluntary.

GASCONY (*Wasconia*), an old province in the S.W. of France. It takes its name from the Vascones, a Spanish tribe which in 580 and 587 crossed the Pyrenees and invaded the district known to the Romans as Novempopulana or Aquitania tertia. Basque, the national language of the Vascones, took root only in a few of the high valleys of the Pyrenees, such as Soule and Labourd; in the plains Latin dialects prevailed, Gascon being a Romance language. In the 7th century the name of Vasconia was substituted for that of Novempopulana. The Vascones readily recognized the sovereignty of the Merovingian kings. In 602 they consented to be governed by a duke called Genialis, but in reality they remained independent. They even appointed national dukes, against whom Charlemagne had to fight at the beginning of his reign. Finally Duke Lupus II. made his submission in 819, and the Carolingians were able to establish Frankish dukes in the country. Three of these are known: Séguin (Sighivinus), William (Guillaume), and Arnaud (Arnaldus). They were at the same time counts of Bordeaux, and succumbed to the Normans. After the death of Arnaud in 864 the history of Gascony falls into the profoundest obscurity. The lists of the 10th-century dukes prepared by ancient and modern historians can only be established by means of hypotheses based in many cases on spurious documents (*e.g.* the charter of Alaon), and little confidence can be placed in them. During this troubled period Gascony was from time to time attached to one or other of the other Vascon states which had been formed on the southern slope of the Pyrenees, but in the reign of Hugh Capet it was considered as forming part of France, from which it has never been separated. Disputed in the 11th century by the counts of Poitiers, who were also dukes of Aquitaine, and by the counts of Armagnac, the duchy finally passed to the house of Poitiers in 1073, when the title of duke of Gascony was merged in that of duke of Aquitaine and disappeared. In the feudal period Gascony comprised a great number of countships (including Armagnac, Bigorre, Fézensac, Gaure and Pardiac), viscountships (including Béarn, Lomagne, Dax, Juliac, Soule, Marsan, Tartas, Labourd and Maremne), and seigneuries (*e.g.* Albret, &c.). From the ecclesiastical point of view, it corresponded nearly to the archbishopric of Auch.

From about 1073 to 1137 Gascony was governed by the dukes of Aquitaine and counts of Poitiers, one of whom, William IX., gave the first charter of privileges to the town of

Bayonne; but the duchy was weakened by the increasing independence of its great feudatories, especially the viscounts of Béarn and the counts of Armagnac. In 1137, the year of her father's death, Eleanor, the daughter and heiress of Duke William X., married the king of France, Louis VII., and with the rest of Aquitaine Gascony passed under his direct rule. In 1151, however, this marriage was annulled, and almost at once Eleanor married Henry of Anjou, who three years later became king of England as Henry II. Thus was the house of Plantagenet introduced into Gascony and a fresh bone of contention was thrown between the kings of England and of France. Having established himself in the duchy by force of arms, Henry handed it over to his son Richard, against whom many of the great Gascon lords revolted, and from Richard it passed to his brother John. The crusade against the Albigenses was carried into Gascony, and this warfare gave a new impetus to the process of disintegration which was already at work in the duchy. King John and his successor Henry III. were weak; the neighbouring counts of Toulouse were powerful and aggressive; and the house of Béarn was growing in strength. Gascony served Henry III. as headquarters during his two short and disastrous wars (1230 and 1242) with Louis IX., and in 1259 he did homage for it to this king; his son, Edward I., lost and then regained the duchy.

During the Hundred Years' War Gascony was obviously a battle-field for the forces of England and of France. The French seized the duchy, but, aided by the rivalry between the powerful houses of Foix and Armagnac, Edward III. was able to recover it, and by the treaty of Bretigny in 1360 John II. recognized the absolute sovereignty of England therein. Handed over as a principality by Edward to his son, the Black Prince, it was used by its new ruler as a base during his expedition into Spain, in which he received substantial help from the Gascon nobles. The renewal of the war between England and France, which took place in 1369, was due in part to a dispute over the sovereignty of Gascony, and during its course the position of the English was seriously weakened, the whole of the duchy save a few towns and fortresses being lost; but the victories of Henry V. in northern France postponed for a time the total expulsion of the foreigner. This was reserved for the final stage of the war and was one result of the efforts of Joan of Arc, the year 1451 witnessing the capture of Bayonne and the final retreat of the English troops from the duchy. During this time the inhabitants of Gascony suffered severely from the ravages of both parties, and the nobles ruled or misruled without restraint.

The French kings, especially Louis XI., managed to restore the royal authority in the duchy, although this was not really accomplished until the close of the 15th century when the house of Armagnac was overthrown. It was by means of administrative measures that these kings attained their object. Gascony was governed on the same lines as other parts of France and from the time of Henry IV., who was prince of Béarn, and who united his hereditary lands with the crown, its history differs very slightly from that of the rest of the country. The Renaissance inspired the foundation of educational institutions and the Reformation was largely accepted in Béarn, but not in other parts of Gascony. The wars of religion swept over the land, which was the scene of some of the military exploits of Henry IV., and Louis XIV. made some slight changes in its government. As may be surmised the boundaries of Gascony varied from time to time, but just before the outbreak of the Revolution they were the Atlantic Ocean, Guienne, Languedoc and the Pyrenees, and from east to west the duchy at its greatest extent measured 170 m.

At the end of the *ancien régime* Gascony was united with Guienne to form a great military government. After the division of France into departments, Gascony, together with Béarn, French Navarre and the Basque country, formed the departments of Basses-Pyrénées, Landes, Hautes-Pyrénées and Gers. Parts of Gascony also now form arrondissements and cantons of the departments of Lot-et-Garonne, Haute-Garonne, Ariège and Tarn-et-Garonne.

See Arnaud Oïhénart, *Notitia utriusque Vasconiae, tam Ibericae quam Aquitanicae* (1637); L'Abbé Monlezun, *Histoire de la Gascogne* (1846-1850), comprising a number of useful but uncritically edited documents; and Jean de Jaurgain, *La Vasconie, étude historique et critique sur les origines ... du duché de Gascogne ... et des grands fiefs du duché de Gascogne* (1898-1902), a learned and ingenious work, but characterized by unbridled genealogical fancy. This last work was rectified by Ferdinand Lot in his *Études sur le règne de Hugues Capet* (1903; see especially appendix x.). See also Barrau-Dihigo, "La Gascogne," a bibliography of manuscript sources and of printed works published in the *Revue de synthèse historique* (1903).

(C. B.*)

GAS ENGINE. A gas engine is a heat engine in which the working fluid is atmospheric air and the fuel an inflammable gas. It differs from a hot-air or a steam engine in that the heat is given to the working fluid by combustion within the motive power cylinder. In most gas engines—in fact, in all those at present on the market—the working fluid and the fuel that supplies it with heat are mixed with each other before the combustion of the fuel. The fuel—which in the steam and in most hot-air engines is burned in a separate furnace—is, in the gas engine, introduced directly to the motor cylinder and burned there; it is, indeed, part of the working fluid. A gas engine, therefore, is an internal combustion engine using gaseous fuel.

The commercial history of the gas engine dates from 1876, when Dr N.A. Otto patented the well-known engine now in extensive use, but long before that year inventors had been at work, attempting to utilize gas for producing motive power. The first proposal made in Great Britain is found in Street's Patent No. 1983 of 1794, where an explosion engine is suggested, the explosion to be caused by vaporizing spirits of turpentine on a heated metal surface, mixing the vapour with air in a cylinder, firing the mixture, and driving a piston by the explosion produced. Most of the early engines were suggested by the fact that a mixture of an inflammable gas and atmospheric air gives an explosion when ignited—that is, produces pressure which can be applied in a cylinder to propel a piston. Lebon, in France, proposed a gas engine in which the gas and air were raised to a pressure above that of the atmosphere before use in the cylinder, but he did not appear to be clear in his ideas.

Some interesting particulars of early experiments are given in a paper read at the Cambridge Philosophical Society in 1820 entitled, "On the Application of Hydrogen Gas to produce a Moving Power in Machinery, with a description of an Engine which is moved by the pressure of the Atmosphere upon a Vacuum caused by Explosions of Hydrogen Gas and Atmospheric Air." In that paper the Rev. W. Cecil describes an engine of his invention constructed to operate on the explosion vacuum method. This engine was stated to run with perfect regularity at 60 revolutions per minute, consuming 17.6 cub. ft. of hydrogen gas per hour. The hydrogen explosion, however, does not seem to have been noiseless, because Mr Cecil states that in building a larger engine "... to remedy the noise which is occasioned by the explosion, the lower end of the cylinder A, B, C, D may be buried in a well or it may be enclosed in a large air-tight vessel." Mr Cecil also mentions previous experiments at Cambridge by Prof. Farish, who exhibited at his lectures on mechanics an engine actuated by the explosion of a mixture of gas and air within a cylinder, the explosion taking place from atmospheric pressure. Prof. Farish is also stated to have operated an engine by gunpowder. These engines of Farish and Cecil appear to be the very earliest in actual operation in the world.

Samuel Brown, in patents dated 1823 and 1826, proposed to fill a closed chamber with a gas flame, and so expel the air; then he condensed the flame by injecting water, and operated an air engine by exhausting into the partial vacuum so obtained. The idea was evidently suggested by Watt's condensing steam engine, flame being employed instead of steam to obtain a vacuum. Brown's engine is said to have been actually employed to pump water, drive a boat on the Thames, and propel a road carriage. L.W. Wright in 1833 described an explosion engine working at atmospheric pressure and exploding on both sides of the piston. The cylinder is shown as water-jacketed. In William Barnett's engine of 1838 two great advances were made. The engine was so constructed that the mixture of gas and air was compressed to a considerable extent in the motor cylinder before ignition. The method of igniting the compressed charge was also effective. The problem of transferring a flame to the interior of a cylinder when the pressure is much in excess of that of the external air was solved by means of a hollow plug cock having a gas jet burning within the hollow. In one position the hollow was opened to the atmosphere, and a gas jet issuing within it was lit by an external flame, so that it burned within the hollow. The plug was then quickly rotated, so that it closed to the external air and opened to the engine cylinder; the flame continued to burn with the air contained in the cock, until the compressed inflammable mixture rushed into the space from the cylinder and ignited at the flame. This mode of ignition is in essentials the one adopted by Otto about thirty years later. To Barnett belongs the credit of being the first to realize clearly the great idea of compression before explosion in gas engines, and to show one way of carrying out the idea in practice. Barnett appears to have constructed an engine, but he attained no commercial success. Several attempts to produce gas engines were made between 1838 and 1860, but they were all failures. Several valuable ideas were published in 1855. Drake, an American, described a mode of igniting a combustible gaseous mixture by raising a thimble-shaped piece of metal to incandescence. In 1857 Barsanti and Matteucci proposed a free-piston engine, in which the explosion propelled a free piston against the atmosphere, and the work was done on the return stroke by the atmospheric pressure, a partial vacuum being produced under the piston. The engine never came into commercial use, although the fundamental idea was good.

Previous to 1860 the gas engine was entirely in the experimental stage, and in spite of many attempts no practical success was attained. E. Lenoir, whose patent is dated 1860, was the inventor of the first gas engine that was brought into general use. The piston, moving forward for a portion of its stroke by the energy stored in the fly-wheel, drew into the cylinder a charge of gas and air at the ordinary atmospheric pressure. At about half stroke the valves closed, and an explosion, caused by an electric spark, propelled the piston to the end of its stroke. On the return stroke the burnt gases were discharged, just as a steam engine exhausts. These operations were repeated on both sides of the piston, and the engine was thus double-acting. Four hundred of these engines were said to be at work in Paris in 1865, and the Reading Iron Works Company Limited built and sold one hundred of them in Great Britain. They were quiet, and smooth in running; the gas consumption, however, was excessive, amounting to about 100 cub. ft. per indicated horse-power per hour. The electrical ignition also gave trouble. Hugon improved on the engine in 1865 by the introduction of a flame ignition, but no real commercial success was attained till 1867, when Otto and Langen exhibited their free-piston engine in the Paris Exhibition of that year. This engine was identical in principle with the Barsanti and Matteucci, but Otto succeeded where those inventors failed. He worked out the engine in a very perfect manner, used flame ignition, and designed a practical clutch, which allowed the piston free movement in one direction but engaged with the fly-wheel shaft when moved in the other; it consisted of rollers and wedge-shaped pockets—the same clutch, in fact, as has since been so much used in free-wheel bicycles. This engine consumed about 40 cub. ft. of gas per brake horse-power per hour—less than half as much as the Lenoir. Several thousands were made and sold, but its strange appearance and unmechanical operation raised many objections. Several inventors meanwhile again advocated compression of the gaseous mixture before ignition, among them being Schmidt, a German, and Million, a Frenchman, both in 1861.

To a Frenchman, Alph. Beau de Rochas, belongs the credit of proposing, with perfect clearness, the cycle of operations now widely used in compression gas engines. In a pamphlet published in Paris in 1862, he stated that to obtain economy with an explosion engine four conditions are requisite: (1) The greatest possible cylinder volume with the least possible cooling surface; (2) the greatest possible rapidity of explosion; (3) the greatest possible expansion; and (4) the greatest possible pressure at the beginning of the expansion. The sole arrangement capable of satisfying these conditions he stated would be found in an engine operating as follows: (1) Suction during an entire out-stroke of the piston; (2) compression during the following in-stroke; (3) ignition at the dead point, and expansion during the third stroke; (4) forcing out of the burnt gases from the cylinder on the fourth and last return stroke. Beau de Rochas thus exactly contemplated, in theory at least, the engine produced by Dr Otto fourteen years later. He did not, however, put his engine into practice, and probably had no idea of the practical difficulties to be overcome before realizing his conception in iron and steel. To Dr Otto belongs the honour of independently inventing the same cycle, now correctly known as the Otto cycle, and at the same time overcoming all practical difficulties and making the gas engine of world-wide application. This he did in 1876, and his type of engine very rapidly surpassed all others, so that now the Otto-cycle engine is manufactured over the whole world by hundreds of makers. In 1876 Dr Otto used low compression, only about 30 ℔ per sq. in. above atmosphere. Year by year compression was increased and greater power and economy were obtained, and at present compressions of more than 100 ℔ per sq. in. are commonly used with most satisfactory results.

The history of the subject since 1876 is one of gradual improvement in detail of construction, enabling higher compressions to be used with safety, and of gradual but accelerating increase in dimensions and power. In the same period light and heavy oil engines have been developed, mostly using the Otto cycle (see Oil Engine).

Gas engines may be divided, so far as concerns their working process, into three well-defined types:—

(1) Engines igniting at constant volume, but without previous compression.

(2) Engines igniting at constant pressure, with previous compression.

(3) Engines igniting at constant volume, with previous compression.

For practical purposes engines of the first type may be disregarded. Gas engines without compression are now considered to be much too wasteful of gas to be of commercial importance. Those of the second type have never reached the stage of extended commercial application; they are scientifically interesting, however, and may take an important place in the future development of the gas engine. The expectations of Sir William Siemens with regard to them have not been realized, although he spent many years in experiments. Of other engineers who also devoted much thought and work to this second type may be mentioned Brayton (1872); Foulis (1878); Crowe (1883); Hargreaves (1888); Clerk (1889);

and Diesel (1892). Diesel's engines are proving successful as oil engines but have not been introduced as gas engines.

The working cycles of the three types are as follows:—

First Type.—Four operations.

(*a*) Charging the cylinder with explosive mixture at atmospheric pressure.

(*b*) Exploding the charge.

(*c*) Expanding after explosion.

(*d*) Expelling the burnt gases.

Second Type.—Five operations.

(*a*) Charging the pump cylinder with gas and air mixture at atmospheric pressure.

(*b*) Compressing the charge into an intermediate receiver.

(*c*) Admitting the charge to the motor cylinder, in a state of flame, at the pressure of compression.

(*d*) Expanding after admission.

(*e*) Expelling the burnt gases.

Third Type.—Five operations.

(*a*) Charging the cylinder with gas and air mixture at atmospheric pressure.

(*b*) Compressing the charge into a combustion space.

(*c*) Exploding the charge.

(*d*) Expanding after explosion.

(*e*) Expelling the burnt gases.

In all these types the heating of the working fluid is accomplished by the rapid method of combustion within the cylinder, and for the cooling necessary in all heat engines is substituted the complete rejection of the working fluid with the heat it contains, and its replacement by a fresh portion taken from the atmosphere at atmospheric temperature. This is the reason why those cycles can be repeated with almost indefinite rapidity, while the old hot-air engines had to run slowly in order to give time for the working fluid to heat or cool through metal surfaces.

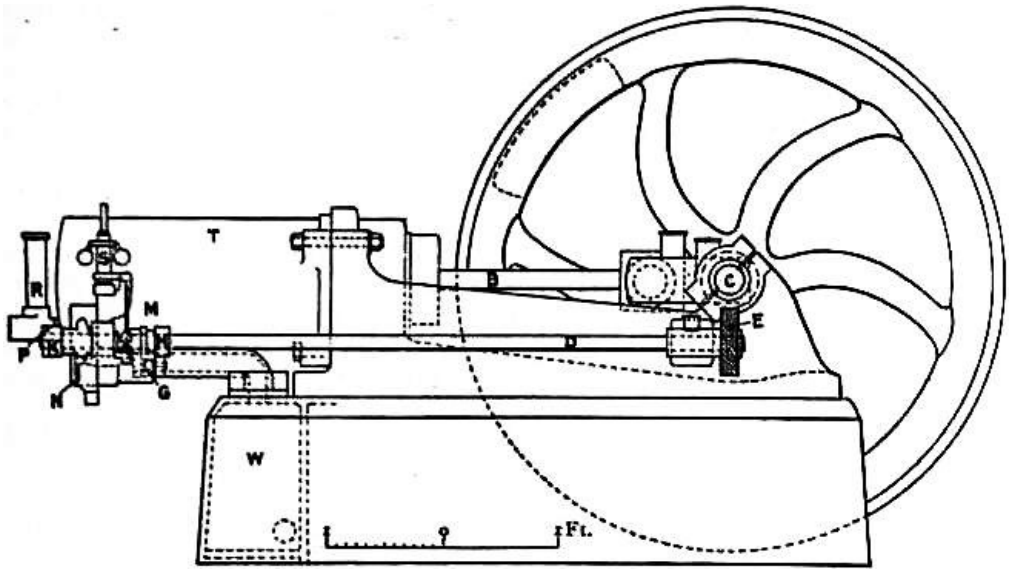

FIG. 1.—Side Elevation of Otto Cycle Engine.

Four-cycle Engines.—Otto-cycle engines belong to the third type, being explosion engines in which the combustible mixture is compressed previous to explosion. Fig. 1 is a side elevation, fig. 2 is a sectional plan, and fig. 3 is an end elevation of an engine built about 1892 by Messrs Crossley of Manchester, who were the original makers of Otto engines in Great Britain. In external appearance it somewhat resembles a modern high-pressure steam engine, of which the working parts are exceedingly strong. In its motor and only cylinder, which is horizontal and open-ended, works a long trunk piston, the front end of which

carries the crosshead pin. The crank shaft is heavy, and the fly-wheel large, considerable stored energy being required to carry the piston through the negative part of the cycle. The cylinder is considerably longer than the stroke, so that the piston when full in leaves a space into which it does not enter. This is the combustion space, in which the charge is first compressed and then burned. On the forward stroke, the piston A (fig. 2) takes into the cylinder a charge of mixed gas and air at atmospheric pressure, which is compressed by a backward stroke into the space Z at the end of the cylinder. The compressed charge is then ignited, and so the charge is exploded with the production of a high pressure. The piston now makes a forward stroke under the pressure of the explosion, and on its return, after the exhaust valve is opened, discharges the products of combustion. The engine is then ready to go through the same cycle of operations. It thus takes four strokes or two revolutions of the shaft to complete the Otto cycle, the cylinder being used alternately as a pump and a motor, and the engine, when working at full load, thus gives one impulse for every two revolutions. The valves, which are all of the conical-seated lift type, are four in number—charge inlet valve, gas inlet valve, igniting valve, and exhaust valve. The igniting valve is usually termed the timing valve, because it determines the time of the explosion. Since the valves have each to act once in every two revolutions, they cannot be operated by cams or eccentrics placed directly on the crank shaft. The valve shaft D is driven at half the rate of revolution of the crank shaft C by means of the skew or worm gear E, one wheel of which is mounted on the crank shaft and the other on the valve shaft. Ignition is accomplished by means of a metal tube heated to incandescence by a Bunsen burner. At the proper moment the ignition or timing valve is opened, and the mixed gas and air under pressure being admitted to the interior of the tube, the inflammable gases come into contact with the incandescent metal surface and ignite; the flame at once spreads back to the cylinder and fires its contents, thus producing the motive explosion.

The working parts are as follows:—A the piston, B the connecting rod, C the crank shaft, D the side or valve shaft, E the skew gearing, F the exhaust valve, G the exhaust valve lever, H the exhaust valve cam, I the charge inlet valve, J the charge inlet valve lever, K the charging valve cam, L the gas inlet valve, M the gas valve cam, N lever and link operating gas valve, O igniting or timing valve, P timing valve cam, Q timing valve lever or tumbler, R igniting tube, S governor, T water jacket and cylinder, U Bunsen burner for heating ignition tube. On the first forward or charging stroke the charge of gas and air is admitted by the inlet valve I, which is operated by the lever J from the cam K, on the valve shaft D. The gas supply is admitted to the inlet valve I by the lift valve L, which is also operated by the lever and link N from the cam M, controlled, however, by the centrifugal governor S. The governor operates either to admit gas wholly, or to cut it off completely, so that the variation in power is obtained by varying the number of the explosions.

Since the engine shown in figs. 1 to 3 was built further modifications have been made, principally in the direction of dispensing with or diminishing port space, that is, so arranging the ports that the compression space is not broken up into several separate chambers. In this way the cooling surface in contact with the intensely hot gases is reduced to a minimum. This is especially important when high compressions are used, as then the compression space being small, the port spaces form a large proportion of the total space. For maximum economy it is necessary to get rid of port space altogether; this is done by making the lift valves open directly into the compression space. This arrangement can be readily made in small- and medium-sized engines, but in the larger engines it becomes necessary to provide ports, so as to allow the valves to be more easily removed for cleaning.

The construction of pressure gas plant in 1878 by J.E. Dowson for the production of inflammable gas from anthracite and coke by the action of air mixed with steam, soon led to the development of larger and larger Otto cycle engines. The gas obtained consisted of a mixture of carbon monoxide, hydrogen, nitrogen and some carbon dioxide and oxygen, having a lower heating value of about 150 British thermal units per cubic foot. With this gas these engines used about 1 lb of anthracite per b.h.p. per hour.

From the pressure producer sprang the suction producer first placed on the market in practical form by M. Benier of Paris in 1894, but then presenting many difficulties which were not removed till about nine years later when Dowson and others placed effective suction plants in use in considerable numbers. Such suction plants are now built by all the leading gas engine constructors for powers varying from 10 to 500 i.h.p.

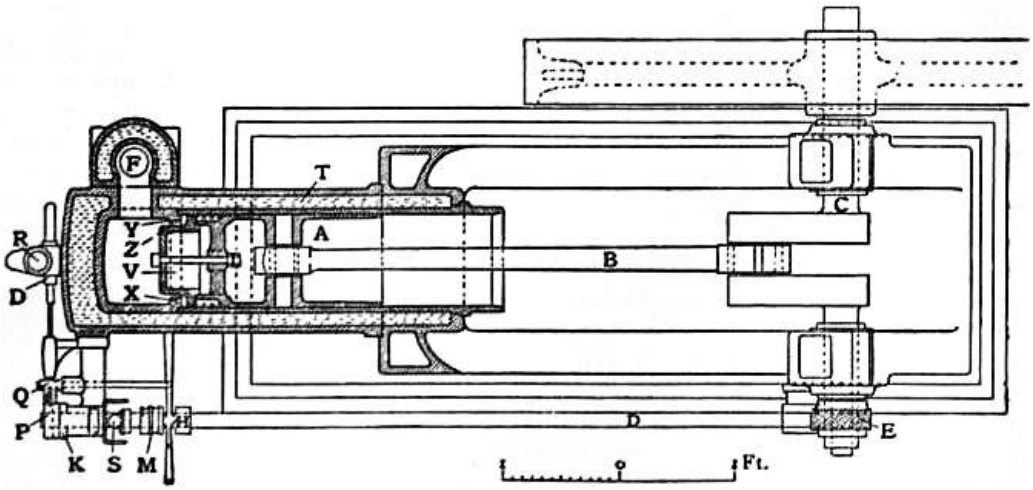

FIG. 2.—Plan of Otto Cycle Engine.

Dr Ludwig Mond and Crossley Bros. also attacked the problem of the bituminous fuel producer, of which many examples are now at work for powers as large as 2000 i.h.p. In 1895 B.H. Thwaite demonstrated that the so-called waste gas from blast furnaces could be used in gas engines, and this undoubtedly led to the design and construction of the very large gas engines now becoming common both in Europe and in America. It appears from Thwaite's experiments that the surplus gas from the blast furnaces of Great Britain is capable of supplying at least three-quarters of a million horse-power continuously day and night, and it is calculated that in America nearly three million horse-power is available from this source. Thwaite's system was put into operation in 1895 at the Glasgow Iron Works, and it was also successfully applied near Barrow-in-Furness. For many reasons the system did not take immediate root in England, but in 1898 the Société Cockerill of Seraing near Liège applied an engine designed by Delamere-Debouteville to utilize blast furnace gas. This engine indicated 213 h.p. running at 105 revolutions per minute. This was followed in 1899 by an engine giving 600 b.h.p. at 90 revolutions per minute used for driving a blowing cylinder for a blast furnace. It had a single cylinder of 51.2 in. diameter and a piston stroke of 55.1 in. About 1900 the Gasmotoren Fabrik Deutz built an Otto cycle engine of 1000 b.h.p. having four cylinders each 33 in. diameter and 39.3 in. stroke, speed 135 revolutions per minute. It was coupled direct to a dynamo. Crossley Bros. Ltd. took up the large gas engine at an early date, and a 400 h.p. engine by them was at work at Brunner, Mond & Co.'s works, Winnington, in 1900; it had two cylinders of 26 in. diameter and 36 in. stroke, and it ran at 150 revolutions per minute.

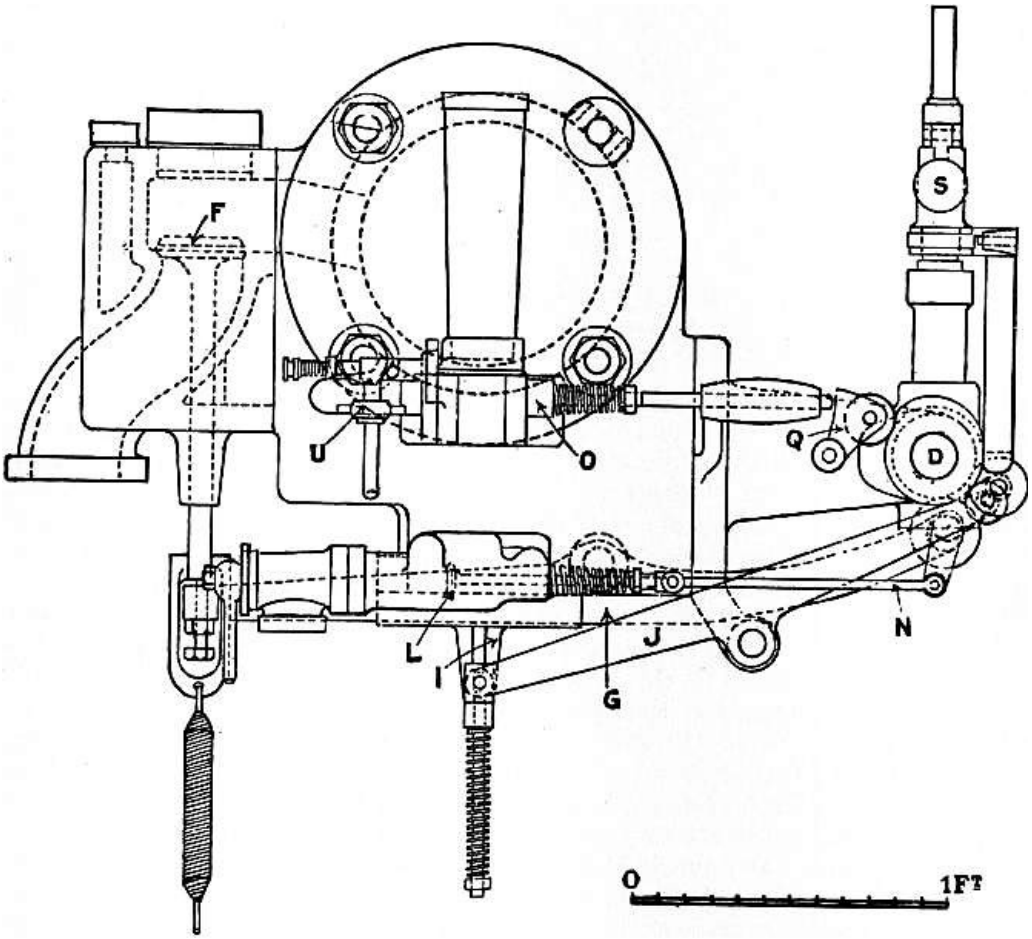

FIG. 3.—End Elevation of Otto Cycle Engine.

Gas engines operating on the Otto cycle are usually of the single acting open cylinder type up to about 200 b.h.p., but for the larger engines closed cylinders of the double acting type are used. The engine then closely resembles a double acting steam engine. It has a cylinder cover with packing box of a special type, and, in addition to the water jacket surrounding the cylinder and combustion spaces, the piston and piston rod are hollow and cooling water is forced through them by a pump. Such a double acting cylinder gives two succeeding power impulses and then two charging strokes so that one revolution of the crank shaft is occupied in charging and compression, while the succeeding revolution gets two power impulses. For still larger engines two such double acting cylinders are arranged in tandem, so that one piston rod runs through two pistons and connects to a slide in front and to one crank pin by a connecting rod. Such an engine gives two power impulses for every revolution of the crank shaft. The greatest power developed in one double acting cylinder is claimed by Ehrhardt and Sehmer for a cylinder of 45¼ in. diameter by 51¼ in. stroke, which at 94 revolutions per minute gives 1100 i.h.p.

Two-Cycle Engine.—While the Otto or four-cycle engine was developing as above described, inventors were hard at work on the two-cycle engine. In Britain this work fell mostly upon Clerk, Robson and Atkinson, while on the continent of Europe the most persevering and determined worker was Koerting.

Dugald Clerk began work on the gas engine at the end of 1876. His first patent was dated 1877 and dealt with an engine of the air pressure vacuum type. His next patent was No. 3045 of 1878, and the engine there described was exhibited at the Royal Agricultural Show at Kilburn, London, 1879. In it a pump compressed a mixture of air and gas into a reservoir, from which it entered the motor cylinder during the first part of its stroke. After cut-off ignition was caused by a platinum igniter, the piston was driven forward, and exhausting was performed on the return stroke. This engine gave three b.h.p., and it was the first compression explosion engine ever run giving one impulse for each revolution of the crank shaft. It had difficulties, however, which prevented it from reaching the market.

The particular type of engine now widely known as operating on the Clerk cycle was patented in 1881 (Brit. Pat. No. 1089). One of the earliest of these engines was set up at Lord Kelvin’s laboratory at the Glasgow university and used for the purpose of driving a Siemens dynamo and supplying his house with electric light. The engine was first exhibited in the Paris Electrical Exhibition of 1881 and the London Smoke Abatement Exhibition of the same year. In this engine the charge was not compressed by a separate pump. A pumping

cylinder, it is true, was used, but its function was to act merely as a displacer to take in a mixture of gas and air and transfer it to the motor cylinder at as low a pressure as possible, in such a way that the entering charge displaced the exhaust gases through ports which were opened by the overrunning of the piston. The motor piston thus timed and controlled the exhaust discharge, and gave a power impulse for every revolution of the crank. Engines of the Clerk type were built largely by Messrs Sterne & Co. of Glasgow, the Clerk Gas Engine Co. of Philadelphia, U.S.A., the Campbell Gas Engine Co., and a modification was made and sold in considerable numbers by the Stockport Company. The lapsing of the Otto patent, however, in 1876 caused engineers to neglect the two cycle for a time, although a little later it was introduced for small engines in an ingenious and simple modification known as the Day engine. This two-cycle engine later became very popular, especially for motor launch work. The Clerk cycle is now much in use for large gas engines up to about 2000 horse as modified by Messrs Koerting of Hanover.

The Clerk cycle engine, as built in 1881, is shown in sectional plan at fig. 4. The engine contains two cylinders—a power cylinder A and a displacer cylinder B. The function of the displacer cylinder is to take in a combustible charge of gas and air and transfer it to the power cylinder, displacing as it enters the exhaust gases of the previous explosion. A compression space G is formed at the end of the motor cylinder A. It is of conical shape and communicates with the displacer cylinder B by means of a large automatic lift valve which opens into the compression space from a chamber communicating by a pipe with the displacer cylinder. At the out-end of the motor cylinder are placed **V**-shaped ports E which open to the atmosphere by an exhaust pipe. The outward travel of the motor piston C causes it to overrun these ports, as seen in fig. 4, and allows the pressure in the cylinder to fall to atmosphere. The action of the engine is as follows:—The displacer piston D on its forward movement draws in its charge of gas and air, and it is so timed with reference to the motor piston C that it has returned a small portion of its stroke just when the motor piston overruns the exhaust ports. The overrunning of the exhaust ports at once causes the pressure in the cylinder to fall to atmosphere, and then the pressure in the displacer overcomes the pressure in the motor cylinder and opens the lift valve, when the charge flows in to the motor cylinder through the conical compression space and displaces the exhaust gases through the ports E, while it fills up the cylinder A with the inflammable charge. The exhaust gases are sufficiently displaced and the fresh charge introduced into the cylinder by the time the motor piston has opened the exhaust ports E on the out-stroke and closed them on the return stroke. The two cylinders are so proportioned that the exhaust gases are expelled as completely as possible and replaced by fresh explosive mixture without any material part of this mixture escaping with the exhaust. Unless the proportions are carefully made such an escape is possible. The relative operations of the motor piston C and the displacer piston D are secured by advancing the crank of the displacer about a right angle compared to the motor crank. The motor piston on its in-stroke compresses the mixed charge into the conical space G; and, when compression is complete, the mixture is ignited by the slide valve F. This produces the power explosion which forces the piston forward until the exhaust ports are opened again. By this cycle of operations one power impulse is given for every revolution of the crank. The motor cylinder is surrounded by a water jacket in the usual manner, but it is unnecessary to water-jacket the displacer, as the gases are never hot.

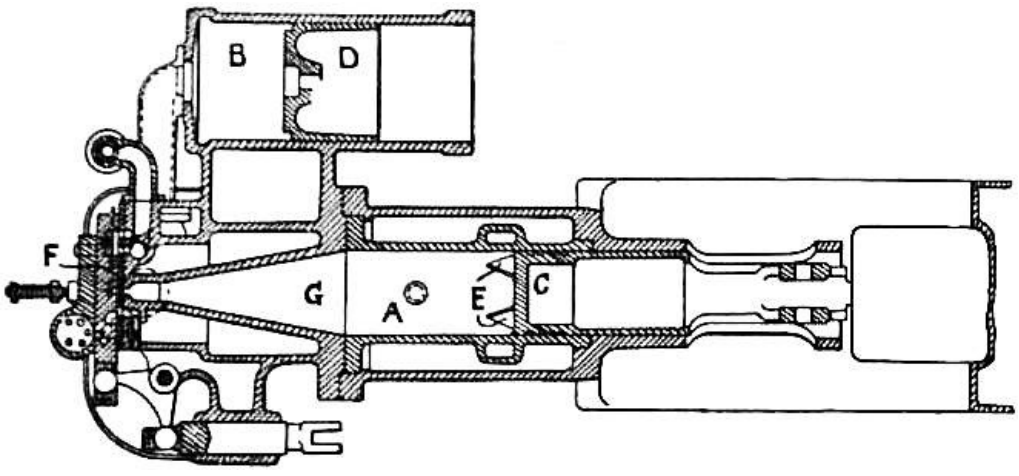

FIG. 4.—Sectional Plan of Clerk Cycle Engine, 1881.

Robson also invented two-cycle engines. His first patent was taken out in 1877 (No. 2334). The engines described in his patents of 1879-1880 were of the two-cycle type, and in them no second cylinder was used. The front end of the motor cylinder was enclosed by a cover and packing box, and was used as a pump to force gas and air into a reservoir at a few

above atmosphere. The motor piston was arranged to overrun ports in the side of the cylinder, but the exhaust discharge was not timed in that way. A separate lift valve controlled the overrun ports and determined when the exhaust should be discharged. When the exhaust was discharged at the end of the stroke the pressure from the gas and air reservoir was admitted by a lift valve to the cylinder to displace the remaining exhaust gases and fill the cylinder with charge. This mixture was compressed into a space at the end of the cylinder and ignited by means of a flame ignition device. Robson's engine was built in considerable numbers by Messrs Tangye of Birmingham, the first exhibited by them at Bingley Hall at the end of 1880. The modern Day engine closely resembles the Robson engine so far as its broad operations are concerned.

Atkinson's work on the gas engine was begun in 1878, his first patent being No. 3212 of 1879. The engine described in that patent somewhat resembled the 1878 engine of Clerk as exhibited at Kilburn. Atkinson was ingenious and persevering in the invention of two-cycle engines. Two of his engines were made in considerable numbers. The first was known as the "Differential" engine, exhibited at the Inventions Exhibition, London, in 1885. A later engine produced by him was called the "Cycle" engine, and it proved to be the most economical of all the motors tested at the Society of Arts trials of motors for electric lighting in 1888-1889. Atkinson joined Crossley Bros., and many of his ingenious contrivances are now at work on the well-known engines of that firm.

Four-cycle engines now practically monopolize the field of the smaller internal combustion engines, and very large engines are also constructed on this plan. The two-cycle, or Clerk cycle engines, however, compete strongly with the four-cycle for large gas engines using blast furnace gas. Koerting engines on the Clerk cycle are now built giving 1000 i.h.p. per double acting motor cylinder, and one power cylinder on this method gives two impulses per revolution. Messrs Mather & Platt build a Koerting engine of a modified type in England; an engine of their construction with a power cylinder of about 29 in. and 40½ in. stroke gives 700 b.h.p.

Fig. 5 shows in longitudinal section the power and pump cylinders of a Mather & Platt Koerting engine on the Clerk cycle; the power cylinder section is shown above that of the pump cylinders, but it is to be understood that both cylinders are in the same horizontal plane as in the Clerk engine shown at fig. 4. The Koerting engine, however, is double acting, whereas the Clerk engine was single acting. The power cylinder A has a power piston A^1 and compression spaces A^2A^3. At the centre of the cylinders are exhaust ports E which open to the atmosphere and are overrun by the piston A^1 at both ends of the stroke. A^4 and A^5 are inlet valves for gas and air. The single acting pump cylinders BB^1 supply the air required for the charge, and the double acting gas cylinder CC^1 supplies the gas. Both gas and air are led from these cylinders by separate passages to the inlet valves A^4A^5. The air pump pistons are lettered B^2B^3 and the gas pump piston C^2. The main crank D connects as usual to the piston rod of the power piston A^1, and the pump crank F to the trunk air pump piston B^2 which drives the other air pump piston B^3 and the gas pump piston C^2 by a piston rod passing through all three. The gas mixture is not made until the inlet valves A^4A^5 are reached, so that no explosive mixture exists until it is formed within the cylinder A. The air is first introduced into the power cylinder to discharge some of the hot gases, and when the gas is also admitted the contents of the cylinder are cooled to some extent. The action of the engine is exactly as described with regard to the Clerk cycle, and the arrangement of the two cranks at about right angles to each other is also similar. The exhaust is discharged through the ports E, and the incoming charge fills the cylinder in the same way as in the Clerk engine.

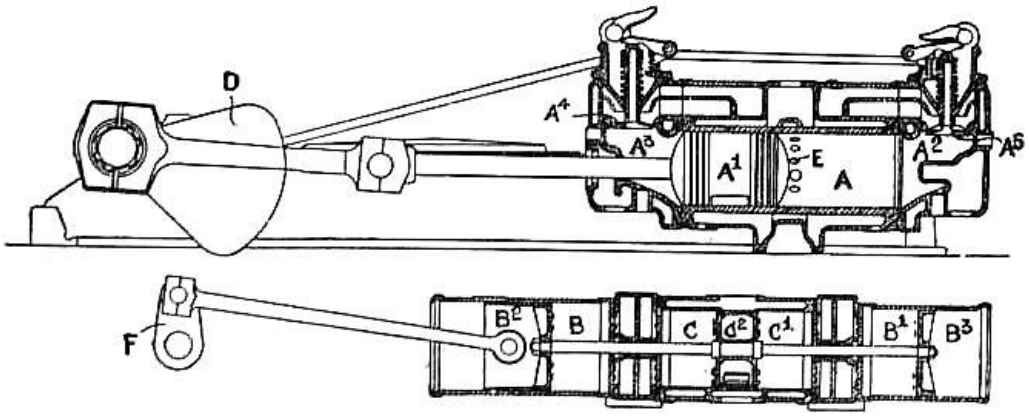

Fig. 5.—Longitudinal Section of Two-Cycle Engine (Koerting-Clerk), new type, by Messrs Mather & Platt, Ltd.

Another large continental gas engine, known as the Oechelhäuser, operates on a modified Clerk cycle and is shown in sectional plan at fig. 6. The motor cylinder A has two pistons A^1A^2, A^1 being operated by a centre and A^2 by two outside cranks, side rods, and cross head; the pistons A^1A^2 thus move in opposite directions and give an effective stroke of double that due to one crank. B is the air and gas pump dealing with air on one side of its piston and gas on the other. A chamber C opens to an air reservoir supplied from the pump and to the power cylinder by ports C^1; a similar chamber D opens to a gas reservoir supplied from the pump and to the power cylinder by ports D^1. The exhaust ports E are provided at the other end of the cylinder. When the front piston overruns the exhaust ports E the pressure within the power cylinder falls to atmosphere; the back piston then opens the air ports C^1 and air under slight pressure flows in, to be followed a little later by gas under slight pressure from the gas ports D^1. In this way the power cylinder A is charged with gas and air mixture at each stroke, and when the pistons A^1A^2 approach each other the charge is compressed into the space between and then ignited by the electric spark. The pistons are then forced apart and perform their power stroke. The Oechelhäuser engine, which is built in Great Britain by Messrs Beardmore of Glasgow, has attained considerable success in driving blowing pumps for blast furnaces, in producing electric light, and in driving iron rolling mills.

Large gas engines are undoubtedly making great progress, as will be seen from the following interesting particulars prepared in 1908 by Mr R.E. Mathot of Brussels giving the numbers and horse power of large gas engines which had then been recently manufactured in Europe:—

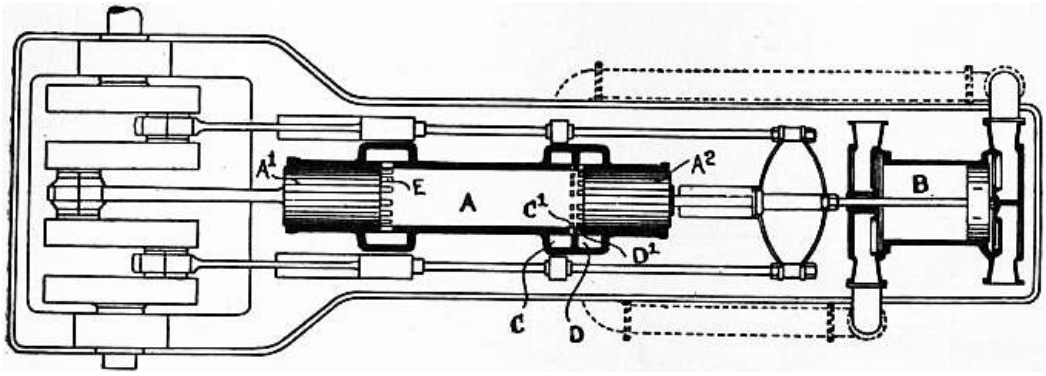

Fig. 6.—Arrangement of Oechelhäuser Gas Engine.

Messrs Crossley Brothers, Limited, 57 motors, with an aggregate of 23,660 h.p.; Messrs Ehrhardt & Sehmer, 59 motors, total, 69,790 h.p.; the Otto Gasmotoren Fabrik, 82, total 47,400 h.p.; Gebrüder Koerting, 198, total 165,760 h.p.; Société Alsacienne, 55, total 23,410 h.p.; Société John Cockerill, 148, total 102,925 h.p.; Société Suisse, Winterthur, 67, total 8620 h.p.; Vereinigte Maschinenfabriken, Augsburg and Nürnberg, 215, total 256,240 h.p. The mean power of each gas engine made by Messrs Ehrhardt & Sehmer and the Augsburg and Nürnberg companies is in each case 1200 h.p. It is stated that in one factory there are gas engines representing a total output of 35,000 h.p. These European large gas engines thus give nearly 575,000 h.p. between them.

The installation of large gas engines has made considerable progress in America. Mr E.L. Adams estimated that 350,000 h.p. was at work or in construction in the United States in 1908. The first large engines were installed at the works of the Lackawanna Steel Co., Buffalo, New York. They were of the Koerting-Clerk type, and were built by the De La Vergne Co. of New York. They included 16 blowing engines, each of 2000 h.p., and 8 engines of 1000 h.p. each, driving dynamos to produce electric light. This large power plant was started in 1902. The Westinghouse Co. of Pittsburgh have also built large engines, several of which are in operation at the various works of the Carnegie Steel Co. These Westinghouse engines are of the horizontal twin tandem type, having two cranks and four double-acting cylinders in each unit, the cylinders being 38 in. in diameter and the stroke 54 in. The Snow Steam Pump Co. have built similar horizontal tandem engines with cylinders of 42 in. diameter and 54 in. stroke. The English Westinghouse Co. have also designed large gas engines, and they exhibited a very interesting vertical multiple cylinder gas engine having four cranks and eight single-acting cylinders, four pairs, in tandem, at the Franco-British Exhibition of 1908; it gave 750 h.p., and the pistons were not watered.

Over two million horse-power of the smaller gas engines are now at work in the world, and certainly above one million horse-power of petrol motors.

The application of large gas engines to marine work, the compounding of the gas engine, and many other matters are being strenuously pursued. Capitaine of Frankfort-on-Main has built several vessels used for towing purposes in which the vessel is driven by gas engines

operated by means of suction gas-producers consuming anthracite. Messrs Thornycroft and Messrs Beardmore in Great Britain have adopted the Capitaine designs, and both firms have applied them to sea-going vessels, Thornycroft to a gas launch which has been tested in the Solent, and Beardmore to an old gunboat, the “Rattler.” The “Rattler” was fitted with five-cylinder Otto cycle engines and suction gas-producers giving 500 i.h.p.; and has sailed some 1500 m. under gas power only. There are many difficulties to be overcome before large light and sufficiently slow-moving gas engines can be installed on board ship, but progress is being made, and without doubt all difficulties will be ultimately surmounted and gas power successfully applied to ships for both large and small power.

The flame and incandescent tube methods of ignition have been displaced by electrical ignition of both high and low tension types; all large gas engines are ignited electrically and generally by more than one igniter per cylinder.

The governing of large gas engines, too, is now effected so as to keep up continuity of impulses by the method either of throttling the charge inlet or by varying the point of admission of gas alone or air and gas mixed.

It may be said, indeed, without exaggeration, that the whole world is now alive to the possibilities of the internal-combustion motor, and that progress will be more and more rapid. This motor has almost fulfilled the expectations of those engineers who have devoted a large part of their lives to its study and advancement. They are looking forward now to the completion of the work begun so many years ago, and expect, at no distant date, to find the internal-combustion motor competing with the steam engine even in its latest form, the steam turbine, on sea as vigorously as it does at present on land.

Thermal Efficiency of Four-Cycle Engines.—The Otto and Clerk type engines are usually designated respectively four-cycle and two-cycle, because in the Otto type four strokes are necessary to complete the power-producing cycle of the engine and in the Clerk engine two strokes complete the cycle.

Indicated thermal efficiency may be defined as the proportion of the total heat of combustion which appears as work done by the explosion and expansion upon the piston. Brake thermal efficiency may be defined as the proportion of the total heat of combustion which appears as work given out by the engine available for overcoming external resistances; that is, brake thermal efficiency is the effective efficiency of the engine for doing work. In the early gas engines the indicated thermal efficiency was only 16%, as shown by tests of Otto engines from about 1877 to 1882, but now indicated thermal efficiencies of from 35% to 37% are often obtained. Some experimenters claim even higher efficiencies, but even 37% is higher than ordinary best practice of 1909. Table I. has been prepared to show this advance. It shows, in addition to indicated thermal efficiency, the brake thermal efficiency and the mechanical efficiency, together with other particulars such as engine dimensions, types and names of experimenters. It will be seen that brake thermal efficiency has also increased from 14% to 32%; that is, practically one-third of the whole heat of combustion is obtained by these engines in effective work available for all motive power purposes.

TABLE I.—*Indicated and Brake Thermal Efficiency of Four-Cycle Engines from 1882 to 1908.*

No.	Mechanical Efficiency.	Names of Experimenters.	Year.	Dimensions of Engine.	Indicated Thermal Efficiency.	Brake Thermal Efficiency.	Type of Engine.
	Per cent.			Diam. Stroke.	Per cent.	Per cent.	
1	87.6	Slaby	1882	6.75″ × 13.7″	16	14	Deutz
2	84.2	Thurston	1884	8.5″ × 14″	17	14.3	Crossley
3	86.1	Society of Arts	1888	9.5″ × 18″	22	18.9	Crossley
4	80.9	Society of Arts	1888	9.02″ × 14″	21	17	Griffin (6-cycle)
5	87.3	Kennedy	1888	7.5″ × 15″	21	18.3	Beck (6-cycle)
6	82.0	Capper	1892	8.5″ × 18″	22.8	17.4	Crossley
7	87.0	Robinson	1898	10″ × 18″	28.7	25	National
8	83	Humphrey	1900	26″ × 36″	31	25.7	Crossley
9	81.7	Witz	1900	51.2″ × 55.13″	28	22.9	Cockerill
10	85.5	Inst. Civil. Eng.	1905	14″ × 22″	35[1]	29.9	National
11	77.1	Burstall	1907	16″ × 24″	41.5[2]	32	Premier
12	87.5	Hopkinson	1908	11.5″ × 21″	36.8	32.2	Crossley

Thermal Efficiency of Two-Cycle Engines.—It has been found that two-cycle engines

present greater practical difficulties in regard to obtaining high indicated and brake thermal efficiencies, but the thermodynamic considerations are not affected by the practical difficulties. As shown by Table II., these engines improved in indicated thermal efficiency from the value of 16.4% attained in 1884 to 38% in 1903, while the brake thermal efficiency rose in the same period from 14% to 29%. The numbers in Table II. are not so well established as those in Table I. The four-cycle engines have been so far subjected to much more rigid and authoritative tests than those of the two-cycle. It is interesting to see from the table that the mechanical efficiency of the early Clerk engines was 84%, while in the later large engines of the same type it has fallen to 75%.

Standards of Thermal Efficiency.—To set up an absolute standard of thermal efficiency it is necessary to know in a complete manner the physical and chemical properties and occurrences in a gaseous explosion. A great deal of attention has been devoted to gaseous explosions by experimenters in England and on the continent of Europe, and much knowledge has been obtained from the work of Mallard and Le Chatelier, Clerk, Langen, Petavel, Hopkinson and Bairstow and Alexander. From these and other experiments it is possible to measure approximately the internal energy or the specific heats of the gases of combustion at very high temperatures, such as 2000° C.; and to advance the knowledge on the subject a committee of the British Association was formed at Leicester in 1907. Recognizing, in 1882, that it was impossible to base any standard cycle of efficiency upon the then existing knowledge of gaseous explosions Dugald Clerk proposed what is called the air standard. This standard has been used for many years, and it was officially adopted by a committee of the Institution of Civil Engineers appointed in 1903, this committee's two reports, dated March 1905 and December 1905, definitely adopting the air-standard cycle as the standard of efficiency for internal combustion engines. This standard assumes that the working fluid is air, that its specific heat is constant throughout the range of temperature, and that the value of the ratio between the specific heat at constant volume and constant pressure is 1.4. The air-standard efficiency for different cycles will be found fully discussed in the report of that committee, but space here only allows of a short discussion of the various cycles using compression previous to ignition.

TABLE II.—*Indicated and Brake Thermal Efficiency of Two-cycle Engines from 1884 to 1908*.

Mechanical Efficiency.	Name of Experimenter.	Year.	Dimensions of Motor Cylinders.		Indicated Thermal Efficiency.	Brake Thermal Efficiency.	Type of Engine.
Per cent.			Diam.	Stroke.	Per cent.	Per cent.	
84	Garrett	1884	9″	× 20″	16.4	14	Clerk-Sterne
..	Stockport Co.	1884	..	..	..	11.2	Andrews & Co.
83	Clerk	1887	9″	× 15″	20.2	16.9	Clerk-Tangye
..	Atkinson	1885	7½″	..	..	15	Atkinson
75	Meyer	1903	26⅝″	× (2″×37½″)	38	29	Oechelhäuser
75	Mather & Platt	1907	..	..	30.6	23	Koerting

For such engines there are three symmetrical thermodynamic cycles, and each cycle has the maximum thermal efficiency possible for the conditions assumed. The three types may be defined as cycles of (1) constant temperature, (2) constant pressure, and (3) constant volume.

The term constant temperature indicates that the supply of heat is added at constant temperature. In this cycle adiabatic compression is assumed to raise the temperature of the working fluid from the lowest to the highest point. The fluid then expands at constant temperature, so that the whole of the heat is added at a constant temperature, which is the highest temperature of the cycle. The heat supply is stopped at a certain period, and then the fluid adiabatically expands until the temperature falls to the lowest temperature. A compression operation then takes place at the lowest temperature, so that the necessary heat is discharged by isothermal compression at the lower temperature. It will be recognized that this is the Carnot cycle, and the efficiency E is the maximum possible between the temperature limits in accordance with the well-known second law of thermo-dynamics. This efficiency is $E = (T - T^1)/T = 1 - T^1/T$, where T is the absolute temperature at which heat is supplied and T^1 the absolute temperature at which heat is discharged.

It is obvious that the temperatures before and after compression are here the same as the lower and the higher temperatures, so that if t be the temperature before compression and t_c the temperature after compression, then $E = 1 - t/t_c$. This equation in effect says that thermal efficiency operating on the Carnot cycle depends upon the temperatures before and after compression.

The constant pressure cycle is so called because heat is added to the working fluid at constant pressure. In this cycle adiabatic compression raises the pressure—not the temperature—from the lower to the higher limit. At the higher limit of pressure, heat is added while the working fluid expands at a constant pressure. The temperature thus increases in proportion to increase of volume. When the heat supply ceases, adiabatic expansion proceeds and reduces the pressure of the working fluid from the higher to the lower point. Again here we are dealing with pressure and not temperature. The heat in this case is discharged from the cycle at the lower pressure but at diminishing temperature. It can be shown in this case also that $E = 1 - t/t_c$, that is, that although the maximum temperature of the working fluid is higher than the temperature of compression and the temperature at the end of adiabatic expansion is higher than the lower temperature, yet the proportion of heat convertible into work is determined here also by the ratio of the temperatures before and after compression.

The constant volume cycle is so called because the heat required is added to the working fluid at constant volume. In this cycle adiabatic compression raises the pressure and temperature of the working fluid through a certain range; the heat supply is added while the volume remains constant, that is, the volume to which the fluid is diminished by compression. Adiabatic expansion reduces the pressure and temperature of the working fluid until the volume is the same as the original volume before compression, and the necessary heat is discharged from the cycle at constant volume during falling temperature. Here also it can be shown that the thermal efficiency depends on the ratio between the temperature before compression and the temperature after compression. It is as before $E = 1 - t/t_c$. Where t is the temperature and v the volume before compression, and t_c the temperature and v_c the volume after adiabatic compression, it can be shown that $(v_c/v)^{\gamma^{-1}} = t/t_c$, so that E may be written

$$E = 1 - \left(\frac{v_c}{v}\right)^{\gamma^{-1}},$$

and if $v_c/v = 1/r$, the compression ratio, then

$$E = 1 - \left(\frac{1}{r}\right)^{\gamma^{-1}}.$$

TABLE III.—*Theoretical Thermal Efficiency for the Three Symmetrical Cycles of Constant Temperature, Pressure and Volume.*

1/r	E		
½	0.026	⅐	0.55
⅓	0.36	1/10	0.61
¼	0.43	1/20	0.70
⅕	0.48	1/100	0.85

Thus in all three symmetrical cycles of constant temperature, constant pressure and constant volume the thermal efficiency depends only on the ratio of the maximum volume before compression to the volume after compression; and, given this ratio, called 1/r, which does not depend in any way upon temperature determinations but only upon the construction and valve-setting of the engine, we have a means of settling the ideal efficiency proper for the particular engine. Any desired ideal efficiency may be obtained from any of the cycles by selecting a suitable compression ratio. Table III., giving the theoretical thermal efficiency for these three symmetrical cycles of constant temperature, pressure and volume, extends from a compression ratio of ½ to 1/100th. Such compression ratios as 100 are, of course, not used in practice. The ordinary value in constant volume engines ranges from ⅕th to ⅐th. In the Diesel engine, which is a constant pressure engine, the ratio is usually 1/12th. As the value of 1/r increases beyond certain limits, the effective power for given cylinder dimensions diminishes, because the temperature of compression is rapidly approaching the maximum temperature possible by explosion; thus a compression of 1/100th raises the temperature of air from 17° C. to about 1600° C, and as 2000º C. is the highest available explosion temperature for ordinary purposes, it follows that a very small amount of work would be possible from an engine using such compressions, apart from other mechanical considerations. It has long been recognized that constant pressure and constant volume engines have the same thermal efficiency for similar range of compression temperature, but Prof. H.L. Callendar first pointed out the interesting fact that a Carnot cycle engine is equally dependent upon the ratio of the temperature before and after compression, and that its efficiency for a given compression ratio is the same as the efficiencies proper for constant

pressure and constant volume engines. Prof. Callendar demonstrated this at a meeting of the Institution of Civil Engineers Committee on thermal standards in 1904. The work of this committee, together with Clerk's investigations, prove that in modern gas-engines up to to 50 h.p. it may be taken that the best result possible in practice is given by multiplying the air-standard value by .7. For instance, an engine with a compression ratio of one-third has an air-standard efficiency of 0.36, and the actual indicated efficiency of a well-designed engine should be .36 multiplied by .7 = 0.25. If, however, the compression ratio be raised to one-fifth, then the air-standard value .48 multiplied by .7 gives .336. The ideal efficiency of the real working fluid can be proved to be about 20% short of the air-standard values given.

(D. C.)

1 The value 35% is deduced by the author from the Inst. C.E. Committee's values.

2 This value is, in the author's view, too high; probably due to indicator error.

GASKELL, ELIZABETH CLEGHORN (1810-1865), English novelist and biographer, was born on the 29th of September 1810 in Lindsay Row, Chelsea, London, since destroyed to make way for Cheyne Walk. Her father, William Stevenson (1772-1829), came from Berwick-on-Tweed, and had been successively Unitarian minister, farmer, boarding-house keeper for students at Edinburgh, editor of the *Scots Magazine*, and contributor to the *Edinburgh Review*, before he received the post of Keeper of the Records to the Treasury, which he held until his death. His first wife, Elizabeth Holland, was Mrs Gaskell's mother. She was a Holland of Sandlebridge, Knutsford, Cheshire, in which county the family name had long been and is still of great account. Mrs Stevenson died a month after her daughter was born, and the babe was carried into Cheshire to Knutsford to be adopted by her aunt, Mrs Lumb. Thus her childhood was spent in the pleasant environment that she has idealized in *Cranford*. At fifteen years of age she went to a boarding-school at Stratford-on-Avon, kept by Miss Byerley, where she remained until her seventeenth year. Then came occasional visits to London to see her father and his second wife, and after her father's death in 1829 to her uncle, Swinton Holland. Two winters seem to have been spent in Newcastle-on-Tyne In the family of William Turner, a Unitarian minister, and a third in Edinburgh. On the 30th of August 1832 she was married in the parish church of Knutsford to William Gaskell, minister of the Unitarian chapel in Cross Street, Manchester, and the author of many treatises and sermons in support of his own religious denomination. Mr Gaskell held the chair of English history and literature in Manchester New College.

Henceforth Mrs Gaskell's life belonged to Manchester. She and her husband lived first in Dover Street, then in Rumford Street, and finally in 1850 at 84 Plymouth Grove. Her literary life began with poetry. She and her husband aspired to emulate George Crabbe and write the annals of the Manchester poor. One poetic "Sketch," which appeared in *Blackwood's Magazine* for January 1837, seems to have been the only outcome of this ambition. Henceforth, while in perfect union in all else, husband and wife were to go their separate literary ways, Mrs Gaskell to become a successful novelist, whose books were to live side by side with those of greater masters, Mr Gaskell to be a distinguished Unitarian divine, whose sermons, lectures and hymns are now all but forgotten. In her earlier married life Mrs Gaskell was mainly occupied with domestic duties—she had seven children—and philanthropic work among the poor. Her first published prose effort was probably a letter that she addressed to William Howitt on hearing that he contemplated a volume entitled *Visits to Remarkable Places*. She then told the legend of Clopton Hall, Warwickshire, as she had heard it in schooldays, and Howitt incorporated the letter in that book, which was published in 1840. Serious authorship, however, does not seem to have been commenced until four or five years later. In 1844 Mr and Mrs Gaskell visited North Wales, where their only son "Willie" died of scarlet fever at the age of ten months, and it was, it is said, to distract Mrs Gaskell from her sorrow that her husband suggested a long work of fiction, and *Mary Barton* was begun. There were earlier short stories in *Howitt's Journal*, where "Libbie Marsh's Three Eras" and "The Sexton's Hero" appeared in 1847. But it was *Mary Barton: A Tale of Manchester Life* that laid the foundation of Mrs Gaskell's literary career. It was completed in 1847 and offered to a publisher who returned it unread. It was then sent to Chapman & Hall, who retained the manuscript for a year without reading it or communicating with the author. A reminder, however, led to its being sought for, considered and accepted, the publishers agreeing to pay the author £100 for the copyright. It was

published anonymously in two volumes in 1848. This story had a wide popularity, and its author secured first the praise and then the friendship of Carlyle, Landor and Dickens. Dickens indeed asked her in 1850 to become a contributor to his new magazine *Household Words*, and here the whole of *Cranford* appeared at intervals from December 1851 to May 1853, exclusive of one sketch, reprinted in the "World's Classics" edition (1907), that was published in *All the Year Round* for November 1863. Earlier than this, indeed, for the very first number of *Household Words* she had written "Lizzie Leigh." Mrs Gaskell's second book, however, was *The Moorland Cottage*, a dainty little volume that appeared at Christmas 1850 with illustrations by Birket Foster. In the Christmas number of *Household Words* for 1853 appeared "The Squire's Story," reprinted in *Lizzie Leigh and other Tales* in 1865. In 1853 appeared another long novel, *Ruth*, and the incomparable *Cranford*. This last—now the most popular of her books—is an idyll of village life, largely inspired by girlish memories of Knutsford and its people. In *Ruth*, which first appeared in three volumes, Mrs Gaskell turned to a delicate treatment of a girl's betrayal and her subsequent rescue. Once more we are introduced to Knutsford, thinly disguised, and to the little Unitarian chapel in that town where the author had worshipped in early years. In 1855 *North and South* was published. It had previously appeared serially in *Household Words*. Then came—in 1857—the *Life of Charlotte Brontë*, in two volumes. Miss Brontë, who had enjoyed the friendship of Mrs Gaskell and had exchanged visits, died in March 1855. Two years earlier she had begged her publishers to postpone the issue of her own novel *Villette* in order that her friend's *Ruth* should not suffer. This biography, by its vivid presentation of the sad, melancholy and indeed tragic story of the three Brontë sisters, greatly widened the interest in their writings and gave its author a considerable place among English biographers. But much matter was contained in the first and second editions that was withdrawn from the third. Certain statements made by the writer as to the school of Charlotte Brontë's infancy, an identification of the "Lowood" of *Jane Eyre* with the existing school, and the acceptance of the story of Bramwell Brontë's ruin having been caused by the woman in whose house he had lived as tutor, brought threats of libel actions. Apologies were published, and the third edition of the book was modified, as Mrs Gaskell declares, by "another hand." The book in any case remains one of the best biographies in the language. An introduction by Mrs Gaskell to the then popular novel, *Mabel Vaughan*, was also included in her work of this year 1857, but no further book was published by her until 1859, when, under the title of *Round the Sofa*, she collected many of her contributions to periodical literature. *Round the Sofa* appeared in two volumes, the first containing only "My Lady Ludlow," the second five short stories. These stories reappeared the same year in one volume as *My Lady Ludlow and other Tales*. In the next year 1860 appeared yet another volume of short stories, entitled *Right at Last and other Tales*. The title story had appeared two years earlier in *Household Words* as "The Sin of a Father." In 1862 Mrs Gaskell wrote a preface to a little book by Colonel Vecchj, translated from the Italian—*Garibaldi and Caprera*, and in 1863 she published her last long novel, *Sylvia's Lovers*, dedicated "to My dear Husband by her who best knows his Value." After this we have—in 1863—a one-volume story, *A Dark Night's Work*, and in the same year *Cousin Phyllis and other Tales* appeared. Reprinted short stories from *All the Year Round*, *Cornhill Magazine*, and other publications, tend to lengthen the number of books published by Mrs Gaskell during her lifetime. *The Grey Woman and other Tales* appeared in 1865.

Mrs Gaskell died on the 12th of November 1865 at Holyburn, Alton, Hampshire, in a house she had just purchased with the profits of her writings as a present for her husband. She was buried in the little graveyard of the Knutsford Unitarian church. Her unfinished novel *Wives and Daughters* was published in two volumes in 1866.

Mrs Gaskell has enjoyed an ever gaining popularity since her death. *Cranford* has been published in a hundred forms and with many illustrators. It is unanimously accepted as a classic. Scarcely less recognition is awarded to the *Life of Charlotte Brontë*, which is in every library. The many volumes of novels and stories seemed of less secure permanence until the falling in of their copyrights revealed the fact that a dozen publishers thought them worth reprinting. The most complete editions, however, are the "Knutsford Edition," edited with introductions by A.W. Ward, in eight volumes (Smith, Elder), and the "World's Classics" edition, edited by Clement Shorter, in 10 volumes (Henry Froude, 1908).

There is no biography of Mrs Gaskell, she having forbidden the publication of any of her letters. See, however, the biographical introduction to the "Knutsford" *Mary Barton* by A.W. Ward; the *Letters of Charles Dickens*; *Women Writers*, by C.J. Hamilton, second series; *H.B. Stowe's Life and Letters*, edited by Annie Fields; *Autobiography of Mrs Fletcher*; *Mrs Gaskell and Knutsford*, by G.A. Payne; *Cranford*, with a preface by Anne Thackeray Ritchie; *Écrivains modernes de l'Angleterre*, by Émile Montégut.

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