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THE ENCYCLOPÆDIA BRITANNICA

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Horticulture to Hudson Bay

Articles in This Slice

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HORTICULTURE (Lat. *hortus*, a garden), the art and science of the cultivation of garden plants, whether for utilitarian or for decorative purposes. The subject naturally divides itself into two sections, which we here propose to treat separately, commencing with the science, and passing on to the practice of the cultivation of flowers, fruits and vegetables as applicable to the home garden. The point of view taken is necessarily, as a rule, that of a British gardener. 741

Part I.—Principles or Science of Horticulture

Horticulture, apart from the mechanical details connected with the maintenance of a garden and its appurtenances, may be considered as the application of the principles of plant physiology to the cultivation of plants from all parts of the globe, and from various altitudes, soils and situations. The lessons derived from the abstract principles enunciated by the physiologist, the chemist and the physicist require, however, to be modified to suit the special circumstances of plants under cultivation. The necessity for this modification arises from the fact that such plants are subjected to conditions more or less unnatural to them, and that they are grown for special purposes which are at variance, in degree at any rate, with their natural requirements.

The life of the plant (see Plants) makes itself manifest in the processes of growth, development and reproduction. By growth is here meant mere increase in bulk, and by development the series of gradual modifications by which a plant, originally simple in its structure and conformation, becomes eventually complicated, and endowed with distinct parts or organs. The reproduction of the higher plants takes place either asexually by the formation of buds or organs answering thereto, or sexually by the production of an embryo plant within the seed. The conditions requisite for the growth, development and reproduction of plants are, in general terms, exposure, at the proper time, to suitable amounts of light, heat and moisture, and a due supply of appropriate food. The various amounts of these needed in different cases have to be adjusted by the gardener, according to the nature of the plant, its “habit” or general mode of growth in its native country, and the influence to which it is there subjected, as also in accordance with the purposes for which it is to be cultivated, &c. It is but rarely that direct information on all these points can be obtained; but inference from previous experience, especially with regard to allied forms, will go far to supply such deficiencies. Moreover, it must be remembered that the conditions most favourable to plants are not always those to which they are subjected in nature, for, owing to the competition of other forms in the struggle for existence, liability to injury from insects, and other adverse circumstances, plants may actually be excluded from the localities best suited for their development. The gardener therefore may, and does, by modifying, improve upon the conditions under which a plant naturally exists. Thus it frequently happens that in our gardens flowers have a beauty and a fragrance, and fruits a size and savour denied to them in their native haunts. It 742
behooves the judicious gardener, then, not to be too slavish in his attempts to imitate natural conditions, and to bear in mind that such attempts sometimes end in failure. The most successful gardening is that which turns to the best account the plastic organization of the plant, and enables it to develop and multiply as perfectly as possible. Experience, coupled with observation and reflection, as well as the more indirect teachings of tradition, are therefore of primary importance to the practical gardener.

We propose here to notice briefly the several parts of a flowering plant, and to point out the rationale of the cultural procedures connected with them (see the references to separate articles at the end of article on Botany).

The Root.—The root, though not precluded from access of air, is not directly dependent for its growth on the agency of light. The efficiency of drainage, digging, hoeing and like operations is accounted for by the manner in which they promote aeration of the soil, raise its temperature and remove its stagnant water. Owing to their growth in length at, or rather in the immediate vicinity of, their tips, roots are enabled to traverse long distances by surmounting some obstacles, penetrating others, and insinuating themselves into narrow crevices. As they have no power of absorbing solid materials, their food must be of a liquid or gaseous character. It is taken up from the interstices between the particles of soil exclusively by the finest subdivisions of the fibrils, and in many cases by the extremely delicate thread-like cells which project from them and which are known as root-hairs. The importance of the root-fibres, or “feeding roots” justifies the care which is taken by every good gardener to secure their fullest development, and to prevent as far as possible

any injury to them in digging, potting and transplanting, such operations being therefore least prejudicial at seasons when the plant is in a state of comparative rest.

Root-Pruning and Lifting.—In apparent disregard of the general rule just enunciated is the practice of root-pruning fruit trees, when, from the formation of wood being more active than that of fruit, they bear badly. The contrariety is more apparent than real, as the operation consists in the removal of the coarser roots, a process which results in the development of a mass of fine feeding roots. Moreover, there is a generally recognised quasi-antagonism between the vegetative and reproductive processes, so that, other things being equal, anything that checks the one helps forward the other.

Watering.—So far as practical gardening is concerned, feeding by the roots after they have been placed in suitable soil is confined principally to the administration of water and, under certain circumstances, of liquid or chemical manure; and no operations demand more judicious management. The amount of water required, and the times when it should be applied, vary greatly according to the kind of plant and the object for which it is grown, the season, the supply of heat and light, and numerous other conditions, the influence of which is to be learnt by experience only. The same may be said with respect to the application of manures. The watering of pot-plants requires especial care. Water should as a rule be used at a temperature not lower than that of the surrounding atmosphere, and preferably after exposure for some time to the air.

Bottom-Heat.—The “optimum” temperature, or that best suited to promote the general activity of roots, and indeed of all vegetable organs, necessarily varies very much with the nature of the plant, and the circumstances in which it is placed, and is ascertained by practical experience. Artificial heat applied to the roots, called by gardeners “bottom-heat,” is supplied by fermenting materials such as stable manure, leaves, &c., or by hot-water pipes. In winter the temperature of the soil, out of doors, beyond a certain depth is usually higher than that of the atmosphere, so that the roots are in a warmer and more uniform medium than are the upper parts of the plant. Often the escape of heat from the soil is prevented by “mulching,” *i.e.* by depositing on it a layer of litter, straw, dead leaves and the like.

The *Stem* and its subdivisions or branches raise to the light and air the leaves and flowers, serve as channels for the passage to them of fluids from the roots, and act as reservoirs for nutritive substances. Their functions in annual, biennial and herbaceous perennial plants cease after the ripening of the seed, whilst in plants of longer duration layer after layer of strong woody tissue is formed, which enables them to bear the strains which the weight of foliage and the exposure to wind entail. The gardener aims usually at producing stout, robust, short-jointed stems, instead of long lanky growths defective in woody tissue. To secure these conditions free exposure to light and air is requisite; but in the case of coppices and woods, or where long straight spars are needed by the forester, plants are allowed to grow thickly so as to ensure development in an upward rather than in a lateral direction. This and like matters will, however, be more fitly considered in dealing hereafter with the buds and their treatment.

Leaves.—The work of the leaves may briefly be stated to consist of the processes of nutrition, respiration and transpiration. Nutri tion (assimilation) by the leaves includes the inhalation of air, and the interaction under the influence of light and in the presence of chlorophyll of the carbon dioxide of the air with the water received from the root, to form carbonaceous food. Respiration in plants, as in other organisms, is a process that goes on by night as well as by day and consists in plants in the breaking up of the complex carbonaceous substances formed by assimilation into less complex and more transportable substances. This process, which is as yet imperfectly understood, is attended by the consumption of oxygen, the liberation of energy in the form of heat, and the exhalation of carbon dioxide and water vapour. Transpiration is loss of water by the plant by evaporation, chiefly from the minute pores or stomata on the leaves. In xerophytic plants (*e.g.* cacti, euphorbias, &c.) from hot, dry and almost waterless regions where evaporation would be excessive, the leaf surface, and consequently the number of stomata, are reduced to a minimum, as it would be fatal to such plants to exhale vapour as freely in those regions as the broad-leaved plants that grow in places where there is abundance of moisture. Although transpiration is a necessary accompaniment of nutrition, it may easily become excessive, especially where the plant cannot readily recoup itself. In these circumstances “syringing” and “damping down” are of value in cooling the temperature of the air in hothouses and greenhouses and increasing its humidity, thereby checking excessive transpiration. Shading the glass with canvas or washes during the summer months has the same object in view. Syringing is also beneficial in washing away dirt and insects.

Buds.—The recognition of the various forms of buds and their modes of disposition in different plants is a matter of the first consequence in the operations of pruning and training. Flower-buds are produced either on the old wood, *i.e.* the shoots of the past year’s growth, or on a shoot of the present year. The peach, horse-chestnut, lilac, morello cherry, black currant, rhododendron and many other trees and shrubs develop flower-buds for the next season speedily after blossoming, and these may be stimulated into premature growth. The peculiar short, stunted branches or “spurs” which bear the flower-buds of the pear, apple, plum, sweet cherry, red currant, laburnum, &c., deserve special attention. In the rose, passion-flower, clematis, honeysuckle, &c., in which the flower-buds are developed at the ends of the young shoot of the year, we have examples of plants destitute of flower-buds during the winter.

Propagation by Buds.—The detached leaf-buds (*gemmae* or *bulbils*), of some plants are capable

under favourable conditions of forming new plants. The edges of the leaves of *Bryophyllum calycinum* and of *Cardamine pratensis*, and the growths in the axils of the leaves of *Lilium bulbiferum*, as well as the fronds of certain ferns (*e.g. Asplenium bulbiferum*), produce buds of this character. It is a matter of familiar observation that the ends of the shoots of brambles take root when bent down to the ground. In some instances buds form on the roots, and may be used for purposes of propagation, as in the Japan quince, the globe thistle, the sea holly, some sea lavenders, *Bocconia*, *Acanthus*, &c. Of the tendency in buds to assume an independent existence gardeners avail themselves in the operations of striking "cuttings," and making "layers" and "pipings," as also in budding and grafting. In taking a slip or cutting the gardener removes from the parent plant a shoot having one or more buds or "eyes," in the case of the vine one only, and places it in a moist and sufficiently warm situation, where, as previously mentioned, undue evaporation from the surface is prevented. For some cuttings, pots filled with light soil, with the protection of the propagating-house and of bell-glasses, are requisite; but for many of our hardy deciduous trees and shrubs no such precautions are necessary, and the insertion of a short shoot about half its length into moist and gritty ground at the proper season suffices to ensure its growth. In the case of the more delicate plants, the formation of roots is preceded by the production from the cambium of the cuttings of a succulent mass of tissue, the *callus*. It is important in some cases, *e.g.* zonal pelargoniums, fuchsias, shrubby calceolarias, dahlias, carnations, &c., to retain on the cutting some of its leaves, so as to supply the requisite food for storage in the callus. In other cases, where the buds themselves contain a sufficiency of nutritive matter for the young growths, the retention of leaves is not necessary. The most successful mode of forming roots is to place the cuttings in a mild bottom-heat, which expedites their growth, even in the case of many hardy plants whose cuttings strike roots in the open soil. With some hard-wooded trees, as the common white-thorn, roots cannot be obtained without bottom-heat. It is a general rule throughout plant culture that the activity of the roots shall be in advance of that of the leaves. Cuttings of deciduous trees and shrubs succeed best if planted early in autumn while the soil still retains the solar heat absorbed during summer. For evergreens August or September, and for greenhouse and stove-plants the spring and summer months, are the times most suitable for propagation by cuttings.

Layering consists simply in bending down a branch and keeping it in contact with or buried to a small depth in the soil until roots are formed; the connexion with the parent plant may then be severed. Many plants can be far more easily propagated thus than by cuttings.

Grafting or "*working*" consists in the transfer of a branch, the "graft" or "scion," from one plant to another, which latter is termed the "stock." The operation must be so performed that the growing tissues, or cambium-layer of the scion, may fit accurately to the corresponding layer of the stock. In *budding*, as with roses and peaches, a single bud only is implanted. *Inarching* is essentially the promotion of the union of a shoot of one plant to that of another of the same or allied species or variety. The outer bark of each being removed, the two shoots are kept in contact by ligature until union is established, when the scion is completely severed from its original attachments. This operation is varied in detail according to the kind of plant to be propagated, but it is essential in all cases that the affinity between the two plants be near, that the union be neatly effected, and that the ratio as well as the season of growth of stock and scion be similar.

The selection of suitable stocks is a matter still requiring much scientific experiment. The object of grafting is to expedite and increase the formation of flowers and fruit. Strong-growing pears, for instance, are grafted on the quince stock in order to restrict their tendency to form "gross" shoots and a superabundance of wood in place of flowers and fruit. Apples, for the same reason, are "worked" on the "paradise" or "doucin" stocks, which from their influence on the scion are known as dwarfing stocks. Scions from a tree which is weakly, or liable to injury by frosts, are strengthened by engrafting on robust stocks. Lindley has pointed out that, while in Persia, its native country, the peach is probably best grafted on the peach, or on its wild type the almond, in England, where the summer temperature of the soil is much lower than that of Persia, it might be expected, as experience has proved, to be most successful on stocks of the native plum.

The soil in which the stock grows is a point demanding attention. From a careful series of experiments made in the Horticultural Society's Garden at Chiswick, it was found that where the soil is loamy, or light and slightly enriched with decayed vegetable matter, the apple succeeds best on the doucin stock, and the pear on the quince; and where it is chalky it is preferable to graft the apple on the crab, and the pear on the wild pear. For the plum on loamy soils the plum, and on chalky and light soils the almond, are the most desirable stocks, and for the cherry on loamy or light rich soils the wild cherry, and on chalk the "mahaleb" stock.

The form and especially the quality of fruit is more or less affected by the stock upon which it is grown. The Stanwick nectarine, so apt to crack and not to ripen when worked in the ordinary way, is said to be cured of these propensities by being first budded close to the ground, on a very strong-growing Magnum Bonum plum, worked on a Brussels stock, and by then budding the nectarine on the Magnum Bonum about a foot from the ground. The fruit of the pear is of a higher colour and smaller on the quince stock than on the wild pear; still more so on the medlar. On the mountain ash the pear becomes earlier.

The effects produced by stock on scion, and more particularly by scion on stock, are as a rule with difficulty appreciable. Nevertheless, in exceptional cases modified growths, termed "graft-hybrids," have been obtained which have been attributed to the commingling of the characteristics of stock and scion (see Hybridism). Of these the most remarkable example is *Cytisus Adami*, a tree

which year after year produces some shoots, foliage and flowers like those of the common laburnum, others like those of the very different looking dwarf shrub *C. purpureus*, and others again intermediate between these. We may hence infer that *C. purpureus* was grafted or budded on the common laburnum, and that the intermediate forms are the result of graft-hybridization. Numerous similar facts have been recorded. Among gardeners the general opinion is against the possibility of graft-hybridization. The wonder, however, seems to be that it does not occur more frequently, seeing that fluids must pass from stock to scion, and matter elaborated in the leaves of the scion must certainly to some extent enter the stock. It is clear, nevertheless, from examination that as a rule the wood of the stock and the wood of the scion retain their external characters year by year without change. Still, as in the laburnum just mentioned, in the variegated jasmine and in *Abutilon Darwinii*, in the copper beech and in the horse-chestnut, the influence of a variegated scion has occasionally shown itself in the production from the stock of variegated shoots. At a meeting of the Scottish Horticultural Association (see *Gard. Chron.*, Jan. 10, 1880, figs. 12-14) specimens of a small roundish pear, the “Aston Town,” and of the elongated kind known as “Beurré Clairgeau,” were exhibited. Two more dissimilar pears hardly exist. The result of working the Beurré Clairgeau upon the Aston Town was the production of fruits precisely intermediate in size, form, colour, speckling of rind and other characteristics. Similar, though less marked, intermediate characters were obvious in the foliage and flowers.

Double grafting (French, *greffe sur greffe*) is sufficiently explained by its name. By means of it a variety may often be propagated, or its fruit improved in a way not found practicable under ordinary circumstances. For its successful prosecution prolonged experiments in different localities and in gardens devoted to the purpose are requisite.

Planting.—By removal from one place to another the growth of every plant receives a check. How this check can be obviated or reduced, with regard to the season, the state of atmosphere, and the condition and circumstances of the plant generally, is a matter to be considered by the practical gardener.

As to season, it is now admitted with respect to deciduous trees and shrubs that the earlier in autumn planting is performed the better; although some extend it from the period when the leaves fall to the first part of spring, before the sap begins to move. If feasible, the operation should be completed by the end of November, whilst the soil is still warm with the heat absorbed during summer. Attention to this rule is specially important in the case of rare and delicate plants. Early autumn planting enables wounded parts of roots to be healed over, and to form fibrils, which will be ready in spring, when it is most required, to collect food for the plant. Planting late in spring should, as far as possible, be avoided, for the buds then begin to awaken into active life, and the draught upon the roots becomes great. It has been supposed that because the surface of the young leaves is small transpiration is correspondingly feeble; but it must be remembered, not only that their newly-formed tissue is unable without an abundant supply of sap from the roots to resist the excessive drying action of the atmosphere, but that, in spring, the lowness of the temperature at that season in Great Britain prevents the free circulation of the sap. The comparative dryness of the atmosphere in spring also causes a greater amount of transpiration then than in autumn and winter. Another fact in favour of autumnal planting is the production of roots in winter.

The best way of performing transplantation depends greatly on the size of the trees, the soil in which they grow, and the mechanical appliances made use of in lifting and transporting them. The smaller the tree the more successfully can it be removed. The more argillaceous and the less siliceous the soil the more readily can balls of earth be retained about the roots. All planters lay great stress on the preservation of the fibrils; the point principally disputed is to what extent they can with safety be allowed to be cut off in transplantation. Trees and shrubs in thick plantations, or in sheltered warm places, are ill fitted for planting in bleak and cold situations. During their removal it is important that the roots be covered, if only to prevent desiccation by the air. Damp days are therefore the best for the operation; the dryest months are the most unfavourable. Though success in transplanting depends much on the humidity of the atmosphere, the most important requisite is warmth in the soil; humidity can be supplied artificially, but heat cannot.

Pruning, or the removal of superfluous growths, is practised in order to equalize the development of the different parts of trees, or to promote it in particular directions so as to secure a certain form, and, by checking undue luxuriance, to promote enhanced fertility. In the rose-bush, for instance, in which, as we have seen, the flower-buds are formed on the new wood of the year, pruning causes the old wood to “break,” *i.e.* to put forth a number of new buds, some of which will produce flowers at their extremities. The manner and the time in which pruning should be accomplished, and its extent, vary with the plant, the objects of the operation, *i.e.* whether for the production of timber or fruit, the season and various other circumstances. So much judgment and experience does the operation call for that it is a truism to say that bad pruning is worse than none. The removal of weakly, sickly, overcrowded and gross infertile shoots is usually, however, a matter about which there can be few mistakes when once the habit of growth and the form and arrangement of the buds are known. Winter pruning is effected when the tree is comparatively at rest, and is therefore less liable to “bleeding” or outpouring of sap. Summer pruning or pinching off the tips of such of the younger shoots as are not required for the extension of the tree, when not carried to too great an extent, is preferable to the coarser more reckless style of pruning. The injury inflicted is less and not so concentrated; the wounds are smaller, and have time to heal before winter sets in. The effects of badly-executed pruning, or rather hacking, are most noticeable in the case of forest trees, the mutilation of which often results in rotting, canker and other

diseases. Judicious and timely thinning so as to allow the trees room to grow, and to give them sufficiency of light and air, will generally obviate the need of the pruning-saw, except to a relatively small extent.

Training is a procedure adopted when it is required to grow plants in a limited area, or in a particular shape, as in the case of many plants of trailing habit. Judicious training also may be of importance as encouraging the formation of flowers and fruit. Growth in length is mainly in a vertical direction, or at least at the ends of the shoots; and this should be encouraged, in the case of a timber tree, or of a climbing plant which it is desired should cover a wall quickly; but where flowers or fruit are specially desired, then, when the wood required is formed, the lateral shoots may often be trained more or less downward to induce fertility. The refinements of training, as of pruning, may, however, be carried too far; and not unfrequently the symmetrically trained trees of the French excite admiration in every respect save fertility.

Sports or Bud Variations.—Here we may conveniently mention certain variations from the normal condition in the size, form or disposition of buds or shoots on a given plant. An inferior variety of pear, for instance, may suddenly produce a shoot bearing fruit of superior quality; a beech tree, without obvious cause, a shoot with finely divided foliage; or a camellia an unwontedly fine flower. When removed from the plant and treated as cuttings or grafts, such sports may be perpetuated. Many garden varieties of flowers and fruits have thus originated. The cause of their production is very obscure.

Formation of Flowers.—Flowers, whether for their own sake or as the necessary precursors of the fruit and seed, are objects of the greatest concern to the gardener. As a rule they are not formed until the plant has arrived at a certain degree of vigour, or until a sufficient supply of nourishment has been stored in the tissues of the plant. The reproductive process of which the formation of the flower is the first stage being an exhaustive one, it is necessary that the plant, as gardeners say, should get “established” before it flowers. Moreover, although the green portions of the flower do indeed perform the same office as the leaves, the more highly coloured and more specialized portions, which are further removed from the typical leaf-form, do not carry on those processes for which the presence of chlorophyll is essential; and the floral organs may, therefore, in a rough sense, be said to be parasitic upon the green parts. A check or arrest of growth in the vegetative organs seems to be a necessary preliminary to the development of the flower.

A diminished supply of water at the root is requisite, so as to check energy of growth, or rather to divert it from leaf-making. Partial starvation will sometimes effect this; hence the grafting of free-growing fruit trees upon dwarfing stocks, as before alluded to, and also the “ringing” or girdling of fruit trees, *i.e.* the removal from the branch of a ring of bark, or the application of a tight cincture, in consequence of which the growth of the fruits above the wound or the obstruction is enhanced. On the same principle the use of small pots to confine the roots, root-pruning and lifting the roots, and exposing them to the sun, as is done in the case of the vine in some countries, are resorted to. A higher temperature, especially with deficiency of moisture, will tend to throw a plant into a flowering condition. This is exemplified by the fact that the temperature of the climate of Great Britain is too low for the flowering, though sufficiently high for the growth of many plants. Thus the Jerusalem artichoke, though able to produce stems and tubers abundantly, only flowers in exceptionally hot seasons.

Forcing.—The operation of forcing is based upon the facts just mentioned. By subjecting a plant to a gradually increasing temperature, and supplying water in proportion, its growth may be accelerated; its season of development may be, as it were, anticipated; it is roused from a dormant to an active state. Forcing therefore demands the most careful adjustment of temperature and supplies of moisture and light.

Deficiency of light is less injurious than might at first be expected, because the plant to be forced has stored up in its tissues, and available for use, a reserve stock of material formed through the agency of light in former seasons. The intensity of the colour of flowers and the richness of flavour of fruit are, however, deficient where there is feebleness of light. Recent experiments show that the influence of electric light on chlorophyll is similar to that of sunlight, and that deficiencies of natural light may to some extent be made good by its use. The employment of that light for forcing purposes would seem to be in part a question of expense. The advantage hitherto obtained from its use has consisted in the rapidity with which flowers have been formed and fruits ripened under its influence, circumstances which go towards compensating for the extra cost of production.

Retardation.—The art of retarding the period of flowering in certain plants consists, in principle, in the artificial application of cold temperatures whereby the resting condition induced by low winter temperature is prolonged. For commercial purposes, crowns of lily of the valley, tulip and other bulbs, and such deciduous woody plants as lilac and deciduous species of rhododendron, while in a state of rest, are packed in wet moss and introduced into cold-storage chambers, where they may be kept in a state of quiescence, it desired, throughout the following summer. The temperature of the cold chamber is varied from the freezing-point of water, to a few degrees lower, according to the needs of the plants under treatment. When required for use they are removed to cool sheds to thaw, and are then gradually inured to higher temperatures. The chief advantages of retarded plants are:—(*a*) they may be flowered almost at will; (*b*) they are readily induced to flower at those times when unretarded plants refuse to respond to forcing. Cold-storage chambers form a part of the equipment of most of the leading establishments where flowers are grown for market.

Double Flowers.—The taste of the day demands that “double flowers” should be largely grown. Though in many instances, as in hyacinths, they are less beautiful than single ones, they always present the advantage of being less evanescent. Under the vague term “double” many very different morphological changes are included. The flower of a double dahlia, *e.g.* offers a totally different condition of structure from that of a rose or a hyacinth. The double poinsettia, again, owes its so-called double condition merely to the increased number of its scarlet involucral leaves, which are not parts of the flower at all. It is reasonable, therefore, to infer that the causes leading to the production of double flowers are varied. A good deal of difference of opinion exists as to whether they are the result of arrested growth or of exuberant development, and accordingly whether restricted food or abundant supplies of nourishment are the more necessary for their production. It must suffice here to say that double flowers are most commonly the result of the substitution of brightly-coloured petals for stamens or pistils or both, and that a perfectly double flower where all the stamens and pistils are thus metamorphosed is necessarily barren. Such a plant must needs be propagated by cuttings. It rarely happens, however, that the change is quite complete throughout the flower, and so a few seeds may be formed, some of which may be expected to reproduce the double-blossomed plants. By continuous selection of seed from the best varieties, and “roguing” or eliminating plants of the ordinary type, a “strain” or race of double flowers is gradually produced.

Formation of Seed—Fertilization.—In fertilization—the influence in flowering plants of the male-cell in the pollen tube upon the egg-cell in the ovule (see BOTANY)—there are many circumstances of importance horticulturally, to which, therefore, brief reference must be made. Flowers, generally speaking, are either self-fertilized, cross-fertilized or hybridized. Self-fertilization occurs when the pollen of a given flower affects the egg-cell of the same individual flower. Cross-fertilization varies both in manner and degree. In the simplest instances the pollen of one flower fertilizes the ovules of another on the same plant, owing to the stamens arriving at maturity in any one flower earlier or later than the pistils.

Cross-fertilization must of necessity occur when the flowers are structurally unisexual, as in the hazel, in which the male and female flowers are monoecious, or separate on the same plant, and in the willow, in which they are dioecious, or on different plants. A conspicuous example of a dioecious plant is the common aucuba, of which for years only the female plant was known in Britain. When, through the introduction of the male plant from Japan, its fertilization was rendered possible, ripe berries, before unknown, became common ornaments of the shrub.

The conveyance of pollen from one flower to another in cross-fertilization is effected naturally by the wind, or by the agency of insects and other creatures. Flowers that require the aid of insects usually offer some attraction to their visitors in the shape of bright colour, fragrance or sweet juices. The colour and markings of a flower often serve to guide the insects to the honey, in the obtaining of which they are compelled either to remove or to deposit pollen. The reciprocal adaptations of insects and flowers demand attentive observation on the part of the gardener concerned with the growing of grapes, cucumbers, melons and strawberries, or with the raising of new and improved varieties of plants. In wind-fertilized plants the flowers are comparatively inconspicuous and devoid of much attraction for insects; and their pollen is smoother and smaller, and better adapted for transport by the wind, than that of insect-fertilized plants, the roughness of which adapts it for attachment to the bodies of insects.

It is very probable that the same flower at certain times and seasons is self-fertilizing, and at others not so. The defects which cause gardeners to speak of certain vines as “shy setters,” and of certain strawberries as “blind,” may be due either to unsuitable conditions of external temperature, or to the non-accomplishment, from some cause or other, of cross-fertilization. In a vinery, tomato-house or a peach-house it is often good practice at the time of flowering to tap the branches smartly with a stick so as to ensure the dispersal of the pollen. Sometimes more delicate and direct manipulation is required, and the gardener has himself to convey the pollen from one flower to another, for which purpose a small camel’s-hair pencil is generally suitable. The degree of fertility varies greatly according to external conditions, the structural and functional arrangements just alluded to, and other causes which may roughly be called constitutional. Thus, it often happens that an apparently very slight change in climate alters the degree of fertility. In a particular country or at certain seasons one flower will be self-sterile or nearly so, and another just the opposite.

Hybridization.—Some of the most interesting results and many of the gardener’s greatest triumphs have been obtained by hybridization, *i.e.* the crossing of two individuals not of the same but of two distinct species of plants, as, for instance, two species of rhododendron or two species of orchid (see HYBRIDISM). It is obvious that hybridization differs more in degree than in kind from cross-fertilization. The occurrence of hybrids in nature explains the difficulty experienced by botanists in deciding on what is a species, and the widely different limitations of the term adopted by different observers in the case of willows, roses, brambles, &c. The artificial process is practically the same in hybridization as in cross-fertilization, but usually requires more care. To prevent self-fertilization, or the access of insects, it is advisable to remove the stamens and even the corolla from the flower to be impregnated, as its own pollen or that of a flower of the same species is often found to be “prepotent.” There are, however, cases, *e.g.* some passion-flowers and rhododendrons, in which a flower is more or less sterile with its own, but fertile with foreign pollen, even when this is from a distinct species. It is a singular circumstance that reciprocal crosses are not always or even often possible; thus, one rhododendron may afford pollen perfectly potent on the stigma of another kind, by the pollen of which latter its own stigma is unaffected.

The object of the hybridizer is to obtain varieties exhibiting improvements in hardihood, vigour, size, shape, colour, fruitfulness, resistance to disease or other attributes. His success depends not alone on skill and judgment, for some seasons, or days even, are found more propitious than others. Although promiscuous and hap-hazard procedures no doubt meet with a measure of success, the best results are those which are attained by systematic work with a definite aim.

Hybrids are sometimes less fertile than pure-bred species, and are occasionally quite sterile. Some hybrids, however, are as fertile as pure-bred plants. Hybrid plants may be again crossed, or even re-hybridized, so as to produce a progeny of very mixed parentage. This is the case with many of our roses, dahlias, begonias, pelargoniums, orchids and other long or widely cultivated garden plants.

Reversion.—In modified forms of plants there is frequently a tendency to "sport" or revert to parental or ancestral characteristics. So markedly is this the case with hybrids that in a few generations all traces of a hybrid origin may disappear. The dissociation of the hybrid element in a plant must be obviated by careful selection. The researches of Gregor Johann Mendel (1822-1884), abbot of the Augustinian monastery at Brünn, in connexion with peas and other plants, apparently indicate that there is a definite natural law at work in the production of hybrids. Having crossed yellow and green seeded peas both ways, he found that the progeny resulted in *all yellow* coloured seeds. These gave rise in due course to a second generation in which there were three yellows to one green. In the third generation the yellows from the second generation gave the proportion of one pure yellow, two impure yellows, and one green; while the green seed of the second generation threw only green seeds in the third, fourth and fifth generations. The pure yellow in the third generation also threw pure yellows in the fourth and fifth and succeeding generations. The impure yellows, however, in the next generation gave rise to one pure yellow, one pure green, to two impure yellows, and so on from generation to generation. Accordingly as the green or the yellow predominated in the progeny it was termed "dominant," while the colour that disappeared was called "recessive." It happened, however, that a recessive colour in one generation becomes the dominant in a succeeding one.

Germination.—The length of the period during which seeds remain dormant after their formation is very variable. The conditions for germination are much the same as for growth in general. Access to light is not required, because the seed contains a sufficiency of stored-up food. The temperature necessary varies according to the nature and source of the seed. Some seeds require prolonged immersion in water to soften their shells; others are of so delicate a texture that they would dry up and perish if not kept constantly in a moist atmosphere. Seeds buried too deeply receive a deficient supply of air. As a rule, seeds require to be sown more deeply in proportion to their size and the lightness of the soil.

The time required for germination in the most favourable circumstances varies very greatly, even in the same species, and in seeds taken from one pod. Thus the seeds of *Primula japonica*, though sown under precisely similar conditions, yet come up at very irregular intervals of time. Germination is often slower where there is a store of available food in the perisperm, or in the endosperm, or in the embryo itself, than where this is scanty or wanting. In the latter case the seedling has early to shift for itself, and to form roots and leaves for the supply of its needs.

Selection.—Supposing seedlings to have been developed, it is found that a large number of them present considerable variations, some being especially robust, others peculiar in size or form. Those most suitable for the purpose of the gardener are carefully selected for propagation, while others not so desirable are destroyed; and thus after a few generations a fixed variety, race or strain superior to the original form is obtained. Many garden plants have originated solely by selection; and much has been done to improve our breeds of vegetables, flowers and fruit by systematic selection.

Large and well-formed seeds are to be preferred for harvesting. The seeds should be kept in sacks or bags in a dry place, and if from plants which are rare, or liable to lose their vitality, they are advantageously packed for transmission to a distance in hermetically sealed bottles or jars filled with earth or moss, without the addition of moisture.

It will have been gathered from what has been said that seeds cannot always be depended on to reproduce exactly the characteristics of the plant which yielded them; for instance, seeds of the greengage plum or of the Ribston pippin will produce a plum or an apple, but not these particular varieties, to perpetuate which grafts or buds must be employed.

(M. T. M.; W. R. W.)

Part II.—The Practice of Horticulture

The details of horticultural practice naturally range under the three heads of flowers, fruits and vegetables (see also Fruit and Flower Farming). There are, however, certain general aspects of the subject which will be more conveniently noticed apart, since they apply alike to each department. We shall therefore first treat of these under four headings: formation and preparation of the garden, garden structures and edifices, garden materials and appliances, and garden operations.

I. *Formation and Preparation of the Garden.*

Site.—The site chosen for the mansion will more or less determine that of the garden, the pleasure grounds and flower garden being placed so as to surround or lie contiguous to it, while the fruit and vegetable gardens, either together or separate, should be placed on one side or in the rear, according to fitness as regards the nature of the soil and subsoil, the slope of the surface or the general features of the park scenery. In the case of villa gardens there is usually little choice: the land to be occupied is cut up into plots, usually rectangular, and of greater or less breadth, and in laying out these plots there is generally a smaller space left in the front of the villa residence and a larger one behind, the front plot being usually devoted to approaches, shrubbery and plantations, flower beds being added if space permits, while the back or more private plot has a piece of lawn grass with flower beds next the house, and a space for vegetables and fruit trees at the far end, this latter being shut off from the lawn by an intervening screen of evergreens or other plants. Between these two classes of gardens there are many gradations, but our remarks will chiefly apply to those of larger extent.

The almost universal practice is to have the fruit and vegetable gardens combined; and the flower garden may sometimes be conveniently placed in juxtaposition with them. When the fruit and vegetable gardens are combined, the smaller and choicer fruit trees only should be admitted, such larger-growing hardy fruits as apples, pears, plums, cherries, &c., being relegated to the orchard.

Ground possessing a gentle inclination towards the south is desirable for a garden. On such a slope effectual draining is easily accomplished, and the greatest possible benefit is derived from the sun’s rays. It is well also to have an open exposure towards the east and west, so that the garden may enjoy the full benefit of the morning and evening sun, especially the latter; but shelter is desirable on the north and north-east, or in any direction in which the particular locality may happen to be exposed. In some places the south-western gales are so severe that a belt of trees is useful as a break wind and shelter.

Soil and Subsoil.—A hazel-coloured loam, moderately light in texture, is well adapted for most garden crops, whether of fruits or vegetables, especially a good warm deep loam resting upon chalk; and if such a soil occurs naturally in the selected site, but little will be required in the way of preparation. If the soil is not moderately good and of fair depth, it is not so favourable for gardening purposes. Wherever the soil is not quite suitable, but is capable of being made so, it is best to remedy the defect at the outset by trenching it all over to a depth of 2 or 3 ft., incorporating plenty of manure with it. A heavy soil, although at first requiring more labour, generally gives far better results when worked than a light soil. The latter is not sufficiently retentive of moisture and gets too hot in summer and requires large quantities of organic manures to keep it in good condition. It is advantageous to possess a variety of soils; and if the garden be on a slope it will often be practicable to render the upper part light and dry, while the lower remains of a heavier and damper nature.

Natural soils consist of substances derived from the decomposition of various kinds of rocks, the bulk consisting of clay, silica and lime, in various proportions. As regards preparation, draining is of course of the utmost importance. The ground should also be trenched to the depth of 3 ft. at least, and the deeper the better so as to bring up the subsoil—whether it be clay, sand, gravel, marl, &c.—for exposure to the weather and thus convert it from a sterile mass into a living soil teeming with bacteria. In this operation all stones larger than a man’s fist must be taken out, and all roots of trees and of perennial weeds carefully cleared away. When the whole ground has been thus treated, a moderate liming will, in general, be useful, especially on heavy clay soils. After this, supposing the work to have occupied most of the summer, the whole may be laid up in ridges, to expose as great a surface as possible to the action of the winter’s frost.

> Argillaceous or clay soils are those which contain a large percentage (45-50) of clay, and a small percentage (5 or less) of lime. These are unfitted for garden purposes until improved by draining, liming, trenching and the addition of porous materials, such as ashes, burnt ballast or sand, but when thoroughly improved they are very fertile and less liable to become exhausted than most other soils. Loamy soils contain a considerable quantity (30-45%) of clay, and smaller quantities of lime, humus and sand. Such soils properly drained and prepared are very suitable for orchards, and when the proportion of clay is smaller (20-30%) they form excellent garden soils, in which the better sort of fruit trees luxuriate. Marly soils are those which contain a considerable percentage (10-20) of lime, and are called clay marls, loamy marls and sandy marls, according as these several ingredients preponderate. The clay marls are, like clay soils, too stiff for garden purposes until well worked and heavily manured; but loamy marls are fertile and well suited to fruit trees, and sandy marls are adapted for producing early crops. Calcareous soils, which may also be heavy, intermediate or light, are those which contain more than 20% of lime, their fertility depending on the proportions of clay and sand which enter into their composition; they are generally cold and wet. Vegetable soils or moulds, or humus soils, contain a considerable percentage (more than 5) of humus, and embrace both the rich productive garden moulds and those known as peaty soils.

The nature of the subsoil is of scarcely less importance than that of the surface soil. Many gardeners are still afraid to disturb an unsuitable subsoil, but experienced growers have proved that by bringing it up to the surface and placing plenty of manure in the bottoms of the various trenches, the very best results are attained in the course of a season or so. An uneven subsoil, especially if retentive, is most undesirable, as water is apt to collect in the hollows, and thus affect

the upper soil. The remedy is to make the plane of its surface agree with that of the ground. When there is a hard pan this should be broken up with the spade or the fork, and have plenty of manure mixed with it. When there is an injurious preponderance of metallic oxides or other deleterious substances, the roots of trees would be affected by them, and they must therefore be removed. When the subsoil is too compact to be pervious to water, effectual drainage must be resorted to; when it is very loose, so that it drains away the fertile ingredients of the soil as well as those which are artificially supplied, the compactness of the stratum should be increased by the addition of clay, marl or loam. The best of all subsoils is a dry bed of clay overlying sandstone.

Plan.—In laying out the garden, the plan should be prepared in minute detail before commencing operations. The form of the kitchen and fruit garden should be square or oblong, rather than curvilinear, since the working and cropping of the ground can thus be more easily carried out. The whole should be compactly arranged, so as to facilitate working, and to afford convenient access for the carting of the heavy materials. This access is especially desirable as regards the store-yards and framing ground, where fermenting manures and tree leaves for making up hot beds, coals or wood for fuel and ingredients for composts, together with flower-pots and the many necessaries of garden culture, have to be accommodated. In the case of villas or picturesque residences, gardens of irregular form may be permitted; when adapted to the conditions of the locality, they associate better with surrounding objects, but in such gardens wall space is usually limited.

The distribution of paths must be governed by circumstances. Generally speaking, the main paths for cartage should be 8 ft. wide, made up of 9 in. hard core covered by 4 in. of gravel or ash, with a gentle rise to centre to throw off surface water. The smaller paths, not intended for cartage, should be 4 ft. to 6 ft. wide, according to circumstances, made up of 6 in. hard core and 3 in. of gravel or ash, and should be slightly raised at centre.

A considerable portion of the north wall is usually covered in front with the glazed structures called forcing-houses, and to these the houses for ornamental plants are sometimes attached; but a more appropriate site for the latter is the flower garden, when that forms a separate department. It is well, however, that everything connected with the forcing of fruits or flowers should be concentrated in one place. The frame ground, including melon and pine pits, should occupy some well-sheltered spot in the slips, or on one side of the garden, and adjoining to this may be found a suitable site for the compost ground, in which the various kinds of soils are kept in store, and in which also composts may be prepared.

As walls afford valuable space for the growth of the choicer kinds of hardy fruits, the direction in which they are built is of considerable importance. In the warmer parts of the country the wall on the north side of the garden should be so placed as to face the sun at about an hour before noon, or a little to the east of south; in less favoured localities it should be made to face direct south, and in still more unfavourable districts it should face the sun an hour after noon, or a little west of south. The east and west walls should run parallel to each other, and at right angles to that on the north side, in all the most favoured localities; but in colder or later ones, though parallel, they should be so far removed from a right angle as to get the sun by eleven o’clock. On the whole, the form of a parallelogram with its longest sides in the proportion of about five to three of the shorter, and running east and west, may be considered the best form, since it affords a greater extent of south wall than any other.

Fig. 1 represents a garden of one acre and admits of nearly double the number of trees on the south aspect as compared with the east and west; it allows a greater number of espalier or pyramid trees to face the south; and it admits of being divided into equal principal compartments, each of which forms nearly a square. The size of course can be increased to any requisite extent. That of the royal gardens at Frogmore, 760 ft. from east to west and 440 ft. from north to south, is nearly of the same proportions.

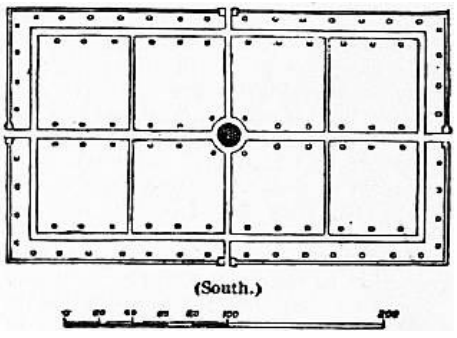

FIG. 1.—Plan of Garden an acre in area.

The spaces between the walls and the outer fence are called “slips.” A considerable extent is sometimes thus enclosed, and utilized for the growth of such vegetables as potatoes, winter greens and sea-kale, for the small bush fruits, and for strawberries. The slips are also convenient as affording a variety of aspects, and thus helping to prolong the season of particular vegetable crops.

Shelter.—A screen of some kind to temper the fury of the blast is absolutely necessary. If the situation is not naturally well sheltered, the defect may be remedied by masses of forest trees disposed at a considerable distance so as not to shade the walls or fruit trees. They should not be nearer than, say, 50 yds., and may vary from that to 100 or 150 yds. distance according to circumstances, regard being had especially to peculiarities occasioned by the configuration of the country, as for instance to aerial currents from adjacent eminences. Care should be taken, however, not to hem in the garden by crowded plantations, shelter from the prevailing strong winds being all that is required, while the more open it is in other directions the better. The trees

employed for screens should include both those of deciduous and of evergreen habit, and should suit the peculiarities of local soil and climate. Of deciduous trees the sycamore, wych-elm, horse-chestnut, beech, lime, plane and poplar may be used,—the abele or white poplar, *Populus alba*, being one of the most rapid-growing of all trees, and, like other poplars, well suited for nursing other choicer subjects; while of evergreens, the holm oak, holly, laurel (both common and Portugal), and such conifers as the Scotch, Weymouth and Austrian pines, with spruce and silver firs and yews, are suitable. The conifers make the most effective screens.

Extensive gardens in exposed situations are often divided into compartments by hedges, so disposed as to break the force of high winds. Where these are required to be narrow as well as lofty, holly, yew or beech is to be preferred; but, if there is sufficient space, the beautiful laurel and the bay may be employed where they will thrive. Smaller hedges may be formed of evergreen privet or of tree-box. These subordinate divisions furnish, not only shelter but also shade, which, at certain seasons, is peculiarly valuable.

Belts of shrubbery may be placed round the slips outside the walls; and these may in many cases, or in certain parts, be of sufficient breadth to furnish pleasant retired promenades, at the same time that they serve to mask the formality of the walled gardens, and are made to harmonize with the picturesque scenery of the pleasure ground.

Water Supply.—Although water is one of the most important elements in plant life, we do not find one garden in twenty where even ordinary precautions have been taken to secure a competent supply. Rain-water is the best, next to that river or pond water, and last of all that from springs; but a chemical analysis should be made of the last before introducing it, as some spring waters contain mineral ingredients injurious to vegetation. Iron pipes are the best conductors; they should lead to a capacious open reservoir placed outside the garden, and at the highest convenient level, in order to secure sufficient pressure for effective distribution, and so that the wall trees also may be effectually washed. Stand-pipes should be placed at intervals beside the walks and in other convenient places, from which water may at all times be drawn; and to which a garden hose can be attached, so as to permit of the whole garden being readily watered. The mains should be placed under the walks for safety, and also that they may be easily reached when repairs are required. Pipes should also be laid having a connexion with all the various greenhouses and forcing-houses, each of which should be provided with a cistern for aerating the daily supplies. In fact, every part of the garden, including the working sheds and offices, should have water supplied without stint.

Fence.—Gardens of large extent should be encircled by an outer boundary, which is often formed by a sunk wall or ha-ha surrounded by an invisible wire fence to exclude ground game, or consists of a hedge with low wire fence on its inner side. Occasionally this sunk wall is placed on the exterior of the screen plantations, and walks lead through the trees, so that views are obtained of the adjacent country. Although the interior garden receives its form from the walls, the ring fence and plantations may be adapted to the shape and surface of the ground. In smaller country gardens the enclosure or outer fence is often a hedge, and there is possibly no space enclosed by walls, but some divisional wall having a suitable aspect is utilized for the growth of peaches, apricots, &c., and the hedge merely separates the garden from a paddock used for grazing. The still smaller gardens of villas are generally bounded by a wall or wood fence, the inner side of which is appropriated to fruit trees. For the latter walls are much more convenient and suitable than a boarded fence, but in general these are too low to be of much value as aids to cultivation, and they are best covered with bush fruits or with ornamental plants of limited growth.

Walks.—The best material for the construction of garden walks is good binding gravel. The ground should be excavated to the depth of a foot or more—the bottom being made firm and slightly concave, so that it may slope to the centre, where a drain should be introduced; or the bottom may be made convex and the water allowed to drain away at the sides. The bottom 9 in. should be filled in compactly with hard, coarse materials, such as stones, brickbats, clinkers, burned clay, &c., on which should be laid 2 or 3 in. of coarse gravel, and then 1 or 2 in. of firm binding gravel on the surface. The surface of the walks should be kept well rolled, for nothing contributes more to their elegance and durability.

All the principal lines of walk should be broad enough to allow at least three persons to walk abreast; the others may be narrower, but a multitude of narrow walks has a puny effect. Much of the neatness of walks depends upon the material of which they are made. Gravel from an inland pit is to be preferred; though occasionally very excellent varieties are found upon the sea-coast. Gravel walks must be kept free from weeds, either by hand weeding, or by the use of one of the many weed killers now on the market. In some parts of the country the available material does not bind to form a close, even surface, and such walks are kept clean by hoeing.

Grass walks were common in English gardens during the prevalence of the Dutch taste, but, owing to the frequent humidity of the climate, they have in a great measure been discarded. Grass walks are made in the same way as grass lawns. When the space to be thus occupied is prepared, a thin layer of sand or poor earth is laid upon the surface and over this a similar layer of good soil. This arrangement is adopted in order to prevent excessive luxuriance in the grass. In many modern gardens pathways made of old paving stones lead from the house to different parts. They give an

old-fashioned and restful appearance to a garden, and in the interstices charming little plants like thyme, *Ionopsidium acaule*, &c., are allowed to grow.

Edgings.—Walks are separated from the adjoining beds and borders in a variety of ways. If a living edging is adopted, by far the best is afforded by the dwarf box planted closely in line. It is of extremely neat growth, and when annually clipped will remain in good order for many years. Very good edgings, but of a less durable character, are formed by thrift (*Armeria vulgaris*), double daisy (*Bellis perennis*), gentianella (*Gentiana acaulis*) and London pride (*Saxifraga umbrosa*), *Cerastium tomentosum*, *Stachys lavata* and the beautiful evergreen *Veronica rupestris* with sheets of bright blue flowers close to the ground, or by some of the finer grasses very carefully selected, such as the sheep's fescue (*Festuca ovina*) or its glaucous-leaved variety. Indeed, any low-growing herbaceous plant, susceptible of minute division, is suitable for an edging. Amongst shrubby plants suitable for edgings are the evergreen candytuft (*Iberis sempervirens*), *Euonymus radicans variegata*, ivy, and *Euonymus microphyllus*—a charming little evergreen with small serrated leaves. Edgings may also be formed of narrow slips of sandstone flag, slate, tiles or bricks. One advantage of using edgings of this kind, especially in kitchen gardens, is that they do not harbour slugs and similar vermin, which all live edgings do, and often to a serious extent, if they are left to grow large. In shrubberies and large flower-plots, verges of grass-turf, from 1 to 3 ft. in breadth, according to the size of the border and width of the walk, make a very handsome edging, but they should not be allowed to rise more than an inch and a half above the gravel, the grass being kept short by repeated mowings, and the edges kept trim and well-defined by frequently clipping with shears and cutting once or twice a year with an edging iron.

II. *Garden Structures.*

Walls.—The position to be given to the garden walls has been already referred to. The shelter afforded by a wall, and the increased temperature secured by its presence, are indispensable in the climate of Great Britain, for the production of all the finer kinds of outdoor fruits; and hence the inner side of a north wall, having a southern aspect, is appropriated to the more tender kinds. It is, indeed, estimated that such positions enjoy an increased temperature equal to 7° of latitude—that is to say, the mean temperature within a few inches of the wall is equal to the mean temperature of the open plain 7° farther south. The eastern and western aspects are set apart for fruits of a somewhat hardier character.

Where the inclination of the ground is considerable, and the presence of high walls would be objectionable, the latter may be replaced by sunk walls. These should not rise more than 3 ft. above the level of the ground behind them. As dryness is favourable to an increase of heat, such walls should be either built hollow or packed behind to the thickness of 3 or 4 ft. with rubble stones, 748
flints, brickbats or similar material, thoroughly drained at bottom. For mere purposes of shelter a height of 6 or 7 ft. will generally be sufficient for the walls of a garden, but for the training of fruit trees it is found that an average height of 12 ft. is more suitable. In gardens of large size the northern or principal wall may be 14 ft., and the side walls 12 ft. in height; while smaller areas of an acre or so should have the principal walls 12 and the side walls 10 ft. in height. As brick is more easily built hollow than stone, it is to be preferred for garden walls. A 14-in. hollow wall will take in its construction 12,800 bricks, while a solid 9-in. one, with piers, will take 11,000; but the hollow wall, while thus only a little more costly, will be greatly superior, being drier and warmer, as well as more substantial. Bricks cannot be too well burnt for garden walls; the harder they are the less moisture will they absorb. Many excellent walls are built of stone. The best is dark-coloured whinstone, because it absorbs very little moisture, or in Scotland Caithness pavement 4 in. thick. The stones can be cut (in the quarries) to any required length, and built in regular courses. Stone walls should always be built with thin courses for convenience of training over their surface. Concrete walls, properly coped and provided with a trellis, may in some places be cheapest, and they are very durable. Common rubble walls are the worst of all.

The coping of garden walls is important, both for the preservation of the walls and for throwing the rain-water off their surfaces. It should not project less than from 2 to 2½ in., but in wet districts may be extended to 6 in. Stone copings are best, but they are costly, and Portland cement is sometimes substituted. Temporary copings of wood, which may be fixed by means of permanent iron brackets just below the stone coping, are extremely useful in spring for the protection of the blossoms of fruit trees. They should be 9 in. or 1 ft. wide, and should be put on during spring before the blossom buds begin to expand; they should have attached to them scrim cloth (a sort of thin canvas), which admits light pretty freely, yet is sufficient to ward off ordinary frosts; this canvas is to be let down towards evening and drawn up again in the morning. These copings should be removed when they are of no further utility as protectors, so that the foliage may have the full benefit of rain and dew. Any contrivance that serves to interrupt radiation, though it may not keep the temperature much above freezing, will be found sufficient. Standard fruit trees must be left to take their chance; and, indeed from the lateness of their flowering, they are generally more injured by blight, and by drenching rains, which wash away the pollen of the flowers, than by the direct effects of cold.

Espalier Rails.—Subsidiary to walls as a means of training fruit trees, espalier rails were formerly much employed, and are still used in many gardens. In their simplest form, they are merely a row of slender stakes of larch or other wood driven into the ground, and connected by a slight rod or fillet at top. The use of iron rails has now been almost wholly discontinued on account of metallic substances acting as powerful conductors of both heat and cold in equal extremes. Standards from which galvanized wire is tightly strained from one end to the other are preferable and very convenient. Trees trained to them are easily got at for all cultural operations, space is saved, and the fruit, while freely exposed to sun and air, is tolerably secure against wind. They form, moreover, neat enclosures for the vegetable quarters, and, provided excess of growth from the centre is successfully grappled with, they are productive in soils and situations which are suitable.

Plant Houses.—These include all those structures which are more intimately associated with the growth of ornamental plants and flowers, and comprise conservatory, plant stove, greenhouse and the subsidiary pits and frames. They should be so erected as to present the smallest extent of opaque surface consistent with stability. With this object in view, the early improvers of hot-house architecture substituted metal for wood in the construction of the roofs, and for the most part dispensed with back walls; but the conducting power of the metal caused a great irregularity of temperature, which it was found difficult to control; and, notwithstanding the elegance of metallic houses, this circumstance, together with their greater cost, has induced most recent authorities to give the preference to wood. The combination of the two, however, shows clearly that, without much variation of heat or loss of light, any extent of space may be covered, and houses of any altitude constructed.

The earliest notice we have of such structures is given in the Latin writers of the 1st century (Mart. *Epigr.* viii. 14 and 68); the Ἀδώνιδος κῆποι, to which allusion is made by various Greek authors, have no claim to be mentioned in this connexion. Columella (xi. 3, 51, 52) and Pliny (*H.N.* xix. 23) both refer to their use in Italy for the cultivation of the rarer and more delicate sorts of plants and trees. Seneca has given us a description of the application of hot water for securing the necessary temperature. The botanist Jungermann had plant houses at Altdorf in Switzerland; those of Loader, a London merchant, and the conservatory in the Apothecaries' Botanic Garden at Chelsea, were among the first structures of the kind erected in British gardens. These were, however, ill adapted for the growth of plants, as they consisted of little else than a huge chamber of masonry, having large windows in front, with the roof invariably opaque. The next step was taken when it became fashionable to have conservatories attached to mansions, instead of having them in the pleasure grounds. This arrangement brought them within the province of architects, and for nearly a century utility and fitness for the cultivation of plants were sacrificed, as still is often the case, to the unity of architectural expression between the conservatory and the mansion.

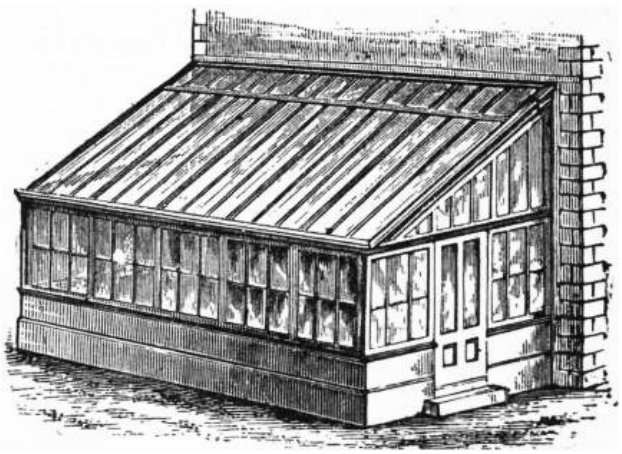

Fig. 2.—Lean-to Plant House.

Plant houses must be as far as possible impervious to wet and cold air from the exterior, provision at the same time being made for ventilation, while the escape of warm air from the interior must also be under control. The most important part of the enclosing material is necessarily glass. But as the rays of light, even in passing through transparent glass, lose much of their energy, which is further weakened in proportion to the distance it has to travel, the nearer the plant can be placed to the glass the more perfectly will its functions be performed; hence the importance of constructing the roofs at such an angle as will admit the most light, especially sunlight, at the time it is most required. Plants in glass houses require for their fullest development more solar light probably than even our best hot-houses transmit—certainly much more than is transmitted through the roofs of houses as generally constructed.

Plant houses constructed of the best Baltic pine timber are very durable, but the whole of the parts should be kept as light as possible. In many houses, especially those where ornament is of no consequence, the rafters are now omitted, or only used at wide intervals, somewhat stouter sash-bars being adopted, and stout panes of glass (usually called 21-oz.) 12 to 18 in. wide, made use of. Such houses are very light; being also very close, they require careful ventilation. The glass roof is

commonly designed so as to form a uniform plane or slope from back to front in lean-to houses (fig. 2), and from centre to sides in span-roofed houses. To secure the greatest possible influx of light, some horticulturists recommend curvilinear roofs; but the superiority of these is largely due to the absence of rafters, which may also be dispensed with in plain roofs. They are very expensive to build and maintain. Span and ridge-and-furrow roofs, the forms now mostly preferred, are exceedingly well adapted for the admission of light, especially when they are glazed to within a few inches of the ground. They can be made, too, to cover in any extent of area without sustaining walls. Indeed, it has been proposed to support such roofs to a great extent upon suspension principles, the internal columns of support being utilized for conducting the rain-water off the roof to underground drains or reservoirs. The lean-to is the least desirable form, since it scarcely admits of elegance of design, but it is necessarily adopted in many cases.

In glazing, the greater the surface of glass, and the less space occupied by rafters and astragals as well as overlaps, the greater the admission of light. Some prefer that the sash-bars should be grooved instead of rebated, and this plan exposes less putty to the action of the weather. The simple bedding of the glass, without the use of over putty, seems to be widely approved; but the glass may be fixed in a variety of other ways, some of which are patented.

The *Conservatory* is often built in connexion with the mansion, so as to be entered from the drawing-room or boudoir. But when so situated it is apt to suffer from the shade of the building, and is objectionable on account of admitting damp to the drawing-room. Where circumstances will admit, it is better to place it at some distance from the house, and to form a connexion by means of a glass corridor. In order that the conservatory may be kept gay with flowers, there should be a subsidiary structure to receive the plants as they go out of bloom. The conservatory may also with great propriety be placed in the flower garden, where it may occupy an elevated terrace, and form the termination of one of the more important walks.

Great variety of design is admissible in the conservatory, but it ought always to be adapted to the style of the mansion of which it is a prominent appendage. Some very pleasing examples are to be met with which have the form of a parallelogram with a lightly-rounded roof; others of appropriate character are square or nearly so, with a ridge-and-furrow roof. Whatever the form, there must be light in abundance; and the shade both of buildings and of trees must be avoided. A southern aspect, or one varying to south-east or south-west, is preferable; if these aspects cannot be secured, the plants selected must be adapted to the position. The central part of the house may be devoted to permanent plants; the side stages and open spaces in the permanent beds should be reserved for the temporary plants.

The *Greenhouse* is a structure designed for the growth of such exotic plants as require to be kept during winter in a temperature considerably above the freezing-point. The best form is the span-roofed, a single span being better even than a series of spans such as form the ridge-and-furrow roof. For plant culture, houses at a comparatively low pitch are better than higher ones where the plants have to stand at a greater distance from the glass, and therefore in greater gloom. Fig. 3 represents a convenient form of greenhouse. It is 20 ft. wide and 12 ft. high, and may be of any convenient length. The side walls are surmounted by short upright sashes which open outwards by machinery a, and the roof is provided with sliding upper sashes for top ventilation. The upper sashes may also be made to lift, and are in many respects more convenient to operate. In the centre is a two-tier stage 6 ft. wide, for plants, with a pathway on each side 3 ft. wide, and a side stage 4 ft. wide, the side stages being flat, and the centre stage having the middle portion one-third of the width elevated 1 ft. above the rest so as to lift up the middle row of plants nearer the light. Span-roofed houses of this character should run north and south so as to secure an equalization of light, and should be warmed by two flow, and one or two return 4-in. hot-water pipes, carried under the side stages along each side and across each end. Where it is desired to cultivate a large number of plants, it is much better to increase the number of such houses than to provide larger structures. The smaller houses are far better for cultural purposes, while the plants can be classified, and the little details of management more conveniently attended to. Pelargoniums, cinerarias, calceolarias, cyclamens, camellias, heaths, roses and other specialities might thus have to themselves either a whole house or part of a house, the conditions of which could then be more accurately fitted to the wants of the inmates.

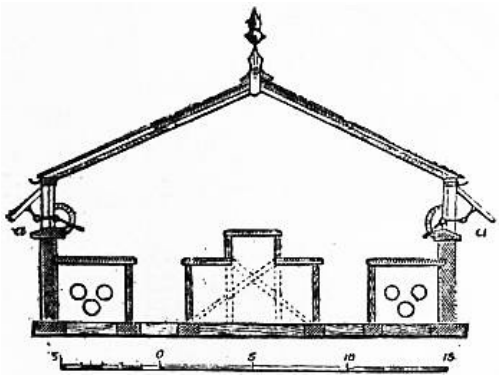

Fig. 3.—Section of Greenhouse.

The lean-to house is in most respects inferior to the span-roofed; one of the latter could be converted into two of the former of opposite aspects by a divisional wall along the centre. Except where space does not permit a span-roofed building to be introduced, a lean-to is not to be recommended; but a house of this class may often be greatly improved by adopting a half-span or hipped roof—that is, one with a short slope behind and a longer in front.

Where the cultivation of large specimens has to

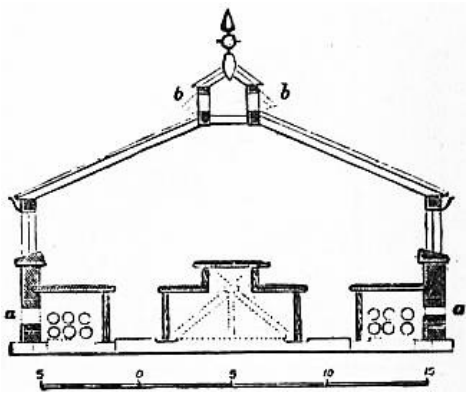

FIG. 4.—Section of Plant Stove.

be carried on, a span-roofed house of greater height and larger dimensions may sometimes prove useful; but space for this class of plants may generally be secured in a house of the smaller elevation, simply by lowering or removing altogether the staging erected for smaller plants, and allowing the larger ones to stand on or nearer the floor. The *Plant Stove* differs in no respect from the greenhouse except in having a greater extent of hot-water pipes for the purpose of securing a greater degree of heat, although, as the plants in stove houses often attain a larger size, and many of them require a bed of coco-nut fibre, tan or leaf mould to supply them with bottom heat, a somewhat greater elevation may perhaps be occasionally required in some of the houses. For the smaller plants, and for all choicer subjects, the smaller size of house already recommended for greenhouses, namely 20 ft. wide and 12 ft. high, with a side table of 4 ft. on each side, a pathway of 3 ft. and a central stage on two levels of 6 ft. wide, will be preferable, because more easily managed as to the supply of heat and moisture. It will be seen (fig. 4) that along the ridge of the roof a raised portion or lantern light *b*, *b* is introduced, which permits of the fixing of two continuous ventilators, one along each side, for the egress of heated and foul air, openings *a*, *a* being also provided in the side walls opposite the hot-water pipes for the admission of pure cold air. This type of house is also very suitable for greenhouse plants, but would not need so much heating apparatus. Three or four rows of flow and return pipes respectively will be required on each side, according to the heat proposed to be maintained.

In their interior fittings plant stoves require more care than greenhouses, which are much drier, and in which consequently the staging does not so soon decay. In stoves the stages should be of slate or stone where practicable, and the supports of iron. These should be covered with a layer of 2 or 3 in. of some coarse gritty material, such as pounded spar, or the shell sand obtained on the sea-coast, on which the pots are to stand; its use is to absorb moisture and gradually give it out for the benefit of the plants. The pathways should be paved with tiles, brick or stone, or made of concrete and cement, and the surface should be gently rounded so that the water required for evaporation may drain to the sides while the centre is sufficiently dry to walk upon; they should also have brick or stone edgings to prevent the water so applied soaking away at the sides and thus being wasted.

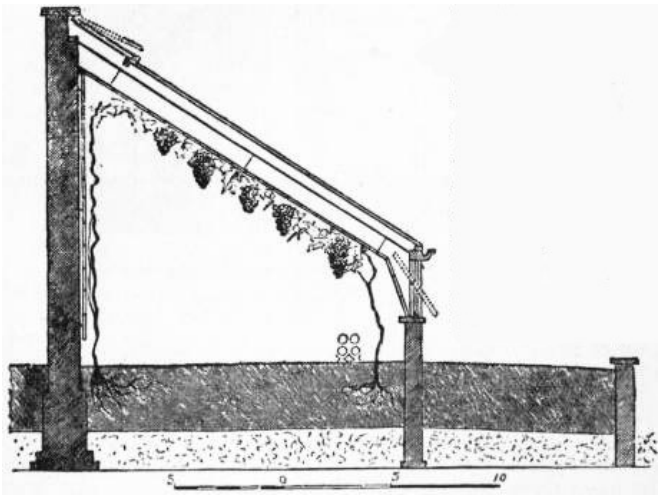

FIG. 5.—Lean-to Vinery.

Fruit Houses.—The principal of these are the vinery, peach house, cucumber and melon house and orchard house. These, or a portion of them, especially the vineries and peacheries, are frequently brought together into a range along the principal interior or south wall of the garden, where they are well exposed to sun and light, an ornamental plant house being sometimes introduced into the centre of the range in order to give effect to the outline of the buildings. When thus associated, the houses are usually of the lean-to class, which have the advantage of being more easily warmed and kept warm than buildings having glass on both sides, a matter of great importance for forcing purposes.

The *Vinery* is a house devoted to the culture of the grape-vine, which is by far the most important exotic fruit cultivated in English gardens. When forming part of a range a vinery would in most cases be a lean-to structure, with a sharp pitch (45-50°) if intended for early forcing, and a flatter roof (40°) with longer rafters if designed for the main and late crops. (1) The *lean-to* (fig. 5) is the simplest form, often erected against some existing wall, and the best for early forcing, being

warmer on account of the shelter afforded by the back wall. In this house the principal part of the roof is a fixture, ventilation being provided for by small lifting sashes against the back wall, and by the upright front sashes being hung on a pivot so as to swing outwards on the lower side. The necessary heat is provided by four 4-in. hot-water pipes, which would perhaps be best placed if all laid side by side, while the vines are planted in front and trained upwards under the roof. A second set of vines may be planted against the back wall, and will thrive there until the shade of the roof becomes too dense. (2) The *hip-roofed* or three-quarter span (fig. 6) is a combination of the lean-to and the span-roofed, uniting to a great degree the advantages of both, being warmer than the span and lighter than the lean-to. The heating and ventilating arrangements are much the same as in the lean-to, only the top sashes which open are on the back slope, and therefore do not interfere so much with the vines on the front slope. In both this and the lean-to the aspect should be as nearly due south as possible. Houses of this form are excellent for general purposes, and they are well adapted both for muscats, which require a high temperature, and for late-keeping grapes. (3) The *span-roofed* (fig. 7), the most elegant and ornamental form, is especially adapted for isolated positions; indeed, no other form affords so much roof space for the development of the vines. The amount of light admitted being very great, these houses answer well for general purposes and for the main crop. The large amount of glass or cooling surface, however, makes it more difficult to keep up a high and regular temperature in them, and from this cause they are not so well adapted for very early or very late crops. They are best, nevertheless, when grapes and ornamental plants are grown in the same house, except, indeed, in very wet and cold districts, where, in consequence of its greater warmth, the lean-to is to be preferred. This type of house, cheaply constructed, is in general use for raising grapes for market.

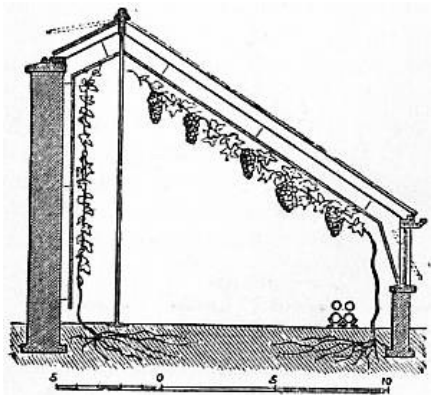

FIG. 6.—Hip-Roofed Vinery.

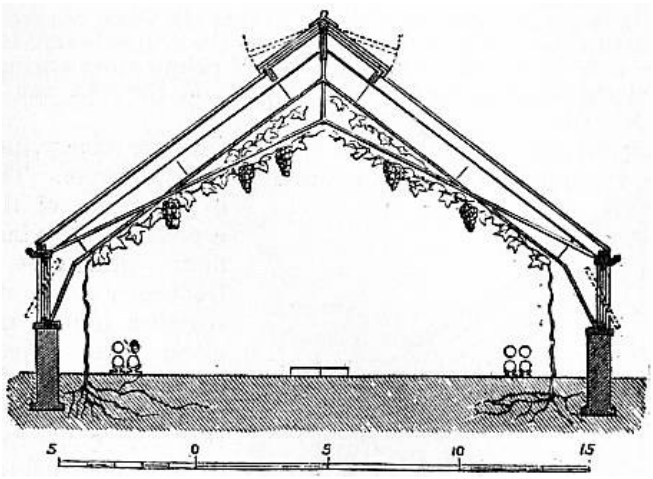

FIG. 7.—Span-Roofed Vinery.

The *Peach House* is a structure in which the ripening of the fruit is accelerated by the judicious employment of artificial heat. For early forcing, as in vineries, the lean-to form is to be preferred, and the house may have a tolerably sharp pitch. A width of 7 or 8 ft., with the glass slope continued down to within a foot or two of the ground, and without any upright front sashes, will be suitable for such a house, which may also be conveniently divided into compartments of from 30 to 50 ft. in length according to the extent of the building, small houses being preferable to larger ones. As a very high temperature is not required, two or three pipes running the whole length of the house will suffice. The front wall should be built on piers and arches to allow the roots to pass outwards into a prepared border, the trees being planted just within the house. Abundant means of ventilation should be provided.

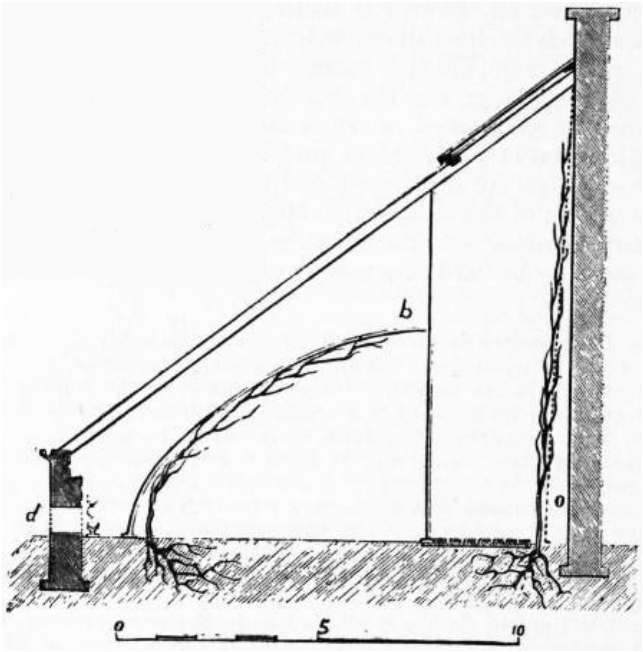

FIG. 8.—Peach House.

For more general purposes the house represented in fig. 8 will be found more useful. One set of trees is planted near the front, and trained to an arched trellis *b*. Another set is planted at the back, and trained on a trellis c, which is nearly upright, and leans against the back wall; or the back wall itself may be used for training. There are no upright front sashes, but to facilitate ventilation there are ventilators d in the front wall, and the upper roof sashes are made to move up and down for the same object. Two or three hot-water pipes are placed near the front wall. The back wall is usually planted with dwarf and standard trees alternately, the latter being temporary, and intended to furnish the upper part of the trellis, while the permanent dwarfs arc gradually filling up the trellis from below. In any case the front trellis should stop conveniently short of the top of the sashes if there are trees against the back wall, in order to admit light to them. They would also be better carried up nearly parallel to the roof, and at about 1 ft. distant from it, supposing there were no trees at the back.

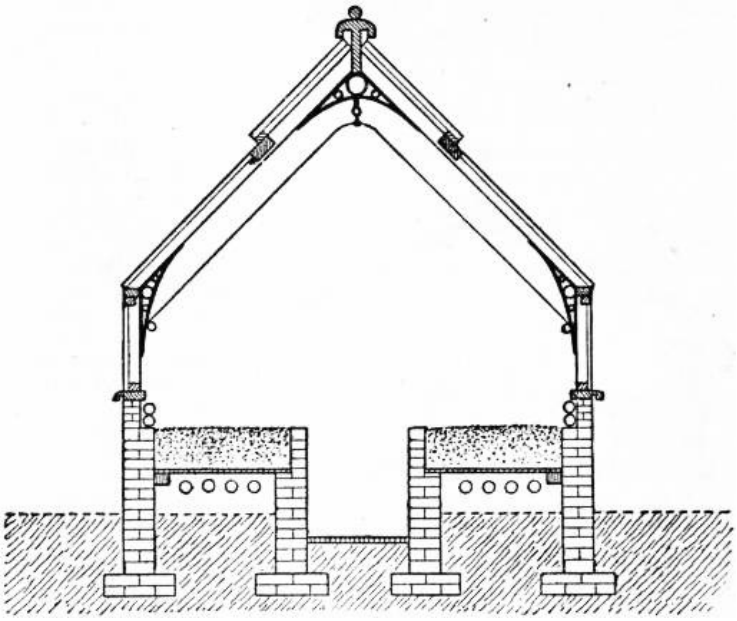

FIG. 9.—Forcing House.

A span-roofed house, being lighter than a lean-to, would be so much the better for peach culture, especially for the crop grown just in anticipation of those from the open walls since a high temperature is not required. A low span, with dwarf side walls, and a lantern ventilator along the ridge, the height in the centre being 9 ft., would be very well adapted for the purpose. The trees should be planted inside and trained up towards the ridge on a trellis about a foot from the glass, the walls being arched to permit the egress of the roots. A trellis path should run along the centre, and movable pieces of trellis should be provided to prevent trampling on the soil while dressing and tying in the young wood.

The *Forcing House*.—Whenever continuous supplies of cucumbers, melons and tomatoes are required, it is most convenient to grow them in properly constructed forcing houses. Span-roofed houses (fig. 9) arc probably the most useful for the purpose. They are usually 12 to 14 ft. wide, by

10 to 12 ft. high, and of any convenient length. Heating is effected by means of hot-water pipes below the beds, and against the side ventilators. The walls bordering the central paths are arched or clotted to admit heat from the chambers below the beds. Side pipes are occasionally dispensed with, heat being obtained by means of slots at the back of the beds, communicating with the chambers. The beds are also of use for plunging pot plants. Ventilation is provided at sides and top.

Pits and frames of various kinds are frequently used for the cultivation of cucumbers and melons, as well as hot beds covered by ordinary garden frames. In these cases the first supply of heat is derived from the hot bed made up within the pit. When the heat of the original bed subsides, linings of fermenting dung must be added, and these must be kept active by occasional turnings and the addition of fresh material as often as required. It is better, however, to effect both top and bottom heating by hot-water pipes.

Orchard Houses are span-roofed or lean-to structures, in which various fruits are cultivated without the aid of artificial heat. Peaches, nectarines, apricots, cherries and the more tender varieties of plums and pears succeed well in houses of this kind. The types of houses in general use are substantially as shown in fig. 7, for span-roofed, and as fig. 5, for lean-to; in each case without the heating apparatus. The orchard house is among the most generally useful of all garden structures. These houses require careful management in early summer so as to induce the more delicate varieties of peaches and nectarines to complete and ripen their growth before cold, sunless weather sets in.

In commercial establishments where utility is of more importance than ornament, the glass houses and hot water apparatus are not of so elaborate a type as indicated in the foregoing remarks, and in many cases excellent produce is grown in structures more or less dilapidated. In some places movable greenhouses have been erected for market purposes, so that the soil may be exposed to the sweetening effect of the weather, when the glass roof is moved to an adjoining patch.

Pits and Frames.—These are used both for the summer growth and winter protection of various kinds of ornamental plants, for the growth of such fruits as cucumbers, melons and strawberries, and for the forcing of vegetables. When heat is required, it is sometimes supplied by means of fermenting dung, or dung and leaves, or tanner's bark, but it is much more economically provided by hot-water pipes. Pits of many different forms have been designed, but it may be sufficient here to describe one or two which can be recommended for general purposes.

An excellent pit for wintering bedding-out plants or young greenhouse stock is shown at fig. 10. It is built upon the pigeon-hole principle as high as the ground level *a*, *a*, and above that in 9-in. brickwork. At a distance of 9 in. retaining walls *b*, *b* are built up to the ground level, and the spaces between the two are covered by thick boarding, which is to be shut down as shown at *c* in cold weather to exclude frost, and opened as shown at *d* in mild weather to promote a free circulation of air through the pit. The height of the pit might be reduced according to the size of the plants; and, to secure the interior against frost, flow and return hot-water pipe e should pass along beneath the staging, which should be a strong wooden trellis supported by projections in the brickwork. The water which drains from the plants or is spilt in watering would fall on the bottom, which should be made porous to carry it away. For many plants this under current of ventilation would be exceedingly beneficial, especially when cold winds prevented the sashes from being opened. A pit of this character may be sunk into the ground deeper than is indicated in the figure if the subsoil is dry and gravelly, bat in the case of a damp subsoil it should rather be more elevated, as the soil could easily be sloped up to meet the retaining wall.

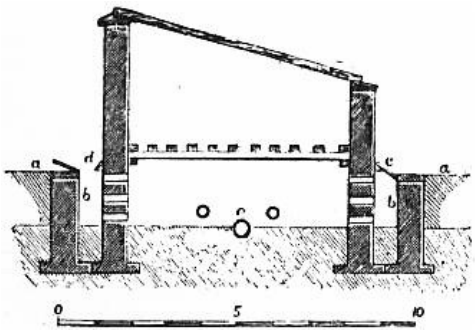

FIG. 10.—Ventilated Plant Pit.

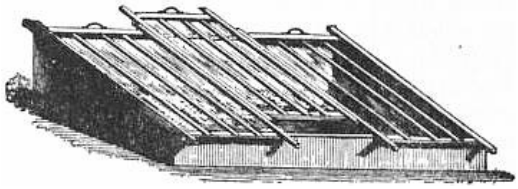
FIG. 11.—Hot-Bed Three-Light Frame.

Frames.—Frames (fig. 11) should be made of the best red deal, 1¼ in. thick. A convenient size is 6 ft. wide, 24 in. high at the back and 15 in front; and they are usually 12 ft. long, which makes three lights and sashes, though they can be made with two lights or one light for particular purposes. Indeed, a one-light frame is often found very convenient for many purposes. The lights should be 2 in. thick, and glazed with 21 oz. sheet glass, in broad panes four or five to the breadth of a light, and of a length which will work in conveniently and economically, very long panes being undesirable from the havoc caused by accidents, and very short ones being objectionable as

multiplying the chances of drip, and the exclusion of light by the numerous lappings; panes about 12 in. long are of convenient size for garden lights of this character. In all gardens the frames and lights should be of one size so as to be interchangeable, and a good supply of extra lights (sashes) may always be turned to good account for various purposes.

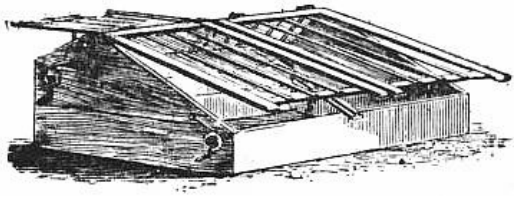

FIG. 12.—Span-Roof Frame.

Span-roof garden frame (fig. 12) may under some circumstances be useful as a substitute for the three-light frame. It is adapted for storing plants in winter, for nursing small plants in summer and for the culture of melons and other crops requiring glass shelter. These frames are made 11 in. high in front, 22 at the back and 32 at the ridge, with ends of 1½-in. red deal; the sashes, which are 2 in. thick, open by gearing, the front and back separately. The lights are hinged so that they can be turned completely back when necessary. This more direct and ready access to the plants within is one of the principal recommendations of this form of pit.

Mushroom House.—Mushrooms may be grown in sheds and cellars, or even in protected ridges in the open ground, but a special structure is usually devoted to them. A lean-to against the north side of the garden wall will be found suitable for the purpose, though a span-roofed form may also be adopted, especially if the building stands apart.

The internal arrangement of a lean-to mushroom house is shown in fig. 13. The length may vary from 30 ft. to 60 ft.; a convenient width is 10 ft., which admits of a 3½ ft. central path, and beds 3 ft. wide on each side. The shelves should be of slate *a*, *a*, supported by iron uprights *b*, *b*, each half having a front ledge of bricks set on edge in cement *c*, *c*. The slabs of slate forming the shelves should not be too closely fitted, as a small interval will prevent the accumulation of moisture at the bottom of the bed. They may be supported by iron standards or brick piers, back and front, bearing up a flat bar of iron on which the slates may rest; the use of the bar will give wider intervals between the supports, which will be found convenient for filling and emptying the beds. The roof may be tiled or slated; but, to prevent the injurious influence of hot sun, there should be an inner roof or ceiling *d*, the space between which and the outer roof *e* should be packed with sawdust. A hot-water pipe *f* should run along both sides of the pathway, close to the front ledge of the lowest beds. The different shelves can be planted in succession; and the lower ones, especially those on the floor level, as being most convenient, can be utilized for forcing sea-kale and rhubarb.

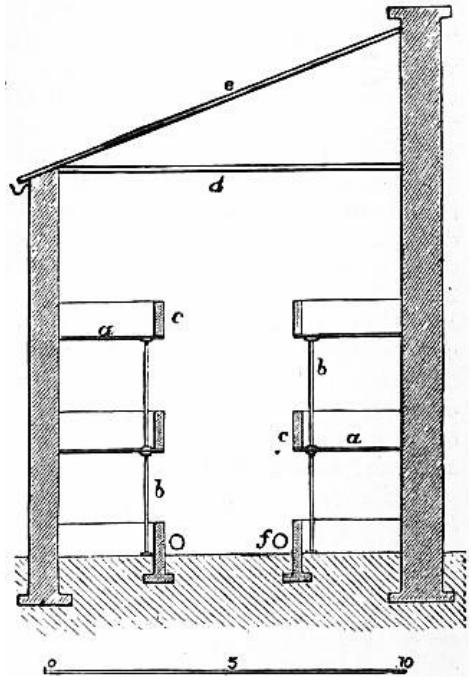

FIG. 13.—Lean-to Mushroom House.

The Fruit Room.—This important store should be dark, moderately dry, with a steady, moderately cool atmosphere, and with the means of giving sufficient ventilation to keep the air sweet. It should also be sufficiently commodious to permit of the fruit being arranged in single layers on the shelves or trays. A type of building which is becoming increasingly popular for this purpose, and which is in many respects superior to the older, and often more expensive structures, is built of wood, with or without brick foundations, and is thickly thatched with reeds or other non-conducting material externally—on walls and roof—while the interior is matchboarded. Ventilation is afforded at the ends, usually by tilting laths, operated by a cord. Two doors are provided at one end—an inner, and an outer—the inner being glazed at the top to admit light. They are generally span-roofed, about 6 ft. high at the eaves, and 8 or 10 ft. high at the ridge, according to width.

The length and breadth of these stores should be governed by the amount and character of the storage accommodation to be provided. If intended for storage only, a width of 9 ft. 6 in. would suffice, but if intended to combine display with storage, the internal diameter should be about 13 ft. In the former type, the walls are fitted with four rows of shelves, about 3 ft. wide, and about 1 ft. 6 in. apart. The shelves are of deal strips, 2 or 3 in. wide, laid about 1 in. apart for ventilation. These are being superseded, however, by sliding-out trays of convenient lengths and about 9 in. deep, working on fixed framework. By this means the storage accommodation is nearly doubled and the fruit is more easily manipulated. The central gangway is about 3 ft. 6 in. wide. In the latter a central exhibition bench about 3 ft. wide and of convenient height is provided. Gangways 2½ ft. wide flank

this, while the shelves or drawers with which the walls are fitted are about 2½ ft. wide.

Care of the Fruit Room.—This consists mainly in the storing only of such fruits as are dry and in proper condition; in judicious ventilation, especially in the presence of large quantities of newly-gathered fruit; in the prompt removal of all decaying fruit; and in the exclusion of vermin. It is also advisable to wash all woodwork and gangways annually with a weak solution of formalin, or other inodorous germicide.

Heating Apparatus.—Plant houses were formerly heated in a variety of ways—by fermenting organic matter, such as dung, by smoke flues, by steam and by hot water circulating in iron pipes. The last-named method has proved so satisfactory in practice that it is now in general use for all ordinary purposes. The water is heated by a furnace, and is conveyed from the boiler into the houses by a main or "flow" pipe, connected by means of syphon branches with as many pipes as it is intended to serve. When cooled it is returned to the boiler by another main or "return" pipe. Heat is regulated in the structures by means of valves on the various branch pipes. The flow pipe is attached to the boiler at its highest point, to take the heated water as it ascends. The return pipe is connected with the boiler at or near its lowest point. The highest points of the pipes are fitted with small taps, for the removal of air, which would retard circulation if allowed to remain. Heating by hot water may be said to depend, in part, on the influence of gravity on water being to some extent overcome by heating in a boiler. It ascends the flow pipe by convection, where its onward journey would speedily end if it were not for the driving force of other molecules of water following, and the suction set up by the gravitation into the boiler of the cooled water by the return pipe. The power of water to conduct heat is very low. The conducting power of the iron in which it is conveyed is high. It is, however, probable that conduction is to some extent a factor in the process.

Pipes.—It is a mistake to stint the quantity of piping, since it is far more economical and better for the plants to have a larger surface heated moderately than a smaller surface heated excessively. In view of the fact that air expands, becomes lighter and rises, under the influence of heat, the pipes should be set near the floor. If intended to raise the temperature of the structure, they should be set on iron or brick supports just clear of walls, earth or other heat-absorbing bodies. Those intended to provide bottom heat, however, are set in (*a*) water tanks running under the beds, or (*b*) in enclosed dry chambers under the beds, or are (*c*) embedded in the soil or plunging material. The first-named method is distinctly superior to the others. Pipes of 2 in., 3 in., 4 in. and 6 in. diameters are mostly used, the 4 in. size being the most convenient for general purposes. The joints are packed or caulked with tow, smeared with a mixture of white and red lead. Flanged joints are made to bolt together on washers of vulcanized rubber.

Boilers.—There are numerous types of boilers in use, illustrative of efforts to secure as much exposure as possible to the action of the flames. The water-tube type, with multiple waterways, consists of a number of separate tubes joined together in various ways. Some of these are built in the form of a blunt cone, and are known as conical tubular boilers. Others are built with the tubes arranged horizontally, and are known as horizontal tubular boilers. The majority of the latter are more or less saddle-shaped. Boilers with a single waterway are of three principal types, the Cornish, the saddle and the conical. The Cornish is cylindrical with the furnace occupying about half the length of the cylinder. The saddle is so named from its supposed resemblance to a saddle. It is set to span the furnace, additional exposure to heat being secured in a variety of ways by flues. Exposure in the conical boiler is direct on its inner surface, and is supplemented by flues. Tubular boilers, especially the horizontal types, are very powerful and economical. The Cornish type is a rather slow and steady boiler, and is much used for providing heat for large areas. The saddle boiler is very commonly employed to provide heat for moderately sized and small areas. Both are powerful and economical. Conical boilers are more expensive to set by reason of their shape, and are not so convenient to manipulate as the horizontal kinds. All the above types require a setting of masonry. Portable boilers are convenient for heating small areas, and are less expensive to install than those described above. They are less economical, however, owing to loss of heat from their exposed surfaces. What are called sectional boilers as used in America and on the Continent are being introduced to British gardens. Portions can be added or taken away according to the amount of heating surface required.

Water Supply.—Wastage of water in the boilers should be made good automatically from a cistern controlled by means of a ball-cock. It should be placed as high above the boiler as practicable. The feed should connect with the return pipe near the point at which it enters the boiler.

Stokeholds.—These have usually to be excavated to admit of the boilers being set below the level of the pipes they are intended to serve. In consequence of their depth, the draining of stokeholds often presents difficulties. Care should be taken to allow sufficient room to properly manipulate the fires and to store fuel. It is important that the ventilation should be as efficient as practicable, especially where coke fuel is to be used.

Stoking.—The management of the furnaces is relatively easy, and consists in adapting the volume and intensity of the fires to particular needs. It involves the keeping dean of flues, ashpits and especially the fires themselves. Where coke or ordinary hard coal are used, the removal of clinkers should be done systematically, and the fires stirred. Anthracite coal fires should not be stirred more than is absolutely necessary, and should not be fed in driblets. They require more draught than coke fires, but care must be taken not to give too much, as excessive heat is likely to melt or soften the fire-bars. Draught is regulated in the ashpit by opening or closing the bottom door of the

furnace and by the damper on the smoke shaft. The latter must be of a fairly good height, according to circumstances, to secure a good draught.

Solar Heat.—The importance of sun heat to the general well-being of plant life, its influence on the production of flowers and the ripening of edible fruits, has long been appreciated in horticulture. The practice of "closing up" early in the afternoon, *i.e.* the closing of ventilators (accompanied by syringing and damping of surfaces to produce a humid atmosphere) has for its object the conservation of as much solar heat as practicable.

Ventilation.—This consists in the admission of air for the purpose of preventing stagnation of the atmosphere and for the regulation of temperature. Means of affording ventilation in all plant houses should be provided in at least two places—as near the floor as practicable, and at the top. Mechanical contrivances whereby whole sets of ventilators may be operated simultaneously are now in common use, and are much more convenient and economical than the older method of working each ventilator separately. Efficient ventilating can only be effected by the exercise of common sense and vigilance, and care must be taken to avoid cold draughts through the houses.

III. *Garden Materials and Appliances.*

Soils and Composts.—The principal soils used in gardens, either alone, or mixed to form what are called composts, are—loam, sand, peat, leaf-mould and various mixtures and combinations of these made up to suit the different subjects under cultivation.

Loam is the staple soil for the gardener; it is not only used extensively in the pure and simple state, but enters into most of the composts prepared specially for his plants. For garden purposes loam should be rather unctuous or soapy to the touch when moderately dry, not too clinging nor adhesive, and should readily crumble when a compressed handful is thrown on the ground. If it clings together closely it is too heavy and requires amelioration by the admixture of gritty material; if it has little or no cohesion when squeezed tightly in the hand, it is too light, and needs to be 753
improved by the addition of heavier or clayey material. Sound friable loam cut one sod deep from the surface of a pasture, and stacked up for twelve months in a heap or ridge, is invaluable to the gardener. When employed for making vine borders, loam of a somewhat heavier nature can be used with advantage, on account of the porous materials which should accompany it. For stone fruits a calcareous loam is best; indeed, for these subjects a rich calcareous loam used in a pure and simple state cannot be surpassed. Somewhat heavy loams are best for potting pine apples, for melons and strawberries, fruit trees in pots, &c., and may be used with the addition of manures only; but for ornamental plants a loam of a somewhat freer texture is preferable and more pleasant to work. Loam which contains much red matter (iron) should be avoided.

Sand is by itself of little value except for striking cuttings, for which purpose fine clean sharp silver sand is the best; and a somewhat coarser kind, if it is gritty, is to be preferred to the comminuted sands which contain a large proportion of earthy matter. River sand and the sharp grit washed up sometimes by the road side are excellent materials for laying around choice bulbs at planting time to prevent contact with earth which is perhaps manure-tainted. Sea sand may be advantageously used both for propagating purposes and for mixing in composts. For the growth of pot plants sand is an essential part of most composts, in order to give them the needful porosity to carry off all excess of moisture from the roots. If the finer earthy sands only are obtainable, they must be rendered sharper by washing away the earthy particles. Washed sand is best for all plants like heaths, which need a pure and lasting peaty compost.

Peat soil is largely employed for the culture of such plants as rhododendrons, azaleas, heaths, &c. In districts where heather and gritty soil predominate, the peat soil is poor and unprofitable, but selections from both the heathy and the richer peat soils, collected with judgment, and stored in a dry part of the compost yard, are essential ingredients in the cultivation of many choice pot plants, such as the Cape heaths and many of the Australian plants. Many monocotyledons do well in peat, even if they do not absolutely require it.

Leaf-mould is eminently suited for the growth of many free-growing plants, especially when it has been mixed with stable manure and has been subjected to fermentation for the formation of hot beds. It any state most plants feed greedily upon it, and when pure or free from decaying wood or sticks it is a very safe ingredient in composts; but it is so liable to generate fungus, and the mycelium or spawn of certain fungi is so injurious to the roots of trees, attacking them if at all sickly or weakened by drought, that many cultivators prefer not to mix leaf-mould with the soil used for permanent plants, as peaches or choice ornamental trees. For quick growing plants, however, as for example most annuals cultivated in pots, such as balsams, cockscombs, globe-amaranths and the like, for cucumbers, and for young soft-wooded plants generally, it is exceedingly useful, both by preventing the consolidation of the soil and as a manure. The accumulations of light earth formed on the surface in woods where the leaves fall and decay annually are leaf-mould of the finest quality. Leaves collected in the autumn and stored in pits or heaps, and covered with a layer of soil, make beautiful leaf-mould at the end of about twelve months, if frequently drenched with water or rain during this period.

Composts are mixtures of the foregoing ingredients in varying proportions, and in combination with manures if necessary, so as to suit particular plants or classes of plants. The chief point to be borne in mind in making these mixtures is not to combine in the same compost any bodies that are antagonistic in their nature, as for example lime and ammonia. In making up composts for pot plants, the fibrous portion should not be removed by sifting, except for small-sized pots, but the turfy portions should be broken up by hand and distributed in smaller or larger lumps throughout the mass. When sifting is had recourse to, the fibrous matter should be rubbed through the meshes of the sieve along with the earthy particles. Before being used the turfy ingredients of composts should lie together in a heap only long enough for the roots of the herbage to die, not to decompose.

Manures (see MANURE).—These are of two classes, organic and inorganic—the former being of animal and vegetable, the latter of mineral origin. The following are organic manures:

Farm-yard manure consists of the mixed dung of horses and cattle thrown together, and more or less soaked with liquid drainings of the stable or byre. It is no doubt the finest stimulant for the growth of plants, and that most adapted to restore the fertile elements which the plants have abstracted from exhausted soils. This manure is best fitted for garden use when in a moderately fermented state.

Horse dung is generally the principal ingredient in all hot bed manure; and, in its partially decomposed state, as afforded by exhausted hot beds, it is well adapted for garden use. It is most beneficial on cold stiff soils. It should not be allowed to lie too long unmoved when fresh, as it will then heat violently, and the ammonia is thus driven off. To avoid this, it should be turned over two or three times if practicable, and well moistened—preferably with farm-yard drainings.

Cow dung is less fertilizing than horse dung, but being slower in its action it is more durable; it is also cooler, and therefore better for hot dry sandy soils. Thoroughly decayed, it is one of the best of all manures for mixing in composts for florists' flowers and other choice plants.

Pig dung is very powerful, containing more nitrogen than horse dung; it is therefore desirable that it should undergo moderate fermentation, which will be secured by mixing it with litter and a portion of earth. When weeds are thrown to the pigs, this fermentation becomes specially desirable to kill their seeds.

Night-soil is an excellent manure for all bulky crops, but requires to be mixed with earth or peat, or coal-ashes, so as both to deodorize it and to ensure its being equally distributed. Quicklime should not be used, as it dispels the greater part of the ammonia. When prepared by drying and mixing with various substances, night-soil is sold as desiccated night-soil or native guano, the value of which depends upon the materials used for admixture.

Malt-dust is an active manure frequently used as a top-dressing, especially for fruit trees in pots. It is rapid in its action, but its effects are not very permanent. *Rape dust* is somewhat similar in its character and action.

Bones are employed as a manure with decided advantage both to vegetable crops and to fruit trees, as well as to flowers. For turnips bone manure is invaluable. The effects of bones are no doubt mainly due to the phosphates they contain, and they are most effectual on dry soils. They are most quickly available when dissolved in sulphuric acid.

Guano is a valuable manure now much employed, and may be applied to almost every kind of crop with decided advantage. It should be mixed with six or eight times its weight of loam or ashes, charred peat, charcoal-dust or some earthy matter, before it is applied to the soil, as from its causticity it is otherwise not unlikely to kill or injure the plants to which it is administered. Peruvian guano is obtained from the excreta of South American sea-birds, and fish guano from the waste of fish. Both are remarkable for the quantity of nitrates and phosphates they contain.

Pigeon dung approaches guano in its power as manure. It should be laid up in ridges of good loamy soil in alternate layers to form a compost, which becomes a valuable stimulant for any very choice subjects if cautiously used. The dung of the domestic fowl is very similar in character.

Horn, *hoof-parings*, *woollen rags*, *fish*, *blubber* and *blood*, after treatment with sulphuric acid, are all good manures, and should be utilized if readily obtainable.

Liquid manure, consisting of the drainings of dung-heaps, stables, cowsheds, &c., or of urine collected from dwelling houses or other sources, is a most valuable and powerful stimulant, and can be readily applied to the roots of growing plants. The urine should be allowed to putrefy, as in its decomposition a large amount of ammonia is formed, which should then be fixed by sulphuric acid or gypsum; or it may be applied to the growing crops after being freely diluted with water or absorbed in a compost heap. Liquid manures can be readily made from most of the solid manures when required, simply by admixture with water. When thus artificially compounded, unless for immediate use, they should be made strong for convenience of storage, and applied as required much diluted.

The following are inorganic manures:

Ammonia is the most powerful and one of the most important of the constituents of manures generally, since it is the chief source whence plants derive their nitrogen. It is largely supplied in

all the most fertilizing of organic manures, but when required in the inorganic state must be obtained from some of the salts of ammonia, as the sulphate, the muriate or the phosphate, all of which, being extremely energetic, require to be used with great caution. These salts of ammonia may be used at the rate of from 2 to 3 cwt. per acre as a top-dressing in moist weather. When dissolved in water they form active liquid manures. The most commonly used nitrogenous manures are nitrate of soda, nitrate of potash and sulphate of ammonia, the prices of which are constantly fluctuating.

Potash and *soda* are also valuable inorganic manures in the form of carbonates, sulphates, silicates and phosphates, but the most valuable is the nitrate of potash. The price, however, is generally so high that its use is practically nil, except in small doses as a liquid manure for choice pot plants. Cheaper substitutes, however, are now found in sulphate of potash, and muriate of potash and kainit. The two last-named must not be applied direct to growing crops, but to the soil some weeks in advance of sowing or cropping. The manures of this class are of course of value only in cases where the soil is naturally deficient in them. On this account the salts of soda are of less importance than those of potash. The value of wood ashes as a manure very much depends upon the carbonate and other salts of potash which they contain.

Phosphoric acid, in the form of phosphates, is a most valuable plant food, and is absorbed by most plants in fairly large quantities from the soil. It induces the earlier production of flowers and fruits. In a natural state it is obtained from bones, guano and wood ashes; and in an artificial condition from basic slag or Thomas's phosphate, coprolites and superphosphate of lime.

Lime in the caustic state is beneficially applied to soils which contain an excess of inert vegetable matter, and hence may be used for the improvement of old garden soils saturated with humus, or of peaty soils not thoroughly reclaimed. It does not supply the place of organic manures, but only renders that which is present available for the nourishment of the plants. It also improves the texture of clay soils.

Gypsum, or sulphate of lime, applied as a top-dressing at the rate of 2 to 3 cwt. per acre, has been found to yield good results, especially on light soils. It is also employed in the case of liquid manures to fix the ammonia.

Gas lime, after it has been exposed to the air for a few months is an excellent manure on heavy soils. In a fresh state it is poisonous and fatal to vegetation, and is often used for this reason to dress land infested with wireworms, grubs, club-root fungus, &c.

Burnt clay has a very beneficial effect on clay land by improving its texture and rendering soluble the alkaline substances it contains. The clay should be only slightly burnt, so as to make it crumble down readily; in fact, the fire should not be allowed to break through, but should be constantly repressed by the addition of material. The burning should be effected when the soil is dry.

Vegetable refuse of all kinds, when smother-burned in a similar way, becomes a valuable mechanical improver of the soil; but the preferable course is to decompose it in a heap with quicklime and layers of earth, converting it into leaf-mould. Potato haulms, and club-rooted cabbage crops should, however, never be mixed with ordinary clean vegetable refuse, as they would be most likely to perpetuate the terrible diseases to which they are subject. The refuse of such plants should be burned as early as possible. The ash may be used as manure.

Soot forms a good top-dressing; it consists principally of charcoal, but contains ammonia and a smaller proportion of phosphates and potash, whence its value as a manure is derived. It should be kept dry until required for use. It may also be used beneficially in preventing the attacks of insects, such as the onion gnat and turnip fly, by dusting the plants or dressing the ground with it.

Common salt acts as a manure when used in moderate quantities, but in strong doses is injurious to vegetation. It suits many of the esculent crops, as onions, beans, cabbages, carrots, beet-root, asparagus, &c.; the quantity applied varies from 5 to 10 bushels per acre. It is used as a top-dressing sown by the hand. Hyacinths and other bulbs derive benefit from slight doses, while to asparagus as much as 20 lb to the rood has been used with beneficial effect. At the rate of from 6 to 10 bushels to the acre it may be used on garden lawns to prevent worm casts. For the destruction of weeds on gravel walks or in paved yards a strong dose of salt, applied either dry or in a very strong solution, is found very effective, especially a hot solution, but after a time much of it becomes washed down, and the residue acts as a manure; its continued application is undesirable, as gravel so treated becomes pasty.

Garden Tools, &c.—Most of these are so well known that we shall not discuss them here. They are, moreover, illustrated and described in the catalogues of most nurserymen and dealers in horticultural sundries.

Tallies or Labels.—The importance of properly labelling plants can hardly be over-estimated. For ordinary purposes labels of wood of various sizes (sold in bundles) are the most convenient. These should be wiped with a little white paint or linseed oil, and written with a soft lead pencil before the surface becomes dry. Copying-ink pencils should not be used, as water will wash away the writing. For permanent plants, as trees, roses, &c., metallic labels with raised type are procurable from dealers, and are neat, durable and convenient. Permanent labels may also be made from sheet lead, the names being punched in by means of steel type. For stove and greenhouse plants, orchids, ferns, &c., labels made of xylonite, zinc and other materials are also used.

IV. *Garden Operations.*

Propagation.—The increase of plants, so far as the production of new individuals of particular kinds is concerned, is one of the most important and constantly recurring of gardening operations. In effecting this, various processes are adopted, which will now be described.

1. *By Seeds.*—This may be called the natural means of increasing the number of any particular kind of plant, but it is to be remembered that we do not by that means secure an exact reproduction of the parent, especially in the case of plants raised or evolved in the course of generations by hybridization and selection. We may get a progeny very closely resembling it, yet each plant possessing a distinct individuality of its own; or we may get a progeny very unlike the parent, or a mixed progeny showing various degrees of divergence. Many seeds will grow freely if sown in a partially ripened state; but as a general rule seeds have to be kept for some weeks or months in store, and hence they should be thoroughly ripened before being gathered. They should be sown in fine rich soil, and such as will not readily get consolidated. In the case of outdoor crops, if the soil is inclined to be heavy, it is a good plan to cover all the smaller seeds with a light compost. Very small seeds should only have a sprinkling of light earth or of sand, and sometimes only a thin layer of soft moss to exclude light and preserve an equable degree of moisture. Somewhat larger seeds sown indoors may be covered to the depth of one-eighth or one-fourth of an inch, according to their size. Outdoor crops require to be sown, the smaller seeds from ½ to 1 in., and the larger ones from 2 to 4 in. under the surface, the covering of the smaller ones especially being light and open. Many seeds grow well when raked in; that is, the surface on which they are scattered is raked backwards and forwards until most of them are covered. Whatever the seeds, the ground should be made tolerably firm both beneath and above them; this may be done by treading in the case of most kitchen garden crops, which are also better sown in drills, this admitting the more readily of the ground being kept clear from weeds by hoeing. All seeds require a certain degree of heat to induce germination. For tropical plants the heat of a propagating house—75° to 80°, with a bottom heat of 80° to 90°—is desirable, and in many cases absolutely necessary; for others, such as half-hardy annuals, a mild hot bed, or a temperate pit ranging from 60° to 70°, is convenient; while of course all outdoor crops have to submit to the natural temperature of the season. It is very important that seeds should be sown when the ground is in a good working condition, and not clammy with moisture.

2. *By Offsets.*—This mode of increase applies specially to bulbous plants, such as the lily and hyacinth, which produce little bulbs on the exterior round their base. Most bulbs do so naturally to a limited but variable extent; when more rapid increase is wanted the heart is destroyed, and this induces the formation of a larger number of offsets. The stem bulbs of lilies are similar in character to the offsets from the parent bulb. The same mode of increase occurs in the gladiolus and crocus, but their bulb-like permanent parts are called corms, not bulbs. After they have ripened in connexion with the parent bulb, the offsets are taken off, stored in appropriate places, and at the proper season planted out in nursery beds.

3. *By Tubers.*—The tuber is a fleshy underground stem, furnished with eyes which are either visible, as in the potato and in some familiar kinds of *Tropaeolum* (*T. tuberosum*) and of *Oxalis* (*O. crenata*), or latent, as in the Chinese yam (*Dioscorea Batatas*). When used for propagation, the tubers are cut up into what are called “sets,” every portion having an eye attached being capable of forming an independent plant. The cut portions of bulky sets should be suffered to lie a short time before being planted, in order to dry the surface and prevent rotting; this should not, however, be done with such tropical subjects as caladiums, the tubers of which are often cut up into very small fragments for propagation, and of course require to be manipulated in a properly heated propagating pit. No eyes are visible in the Chinese yam, but slices of the long club-shaped tubers will push out young shoots and form independent plants, if planted with ordinary care.

4. *By Division.*—Division, or partition, is usually resorted to in the case of tufted growing plants, chiefly perennial herbs; they may be evergreen, as chamomile or thrift, or when dormant may consist only of underground crowns, as larkspur or lily-of-the-valley; but in either case the old tufted plant being dug up may be divided into separate pieces, each furnished with roots, and, when replanted, generally starting on its own account without much check. Suffruticose plants and even small shrubs may be propagated in this way, by first planting them deeper than they are ordinarily grown, and then after the lapse of a year, which time they require to get rooted, taking them up again and dividing them into parts or separate plants. Box-edging and southernwood are examples. The same ends may sometimes be effected by merely working fine soil in amongst the base of the stems, and giving them time to throw out roots before parting them.

5. *By Suckers.*—Root suckers are young shoots from the roots of plants, chiefly woody plants, as may often be seen in the case of the elm and the plum. The shoots when used for propagation must be transplanted with all the roots attached to them, care being taken not to injure the parent plant. If they spring from a thick root it is not to be wantonly severed, but the soil should be removed and the sucker taken off by cutting away a clean slice of the root, which will then heal and sustain no harm. Stem suckers are such as proceed from the base of the stem, as is often seen in the case of the currant and lilac. They should be removed in any case; when required for propagation they should be taken with all the roots attached to them, and they should be as thoroughly disbudded below ground as possible, or they are liable to continue the habit of suckering. In this case, too, the

soil should be carefully opened and the shoots removed with a suckering iron, a sharp concave implement with long iron handle (fig. 14). When the number of roots is limited, the tops should be shortened, and some care in watering and mulching should be bestowed on the plant if it is of value.

FIG. 14.—Suckering Iron.

6. *By Runners.*—The young string-like shoots produced by the strawberry are a well-known example of runners. The process of rooting these runners should be facilitated by fixing them close down to the soil, which is done by small wooden hooked pegs or by stones; hair-pins, short lengths of bent wire, &c., may also be used. After the roots are formed, the strings are cut through, and the runners become independent plants.

7. *By Proliferous Buds.*—Not unlike the runner, though growing in a very different way, are the bud-plants formed on the fronds of several kinds of ferns belonging to the genera *Asplenium*, *Woodwardia*, *Polystichum*, *Lastrea*, *Adiantum*, *Cystopteris*, &c. In some of these (*Adiantum caudatum*, *Polystichum lepidocaulon*) the rachis of the frond is lengthened out much like the string of the strawberry runner, and bears a plant at its apex. In others (*Polystichum angulare proliferum*) the stipes below and the rachis amongst the pinnae develop buds, which are often numerous and crowded. In others again (*Woodwardia orientalis*, *Asplenium bulbiferum*), buds are numerously produced on the upper surface of the fronds. These will develop on the plant if allowed to remain. For propagation the buibiferous portion is pegged down on the surface of a pot of suitable soil; if kept close in a moist atmosphere, the little buds will soon strike root and form independent plants. In *Cystopteris* the buds are deciduous, falling off as the fronds acquire maturity, but, if collected and pressed into the surface of a pot of soil and kept close, they will grow up into young plants the following season. In some genera of flowering plants, and notably in Bryophyllum, little plants form on various parts of the leaves. In some Monocotyledons, ordinarily in Chlorophytum, and exceptionally in Phalaenopsis and others, new plants arise on the flower stems.

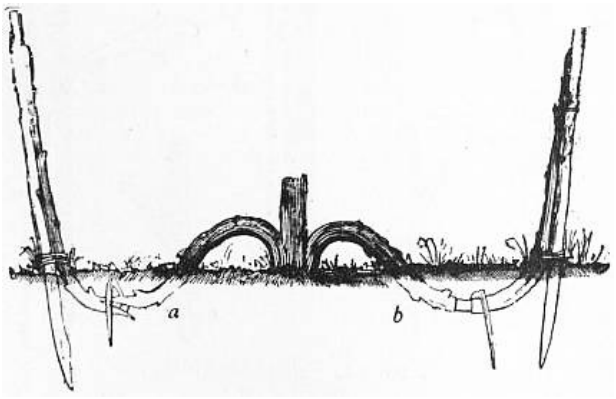

FIG. 15.—Propagation by Layers—*a*, tonguing; *b*, ringing.

8. *By Layers.*—Layering consists in preparing the branch of a plant while still attached to the parent, bending it so that the part operated on is brought under ground, and then fixing it there by means of a forked peg. Some plants root so freely that they need only pegging down; but in most cases the arrest of the returning sap to form a callus, and ultimately young roots, must be brought about artificially, either by twisting the branch, by splitting it, by girding it closely with wire, by taking off a ring of bark, or by “tonguing.” In tonguing the leaves are cut off the portion which has to be brought under ground, and a tongue or slit is then cut from below upwards close beyond a joint, of such length that, when the cut part of the layer is pegged an inch or two (or in larger woody subjects 3 or 4 in.) below the surface, the elevation of the point of the shoot to an upright position may open the incision, and thus set it free, so that it may be surrounded by earth to induce it to form roots. The whole branch, except a few buds at the extremity, is covered with soil. The best seasons for these operations are early spring and mid-summer, that is, before the sap begins to flow, and after the first flush of growth has passed off. One whole summer, sometimes two, must elapse before the layers will be fully rooted in the case of woody plants; but such plants as carnations and picotees, which are usually propagated in this way, in favourable seasons take only a few weeks to root, as they are layered towards the end of the blooming season in July, and are taken off and planted separately early in the autumn. Fig. 15 shows a woody plant with one layer prepared by tonguing and another by ringing.

In general, each shoot makes one layer, but in plants like the *Wistaria* or *Clematis*, which make long shoots, what is called serpentine layering may be adopted; that is, the shoot is taken alternately below and above the surface, as frequently as its length permits. There must, however, be a joint at the underground part where it is to be tongued and pegged, and at least one sound bud in each exposed part, from which a shoot may be developed to form the top of the young plant.

9. *By Circumposition.*—When a plant is too high or its habit does not conveniently admit of its being layered, it may often be increased by what is called circumposition, the soil being carried up to the branch operated on. The branch is to be prepared by ringing or notching or wiring as in layering, and a temporary stand made to support the vessel which is to contain the soil. The vessel may be a flower-pot sawn in two, so that the halves may be bound together when used, or it may be a flower-pot or box with a side slit which will admit the shoot; this vessel is to be filled compactly with suitable porous earth, the opening at the slit being stopped by pieces of slate or tile. The earth must be kept moist, which is perhaps best done by a thick mulching of moss, the moss being also bound closely over the openings in the vessel, and all being kept damp by frequent syringings. Gardeners often dispense with the pot, using sphagnum moss and leaf-mould only when propagating india-rubber plants, perpetual carnations, dracaenas, &c.

10. *By Grafts.*—Grafting is so extensively resorted to that it is impossible here to notice all its phases. It is perhaps of most importance as the principal means of propagating our hardy kinds of fruit, especially the apple and the pear; but the process is the same with most other fruits and ornamental hardy trees and shrubs that are thus propagated. The stocks are commonly divided into two classes:—(1) free stocks, which consist of seedling plants, chiefly of the same genus or species as the trees from which the scions are taken; and (2) dwarfing stocks, which are of more diminutive growth, either varieties of the same species or species of the same or some allied genus as the scion, which have a tendency to lessen the expansion of the engrafted tree. The French Paradise is the best dwarfing stock for apples, and the quince for pears. In determining the choice of stocks, the nature of the soil in which the grafted trees are to grow should have full weight. In a soil, for example, naturally moist, it is proper to graft pears on the quince, because this plant not only thrives in such a soil, but serves to check the luxuriance thereby produced. The scions should always be ripened portions of the wood of the preceding year, selected from healthy parents; in the case of shy-bearing kinds, it is better to obtain them from the fruitful branches. The scions should be taken off some weeks before they are wanted, and half-buried in the earth, since the stock at the time of grafting should in point of vegetation be somewhat in advance of the graft. During winter, grafts may be conveyed long distances, if carefully packed. If they have been six weeks or two months separated from the parent plant, they should be grafted low on the stock, and the earth should be ridged up round them, leaving only one bud of the scion exposed above ground. The best season for grafting apples and similar hardy subjects in the open air is in March and April; but it may be commenced as soon as the sap in the stock is fairly in motion.

Whip-grafting or *Tongue-grafting* (fig. 16) is the most usual mode of performing the operation when there is no great difference in thickness between the stock and scion. The stock is headed off by an oblique transverse cut as shown at *a*, a slice is then pared off the side as at *b*, and on the face of this a tongue or notch is made, the cut being in a downward direction; the scion *c* is pared off in a similar way by a single clean sharp cut, and this is notched or tongued in the opposite direction as the figure indicates; the two are then fitted together as shown at *d*, so that the inner bark of each may come in contact at least on one side, and then tied round with damp soft bast as at *e*; next some grafting clay is taken on the forefinger and pushed down on each side so as to fill out the space between the top of the stock and the graft, and a portion is also rubbed over the ligatures on the side where the graft is placed, a handful of the clay is then taken, flattened out, and rolled closely round the whole point of junction, being finished off to a tapering form both above and below, as shown by the dotted line *f*. To do this deftly, the hands should be plunged from time to time in dry ashes, to prevent the clay from sticking to them. Various kinds of grafting wax are now obtainable, and are a great improvement upon the clay process. Some cold mastics become very pliable with the warmth of the hands. They are best applied with a piece of flat wood; or very liquid waxes may be applied with a brush.

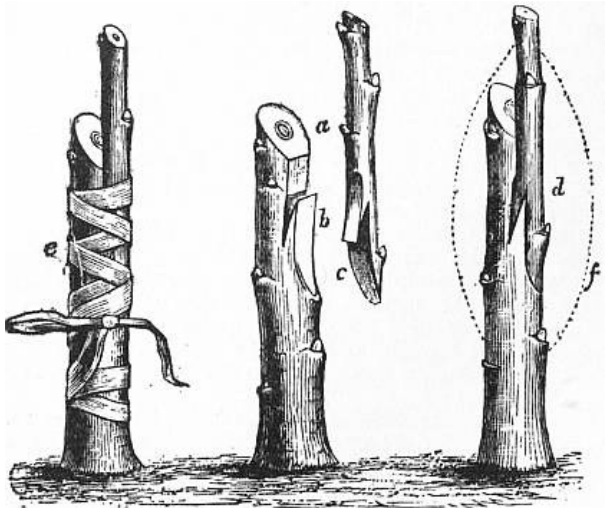

FIG. 16.—Whip-grafting or Tongue-grafting.

Cleft-grafting (fig. 17) is another method in common use. The stock *a* is cleft down from the horizontal cut *d* (but not nearly so much as the sketch would indicate), and the scion, when cut to a

thin wedge form, as shown at *c* and *e*, is inserted into the cleft; the whole is then bound up and clayed as in the former case. This is not so good a plan as whip-grafting; it is improved by sloping the stock on one side to the size of the graft.

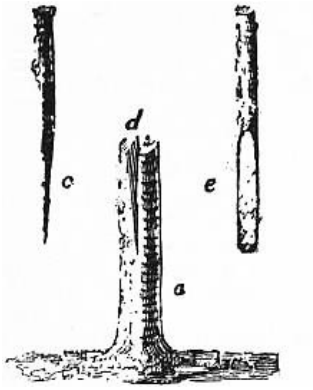

FIG. 17.—Cleft-grafting.

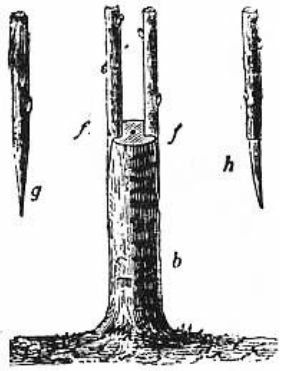

FIG. 18.—Crown-Grafting.

Crown-grafting or *Rind-grafting* (fig. 18) is preferable to cleft-grafting, inasmuch as it leaves no open spaces in the wood. The stock *b* is cut off horizontally or nearly so in January or February. At grafting time a slit is cut in the bark *f*, *f*, a wedge-shaped piece of iron or a small chisel being inserted to raise the bark; the scion is then cut to the same wedge-shaped form *g*, *h*, and inserted in the space opened for it between the alburnum and the bark, after which it is tied down and clayed or waxed over in the manner already described.

Side-grafting is performed like whip-grafting, the graft being inserted on the side of a branch and not at the cut end of the stock. It may be practised for the purpose of changing a part of the tree, and is sometimes very useful for filling out vacant spaces, in trained trees especially.

Inarching is another form of side-grafting. Here the graft is fixed to the side of the stock, which is planted or potted close to the plant to be worked. The branches are applied to the stock while yet attached to the parent tree, and remain so until united. In the case of trained trees, a young shoot is sometimes inarched to its parent stem to supply a branch where one has not been developed in the ordinary way.

For the propagation by grafts of stove and greenhouse plants the process adopted is whip-grafting or a modification of it. The parts are, however, sometimes so small that the tongue of the graft is dispensed with, and the two stems simply pared smooth and bound together. In this way hardy rhododendrons of choice sorts, greenhouse azaleas, the varieties of the orange family, camellias, roses, rare conifers, clematises and numerous other plants are increased. Raffia—which has taken the place of bast—is generally used for tying, and grafting wax is only used occasionally with such plants under glass. All grafting of this kind is done in the propagating house, at any season when grafts are obtainable in a fit state—the plants when operated on being placed in close frames warmed to a suitable temperature. Roses and clematis, however, are generally grafted from January to March and April.

Root-grafting is sometimes resorted to where extensive increase is an object, or where stem-grafting or other means of propagation are not available. In this case the scion is grafted directly on to a portion of the root of some appropriate stock, both graft and stock being usually very small; the grafted root is then potted so as to cover the point of junction with the soil, and is plunged in the bed of the propagating house, where it gets the slight stimulus of a gentle bottom heat. Dahlias (fig. 19), paeonies, and Wistarias may be grafted by inserting young shoots into the neck of one of the fleshy roots of each kind respectively—the best method of doing so being to cut a triangular section near the upper end of the root, just large enough to admit the young shoot when slightly pared away on two sides to give it a similar form. In the case of large woody plants thus worked (fig. 20) the grafted roots, after the operation is completed, are planted in nursery beds, so that the upper buds only are exposed to the atmosphere, as shown in the figure.

FIG. 19.—Root-grafting of Dahlia.

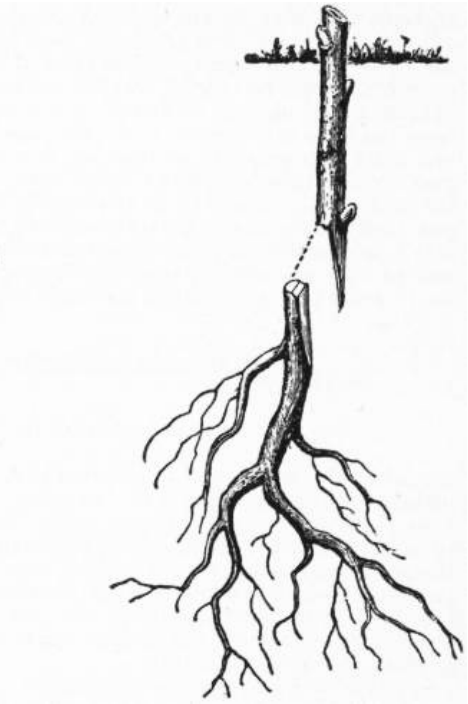

FIG. 20.—Root-grafting of Woody Plant.

11. *By Buds.*—Budding is the inserting of a bud of a choice variety cut with a portion of bark into the bark of the stock of an inferior nature where it is bound gently but firmly. Stone fruits, such as peaches, apricots, plums, cherries, &c., are usually propagated in this way, as well as roses and many other plants. In the propagating house budding may be done at any season when the sap is in motion; but for fruit trees, roses, &c., in the open air, it is usually done in July or August, when the buds destined for the following year are completely formed in the axils of the leaves, and when the bark separates freely from the wood it covers. Those buds are to be preferred, as being best ripened, which occur on the middle portion of a young shoot, and which are quite dormant at the time.

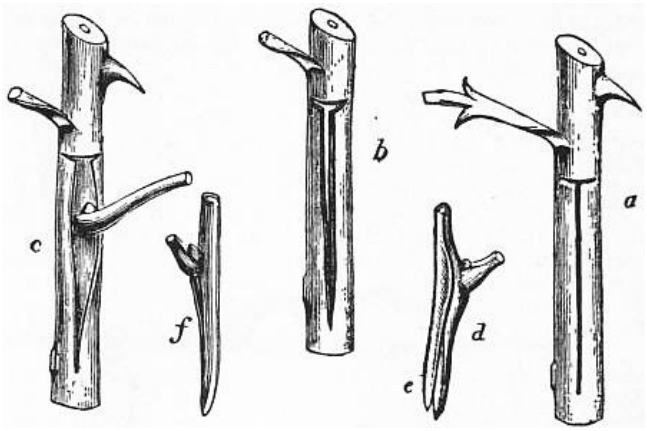

FIG. 21.—Shield-budding.

The simplest and most generally practised form of budding is that called *shield-budding* or **T**-*budding* (fig. 21). The operator should be provided with a sharp budding knife having a thin ivory or bone handle, for raising the bark of the stock. A horizontal incision is made in the bark quite down to the wood, and from this a perpendicular slit is drawn upwards to the extent of perhaps an inch, so that the slit has a resemblance to the letter **T**, as at *a*. A bud is then cut by a clean incision from the tree intended to be propagated, having a portion of the wood attached to it, and so that the whole may be about 1 in. long, as at *d*. The bit of wood e must be gently withdrawn, care being taken that the bud adheres wholly to the bark or shield, as it is called, of which f is a side view. The bark on each side of the perpendicular slit being then cautiously opened, as at *b*, with the handle of the knife, the bud and shield are inserted as shown at *c*. The upper tip of the shield is cut off horizontally, and brought to fit the bark of the stock at the transverse incision. Slight ties of soft cotton wool or worsted, or moist raffia, are then applied. In about a month or six weeks the ligatures may be removed or slit with the knife to allow for the swelling stem, when, if the operation has been successful, the bud will be fresh and full, and the shield firmly united to the wood. In the following spring a strong shoot will be thrown out, and to prevent its being blown out by the wind, must be fastened to a stake, or to the lower portion of the old stock which has been left for the purpose.

To be successful the operation should be performed with a quick and light hand, so that no part of

the delicate tissues be injured, as would happen if they were left for a time exposed, or if the bud were forced in like a wedge. The union is effected as in grafting, by means of the organizable sap or cambium, and the less this is disturbed until the inner bark of the shield is pressed and fixed against it the better. Trees to be grown in the form of a bush are usually budded low down on the stem of the stock as near the root as possible to obviate the development of wild suckers later on. Standard trees, however, are budded on a sturdy young shoot close to the top. In either case the stocks should have been carefully planted at least the previous November when the work is to be done in the open air the following July or August.

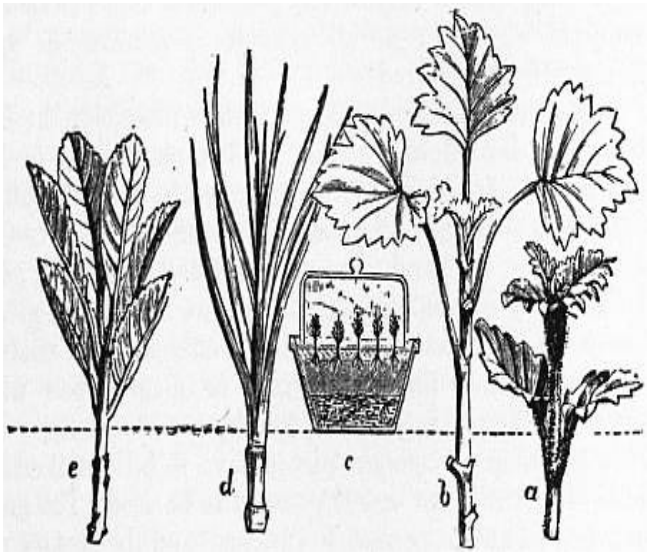

FIG. 22.—Propagation by Cuttings.

12. *By Branch Cuttings.*—Propagation by cuttings is the mode of increase most commonly adopted, next to that by seeds. It is effected by taking a portion from a branch or shoot of the plant, and placing it in the soil. There are great differences to be observed in the selection and treatment of cuttings. Sometimes soft green leafy shoots, as in *Verbena* (fig. 22, *a*), are used; sometimes the shoots must be half-ripened, and sometimes fully matured. So of the mode of preparation; some will root if cut off or broken off at any point and thrust into wet earth or sand in a warm place (fig. 22, *a*); others require to be cut with the utmost care just below a joint or leaf-base, and by a keen blade so as to sever the tissues without tearing or bruising; and others again after being cut across may be split up for a short distance, but there seems to be no particular virtue in this. It is usual and in most cases necessary to cut away the lower portion of a cutting up to just below the node or joint (fig. 22, *b*, *d*, *e*). The internodal parts will not often divide so as to form separate individual plants; sometimes, however, this happens; it is said that the smallest piece of *Torenia asiatica*, for instance, will grow. Then as to position, certain cuttings grow readily enough if planted outdoors in the open soil, some preferring shade, others sunshine, while less hardy subjects must be covered with a bell-glass, or must be in a close atmosphere with bottom heat, or must have the aid of pure silver sand to facilitate their rooting (fig. 22, *c*). Cuttings should in all cases be taken from healthy plants, and from shoots of a moderate degree of vigour. It is also important to select leafy growths, and not such as will at once run up to flower. Young shoots which have become moderately firm generally make the best cuttings, but sometimes the very softest shoots strike more readily. For all indoor plants in a growing state spring is a good time for taking cuttings, but at any time during the summer months is also favourable if cuttings are obtainable.

Cuttings of deciduous plants should be taken off after the fall of the leaf. These cuttings should be about 6 in. to 1 ft. in length, and should be planted at once in the ground so as to leave only the top with the two or three preserved buds exposed. If a clean stem, however, is desired, a longer portion may be left uncovered. Gooseberries, currants, roses and many hardy deciduous trees and shrubs are easily propagated in this way if the cuttings are inserted in well-drained soil about the end of October or early in November.

Cuttings of growing plants are prepared by removing with a sharp knife, and moderately close, the few leaves which would otherwise be buried in the soil; they are then cut clean across just below a joint; the fewer the leaves thus removed, however, the better, as if kept from being exhausted they help to supply the elaborated sap out of which the roots are formed. Free-rooting subjects strike in any lightish sandy mixture; but difficult subjects should have thoroughly well-drained pots, a portion of the soil proper for the particular plants made very sandy, and a surfacing of clean sharp silver sand about as deep as the length of the cutting.

Such difficult plants as heaths are reared in silver sand, a stratum of which is placed over the sandy peat soil in a specially prepared cutting pot, and thus the cuttings, though rooting in the sand under a bell-glass, find at once on the emission of roots congenial soil for them to grow in (fig. 22,

c).

Hardy plants, such as pinks, pansies, &c., are propagated by cuttings planted during early summer in light rich soil. The cuttings of pinks are called pipings (fig. 22, *d*), and are planted about June, while pansies may be renewed in this way both in spring and in autumn.

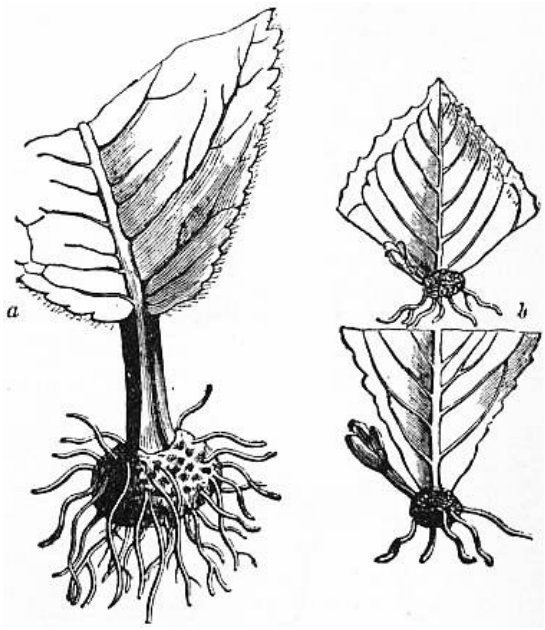

FIG. 23.—Leaf Cuttings.

13. *By Leaf Cuttings.*—Many plants may be propagated by planting their leaves or portions of the leaves as cuttings, as, for example, the *Gloxinia* (fig. 23, *a*) and *Gesnera*, the succulent *Sempervivum*, *Echeveria*, *Pachyphytum* and their allies, and such hard-leaved plants as *Theophrasta* (fig. 23, *b*). The leaves are best taken off with the base whole, and should be planted in well-drained sandy soil; in due time they form roots, and ultimately from some latent bud a little shoot which forms the young plant. The treatment is precisely like that of branch cuttings. Gloxinias, begonias, &c., grow readily from fragments of the leaves cut clean through the thick veins and ribs, and planted edgewise like cuttings. This class of subjects may also be fixed flat on the surface of the cutting pot, by means of little pegs or hooks, the main ribs being cut across at intervals, and from these points roots, and eventually young tubers, will be produced (fig. 24).

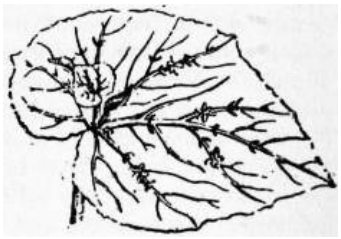
FIG. 24.—Leaf-Propagation of Begonia.

14. *By Root Cuttings.*—Some plants which are not easily increased by other means propagate readily from root cuttings. Amongst the indoor plants which may be so treated, *Bouvardia*, *Pelargonium*, *Aralia* and *Wigandia* may be mentioned. The *modus operandi* is to turn the plant out of its pot, shake away the soil so as to free the roots, and then select as many pieces of the stouter roots as may be required. These are cut up into half-inch lengths (more or less), and inserted in light sandy soil round the margin of a cutting pot, so that the upper end of the root cutting may be level with the soil or only just covered by it. The pots should be watered so as to settle the soil, and be placed in the close atmosphere of the propagating pit or frame, where they will need scarcely any water until the buds are seen pushing through the surface.

There are various herbaceous plants which may be similarly treated, such as sea-kale and horseradish, and, among ornamental plants, the beautiful autumn-blooming *Anemone japonica*, *Bocconia cordata*, *Dictamnus Fraxinella*—the burning bush; the sea hollies (*Eryngium*), the globe thistle (*Echinops ritro*), the Oriental poppy (Papaver orientale), the sea lavender (*Statice latifolia*), *Senecio pulcher*, &c. The sea-kale and horseradish require to be treated in the open garden, where the cut portions should be planted in lines in well-worked soil; but the roots of the others should be planted in pots and kept in a close frame with a little warmth till the young shoots have started.

Various hardy ornamental trees are also increased in this way, as the quince, elm, robinia and mulberry, and the rose amongst shrubs. The most important use to which this mode of propagation is put is, however, the increase of roses, and of the various plums used as stocks for working the choicer stone fruits. The method in the latter case is to select roots averaging the thickness of the little finger, to cut these into lengths of about 3 or 4 in., and to plant them in lines just beneath the surface in nursery beds. The root cuttings of rose-stocks are prepared and treated in a similar way.

15. *By Cuttings of Single Eyes.*—This mode of propagation is by cutting the ripened young branches into short lengths, each containing one well-matured bud or eye, with a short portion of the stem above and below. It is a common mode of propagating vines, the eyes being in this case cut from the ripened leafless wood. The eyes (fig. 25, *a*) are planted just below the surface in pots of light soil, which are placed in a hot bed or propagating pit, and in due time each pushes up a young shoot which forms the future stem, while from about its base the young roots are produced (fig. 25, *b*) which convert it into an independent plant. In the case of plants with persistent leaves, the stem may be cut through just above and below the bud, retaining the leaf which is left on

the cutting, the old wood and eye being placed beneath the soil and the leaf left exposed. In this way the india-rubber tree (*Ficus elastica*), for example, and many other tender plants may be increased with the aid of a brisk bottom heat. Many of the free-growing soft-wooded plants may also be grown from cuttings of single joints of the young wood, where rapid increase is desired; and in the case of opposite-leaved plants two cuttings may often be made from one joint by splitting the stem longitudinally, each cutting consisting of a leaf and a perfect bud attached to half the thickness of the stem.

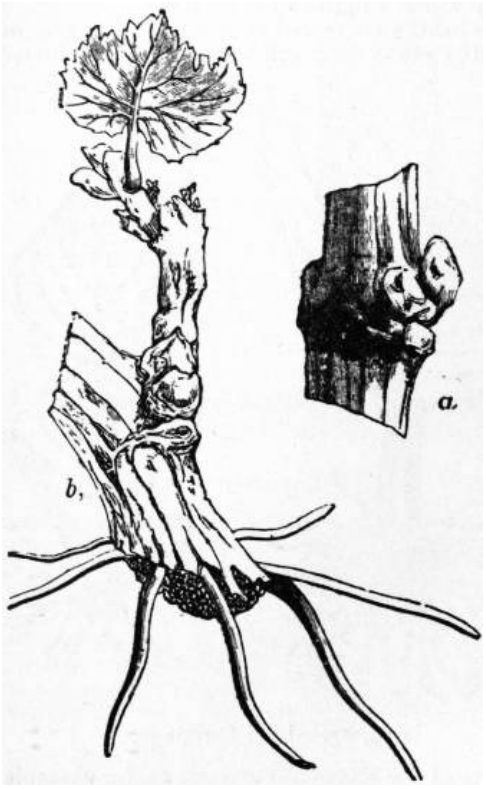

FIG. 25.—Cutting of Single Eye.

Planting and Transplanting.—In preparing a fruit tree for transplantation, the first thing to be done is to open a trench round it at a distance of from 3 to 4 ft., according to size. The trench should be opened to about two spades' depth, and any coarse roots which may extend thus far from the trunk may be cut clean off with a sharp knife. The soil between the trench and the stem is to be reduced as far as may seem necessary or practicable by means of a digging fork, the roots as soon as they are liberated being fixed on one side and carefully preserved. By working in this way all round the ball, the best roots will be got out and preserved, and the ball lightened of all superfluous soil. The tree will then be ready to lift if carefully prized up from beneath the ball, and if it does not lift readily, it will probably be found that a root has struck downwards, which will have to be sought out and cut through. Whenever practicable, it is best to secure a ball of earth round the roots. On the tree being lifted from its hole the roots should be examined, and all which have been severed roughly with the spade should have the ends cut smooth with the knife to facilitate the emission of fibres. The tree can then be transported to its new position. The hole for its reception should be of sufficient depth to allow the base of the ball of earth, or of the roots, to stand so that the point whence the uppermost roots spring from the stem may be 2 or 3 in. below the general surface level. Then the bottom being regulated so as to leave the soil rather highest in the centre, the plant is to be set in the hole in the position desired, and steadied there by hand. Next the roots from the lower portion of the ball are to be sought out and laid outwards in lines radiating from the stem, being distributed equally on all sides as nearly as this can be done; some fine and suitable good earth should be thrown amongst the roots as they are thus being placed, and worked in well up to the base of the ball. The soil covering the roots may be gently pressed down, but the tree should not be pulled up and down, as is sometimes done, to settle the soil. This done, another set of roots higher up the ball must be laid out in the same way, and again another, until the whole of the roots, thus carefully laid, are embedded as firmly as may be in the soil, which may now receive another gentle treading. The stem should next be supported permanently, either by one stake or by three, according to its size. The excavation will now be filled up about two-thirds perhaps; and if so the tree may have a thorough good watering, sufficient to settle the soil closely about its roots. After twenty-four hours the hole may be levelled in, with moderate treading, if the water has soaked well in, the surface being left level and not sloping upwards towards the stem of the tree. In transplanting trees of the ornamental class, less need be attempted in respect to providing new soil, although the soil should be made as congenial as practicable. Generally speaking, fruit trees are best transplanted when three or four years of age, in which time they will have acquired the shape given by the nurseryman, who generally transplants his stock each autumn to produce large masses of root fibres. Nowadays, however, quite large trees, chiefly of an ornamental character, and perhaps weighing several tons, are lifted with a large ball of soil attached to the roots, by means of a special tree-lifting machine, and are readily transferred from one part of the garden to another, or even for a distance of several miles, without serious injury. The best season for transplanting deciduous trees is during the early autumn months. As regards evergreens opinions are divided, some preferring August and September, others April or May. They can be successfully planted at either period, but for subjects which are at all difficult to remove the spring months are to be preferred.

In transplanting smaller subjects, such as plants for the flower garden, much less effort is required. The plant must be lifted with as little injury to its rootlets as possible, and carefully set into the hole, the soil being filled in round it, and carefully pressed close by the hand. For moving small plants the garden trowel is a very convenient tool, but we are inclined to give the preference to the hand-fork. For larger masses, such as strong-growing herbaceous plants, a spade or digging-fork will be requisite and the soil may be trodden down with the feet.

When seedlings of vigorous plants have to be "pricked out," a dibble or dibber is the best

implement to be used. The ground being prepared and, if necessary, enriched, and the surface made fine and smooth, a hole is made with the dibble deep enough and large enough to receive the roots of the seedling plants without doubling them up, and the hole is filled in by working the soil close to the plant with the point of the dibble. The pricking out of seedlings in pots in the propagating pit is effected in a similar way. The plants, indeed, often require to be removed and set from ½ in. to 1 in. apart before they have become sufficiently developed to admit of being handled with any degree of facility, and for these a pointed stick of convenient size is used as a dibble. In delicate cases, such as seedling gloxinias and begonias, it is best to lift the little seedling on the end of a flattish pointed stick, often cleft at the apex, pressing this into the new soil where the plant is to be placed, and liberating it and closing the earth about it by the aid of a similar stick held in the other hand.

Potting and Repotting.—Garden pots are made with a comparatively large hole in the bottom, and those of the largest size have also holes at the side near the bottom; these openings are to prevent the soil becoming saturated or soured with superabundant water. To prepare the pot for the plant, a broadish piece of potsherd, called a “crock,” is placed over the large hole, and if there be side holes they also are covered. The bottom crock is made from a piece of a broken garden pot, and is laid with the convex side upwards; then comes a layer of irregular pieces of crock of various sizes, about 1 in. deep in a 5-in. pot, 2 in. in an 11-in. or 12-in. pot, &c. The mode of crocking a pot is shown in fig. 26. A few of the coarser lumps from the outer edge of the heap of potting soil are spread over the crocks. The same end, that of keeping the finer particles of the soil from mixing with the drainage crocks, may be attained by shaking in a little clean moss. A handful or two of the soil is then put in, and on this the plant with its roots spread out is to be set, a trifle higher than the plant should stand in the pot when finished off; more soil is to be added, and the whole pressed firmly with the fingers, the base of the stem being just below the pot-rim, and the surface being smoothed off so as to slope a little outwards. When finished off, the pots should be watered well, to settle the soil; but they should stand till the water has well drained away, since, if they are moved about while the fresh soil is very wet, there will be a risk of its becoming puddled or too much consolidated. Larger plants do not need quite such delicate treatment, but care should be taken not to handle the roots roughly. The soil for these may be somewhat coarser, and the amount of drainage material more ample. Larger bodies of soil also require to be more thoroughly consolidated before watering; otherwise they would settle down so as to leave an unsightly void at the pot-rim.

Fig. 26.—Section of Pot showing Crocks.

Some plants, especially when potted temporarily, may be dealt with in a simpler way. A single crock may be used in some cases, and in others no crock at all, but a handful of half-decayed leaves or half-decayed dung thrown into the bottom of the pot. This mode of potting does well for bulbs, such as hyacinths, which are either thrown away or planted out when the bloom is over. The bedding plants generally may be potted in this way, the advantage being that at planting-out time there is less risk of disturbing the roots than if there were potsherds to remove. Plants of this character should be potted a little less firmly than specimens which are likely to stand long in the pot, and indeed the soil should be made comparatively light by the intermixture of leaf-mould or some equivalent, in order that the roots may run freely and quickly into it.

For epiphytal plants like orchids the most thorough drainage must be secured by the abundant use of potsherds, small pots being sometimes inserted inside the larger ones, or by planting in shallow pots or pans, so that there shall be no large mass of soil to get consolidated. For most of these the lightest spongy but sweet turfy peat must be used, this being packed lightly about the roots, and built up above the pot-rim, or in some cases freely mixed before use with chopped sphagnum moss and small pieces of broken pots or nodules of charcoal. The plants under these conditions often require to be supported by wooden pegs or sticks. Some of the species grow better when altogether taken out of the soil and fixed to blocks of wood, but in this case they require a little coaxing with moss about the roots until they get established. In other cases they are planted in open baskets of wood or wire, using the porous peat and sphagnum compost. Both blocks and baskets are usually suspended from the roof of the house, hanging free, so that no accumulation of water is possible. These conditions of orchid-growing have undergone great changes of late years, and the plants are grown much as other stove and greenhouse plants in ordinary pots with composts not only of peat but of leaf-mould, and fibres from osmunda and polypodium ferns.

When repotting is adopted as a temporary expedient, as in the case of bedding-out plants which it is required to push forward as much as possible, it will suffice if provision is made to prevent the drainage hole from getting blocked, and a rich light compost is provided for the encouragement of the roots. When, however, a hard-wooded plant has to be repotted, the case is different; it may stand without further potting for one year or two years or more, and therefore much more care is necessary. The old ball of earth must be freed from all or most of the old crocks without doing injury to the roots, and the sharp edge of the upper surface gently rubbed off. If there be any sour or sodden or effete soil into which the roots have not run, this should be carefully picked out with a pointed stick. The ball is to be set on the new soil just high enough that when finished the base of

the stem may be somewhat below the pot-rim, and the space between the old ball and the sides of the pot is to be filled in gradually with the prepared compost, which is from time to time to be pressed down with a blunt-ended flat piece of wood called a potting-stick, so as to render the new soil as solid as the old. The object of this is to prevent the plant from starving by the water applied all running off by way of the new soil, and not penetrating the original ball of earth. When this amount of pressure is necessary, especially in the case of loamy composts, the soil itself should be rather inclined to dryness, and should in no case be sufficiently moist to knead together into a pasty mass. In ordinary cases the potting soil should be just so far removed from dryness that when a handful is gently pressed it may hang together, but may lose its cohesion when dropped.

When plants are required to stand in ornamental china pots or vases, it is better, both for the plants and for avoiding risk of breakage, to grow them in ordinary garden pots of a size that will drop into the more valuable vessels. Slate pots or tubs, usually square, are sometimes adopted, and are durable and otherwise unobjectionable, only, their sides being less porous, the earth does not dry so rapidly, and some modification of treatment as to watering is necessary. For large conservatory specimens wooden tubs, round or square, are frequently used; these should be coated with pitch inside to render them more durable.

Various other contrivances take the place of garden pots for special purposes. Thus shallow square or oblong wooden boxes, made of light, inexpensive wood, are very useful for seed-sowing, for pricking out seedlings, or for planting cuttings. When the disturbance of the roots incidental to all transplanting is sought to be avoided, the seed or plant is started in some cases in squares of turf (used grassy-side downwards), which can when ready be transferred to the place the plant is to occupy. Cucumber and melon plants and vines reared from eyes are sometimes started in this way, both for the reason above mentioned and because it prevents the curling of the roots apt to take place in plants raised in pots. Strips of turf are sometimes used for the rearing of early peas, which are sown in a warmish house or frame, and gradually hardened so as to bear exposure before removal to the open air.

Watering.—The guiding principle in watering plants is to do it thoroughly when it is required, and to abstain from giving a second supply till the first has been taken up.

When watering becomes necessary for kitchen-garden crops, the hose should be laid on and the lines of esculents allowed to drink their fill, if fresh succulent vegetables are desired. So also, if well-swelled and luscious fruits, such as strawberries, are required, there must be no parching at the roots. This applies even more strongly to conservatory borders and to forcing-houses than to the outside fruit-tree borders, because from these the natural rain supply is in most cases more distinctly cut off. In the case of forcing-houses, the water should be heated before being applied to the borders containing the roots of the trees.

In the watering of pot plants the utmost care is requisite if the plant be a shy-growing or valuable one, and yet it is almost impossible to give any intelligible instruction for performing the operation. The roots should never be suffered either to get thoroughly dry or to get sodden with excess of water. An adept will know by the ring of the pot on striking it with his knuckles whether water is wanted or not, according as it rings loud and clear or dull and heavy. With very choice subjects watering may be necessary two or three times a day in drying summer weather. It is a wrong though common practice to press the surface of the soil in the pot in order to feel if it is moist enough, as this soon consolidates it, and prevents it from getting the full benefit of aeration.

In all heated houses the water used should be warmed at least up to the temperature of the atmosphere, so as to avoid chilling the roots. This is also necessary in the case of water used for syringing the plants, which should be done two or three times a day in all stoves and forcing-houses, especially during the period when the young growth is being developed. The damping of all absorbent surfaces, such as the floors or bare walls, &c., is frequently necessary several times a day in the growing season, so as to keep up a humid atmosphere; hence the advantage of laying the floors a little rounded, as then the water draws off to the sides against the kerbstone, while the centre remains dry for promenaders.

In cooler structures it becomes necessary in the dull season of the year to prevent the slopping of water over the plants or on the floor, as this tends to cause “damping off,”—the stems assuming a state of mildewy decay, which not infrequently, if it once attacks a plant, will destroy it piece by piece. For the same reason cleanliness and free ventilation under favourable weather conditions are of great importance.

Pruning.—Pruning is a very important operation in the fruit garden, its object being twofold—(1) to give form to the tree, and (2) to induce the free production of flower buds as the precursors of a plentiful crop of fruit. To form a standard tree, either the stock is allowed to grow up with a straight stem, by cutting away all side branches up to the height required, say about 6 ft., the scion or bud being worked at that point, and the head developed therefrom; or the stock is worked close to the ground, and the young shoot obtained therefrom is allowed to grow up in the same way, being pruned in its progress to keep it single and straight, and the top being cut off when the desired height is reached, so as to cause the growth of lateral shoots. If these are three or four in number, and fairly balanced as to strength and position, little pruning will be required. The tips of

unripened wood should be cut back about one-third their length at an outwardly placed bud, and the chief pruning thereafter required will be to cut away inwardly directed shoots which cross or crowd each other and tend to confuse the centre of the tree. Bushy heads should be thinned out, and those that are too large cut back so as to remodel them. If the shoots produced are not sufficient in number, or are badly placed, or very unequal in vigour, the head should be cut back moderately close, leaving a few inches only of the young shoots, which should be pruned back to buds so placed as to furnish shoots in the positions desired. When worked at the top of a stem formed of the stock, the growth from the graft or bud must be pruned in a similar way. Three or four leading shoots should be selected to pass ere long into boughs and form a well-balanced framework for the tree; these boughs, however, will soon grow beyond any artificial system the pruner may adopt.

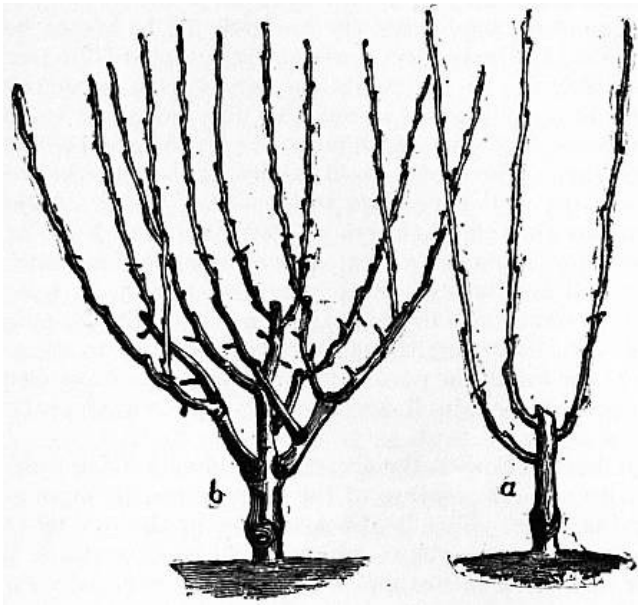

FIG. 27.—Dwarf-Tree Pruning.

To form a dwarf or bush fruit tree the stock must be worked near the ground, and the young shoot produced from the scion or bud must be cut back to whatever height it is desired the dwarf stem should be, say 1½ to 2 ft. The young shoots produced from the portion of the new wood retained are to form the framework of the bush tree, and must be dealt with as in the case of standard trees. The growth of inwardly directed shoots is to be prevented, and the centre kept open, the tree assuming a cup-shaped outline. Fig. 27, reduced from M. Hardy's excellent work, *Traité de la taille des arbres fruitiers*, will give a good idea how these dwarf trees are to be manipulated, *a* showing the first year's development from the maiden tree after being headed back, and *b* the form assumed a year or two later.

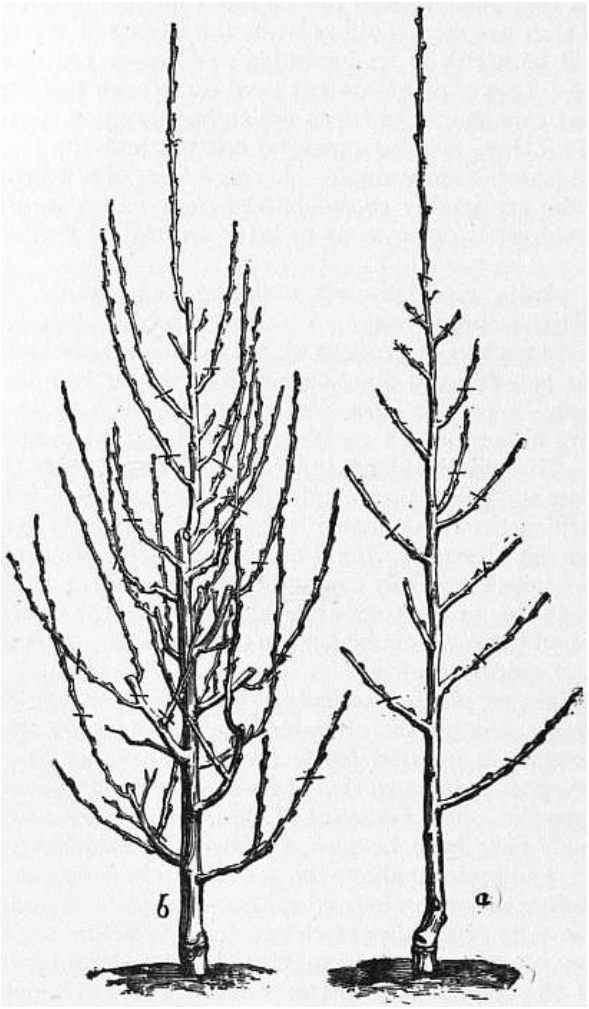

Fig. 28.—Pyramid Pruning.

In forming a pyramidal tree, the lateral growths, instead of being removed, as in the standard tree, are encouraged to the utmost; and in order to strengthen them the upper part of the leading shoot is removed annually, the side branches being also shortened somewhat as the tree advances in size. In fig. 28, reduced from M. Hardy's work, *a* shows a young tree with its second year's growth, the upright shoot of the maiden tree having been moderately headed back, being left longer if the buds near the base promise to break freely, or cut shorter if they are weak and wanting in vigour. The winter pruning, carried out with the view to shape the tree into a well-grown pyramid, would be effected at the places marked by a cross line. The lowest branch would have four buds retained, the end one being on the lower side of the branch. The two next would be cut to three buds, which here also are fortunately so situated that the one to be left is on the lower side of the branches. The fourth is not cut at all owing to its shortness and weakness, its terminal bud being allowed to grow to draw strength into it. The fifth is an example where the bud to which the shoot should be cut back is badly placed; a shoot resulting from a bud left on the upper side is apt instead of growing outwards to grow erect, and lead to confusion in the form of the tree; to avoid this it is tied down in its proper place during the summer by a small twig. The upper shoots are cut closer in. Near the base of the stem are two prominent buds, which would produce two vigorous shoots, but these would be too near the ground, and the buds should therefore be suppressed; but, to strengthen the lower part, the weaker buds just above and below the lowest branch should be forced into growth, by making a transverse incision close above each. Fig. 28, *b*, shows what a similar tree would be at the end of the third year's growth.

In order to bring a young tree into the cordon shape, all its side branches are shortened back, either to form permanent spurs, as in the case of pears, or to yield annual young shoots, as in peaches and nectarines. The single-stemmed cordon may be trained horizontally, obliquely at any required angle, or vertically if required, the first two arrangements being preferable. If a double cordon is required, the original young stem must be headed back, and the two best shoots produced must be selected, trained right and left, and treated as for the single cordon.

The forms chiefly adopted for trees trained to walls and espalier rails are the fan-shaped, the half-fan and the horizontal, with their various modifications.

The maiden tree is headed down, and two shoots led away right and left. Two laterals should be allowed to grow from the upper side of them, one from near the base, the other from near the middle, all others being pinched out beyond the second or third leaf during summer, but cut away to the last bud in winter. The tree will thus consist of six shoots, probably 3 ft. to 4 ft. long, which are not to be pruned unless they are unequal in strength, a defect which is rather to be remedied

by summer pinching than by winter pruning. The second year three young shoots are to be left on each of the six, one close to the base, one about the middle, and one at the point, the rest being rubbed off. These three shoots will produce laterals, of which one or two may be selected and laid in; and thus a number of moderately strong fertile shoots will be obtained, and at the end of the season a comparatively large tree will be the result.

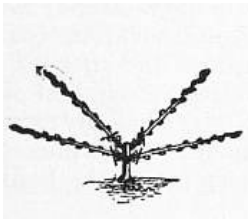

FIG. 29.—Pruning for Fan-shaped Tree.

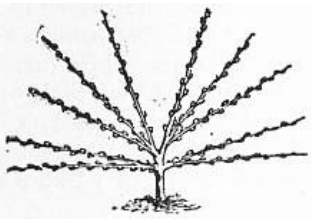

FIG. 30.—The same—third year.

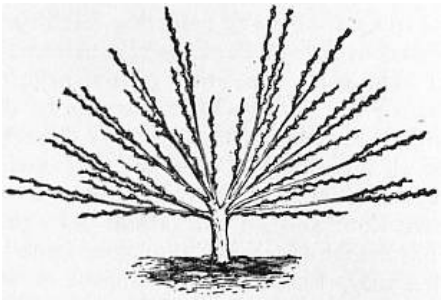

FIG. 31.—The same—fourth year.

The method of pruning formerly adopted for the formation of a fan-shaped tree was to head down the maiden plant to about two eyes, so placed as to yield a young shoot on each side (fig. 29), the supernumerary shoots being rubbed off while quite young, and the reserved shoots trained against the wall during the summer so as to get them well matured. The next year they were cut back again; often nearly to the base, in order that the lower pair of these shoots might each produce two well-placed young shoots, and the upper pair three young shoots. The tree would thus consist of ten shoots, to be laid out at regular distances, and then if closely cut the frame-work of the tree would be as in fig. 30. These main shoots were not again to be shortened back, but from each of them three young shoots were to be selected and trained in two, on the upper side, one near the base, and the other halfway up, and one on the lower side placed about midway between these two; these with the leading shoot, which was also to be nailed in, made four branches of the current year from each of the ten main branches, and the form of the tree would therefore be that of fig. 31. The other young shoots produced were pinched off while quite young, to throw all the strength of the tree into those which were to form its basis, and to secure abundant light and air. In after years the leading shoot was not to be cut back, but all the lateral shoots were to be shortened, and from these year by year other shoots were to be selected to fill up the area occupied by the tree.

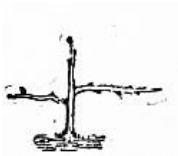

FIG. 32.—Pruning for Horizontally trained Tree.

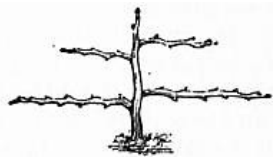

FIG. 33.—The same—third year.

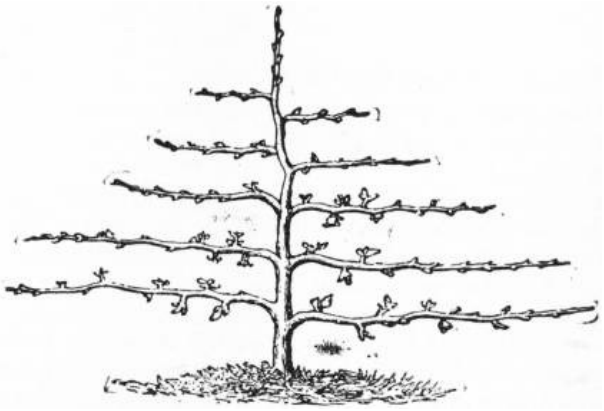

FIG. 34.—The same—fifth year.

In pruning for a horizontal tree the young maiden tree has to be headed back nearly to its base, and from the young shoots three are to be selected, the two best-placed lower ones to form an opposite or nearly opposite pair of main branches, and the best-placed upper one to continue the erect stem (fig. 32). This upper shoot is at the next winter pruning to be cut down to within about a foot of the point whence it sprung, and its buds rubbed off except the upper one for a leader, and

one on each side just below it to furnish another pair of side shoots; these being trained in position, the tree would appear as in fig. 33. The same course is to be followed annually till the space is filled. Sometimes in very favourable soils and with vigorous trees two pairs of branches may be obtained in one season by summer-stopping the erect shoots and selecting others from the young growths thus induced, but more commonly the trees have to be built up by forming one pair of branches annually. The shoots are not at first lowered to the horizontal line, but are brought down gradually and tied to thin stakes; and while the tree is being formed weak shoots may be allowed to grow in a more erect position than it is ultimately intended they should occupy. Thus in four or five years the tree will have acquired something of the character of fig. 34, and will go on thus increasing until the space is filled.

The half-fan is a combination of the two forms, but as regards pruning does not materially differ from the horizontal, as two opposite side branches are produced in succession upwards till the space is filled, only they are not taken out so abruptly, but are allowed to rise at an acute angle and then to curve into the horizontal line.

In all the various forms of cordons, in horizontal training, and in fan and half-fan training, the pruning of the main branches when the form of the tree is worked out will vary in accordance with the kind of fruit under treatment. Thus in the peach, nectarine, apricot, plum and cherry, which are commonly trained fan-fashion, the first three (and also the morello cherry if grown) will have to be pruned so as to keep a succession of young annual shoots, these being their fruit-bearing wood. The others are generally pruned so as to combine a moderate supply of young wood with a greater or less number of fruit spurs. In the pear and apple the fruit is borne principally on spurs, and hence what is known as spur-pruning has to be adopted, the young shoots being all cut back nearly to their base, so as to cause fruit buds to evolve from the remaining eyes or buds. Cordons of apples and pears have to be similarly treated, but cordons of peaches and nectarines are pruned so as to provide the necessary annual succession of young bearing wood.

Fruit trees trained as espaliers, fans or cordons against walls, trellises or fences, are not only 762
pruned carefully in the winter but must be also pruned during the early summer months. Many of the smaller, useless shoots are rubbed out altogether; the best are allowed to grow perhaps a foot or more in length, and then either have the tips pinched out with the finger and thumb, or the ends may be cracked or broken, and allowed to hang down, but are not detached completely. This is called summer pruning, and is an important operation requiring knowledge on the part of the gardener to perform properly. Shoots of peaches, nectarines and morello cherries are “laid in,” that is, placed in between fruiting shoots where there is the space to be ripened for next year’s crop.

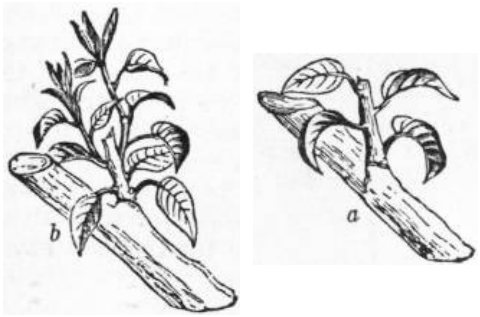

Fig. 35.—Summer Pruning for Spurs.

Summer Pruning should be performed while the shoots are yet young and succulent, so that they may in most cases be nipped off with the thumb-nail. It is very necessary in the case of trees trained to a flat surface, as a wall or espalier rail, to prevent undue crowding. In some cases, as, for example, with peaches, the superfluous shoots are wholly removed, and certain selected shoots reserved to supply bearing wood for next year. In others, as pears, the tops of the young shoots are removed, leaving three or four leaves and their buds at the base, to be developed into fruit buds by the additional nourishment thus thrown into them (fig. 35, *a*). One or two may push out a late summer growth, *b*; this will serve as a vent for the vigour of the tree, and if the lowermost only go to the formation of a fruit spur, the object will have been gained. They are cut to the last dormant bud in winter.

But summer pruning has been much extended since the introduction of restricted growth and the use of dwarfing stocks. Orchard-house trees, and also pyramidal and bush trees of apples, pears and plums, are mainly fashioned by summer pruning; in fact, the less the knife is used upon them, except in the necessary cutting of the roots in potted trees, the better. In the case of orchard-house plants no shoots are suffered to lengthen out, except as occasionally wanted to fill up a gap in the outline of the tree. On the contrary, the tops of all young shoots are pinched off when some three or four leaves are formed, and this is done again and again throughout the season. When this pruning is just brought to a balance with the vigour of the roots, the consequence is that fruit buds are formed all over the tree, instead of a thicket of sterile and useless wood. Pyramidal and bush trees out of doors are, of course, suffered to become somewhat larger, and sufficient wood must be

allowed to grow to give them the form desired; but after the first year or two, when the framework is laid out, they are permitted to extend very slowly, and never to any great extent, while the young growths are continually nipped off, so as to clothe the branches with fruit buds as closely placed as will permit of their healthy development.

The nature of the cut itself in pruning is of more consequence, especially in the case of fruit trees, than at first sight may appear. The branches should be separated by a clean cut at an angle of about 45°, just at the back of a bud, the cut entering on a level with the base of the bud and passing out on a level with its top (fig. 36, *a*), for when cut in this way the wound becomes rapidly covered with new wood, as soon as growth recommences, whereas if the cut is too close the bud is starved, or if less close an ugly and awkward snag is left. Fig 36, *b* and *c*, are examples of the former, and *d*, *e*, *f* of the latter. In fact there is only one right way to cut a shoot and that is as shown at *a*.

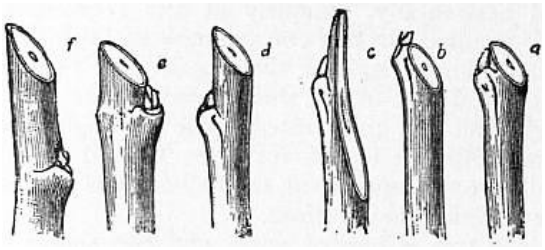

FIG. 36.—Cuts—Good and Bad.

The *Pruning of flowering plants* is generally a much lighter matter than the pruning of fruit trees. If a young seedling or cutting of any soft-wooded plant is to be bushy, it must have its top nipped out by the thumb-nail or pruning-scissors at a very early stage, and this stopping must be repeated frequently. If what is called a well-furnished plant is required, an average of from 2 to 3 in. is all the extension that must be permitted—sometimes scarcely so much—before the top is nipped out; and this must be continued until the desired size is attained, whether that be large or small. Then generally the plant is allowed to grow away till bloom or blooming shoots are developed. To form a pyramidal plant, which is a very elegant and useful shape to give to a decorative pot plant, the main stem should be encouraged to grow upright, for a length perhaps of 6 or 8 in. before it is topped; this induces the formation of laterals, and favours their development. The best-placed upper young shoot is selected and trained upright to a slender stake, and this also is topped when it has advanced 6 or 8 in. further, in order to induce the laterals on the second portion to push freely. This process is continued till the required size is gained. With all the difficult and slow-growing plants of the hard-wooded section, all the pruning must be done in this gradual way in the young wood as the plant progresses.

Some plants, like pelargoniums, can only be kept handsomely formed and well furnished by cutting them down severely every season, after the blooming is over. The plants should be prepared for this by keeping them rather dry at the root, and after cutting they must stand with little or no water till the stems heal over, and produce young shoots, or “break,” as it is technically termed. The appearance of a specimen pelargonium properly pruned is shown in fig. 37, in which *a* shows a young plant, the head of which has been taken off to form a cutting, and whose buds are ready to break into young shoots. Three shoots will be produced, and these, after growing from 4 to 6 in. in length, should be stopped by pinching out the point, this giving rise to lateral shoots. These will blossom in due course, and, after being ripened thoroughly by full exposure to the sun, should be cut back as shown at *b*. This is the proper foundation for a good specimen, and illustrates how all such subjects should be pruned to keep them stocky and presentable in form.

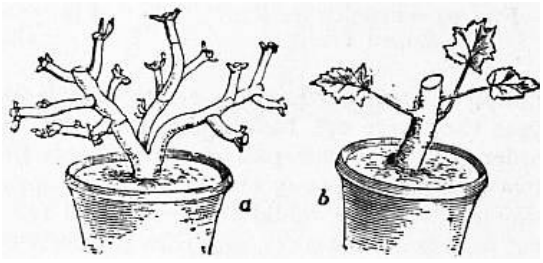

FIG. 37.

Root-pruning is most commonly practised in fruit-tree cultivation. It is often resorted to as a means of restoring fertility in plants which have become over rank from an excess of nourishment in the soil, or sterile from want of it. The effect of root-pruning in the first case is to reduce the supply of crude sap to the branches, and consequently to cause a check in their development. In the second case all roots that have struck downwards into a cold uncongenial subsoil must be pruned off if they cannot be turned in a lateral direction, and all the lateral ones that have become coarse and fibreless must also be shortened back by means of a clean cut with a sharp knife, while a compost of rich loamy soil with a little bone-meal, and leaf-mould or old manure, should be filled into the trenches from which the old sterile soil has been taken. The operation is best performed early in autumn, and may be safely resorted to in the case of fruit trees of moderate age, and even of old trees if due care be exercised. In transplanting trees all the roots which may have become bruised or broken in the process of lifting should be cut clean away behind the broken part, as they

then more readily strike out new roots from the cut parts. In all these cases the cut should be a clean sloping one, and made in an upward and outward direction.

The root-pruning of pot-plants is necessary in the case of many soft-wooded subjects which are grown on year after year—pelargoniums and fuchsias, for example. After the close pruning of the branches to which they are annually subjected, and when the young shoots have shot forth an inch or two in length, they are turned out of their pots and have the old soil shaken away from their roots, the longest of which, to the extent of about half the existing quantity, are then cut clean away, and the plants repotted into small pots. This permits the growing plant to be fed with rich fresh soil, without having been necessarily transferred to pots of unwieldy size by the time the flowering stage is reached.

Ringing.—One of the expedients for inducing a state of fruitfulness in trees is the ringing of the branches or stem, that is, removing a narrow annular portion of the bark, by which means, it is said, the trees are not only rendered productive, but the quality of the fruit is at the same time improved. The advantage depends on the obstruction given to the descent of the sap. The ring should be cut out in spring, and be of such a width that the bark may remain separated for the season. A tight ligature of twine or wire answers the same end. The advantages of the operation may generally be gained by judicious root pruning, and it is not at all adapted for the various stone fruits.

Training.—What is called training is the guiding of the branches of a tree or plant in certain positions which they would not naturally assume, the object being partly to secure their full exposure to light, and partly to regulate the flow and distribution of the sap. To secure the former object, the branches must be so fixed as to shade each other as little as possible; and to realize the second, the branches must have given to them an upward or downward direction, as they may require to be encouraged or repressed. Something of the same vegetative vigour which is given to a plant or tree by hard pruning is afforded by training in an upward direction so as to promote the flow of the sap; while the repression effected by summer pruning is supplemented by downward training, which acts as a check. One main object is the preservation of equilibrium in the growth of the several parts of the tree; and for this various minor details deserve attention. Thus a shoot will grow more vigorously whilst waving in the air than when nailed close to the wall; consequently a weak shoot should be left free, whilst its stronger antagonist should be restrained; and a luxuriant shoot may be retarded for some time by having its tender extremity pinched off to allow a weaker shoot to overtake it.

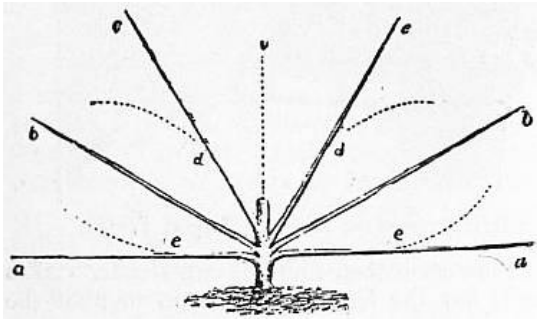

FIG. 38.—Diagram illustrating Branch Distribution.

By the prudent use of the knife, fruit trees may be readily trained into the forms indicated below, which are amongst the best out of the many which have been devised.

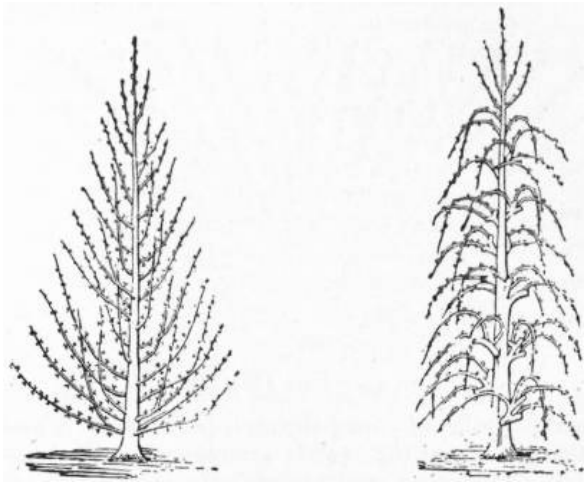
FIG. 39.—Pyramidal Training.

FIG. 40.—Training *en quenouille*.

The training of standard and bush trees in the open ground has been already referred to under the section *Pruning*. When the growth of pyramids is completed, the outline is something like that of fig. 39, and very pretty trees are thus formed. It is better, however, especially if the tendency to bear fruit is rather slack, to adopt what the French call *en quenouille* training (fig. 40), which consists in tying or weighting the tips of the branches so as to give them all a downward curve. Pear trees worked on the quince stock, and trained en quenouille, are generally very fertile.

Wall trees, it must be evident, are placed in a very unnatural and constrained position, and would

in fact soon be reduced to a state of utter confusion if allowed to grow unrestricted; hence the following modes of training have been adopted.

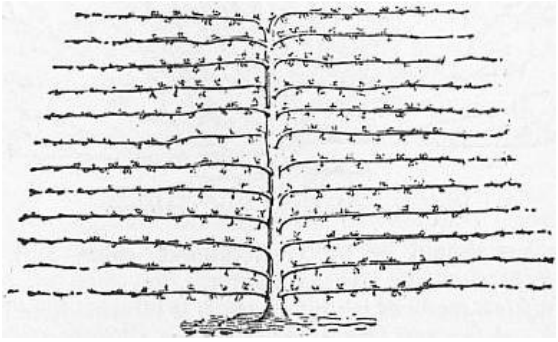

FIG. 41.—Horizontal Training.

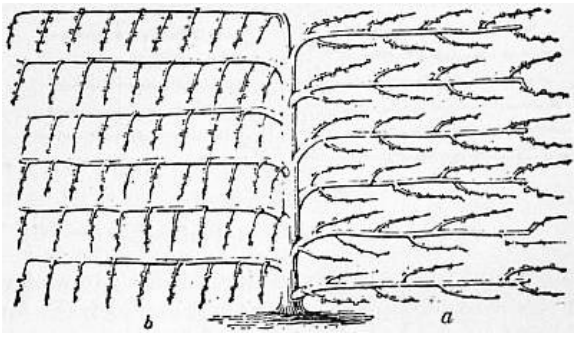

FIG. 42.—Forms of Horizontal Training.

Horizontal Training (fig. 41) has long been a favourite form in England. There is one principal ascending stem, from which the branches depart at right angles, at intervals of about a foot. Horizontal training is best adapted to the apple and the pear; and for the more twiggy growing slender varieties, the forms shown in fig. 42 have been recommended. In these the horizontal branches are placed wider, 18 to 20 in. apart, and the smaller shoots are trained between them, either on both sides, as at *a*, or deflexed from the lower side, as at *b*. The latter is an excellent method of reclaiming neglected trees. Every alternate branch should be taken away, and the spurs cut off, after which the young shoots are trained in, and soon produce good fruit.

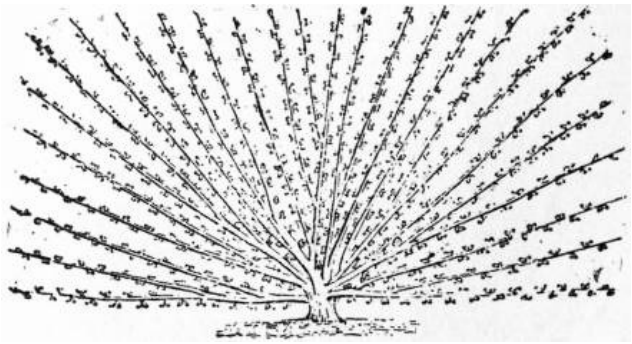

FIG. 43.—Fan Training.

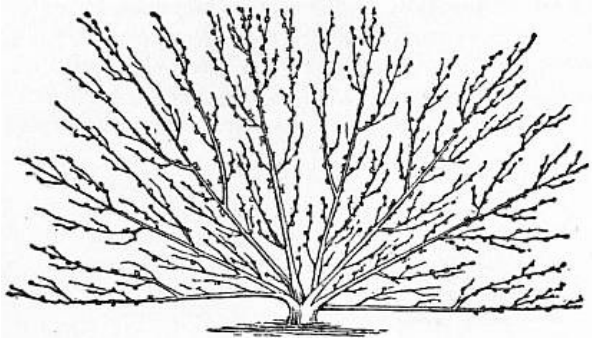

FIG. 44.—Modified Fan Training.

In *Fan Training* (fig. 43) there is no leading stem, but the branches spring from the base and are arranged somewhat like the ribs of a fan. This mode of training is commonly adopted for the peach, nectarine, apricot and morello cherry, to which it is best adapted. Though sometimes adopted, it is

not so well suited as the horizontal form for apples and pears, because, when the branches reach the top of the wall, where they must be cut short, a hedge of young shoots is inevitable. A modification of the fan shape (fig. 44) is sometimes adopted for stone fruits, such as the plum and apricot. In this the object is to establish a number of mother branches, and on these to form a series of subordinate members, chiefly composed of bearing wood. The mother branches or limbs should not be numerous, but well marked, equal in strength and regularly disposed. The side branches should be pretty abundant, short and not so vigorous as to rival the leading members.

The *Half-fan* mode of training, which is intermediate between horizontal and fan training, is most nearly allied to the former, but the branches leave the stem at an acute angle, a disposition supposed to favour the more equal distribution of the sap. Sometimes, as in fig. 45, two vertical stems are adopted, but there is no particular advantage in this, and a single-stemmed tree is more manageable. The half-fan form is well adapted for such fruits as the plum and the cherry; and, indeed, for fruits of vigorous habit, it seems to combine the advantages of both the foregoing.

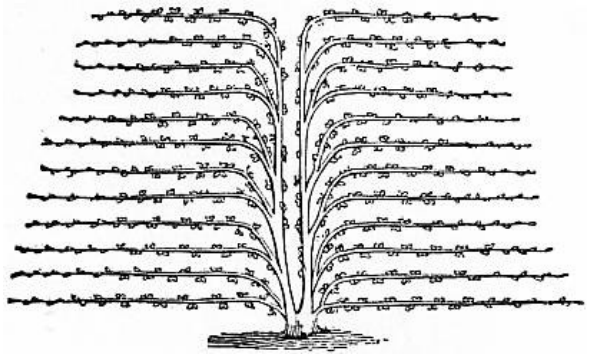

FIG. 45.—Half-Fan Training.

Trees must be fixed to the walls and buildings against which they are trained by means of nails and shreds (neat medicated strips are now sold for this purpose), or in cases where it is desired to preserve the wall surface intact, by permanent nails or studs driven in in regular order. Sometimes the walls are furnished with galvanized wires, but this has been objected to as causing cankering of the shoots, for which, however, painting is recommended as a remedy. By crossing the tying material between the wire and the wood, however, and so preventing them from coming in contact, there is no danger. If they are adopted, the wires should be a few inches away from the wall, to allow free circulation of air between it and the tree, and thus avoid the scorching or burning of leaves and fruits during the summer months in very hot places. Care should be taken that the ties or fastenings do not eventually cut into the bark as the branches swell with increased age. When shreds and nails are used, short thick wire nails and “medicated shreds” are the best; the ordinary cast iron wall nails being much too brittle and difficult to drive into the wall. It must be remembered that nails spoil a wall sooner or later, whereas a wire trellis is not only much neater, but enables the gardener to tie his trees up much more quickly.

For tying plants to trellises and stakes soft tarred string or raffia (the fibre from the Raphia palm of Madagascar) is used.

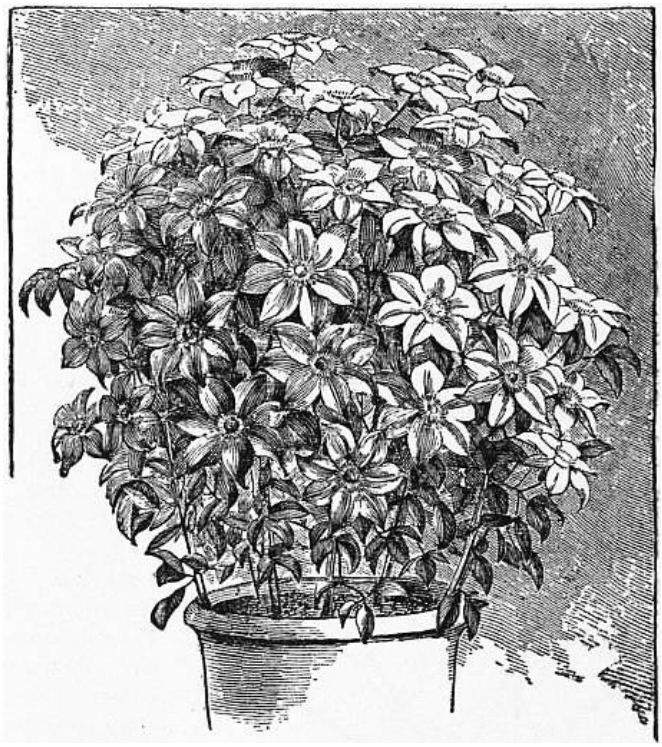

FIG. 46.—Clematis trained on Balloon-Shaped Trellis.

In training greenhouse plants the young branches should be drawn outwards by means of ties fastened to a string or wire under the pot-rim; the centre then fills up, and slender stakes are used as required; but the fewer these are in number the better. Climbers are trained from the bottom around or across trellises, of which the cylindrical or the balloon-shaped, or sometimes the flat oval or circular, are the best forms. The size should be adapted to the habit of the plant, which should cover the whole by the time flowers are produced. Bast fibre and raffia fibre are to be preferred for light subjects of this character, as they can be split to any degree of fineness. Very durable trellises for greenhouse climbers are made of slender round iron rods for standards, having a series of hooks on the inner edge, into which rings of similar metal are dropped; the rings may be graduated so as to form a broad open top, or may be all of the same size, when the trellis will assume the cylindrical form. Fig. 46 shows a pot specimen of clematis trained, over a balloon-shaped trellis.

The training of certain bedding plants over the surface of the soil is done by small pegs of birch wood or bracken, by loops of wire or cheap hair-pins, or sometimes by loops of raffia having the ends fixed in the soil by the aid of the dibble. The object is to fill up the blank space as quickly and as evenly as possible.

Forcing is the accelerating, by special treatment, of the growth of certain plants, which are required to be had in leaf, in flower or in fruit before their natural season,—as, for instance, the leaves of mint at Eastertide or the leafstalks of sea-kale and rhubarb at Christmas, the flowers of summer in the depth of winter, or some of the choicest fruits perfected so much before their normal period as to complete, with the retarded crops of winter, the circle of the seasons.

In the management of artificial heat for this purpose, a considerable degree of caution is required. The first stages of forcing should, of course, be very gentle, so that the whole growth of the plants may advance in harmony. The immediate application of a very hot atmosphere would unduly force the tops, while the roots remained partially or wholly inactive; and a strong bottom heat, if it did not cause injury by its excess, would probably result in abortive growth.

Any sudden decrease of warmth would be very prejudicial to the progress of vegetation through the successive stages of foliation, inflorescence and fructification. But it is not necessary that one unvarying range of temperature should be kept up at whatever pains or risk. Indeed, in very severe weather it is found better to drop a little from the maximum temperature by fire heat, and the loss so occasioned may be made good by a little extra heat applied when the weather is more genial. Night temperatures also should always be allowed to drop somewhat, the heat being increased again in the morning. In other words, the artificial temperature should increase by day and decrease by night, should rise in summer and fall in winter, should, in short, imitate as nearly as possible the varying influence of the sun.

For the growth of flowers generally, and for that of all fruits, every ray of light to be obtained in the dull winter season is required, and therefore every possible care should be taken to keep the glass clean. A moist genial atmosphere too is essential, a point requiring unremitting attention on account of the necessity of keeping up strong fires. With moisture as with heat, the cultivator must hold his hand somewhat in very severe or very dull weather; but while heat must not drop so as to chill the progressing vegetation, so neither must the lack of moisture parch the plants so as to check their growth.

There are some few subjects which when forced do not require a light house. Thus amongst flowers the white blossoms of the lilac, so much prized during winter, are produced by forcing purple-flowered plants in darkness. Rhubarb and sea-kale among esculents both need to be forced in darkness to keep them crisp and tender, and mushrooms also are always grown in dark structures. In fact, a roomy mushroom house is one of the most convenient of all places for forcing the vegetables just referred to. The lilac would be better placed in a dark shed heated to about 70° or 80°, in which some dung and leaves could be allowed to lie and ferment, giving off both a genial heat and moisture.

One of the most important preliminaries to successful forcing is the securing to the plants a previous state of rest. The thorough ripening of the preceding season's wood in fruit trees and flowering plants, and of the crown in perennial herbs like strawberries, and the cessation of all active growth before the time they are to start into a new growth, are of paramount importance. The ripening process must be brought about by free exposure to light, and by the application of a little extra heat with dryness, if the season should be unfavourable; and both roots and tops must submit to a limitation of their water supply. When the ripening is perfected, the resting process must be aided by keeping the temperature in which they await the forcing process as low as each particular subject can bear. (See *Retardation* above.)

V. *Flowers.*

Flower Garden and Pleasure Grounds.—Wherever there is a flower garden of considerable magnitude, and in a separate situation, it should be constructed on principles of its own. The great object must be to exhibit to advantage the graceful forms and glorious hues of flowering plants and shrubs. Two varieties of flower gardens have chiefly prevailed in Britain. In one the ground is turf, out of which flower-beds, of varied patterns, are cut; in the other the flower-beds are separated by gravel walks, without the introduction of grass. When the flower garden is to be seen from the windows, or any other elevated point of view, the former is to be preferred; but where the surface is irregular, and the situation more remote, and especially where the beauty of flowers is mainly looked to, the choice should probably fall on the latter.

The flower garden may include several different compartments. Thus, for example, there is the "Rock Garden," which should consist of variously grouped masses of large stones, those which are remarkable for being figured by water-wearing, or containing petrifactions or impressions, or showing something of natural stratification, being generally preferred. In the cavities between the stones, filled with earth, alpine or trailing plants are inserted, and also some of the choicest flowers. In proper situations, a small pool of water may be introduced for the culture of aquatic plants. In these days the rock-garden is a most important feature, and it requires a good deal of care and skill to arrange the boulders, walks, pools or streams in natural and artistic fashion. The selection of suitable alpines, perennials and shrubs and trees also necessitates considerable knowledge on the part of the gardener. A separate compartment laid out on some regular plan is often set apart for roses, under the name of the "Rosery." A moist or rather a shady border, or a section of the pleasure ground supplied with bog earth, may be devoted to what is called the "American Garden," which, as it includes the gorgeous rhododendrons and azaleas, forms one of the grandest features of the establishment during the early summer, while if properly selected the plants are effective as a garden of evergreens at all seasons. The number of variegated and various-coloured hardy shrubs is now so great that a most pleasant plot for a "Winter Garden" may be arrayed with plants of this class, with which may be associated hardy subjects which flower during that season or very early spring, as the Christmas rose, and amongst bulbs the crocus and snowdrop. Later the spring garden department is a scene of great attraction; and some of the gardens of this character, as those of Cliveden and Belvoir, are among the most fascinating examples of horticultural art. The old-fashioned stereotyped flower garden that one met with almost everywhere is rapidly becoming a thing of the past, and grounds are now laid out more in accordance with their natural disposition, their climatic conditions and their suitability for certain kinds of plants. Besides the features already mentioned there are now bamboo gardens, Japanese gardens, water gardens and wall gardens, each placed in the most suitable position and displaying its own special features.

Lawns.—In the formation of lawns the ground must be regularly broken up so that it may settle down evenly, any deep excavations that may have to be filled in being very carefully rammed down to prevent subsequent settlement. The ground must also be thoroughly cleared of the roots of all coarse, perennial weeds, and be worked to a fine tilth ready for turfing or sowing. The more expeditious method is of course to lay down turf, which should be free from weeds, and is cut usually in strips of 1 ft. wide, 3 ft. long, and about 1 in. in thickness. This must be laid very evenly and compactly, and should then be beaten down firmly with the implement called a turf-beater (fig. 47). When there is a large space to cover, it

is much the cheaper plan to sow the lawn with grass-seeds, and equally effective, though the sward takes much longer to thicken. It is of the utmost importance that a good selection of grasses be made, and that pure seeds should be obtained (see GRASS AND GRASSLAND). The following sorts can be recommended, the quantities given being those for sowing an acre of ground:—

Cynosurus cristatus—Crested Dog's-tail	6 lb
Festuca duriuscula—Hard Fescue	3 lb
Festuca ovina—Sheep's Fescue	3 lb
Lolium perenne tenue	18 lb
Poa nemoralis sempervirens—Evergreen Meadow-grass	3 lb
Poa trivialis—Trivial Meadow-grass	3 lb
Trisetum flavescens—Yellow Oat-grass	2 lb
Trifolium repens—Dutch Clover	6 lb

FIG. 47.—Turf-Beater.

The seeds should be thoroughly mixed, and very evenly sown, after which the surface should be raked over to bury them, and then rolled down while dry so as to finish it off smooth and level. When thus sown, lawns require to be promptly weeded. During the growing season established lawns should be mown at least once a week. They should be occasionally rolled, and towards autumn they require frequent sweepings to remove worm-casts.

HARDY ANNUALS.—Annual plants are those which grow up from seed, flower, ripen seed, and die in the course of one season—one year. They are useful in the mixed garden, for though in some cases they are of short duration, many of them are possessed of much beauty of hue and elegance of form. Annuals may be divided into three classes: the *hardy*, which are sown at once in the ground they are to occupy; the *half-hardy*, which succeed best when aided at first by a slight hot bed, and then transplanted into the open air; and the *tender*, which are kept in pots, and treated as greenhouse or stove plants, to which departments they properly belong. Some of the more popular annuals, hardy and half-hardy, have been very much varied as regards habit and the colour of the flowers, and purchases may be made in the seed shops of such things as China asters, stocks, Chinese and Indian pinks, larkspurs, phloxes and others, amongst which some of the most beautiful of the summer flowers may be found.

The hardy annuals may be sown in the open ground during the latter part of March or beginning of April, as the season may determine, for the weather should be dry and open, and the soil in a free-working condition before sowing is attempted. In favourable situations and seasons some of the very hardiest, as *Silene pendula*, Saponaria, Nemophila, Gilia, &c., may be sown in September or October, and transplanted to the beds or borders for very early spring flowering. Those sown in spring begin to flower about June. The plants, if left to flower where they are sown, should be thinned out while young, to give them space for proper development. It is from having ample room that pricked out transplanted seedlings often make the finest plants. The soil should be rich and light.

The half-hardy series are best sown in pots or pans under glass in mild heat, in order to accelerate germination. Those of them which are in danger of becoming leggy should be speedily removed to a cooler frame and placed near the glass, the young plants being pricked off into fresh soil, in other pots or pans or boxes, as may seem best in each case. All the plants must be hardened off gradually during the month of April, and may generally be planted out some time in May, earlier or later according to the season.

The class of tender annuals, being chiefly grown for greenhouse decoration, should be treated much the same as soft-wooded plants, being sown in spring, and grown on rapidly in brisk heat, near the glass, and finally hardened off to stand in the greenhouse when in flower.

We add a select list of some of the more distinct annuals desirable for general cultivation as decorative plants for the open air:—

Acroclinium roseum: half-hardy, 1 ft., rose-pink or white; everlasting.

Agrostis pulchella: hardy, 6 in.; a most graceful grass for bouquets.

Amberboa moschata atropurpurea (Sweet Sultan): hardy, 1½ ft., purple: musk-scented.

Antirrhinum majus (Snapdragon): hardy, 6 in. to 2 ft., white, yellow and red. This plant is perennial, but is best treated as an annual.

Arnebia cornuta: hardy, 1½ to 2 ft. yellow.

Bartonia aurea: hardy, 2 ft., golden yellow; showy and free.

Brachycome iberidifolia: half-hardy, 1 ft., blue or white with dark disk.

Calendula officinalis Meteor: hardy, 1 ft., orange striped with yellow.

Calliopsis or *Coreopsis bicolor* (*tinctoria*): hardy, 2 to 3 ft., yellow and chestnut-brown.

Calliopsis or *Coreopsis Drummondii*: hardy, 1 to 2 ft., golden yellow with red disk.

Callistephus hortensis or *chinensis* (the China aster): half-hardy, 6 in. to 1½ ft.; there arc several groups of various colours. The species itself is a very handsome plant.

Campanula Loreyi: hardy, 1½ ft., purplish-lilac or white.

Campanula macrostyla: hardy, 1 to 2 ft., purple, beautifully veined.

Carnations, *Marguerite*: half-hardy, 9 to 12 in., colours various.

Centaurea Cyanus: hardy, 3 ft., blue, purple, pink or white; showy.

Centranthus macrosiphon: hardy, 1½ to 2 ft., rosy-carmine.

Centranthus ruber (known as Pretty Betsy and Red Valerian): hardy, 2 to 3 ft., red.

Chrysanthemum carinatum: a charming half-hardy annual, 2 to 3 ft. high, with several varieties, of which C. Burridgeanum with zones of white, crimson and yellow is best.

C. coronarium, a yellow-flowered species requires similar treatment.

Clarkia pulchella: hardy, 1½ ft., rosy-purple; some varieties very handsome.

Collinsia bicolor: hardy, 1½ ft., white and purple; pretty.

Collinsia verna: hardy, 1 ft., white and azure; sow as soon as ripe.

Convolvulus tricolor atroviolacea: hardy, 1 ft., white, blue and yellow. This is the *Convolvulus minor* of gardens.

Cosmos bipinnatus: half-hardy, 3 ft., rose, purple, white; requires sunny spots.

Dianthus chinensis (Indian pink): half-hardy, 6 in. to 1 ft., various shades of red and white.

Delphinium Ajacis and *Delphinium Consolida* (Larkspurs): hardy, 3 ft., various colours.

Erysimum Peroffskianum: hardy, 2 ft., deep orange; in erect racemes.

Eschscholtzia californica: hardy, 1½ ft., yellow with saffron eye.

Eschscholtzia crocea flore-pleno: hardy, 1½ ft., orange yellow; double.

Eutoca viscida: hardy, 2 ft., bright blue, with white hairy centre.

Gaillardia Drummondii (*picta*): half-hardy, 1½ ft., crimson, yellow margin.

Gilia achilleaefolia: hardy, 2 ft., deep blue; in large globose heads.

Godetia Lindleyana: hardy, 2 to 3 ft., rose-purple, with crimson spots.

Godetia Whitneyi: hardy, 1 ft., rosy-red, with crimson spots. The variety *Lady Albemarle* is wholly crimson, and very handsome.

Gypsophila elegans: hardy, 1½ ft., pale rose; branched very gracefully.

Helianthus cucumerifolius: hardy, 3 to 4 ft., golden yellow, black disk; branching, free and bold without coarseness.

Helichrysum bracteatum: half-hardy, 2 ft., the incurved crimson, rose and other forms very handsome.

Hibiscus Trionum (*africanus*): hardy, 1½ ft., cream colour, dark purple centre.

Iberis umbellata (Candytuft): hardy, 1 ft., white, rose, purple, crimson. Some new dwarf white and flesh-coloured varieties are very handsome.

Kaulfussia amelloides: hardy, 1 ft., blue or rose; the var. kermesina is deep crimson.

Kochia scoparia (Belvedere or lawn cypress): hardy, graceful green foliage, turning purple in autumn.

Königa maritima (Sweet Alyssum): hardy, 1 ft., white; fragrant, compact.

Lathyrus odoratus (Sweet Pea): hardy; there are two races, dwarf and tall, the latter—far and away the most beautiful—requires support; various colours; numerous immensely popular forms.

Lavatera trimestris: hardy, 3 ft., pale-rose, showy malvaceous flowers.

Leptosiphon densiflorus: hardy in light soil, 1 ft., purplish or rosy-lilac.

Leptosiphon roseus: hardy in light soil, 6 in., delicate rose; fine in masses.

Linaria bipartita splendida: hardy, 1 ft., deep purple.

Linum grandiflorum: hardy, 1 ft., splendid crimson; var. roseum is pink.

Lupinus luteus: hardy, 2 ft., bright yellow, fragrant.

Lupinus mutabilis Cruickshanksii: hardy, 4 ft., blue and yellow; changeable.

Lupinus nanus: hardy, 1 ft., bluish-purple; abundant flowering.

Lychnis Coeli-rosa: hardy, 1½ ft., rosy-purple, with pale centre; pretty.

Lychnis oculata cardinalis: hardy, 1½ ft., rosy-crimson; very brilliant.

Malcolmia maritima (Virginian Stock): hardy, 6 in., lilac, rose or white.

Malope trifida: hardy, 3 ft., rich glossy purplish-crimson; showy. *M. grandiflora* is a finer plant in every way.

Matthiola annua (Ten-week Stock and its variety, the intermediate stock): half-hardy, 1 to 2 ft., white, rose and red.

Matthiola graeca (Wallflower-lvd. Stock): hardy, 1 ft., various as in Stock.

Mesembryanthemum tricolor: half-hardy, 3 in., pink and crimson, with dark centre.

Mimulus cupreus: half-hardy, 6 in., coppery red, varying considerably.

Mimulus luteus tigrinus: half-hardy, 1 ft., yellow spotted with red; var. *duplex* has hose-in-hose flowers.

Mirabilis Jalapa: half-hardy, 3 ft., various colours; flowers evening-scented.

Nemesia floribunda: hardy, 1 ft., white and yellow; pretty and compact.

Nemophila insignis: hardy, 6 in., azure blue, with white centre.

Nemophila maculata: hardy, 6 in., white, with violet spots at the edge.

Nicotiana affinis: half-hardy, 2 to 3 ft., white.

Nicotiana Sanderae: half-hardy, 2 to 3 ft., white, crimson, scarlet, &c.

Nigella hispanica: hardy, 1½ ft., pale blue, white or dark purple.

Oenothera odorata: hardy, 2 to 3 ft., yellow; fragrant.

Omphalodes linifolia (Venus's Navelwort): hardy, 1 ft., white.

Papaver Rhoeas flore-pleno: hardy, 2 ft., scarlet and other colours; showy.

Papaver somniferum flore-pleno: hardy, 3 ft., white, lilac, rose, &c.; petals sometimes fringed.

Petunia violacea hybrida: half-hardy, 1½ ft., various colours; sow in heat.

Pharbitis hispida: hardy, 6 ft., various; the many-coloured twining *Convolvulus major*.

Phlox Drummondii: half-hardy, 1 ft., various colours.

Platystemon californicus: hardy, 1 ft., sulphur yellow; neat and distinct.

Portulaca splendens: half-hardy, 6 in., crimson, rose, yellow, white, &c., single and double; splendid prostrate plants for sunny rockwork.

Pyrethrum Parthenium aureum: half-hardy, 1 ft.; grown for its golden foliage, and much used for bedding.

Reseda odorata (Mignonette): hardy, 1 ft., greenish, but exquisitely fragrant; there are some choice new sorts.

Rhodanthe maculata: half-hardy, 1½ ft., rosy-pink or white; larger flower-heads than the next.

Rhodanthe Manglesii: half-hardy, 1 ft., rosy-pink; a drooping everlasting.

Salpiglossis sinuata: half-hardy, 2 to 3 ft., yellow, purple, crimson, &c.; much varied and beautifully veined.

Sanvitalia procumbens flore-pleno: half-hardy, 6 in., golden yellow; procumbent.

Saponaria calabrica: hardy, 6 to 8 in., bright rose pink or white; continuous blooming, compact-growing.

Scabiosa atropurpurea: hardy, 1 to 2 ft., rose, white, lilac, crimson, &c.

Schizanthus pinnatus: hardy, 1 to 2 ft., purple-lilac, prettily blotched; curiously lobed flowers.

Schizopetalon Walkeri: hardy, 1 ft., white, sweet-scented at night; curiously fringed petals.

Senecio elegans: half-hardy, 1½ ft., white, rose or purple; the various double forms are showy.

Silene pendula: hardy, 1 ft., bright rose pink; very showy in masses; var. *compacta* forms close dense tufts.

Silene Pseudo-Atocion: hardy, 1 ft., rose pink; free-flowering.

Specularia Speculum: hardy, 6 in., reddish-violet; free-flowering.

Sphenogyne speciosa: half-hardy, 1 ft., orange-yellow, with black ring around the disk.

Statice Bonduelli (Sea Lavender): half-hardy, 1½ ft., yellow.

S. Limonum: bluish purple.

S. sinuata: white, blue, yellow.

S. Suworowi: lilac.

Tagetes signata: half-hardy, 1½ ft., golden yellow; continuous blooming, with elegant foliage. The French and African marigolds, favourites of some, are allied to this.

Tropaeolum aduncum (Canary creeper): half-hardy, 10 ft., yellow, fringed; an elegant climber.

Tropaeolum majus (the nasturtium of gardens): hardy. There are two races, dwarf and tall, various shades of red and yellow.

Waitzia aurea: half-hardy, 1½ ft., golden yellow; a showy everlasting.

Xeranthemum annuum flore-pleno: hardy, 2 ft., lilac-purple; floriferous.

Zinnia elegans: half-hardy, 1 to 2 ft., various colours.

HARDY BIENNIALS.—Biennials live through one winter period. They require to be sown in the summer months, about June or July, in order to get established before winter; they should be pricked out as soon as large enough, and should have ample space so as to become hardy and stocky. They should be planted in good soil, but not of too stimulating a character. Those that are perfectly hardy are best planted where they are to flower in good time during autumn. This transplanting acts as a kind of check, which is rather beneficial than otherwise. Of those that are liable to suffer injury in winter, as the Brompton and Queen Stocks, a portion should be potted and wintered in cold frames ventilated as freely as the weather will permit.

The number of biennials is not large, but a few very desirable garden plants, such as the following, occur amongst them:—

Agrostemma coronaria (Rose Campion): hardy, 1½ ft., bright rose-purple or rose and white.

Beta Cicla variegata: hardy, 2 ft., beautifully coloured leaves and midribs, crimson, golden, &c.

Campanula Medium (Canterbury Bell): hardy, 2 ft., blue, white, rose, &c. The double-flowered varieties of various colours are very handsome.

Campanula Medium calycanthema: hardy, 2 ft., blue or white; hose-in-hose flowered.

Catananche coerulea: hardy, 2 to 3 ft., blue or white.

Celsia cretica: hardy, 4 to 5 ft., yellow, with two dark spots near centre; in spikes.

Cheiranthus Cheiri (Wallflower): hardy, 1½ to 2 ft., red, purple, yellow, &c.; really a perennial but better as a biennial.

Coreopsis grandiflora: hardy, 2 to 3 ft., bright yellow; the finest member of the genus.

Dianthus barbatus (Sweet William): hardy, 1 to 1½ ft., crimson, purple, white or parti-coloured.

Dianthus chinensis (Indian Pink): half-hardy, 1 ft., various; flower earlier if treated as biennials; must be protected from frost.

Digitalis purpurea (Foxglove): hardy, 3 to 5 ft., rosy-purple or white; beautifully spotted; the variety called *gloxinioides* has regular, erect flowers.

Echium pomponium: hardy, 4 ft., rosy-pink.

Hedysarum coronarium (French Honeysuckle): hardy, 2 to 3 ft., scarlet or white; fragrant.

Hesperis tristis (Night-scented Rocket): hardy, 3 ft., dull purplish; fragrant at night.

Lunaria biennis (Honesty): hardy, 2 to 3 ft., purple; the silvery dissepiment attractive among everlastings.

Matthiola incana (two groups, the Brompton and the Queen stocks): hardy, 2 to 2½ ft., white, red and purple.

Meconopsis. Charming members of the poppy family, of which *M. aculeata*, purple; *M. grandis*, purple; *M. heterophylla*, coppery-orange; *M. nepalensis*, golden yellow; *M. integrifolia*, yellow; *M. simplicifolia*, violet purple, are grown with care in sheltered spots, and in rich, very gritty soil.

Michauxia campanuloides, a remarkable bell flower, 3 to 8 ft. high, white tinged purple. Requires rich loam in warm sheltered spots.

Oenothera biennis and *O. Lamarckiana* (Evening primrose): hardy, 5 ft., bright yellow; large.

Scabiosa caucasica: hardy, 3 ft., blue, white.

Silene compacta: half-hardy, 3 to 6 inches, bright pink; clustered as in S. Armeria.

Verbascum Blattaria: hardy, 3 to 4 ft., yellowish, with purple hairs on the filaments; in tall spikes.

HARDY HERBACEOUS PERENNIALS.—This term includes not only those fibrous-rooted plants of herbaceous habit which spring up from the root year after year, but also those old-fashioned subjects known as florists' flowers, and the hardy bulbs. Some of the most beautiful of hardy

flowering plants belong to this class. When the length of the flowering season is considered, it will be obvious that it is impossible to keep up the show of a single border or plot for six months together, since plants, as they are commonly arranged, come dropping into and out of flower one after another; and even where a certain number are in bloom at the same time, they necessarily stand apart, and so the effects of contrast, which can be perceived only among adjacent objects, are lost. To obviate this defect, it has been recommended that ornamental plants should be formed into four or five separate suites of flowering, to be distributed over the garden. Not to mention the more vernal flowers, the first might contain the flora of May; the second that of June; the third that of July; and the fourth that of August and the following months. These compartments should be so intermingled that no particular class may be entirely absent from any one quarter of the garden.

Before beginning to plant, it would be well to construct tables or lists of the plants, specifying their respective times of flowering, colours and heights. To diversify properly and mingle well together the reds, whites, purples, yellows and blues, with all their intervening shades, requires considerable taste and powers of combination; and ascertained failures may be rectified at the proper time the next season. The one great object aimed at should be to present an agreeable contrast—a floral picture; and, as at particular seasons a monotony of tint prevails, it is useful at such times to be in possession of some strong glaring colours. White, for instance, should be much employed in July, to break the duller blues and purples which then preponderate. Orange, too, is very effective at this season. On the other hand, yellows are superabundant in autumn, and therefore reds and blues should then be sought for. The flower-gardener should have a small nursery, or reserve garden, for the propagation of the finer plants, to be transferred into the borders as often as is required.

As a rule, all the fibrous-rooted herbaceous plants flourish in good soil which has been fairly enriched with manure, that of a loamy character being the most suitable. Many of them also grow satisfactorily in a peaty soil if well worked, especially if they have a cool moist subsoil. Pentstemons and phloxes, amongst others, succeed well in soil of this character, but the surface must be well drained; the former are rather apt to perish in winter in loamy soil, if at all close and heavy. The herbaceous border should be a distinct compartment varying from 6 to 10 ft. in width, and perhaps backed up by evergreens under certain conditions. Such a border will take in about four lines of plants, the tallest being placed in groups at the back and in the centre, and the others graduated in height down to the front. In the front row patches of the white arabis, the yellow alyssum, white, yellow, blue, or purple violas, and the purple aubrietia, recurring at intervals of 5 or 6 yards on a border of considerable length, carry the eye forwards and give a balanced kind of finish to the whole. The same might be done with dianthuses or the larger narcissi in the second row, with paeonies, columbines and phloxes in the third, and with delphiniums, aconitums and some of the taller yellow composites as helianthus and rudbeckia at the back. Spring and autumn flowers, as well as those blooming in summer, should be regularly distributed throughout the border, which will then at no season be devoid of interest in any part. Many of the little alpines may be brought into the front line planted between suitable pieces of stone, or they may be relegated to a particular spot, and placed on an artificial rockery. Most of the hardy bulbs will do well enough in the border, care being taken not to disturb them while leafless and dormant.

Some deep-rooting perennials do not spread much at the surface, and only require refreshing from time to time by top-dressings. Others, as the asters, spread rapidly; those possessing this habit should be taken up every second or third year, and, a nice patch being selected for replanting from the outer portions, the rest may be either thrown aside, or reserved for increase; the portion selected for replanting should be returned to its place, the ground having meanwhile been well broken up. Some plants are apt to decay at the base, frequently from exposure caused by the lifting process going on during their growth; these should be taken up annually in early autumn, the soil refreshed, and the plants returned to their places, care being taken to plant them sufficiently deep.

Only a section of some of the best of the decorative hardy perennials can be noted, before we pass on to those popular subjects of this class which have been directly influenced by the hybridizer and improver. Many more might be added to the subjoined list:—

Acaena.—Neat trailing plants adapted for rockwork, thriving in sandy soil. *A. microphylla* and *A. myriophylla* have pretty spiny heads of flowers.

Acantholimon.—Pretty dwarf tufted plants, with needle-shaped leaves, adapted for rockwork. *A. glumaceum* and *A. venustum* bear bright pink flowers in July and August. Light sandy loam.

Acanthus.—Bold handsome plants, with stately spikes, 2 to 3 ft. high, of flowers with spiny bracts. *A. mollis*, *A. latifolius*, and *A. longifolius* are broad-leaved sorts; *A. spinosus* and *A. spinosissimus* have narrower spiny toothed leaves.

Achillea.—Handsome composite plants, the stronger ones of easy culture in common soil. *A. Eupatorium* and *filipendula*, 3 to 4 ft., have showy yellow corymbose flowers; *A. rosea*, 2 ft., rosy-crimson; and *A. Ptarmica flore-pleno*, 2 ft., double white flowers. Others suitable for front lines or rockwork are *A. tomentosa*, 9 in., bright yellow; *A. aegyptiaca*, 1 ft., silvery leaves and yellow flowers; *A. umbellata*, 8 in., silvery leaves and white flowers; and *A. Clavennae*, 6 in., with silvery leaves and pure white flowers.

Aconitum.—Handsome border plants, the tall stems crowned by racemes of showy hooded flowers. *A. Camarum*, 3 to 4 ft., has deep purple flowers in August; *A. sinense*, 1½ to 2 ft., has large dark purple flowers in September; *A. variegatum*, 3 ft., has the flowers white edged with blue; *A.*

autumnale, 3 ft., has pale blue flowers; *A. Anthora*, 1 to 2 ft., yellow; and *A. japonicum*, 2½ ft., deep blue flowers, produced in September and October. *A. Wilsoni*, a new species from China, 6 ft. high, with bluish-purple flowers.

Adenophora.—Bell-shaped flowers. *A. stylosa*, 2 ft., pale blue, elegant; *A. denticulata*, 1½ ft., dark blue; and in *A. liliifolia*, 1½ ft., pale blue, sweet-scented—all blooming during summer. Light soil.

Adonis.—*A. vernalis*, 1 ft., has large bright yellow stellate flowers in April. Deep light soil. *A. amurensis* is a fine Chinese species.

Ajuga.—Free growing, dwarf and showy. *A. reptans*, 8 in., has creeping runners, which *A. genevensis* has not; both bear handsome spikes of blue labiate flowers. Ordinary soil.

Allium.—Hardy bulbs of the garlic family, some species of which are ornamental; the inflorescence is umbellate. In *A. azureum*, 1 to 2 ft., the flowers are deep-blue; in *A. Moly*, 1 ft., golden yellow; in *A. neapolitanum*, 1½ ft., white, very handsome; in *A. triquetrum*, 8 in., white with green central stripes; in *A. pedemontanum*, 9 in., reddish-violet, very beautiful, the umbels nodding.

Alstroemeria.—Beautiful plants with fleshy tuberous roots, which are the better if not often disturbed. *A. aurantiaca*, 2 to 3 ft., orange streaked with red, in July and August; *A. chilensis*, 2 to 3 ft., blood-red, streaked with yellow, affording many varieties. Deep sandy loam or peat. Should be planted at least 6 or 8 in. deep.

Althaea rosea.—The hollyhock is a noble perennial, 6 to 15 ft. high, with flowers of every colour except blue. Requires rich loamy soil and plenty of space.

Alyssum.—Showy rockwork or front row border plants of easy culture in any light soil; the plants should be frequently renewed from cuttings. *A. saxatile*, with greyish leaves, and deep yellow flowers, produced in April and May, and the dwarfer *A. montanum* are useful.

Amaryllis.—Noble half-hardy bulbs, for planting near the front wall of a hothouse or greenhouse; the soil must be deep, rich and well drained. *A. Belladonna*, the Belladonna Lily, 3 ft., has large funnel-shaped flowers in September, of a delicate rose colour. The variety *A. blanda* has paler flowers, almost white.

Anchusa.—Pretty boraginaceous herbs, easily grown. *A. italica*, 3 to 4 ft., has blue star-like flowers. *A. sempervirens*, 1½ ft., rich blue, is well suited for rough borders.

Androsace.—Pretty dwarf rock plants, requiring rather careful management and a gritty soil. *A. Vitaliana*, yellow; *A. Wulfeniana*, purplish-crimson; *A. villosa*, white or pale rose; *A. lactea*, white with yellow eye; *A. lanuginosa*, delicate rose; and *A. Chamaejasme*, delicate rose, are some of the best.

Anemone.—The Japanese kinds, *A. japonica*, flowers white and purple, are very easily grown and are particularly fine in autumn. The scarlet *A. fulgens*, and *A. coronaria*, the poppy anemone, are useful for the front, or in nooks in the rockery; while the common hepatica (*A. hepatica*) with its bright blue flowers should also have a place.

Antennaria.—Composite plants, with everlasting flowers. *A. margaritacea*, 1½ to 2 ft., has white woolly stems and leaves, and white flower-heads.

Anthericum.—Charming border flowers. *A. Liliastrum*, St Bruno's Lily, 1½ ft., bears pretty white sweet-scented flowers in May; *A. Hookeri* (*Chrysobactron*), 2 ft., with long racemes of bright golden yellow flowers, requires cool peaty soil.

Aquilegia.—The Columbine family, consisting of beautiful border flowers in great variety, ranging from 1 to 2 or 3 ft. in height. Besides the common purple *A. vulgaris* with its numerous varieties, double and single, there are of choice sorts *A. alpina* and *A. pyrenaica*, blue; *A. glandulosa*, *A. jucunda*, and *A. coerulea*, blue and white; *A. leptoceras*, blue and yellow; *A. canadensis*, *A. Skinneri*, and *A. truncata* (*californica*), scarlet and yellow; *A. chrysantha*, yellow; and *A. fragrans*, white or flesh-colour, very fragrant. Light rich garden soil.

Arabis.—Dwarf close-growing evergreen cruciferous plants, adapted for rockwork and the front part of the flower border, and of the easiest culture. *A. albida* forms a conspicuous mass of greyish leaves and white blossoms. There is also a charming double variety. *A. lucida*, which is also white-flowered, bears its bright green leaves in rosettes, and has a variety with prettily gold-margined leaves.

Arenaria.—Evergreen rock plants of easy culture. *A. graminifolia*, and *A. laricifolia* are tufted, with grassy foliage and white flowers, while *A. balearica*, a creeping rock plant, has tiny leaves and solitary white flowers.

Armeria.—The Thrift or Sea-Pink, of which the common form *A. maritima* is sometimes planted as an edging for garden walks; there are three varieties, the common pale pink, the deep rose, and the white, the last two being the most desirable. *A. cephalotes*, 1½ ft., is a larger plant, with tufts of linear lance-shaped leaves, and abundant globular heads of deep rose flowers, in June and July.

Asclepias.—*A. tuberosa* is a handsome fleshy-rooted plant, very impatient of being disturbed, and preferring good peat soil; it grows 1 to 1½ ft. high, and bears corymbs of deep yellow and orange flowers in September. *A. incarnata*, 2 to 4 ft., produces deep rose sweet-scented flowers towards the end of summer.

Asperula odorata.—The woodruff, a charming white-flowered plant with leaves in circles. Well adapted for carpeting the border or rockery.

Asphodelus.—Handsome liliaceous plants, with fleshy roots, erect stems, and showy flowers, thriving in any good garden soil. *A. albus*, 4 ft., *A. aestivus*, 4 ft., and *A. ramosus*, 4 ft., have all long tapering keeled leaves, and simple or branched spikes of white flowers; *A. luteus*, 2 ft., has awl-shaped leaves and dense spikes of fragrant yellow flowers; *A. capillaris* is similar to *A. luteus*, but more slender and elegant.

Aster.—A very large family of autumn-blooming composites, including some ornamental species, all of the easiest culture. Of these, *A. alpinus*, 1 ft., and *A. Amellus*, 1½ ft., with its var. *bessarabicus*, have broadish blunt leaves, and large starry bluish flowers; *A. longifolius formosus*, 2 ft., bright rosy lilac; *A. elegans*, 3 to 5 ft., small pale purple or whitish; *A. laxus*, 2 ft., purplish-blue; *A. pendulus*, 2½ ft., white, changing to rose; *A. pyrenaeus*, 2 to 3 ft., lilac-blue; *A. turbinellus*, 2 to 3 ft., mauve-coloured, are showy border plants; and *A. Novae Angliae*, 5 to 6 ft., rosy-violet; *A. cyaneus*, 5 ft., blue-lilac; and *A. grandiflorus*, 3 ft., violet, are especially useful from their late-flowering habit.

Astilbe.—A. japonica, 1 to 1½ ft., better known as *Hoteia japonica* or *Spiraea japonica*, thrives in peaty or sandy soil; its glossy tripinnate leaves, and feathery panicles of white flowers early in summer, are very attractive. It proves to be a fine decorative pot-plant, and invaluable for forcing during the spring.

Astragalus.—Showy pea-flowered plants, the smaller species adapted for rockwork; sandy soil. *A. dasyglottis*, 6 in., has bluish-purple flowers in August and September; and *A. monspessulanus*, 8 in., crimson-purple in July; while *A. hypoglottis*, 6 in., produces in summer compact heads of pretty flowers, which are either purple or white. There are many very ornamental kinds.

Aubrietia.—Beautiful dwarf spring-blooming rock plants, forming carpety tufts of flowers of simple cruciferous form. *A. delioidea* is of a deep lilac-blue; *A. Campbelliae* is more compact and rather darker, approaching to purple; *A. grandiflora* and *graeca* are rather larger, but of a lighter hue. Light sandy soil.

Bambusa.—The bamboo family are elegant arborescent grasses (see Bamboo).

Baptisia.—Stoutish erect-growing, 2 to 3 ft., with smooth foliage and spikes of pea-like flowers. *B. australis* is purplish-blue, *B. alba*, white, *B. exaltata*, deep blue; all flowering in the summer months.

Bellis.—B. perennis flore-pleno, the Double Daisy, consists of dwarf showy plants 3 to 4 in. high, flowering freely in spring if grown in rich light soil, and frequently divided and transplanted. The white and pink forms, with the white and red quilled, and the variegated-leaved *aucubaefolia*, are some of the best.

Bocconia.—Stately poppyworts, 6 to 8 ft. *B. cordata* has heart-shaped lobed leaves, and large panicles of small flesh-coloured flowers. Sometimes called *Macleaya*. Deep sandy loam.

Brodiaea.—Pretty bulbous plants. *B. grandiflora*, 1 ft., has large bluish-purple flowers; *B. coccinea*, 2 to 3 ft., has tubular campanulate nodding flowers of a rich crimson with green tips. Sandy loam.

Bulbocodium.—Pretty spring-flowering crocus-like bulbs. *B. vernum*, 4 to 6 in. high, purplish-lilac, blooms in March. Good garden soil.

Buphthalmum.—Robust composite herbs with striking foliage, for the back of herbaceous or shrubbery borders. *B. cordifolium*, 4 ft., has large cordate leaves, and heads of rich orange flowers in cymose panicles in July. Also called *Telekia speciosa*.

Calandrinia.—Showy dwarf plants for sunny rockwork, in light sandy soil. *C. umbellata*, 3 to 4 in., much branched, with narrow hairy leaves, and corymbs of magenta-crimson flowers in the summer months.

Calochortus.—Beautiful bulbous plants, called mariposa lilies, requiring warm sheltered spots in rich gritty and well-drained soil. There are several species known, the best being *albus*, *elegans*, *luteus*, *Plummerae*, *splendens*, *Purdyi*, *venustus* and *Weedi*.

Caltha.—Showy marsh plants, adapted for the margins of lakes, streamlets or artificial bogs. *C. palustris flore-pleno*, 1 ft., has double brilliant yellow flowers in May.

Calystegia.—Twining plants with running perennial roots. *C. pubescens flore-pleno*, 8 to 10 ft., has showy double-pink convolvuloid flowers in July; *C. dahurica* is a handsome single-flowered summer-blooming kind, with rosy-coloured flowers.

Camassia esculenta.—A beautiful bulbous plant 2 to 3 ft. high with large pale blue flowers. Also a white variety.

Campanula.—Beautiful, as well as varied in habit and character. They are called bell-flowers. *C. pulla*, 6 in., purplish, nodding, on slender erect stalks; *C. turbinata*, 9 in., purple, broad-belled; *C. carpatica*, 1 ft., blue, broad-belled; *C. nobilis*, 1½ ft., long-belled, whitish or tinted with chocolate; *C. persicifolia*, 2 ft., a fine border plant, single or double, white or purple, blooming in July; and *C. pyramidalis*, 6 ft., blue or white, in tall branching spikes, are good and diverse. There are many other fine sorts.

Centaurea.—Bold-habited composites of showy character; common soil. *C. babylonica*, 5 to 7 ft., has winged stems, silvery leaves, and yellow flower-heads from June to September; *C. montana*, 3 ft., deep bright blue or white.

Centranthus.—Showy free-flowering plants, for rockwork, banks, or stony soil. *C. ruber*, 2 ft., branches and blooms freely all summer, and varies with rosy, or crimson, or white flowers. It clothes the chalk cuttings on some English railways with a sheet of colour in the blooming season.

Cheiranthus.—Pretty rock plants, for light stony soils. *C. alpinus*, 6 in., grows in dense tufts, and bears sulphur-yellow flowers in May. *C. ochroleucus* is similar in character.

Chionodoxa.—Charming dwarf hardy bulbous plants of the liliaceous order, blooming in the early spring in company with *Scilla sibirica*, and of equally easy cultivation. *C. Luciliae*, 6 in., has star-shaped flowers of a brilliant blue with a white centre. *C. gigantea* is the finest of the few known species. It blooms from February to April.

Chrysanthemum.—Apart from the florist's varieties of *C. indicum* there are a few fine natural species. One of the best for the flower border is *C. maximum* and its varieties—all with beautiful white flowers having yellow centres. *C. latifolium* is also a fine species.

Colchicum.—Showy autumn-blooming bulbs (corms), with crocus-like flowers, all rosy-purple or white. *C. speciosum*, *C. autumnale*, single and double, *C. byzantinum*, and *C. variegatum* are all worth growing.

Convallaria.—*C. majalis*, the lily of the valley, a well-known sweet-scented favourite spring flower, growing freely in rich garden soil; its spikes, 6 to 9 in. high, of pretty white fragrant bells, are produced in May and June. Requires shady places, and plenty of old manure each autumn.

Coreopsis.—Effective composite plants, thriving in good garden soil. *C. auriculata*, 2 to 3 ft., has yellow and brown flowers in July and August; *C. lanceolata*, 2 to 3 ft., bright yellow, in August; next to the biennial *C. grandiflora* it is the best garden plant.

Corydalis.—Interesting and elegant plants, mostly tuberous, growing in good garden soil. *C. bracteata*, 9 in., has sulphur-coloured flowers in April, and *C. nobilis*, 1 ft., rich yellow, in May; *C. solida*, with purplish, and *C. tuberosa*, with white flowers, are pretty spring-flowering plants, 4 to 6 in. high. *C. thalictrifolia*, 1 ft., yellow, May to October.

Cyclamen.—Charming tuberous-rooted plants of dwarf habit, suitable for sheltered rockeries, and growing in light gritty soil. *C. europaeum*, reddish-purple, flowers in summer, and *C. hederae-folium* in autumn.

Cypripedium.—Beautiful terrestrial orchids, requiring to be planted in peat soil, in a cool and rather shady situation. *C. spectabile*, 1½ to 2 ft., white and rose colour, in June, is a lovely species, as is *C. Calceolus*, 1 ft., yellow and brown, in May; all are full of interest and beauty.

Delphinium.—The Larkspur family, tall showy plants, with spikes of blue flowers in July. Distinct sorts are *D. grandiflorum* and *D. grandiflorum flore-pleno*, 2 to 3 ft., of the richest dazzling blue, flowering on till September; *D. chinense*, 2 ft., blue, and its double-flowered variety, are good, as is *D. Barlowi*, 3 ft., a brilliant double blue-purple. *D. nudicaule*, 2 ft., orange-scarlet, very showy, is best treated as a biennial, its brilliant flowers being produced freely in the second year from the seed.

Dianthus.—Chiefly rock plants with handsome and fragrant flowers, the smaller sorts growing in light sandy soil, and the larger border plants in rich garden earth. Of the dwarfer sorts for rock gardens, *D. alpinus*, *D. caesius*, *D. deltoides*, *D. dentosus*, *D. neglectus*, *D. petraeus*, and *D. glacialis* are good examples; while for borders or larger rockwork *D. plumarius*, *D. superbus*, *D. Fischeri*, *D. cruentus*, and the clove section of *D. Caryophyllus* are most desirable.

Dicentra.—Very elegant plants, of easy growth in good soil. *D. spectabilis*, 2 to 3 ft., has paeony-like foliage, and gracefully drooping spikes of heart-shaped pink flowers, about May, but it should have a sheltered place, as it suffers from spring frosts and winds; *D. formosa* and *D. eximia*, 1 ft., are also pretty rosy-flowered species.

Dictamnus.—*D. Fraxinella* is a very characteristic and attractive plant, 2 to 3 ft., with bold pinnate leaves, and tall racemes of irregular-shaped purple or white flowers. It is everywhere glandular, and strongly scented.

Digitalis.—Stately erect-growing plants, with long racemes of pouch-shaped drooping flowers. The native D. purpurea, or foxglove, 3 to 5 ft., with its dense racemes of purple flowers, spotted inside, is very showy, but is surpassed by the garden varieties that have been raised. It is really a biennial, but grows itself so freely as to become perennial in the garden. An erect flowered form is called *gloxinioides*. The yellow-flowered *D. lutea* and *D. grandiflora* are less showy. Good garden soil, and frequent renewal from seeds.

Doronicum.—Showy composites of free growth in ordinary soil. *D. caucasicum* and *D. austriacum*, 1 to 1½ ft., both yellow-flowered, bloom in spring and early summer. *D. plantagineum excelsum*, 3 to 5 ft. high, is the best garden plant.

Draba.—Good rockwork cruciferous plants. *D. alpina*, *D. aizoides*, *D. ciliaris*, *D. Aizoon*, and *D. cuspidata* bear yellow flowers in early spring; *D. cinerea* and *D. ciliata* have white flowers. Gritty

well-drained soil.

Dracocephalum.—Handsome labiate plants, requiring a warm and well-drained soil. *D. argunense*, 1½ ft., *D. austriacum*, 1 ft., *D. grandiflorum*, 1 ft., and *D. Ruyschianum*, 1½ ft., with its var. japonicum, all produce showy blue flowers during the summer months.

Echinacea.—Stout growing showy composites for late summer and autumn flowering, requiring rich deep soil, and not to be often disturbed. *E. angustifolia*, 3 to 4 ft., light purplish-rose, and *E. intermedia*, 3 to 4 ft., reddish-purple, are desirable kinds. *E. purpurea* (often called Rudbeckia) is the showiest species. Height 3 to 4 ft., with rosy-purple flowers.

Eomecon chionanthus.—A lovely poppywort about 1 ft. high, with pure white flowers 2 to 3 in. across. Root-stocks thick, creeping.

Epimedium.—Pretty plants, growing about 1 ft. high, with elegant foliage, and curious flowers. *E. macranthum*, white flowers, and *E. rubrum*, red, are distinctly spurred; *E. pinnatum* and *E. Perralderianum*, yellow, less so. They bloom in spring, and prefer a shady situation and a peaty soil.

Eranthis hyemalis.—A charming tuberous rooted plant, called winter aconite. Flowers bright yellow, January to March, close to the ground.

Eremurus.—Noble plants with thick rootstocks, large sword-like leaves, and spikes of flowers from 3 to 10 ft. high. They require warm sunny spots and rich gritty soil. The best kinds are *robustus*, pink, 6 to 10 ft.; *himalaicus*, 4 to 8 ft., white; *Aitchisoni*, 3 to 5 ft., red; *Bungei*, 2 to 3 ft., yellow; and *aurantiacus*, 2 to 3 ft., orange-yellow. There are now several hybrid forms.

Erigeron.—Composite plants, variable in character. *E. purpureus*, 1½ ft., with pink flower-heads, having narrow twisted ray-florets; *E. Roylei*, 1 ft., dark blue; and *E. pulchellus*, 1 ft., rich orange, flowering during the summer, are among the best kinds. Good ordinary garden soil.

Erinus.—*E. alpinus* is a beautiful little alpine for rockwork, 3 to 6 in., of tufted habit, with small-toothed leaves, and heads of pinkish-purple or, in a variety, white flowers, early in summer. Sandy well-drained soil.

Erodium.—Handsome dwarf tufted plants. *E. Manescavi*, 1 to 1½ ft., has large purplish-red flowers in summer; *E. Reichardi*, a minute stemless plant, has small heart-shaped leaves in rosette-like tufts, and white flowers striped with pink, produced successively. Light soil.

Eryngium.—Very remarkable plants of the umbelliferous order, mostly of an attractive character. *E. amethystinum*, 2 ft., has the upper part of the stem, the bracts, and heads of flowers all of an amethystine blue. Some of more recent introduction have the aspect of the pine-apple, such as *E. bromeliaefolium*, *E. pandanifolium*, and *E. eburneum*. Deep light soil.

Erythronium.—*E. dens-canis*, the Dog’s Tooth Violet, is a pretty dwarf bulbous plant with spotted leaves, and rosy or white flowers produced in spring, and having reflexed petals. Mixed peaty and loamy soil, deep and cool. Several charming American species are now in cultivation.

Euphorbia.—Plants whose beauty resides in the bracts or floral leaves which surround the inconspicuous flowers. *E. aleppica*, 2 ft., and *E. Characias*, 2 to 3 ft., with green bracts, are fine plants for rockwork or sheltered, corners.

Ferula.—Gigantic umbelliferous plants, with magnificent foliage, adapted for shrubbery borders or open spots on lawns. They have thick fleshy roots, deeply penetrating, and therefore requiring deep soil, which should be of a light or sandy character. *F. communis*, *F. glauca*, and *F. tingitana*, the last with glossy lozenge-shaped leaflets, grow 8 to 10 ft. high; *F. Ferulago*, with more finely cut leaves, grows 5 to 6 ft. high. They flower in early spring, and all have a fine appearance when in bloom, on account of their large showy umbels of yellow flowers.

Fritillaria.—A large genus of liliaceous bulbs, the best known of which is the crown imperial (*F. imperialis*) and the snake’s head (*F. Meleagris*). There are many charming species grown, such as *aurea*, *pudica*, *recurva*, *sewerzowi*, *askabadensis*, &c.

Funkia.—Pretty liliaceous plants, with simple conspicuously longitudinal-ribbed leaves, the racemose flowers funnel-shaped and deflexed. *F. Sieboldiana*, 1 ft., has lilac flowers; *F. grandiflora*, 18 in., is white and fragrant; *F. coerulea*, 18 in., is violet-blue; *F. albo-marginata*, 15 in., has the leaves edged with white, and the flowers lilac. Rich garden soil.

Gaillardia.—Showy composite plants, thriving in good garden soil. *G. aristata*, 2 ft., has large yellow flower-heads, 2 or 3 in. across, in summer; *G. Baeselari* and *G. Loiselii* have the lower part of the ray-florets red, the upper part yellow.

Galanthus.—The Snowdrop. Early spring-flowering amaryllidaceous bulbs, with pretty drooping flowers, snow-white, having the tips of the enclosed petals green. The common sort is *G. nivalis*, which blossoms on the first break of the winter frosts; *G. Imperoti*, *G. Elwesi* and *G. plicatus* have larger flowers.

Galax aphylla.—A neat little rock plant, 6 to 8 in. high, with pretty round leaves and white flowers. Requires moist peaty soil.

Galega officinalis.—A strong-growing leguminous plant, 2 to 5 ft. high, with pinnate leaves, and masses of pinkish purple pea-like flowers. Also a white variety. Grows anywhere.

Galtonia candicans.—~A fine bulbous plant, 3 to 4 ft. high, with drooping white flowers.

Gaura.—*G. Lindheimeri*, 3 to 5 ft., is much branched, with elegant white and red flowers of the onagraceous type, in long slender ramose spikes during the late summer and autumn months. Light garden soil; not long-lived.

Gentiana.—Beautiful tufted erect-stemmed plants preferring a strong rich loamy soil. *G. acaulis*, known as the Gentianella, forms a close carpet of shining leaves, and in summer bears large erect tubular deep blue flowers. *G. Andrewsii*, 1 ft., has, during summer, large deep blue flowers in clusters, the corollas closed at the mouth; *G. asclepiadea*, 18 in., purplish-blue, flowers in July.

Geranium.—Showy border flowers, mostly growing to a height of 1½ or 2 ft., having deeply cut leaves, and abundant saucer-shaped blossoms of considerable size. *G. ibericum*, *platypetalum*, *armenum* and *Endressi* are desirable purple- and rose-flowered sorts; *G. sanguineum*, a tufted grower, has the flowers a deep rose colour; and the double-flowered white and blue forms of *G. pratense* and *G. sylvaticum* make pretty summer flowers. Good garden soil.

Gerbera.—A South African genus of composites requiring very warm sunny spots and rich gritty soil. *G. Jamesoni*, with large scarlet marguerite-like flowers, and *G. viridiflora*, with white flowers tinged with lilac, are best known. Numerous hybrids have been raised, varying in colour from creamy white to salmon, pink, yellow, red and orange.

Geum.—Pretty rosaceous plants. The single and double flowered forms of *G. chiloense* and its varieties *grandiflorum* and *miniatum*, 2 ft., with brilliant scarlet flowers; *G. coccineum*, 6 to 12 in., scarlet, and *G. montana*, 9 in., yellow, are among the best sorts. Good garden soil.

Gillenia trifoliata.—A pretty rosaceous plant about 2 ft. high. Flowers white in graceful panicles; flourishes in a mixture of sandy peat and loam.

Gunnera.—Remarkable rhubarb-like plants with huge lobed leaves, often 6 ft. across. They should be grown near water as they like much moisture, and a good loamy soil. *G. manicata* and *G. scabra* are the two kinds grown.

Gynerium.—The Pampas-Grass, a noble species, introduced from Buenos Aires; it forms huge tussocks, 4 or 5 ft. high, above which towards autumn rise the bold dense silvery plumes of the inflorescence. It does best in sheltered nooks.

Gypsophila.—Interesting caryophyllaceous plants, thriving in dryish situations. *G. paniculata*, 2 ft., from Siberia, forms a dense semi-globular mass of small white flowers from July onwards till autumn, and is very useful for cutting.

Haberlea rhodopensis.—A pretty rock plant with dense tufts of leaves and bluish-lilac flowers. It likes fibrous peat in fissures of the rocks.

Helenium.—Showy composites of free growth in lightish soil. *H. autumnale*, 4 ft., bears a profusion of yellow-rayed flower-heads in August and September.

Helianthemum.—Dwarf subshrubby plants well suited for rockwork, and called Sun-Roses from their blossoms resembling small wild roses and their thriving best in sunny spots. Some of the handsomest are *H. roseum*, *mutabile*, *cupreum* and *rhodanthum*, with red flowers; *H. vulgare flore-pleno*, *grandiflorum* and *stramineum*, with yellow flowers; and *H. macranthum* and *papyraceum*, with the flowers white.

Helianthus.—The Sunflower genus, of which there are several ornamental kinds. *H. multiflorus*, 4 ft., and its double-flowered varieties, bear showy golden yellow flower-heads in profusion, and are well adapted for shrubbery borders; *H. orgyalis*, 8 ft., has drooping willow-like leaves. Many other showy species.

Helichrysum.—Composite plants, with the flower-heads of the scarious character known as Everlastings. *H. arenarium*, 6 to 8 in., is a pretty species, of dwarf spreading habit, with woolly leaves and corymbs of golden yellow flowers, about July.

Helleborus.—Charming very early blooming dwarf ranunculaceous herbs. *H. niger* or Christmas Rose, the finest variety of which is called *maximus*, has white showy saucer-shaped flowers; *H. orientalis*, 1 ft., rose-coloured; *H. atrorubens*, 1 ft., purplish-red; and *H. colchicus*, 1 ft., deep purple. Deep rich loam.

Hemerocallis.—The name of the day lilies of which *H. fulva*, *H. disticha*, *H. flava*, *H. Dumortieri* and *H. aurantiaca major* are the most showy, all with yellow or orange flowers. They flourish in any garden soil.

Hepatica.—Charming little tufted plants requiring good loamy soil, and sometimes included with Anemone. *H. triloba*, 4 in., has three-lobed leaves, and a profusion of small white, blue, or pink single or double flowers, from February onwards; *H. angulosa*, from Transylvania, 6 to 8 in., is a larger plant, with sky-blue flowers.

Hesperis.—*H. matronalis*, 1 to 2 ft., is the old garden Rocket, of which some double forms with white and purplish blossoms are amongst the choicest of border flowers. They require a rich loamy soil, not too dry, and should be divided and transplanted into fresh soil annually or every second year, in the early autumn season.

Heuchera.—*H. sanguinea* and its varieties are charming and brilliant border plants with scarlet flowers in long racemes. Rich and well-drained soil.

Hibiscus.—Showy malvaceous plants. *H. Moscheutos*, rose-coloured, and *H. palustris*, purple, both North American herbs, 3 to 5 ft. high, are suitable for moist borders or for boggy places near the margin of lakes.

Iberis.—The Candytuft, of which several dwarf spreading subshrubby species are amongst the best of rock plants, clothing the surface with tufts of green shoots, and flowering in masses during May and June. The best are *I. saxatilis*, 6 to 10 in.; *I. sempervirens*, 12 to 15 in.; and *I. Pruitii* (variously called *coriacea*, *carnosa*, *correaefolia*), 12 in.

Incarvillea.—*I. Delavayi* is the best species for the open air. It grows 2 ft. high and has large tubular rosy carmine blossoms. It likes rich sandy loam and sunny spots.

Lathyrus.—Handsome climbing herbs, increased by seeds or division. *L. grandiflorus*, 3 ft., has large rose-coloured flowers with purplish-crimson wings, in June; *L. latifolius*, the everlasting pea, 6 ft., has bright rosy flowers in the late summer and autumn; the vars. *albus*, white, and *superbus*, deep rose, are distinct. Ordinary garden soil.

Lavatera.—*L. thuringiaca*, 4 ft., is a fine erect-growing malvaceous plant, producing rosy-pink blossoms freely, about August and September. Good garden soil.

Leucojum.—Snowflake. Pretty early-blooming bulbs, quite hardy. *L. vernum*, 6 in., blooms shortly after the snowdrop, and should have a light rich soil and sheltered position; *L. carpaticum*, flowers about a month later; *L. pulchellum*, 1½ ft., blooms in April and May; and *L. aestivum*, 2 ft., in May. All have white pendant flowers, tipped with green.

Liatris.—Pretty composites with the flower-heads collected into spikes. *L. pumila*, 1 ft., *L. squarrosa*, 2 to 3 ft., *L. spicata*, 3 to 4 ft., *L. pycnostachya*, 3 to 4 ft., all have rosy-purplish flowers. Deep, cool, and moist soil.

Lilium.—See Lily.

Linaria.—Toadflax. Pretty scrophulariads, of which *L. alpina*, 3 to 6 in., with bluish-violet flowers having a brilliant orange spot, is suitable for rockwork; *L. dalmatica*, 4 ft., and *L. genistifolia*, 3 ft., both yellow-flowered, are good border plants; *L. vulgaris*, the common British toad-flax, and its regular peloriate form, are very handsome and free flowering during the summer months.

Linum.—Flax. *L. alpinum*, 6 in., large, dark blue; *L. narbonnense*, 1½ ft., large, blue; *L. perenne*, 1½ ft., cobalt blue; and *L. arboreum* (*flavum*), 1 ft., yellow, are all pretty. The last is liable to suffer from damp during winter, and some spare plants should be wintered in a frame. It is really shrubby in character.

Lithospermum.—*L. prostratum*, 3 in., is a trailing evergreen herb, with narrow hairy leaves, and paniculate brilliant blue flowers in May and June. Well adapted for rockwork or banks of sandy soil.

Lupinus.—Showy erect-growing plants with papilionaceous flowers, thriving in good deep garden soil. *L. polyphyllus*, 3 ft., forms noble tufts of palmate leaves, and long spikes of bluish-purple or white flowers in June and July; *L. arboreus* is subshrubby, and has yellow flowers.

Lychnis.—Brilliant erect-growing caryophyllaceous plants, thriving best in beds of peat earth or of deep sandy loam. *L. chalcedonica*, 3 ft., has dense heads of bright scarlet flowers, both single and double, in June and July; *L. fulgens*, 1 ft., vermilion; *L. Haageana*, 1½ ft., scarlet; and *L. grandiflora*, 1 to 2 ft., with clusters of scarlet, crimson, pink and white flowers. All large-flowered and showy, but require a little protection in winter.

Lysimachia.—The best known is the Creeping Jenny, *L. Nummularia*, much used for trailing over rockeries and window boxes, with bright yellow flowers. The variety *aurea* with golden leaves is also popular. Other species that grow from 2 to 3 ft. high, and are good border plants, are *L. clethroides*, with white spikes of flowers; *L. vulgaris*, *L. thyrsiflora*, *L. ciliata*, *L. verticillata* and *L. punctata*, all yellow.

Malva.—*M. moschata*, 2 ft., with a profusion of pale pink or white flowers, and musky deeply cut leaves, though a British plant, is worth introducing to the flower borders when the soil is light and free.

Meconopsis.—The Welsh poppy, *M. cambrica*, 1 to 2 ft. high, yellow, and *M. Wallichi*, from the Himalayas, 4 to 6 ft. high with pale blue flowers, are the best known perennials of the genus. The last-named, however, is best raised from seeds every year, and treated like the biennial kinds.

Mertensia.—*M. virginica*, 1 to 1½ ft., azure blue, shows flowers in drooping panicles in May and June. It does best in shady peat borders.

Mimulus.—Monkey-flower. Free-blooming, showy scrophulariaceous plants, thriving best in moist situations. *M. cardinalis*, 2 to 3 ft., has scarlet flowers, with the limb segments reflexed; *M. luteus* and its many garden forms, 1 to 1½ ft., are variously coloured and often richly spotted; and *M. cupreus*, 8 to 10 in., is bright coppery-red. *M. moschatus* is the Musk-plant, of which the variety *Harrisoni* is a greatly improved form, with much larger yellow flowers.

Monarda.—Handsome labiate plants, flowering towards autumn, and preferring a cool soil and

partially shaded situation. *M. didyma*, 2 ft., scarlet or white; M. fistulosa, 3 ft., purple; and *M. purpurea*, 2 ft., deep purple, are good border flowers.

Muscari.—Pretty dwarf spring-flowering bulbs. *M. botryoides* (Grape Hyacinth), 6 in., blue or white, is the handsomest; *M. moschatum* (Musk Hyacinth), 10 in., has peculiar livid greenish-yellow flowers and a strong musky odour; *M. monstrosum* (Feather Hyacinth) bears sterile flowers broken up into a feather-like mass. Good garden soil.

Myosotidium nobile.—A remarkable plant, 1½ to 2 ft. high, with large blue forget-me-not-like flowers. Requires gritty peat soil and cool situations, but must be protected from frost in winter.

Myosotis.—Forget-me-not. Lovely boraginaceous plants. M. dissitiflora, 6 to 8 in., with large, handsome and abundant sky-blue flowers, is the best and earliest, flowering from February onwards; it does well in light cool soils, preferring peaty ones, and should be renewed annually from seeds or cuttings. *M. rupicola*, 2 to 3 in., intense blue, is a fine rock plant, preferring shady situations and gritty soil; *M. sylvatica*, 1 ft., blue, pink or white, used for spring bedding, should be sown annually in August.

Narcissus.—See NARCISSUS.

Nepeta.—N. Mussinii, 1 ft., is a compactly spreading greyish-leaved labiate, with lavender-blue flowers, and is sometimes used for bedding or for marginal lines in large compound beds.

Nierembergia.—N. rivularis, 4 in., from La Plata, has slender, creeping, rooting stems, bearing stalked ovate leaves, and large funnel-shaped white flowers, with a remarkably long slender tube; especially adapted for rockwork, requiring moist sandy loam.

Nymphaea.—See WATER-LILY.

Oenothera.—The genus of the Evening Primrose, consisting of showy species, all of which grow and blossom freely in rich deep soils. *Oe. missouriensis* (*macrocarpa*), 6 to 12 in., has stout trailing branches, lance-shaped leaves and large yellow blossoms; *Oe. taraxacifolia*, 6 to 12 in., has a stout crown from which the trailing branches spring out, and these bear very large white flowers, changing to delicate rose; this perishes in cold soils, and should therefore be raised from seed annually. Of erect habit are *Oe. speciosa*, 1 to 2 ft., with large white flowers; *Oe. fruticosa*, 2 to 3 ft., with abundant yellow flowers; and *Oe. serotina*, 2 ft., also bright yellow.

Omphalodes.—Elegant dwarf boraginaceous plants. *O. verna*, 4 to 6 in., a creeping, shade-loving plant, has bright blue flowers in the very early spring; *O. Luciliae*, 6 in., has much larger lilac-blue flowers, and is an exquisite rock plant for warm, sheltered spots. Light sandy soil.

Onosma.—O. taurica, 6 to 8 in., is a charming boraginaceous plant from the Caucasus, producing hispid leaves and cymose heads of drooping, tubular, yellow flowers. It is of evergreen habit, and requires a warm position on the rockwork and well-drained sandy soil; or a duplicate should be sheltered during winter in a cold, dry frame.

Ornithogalum.—The Star of Bethlehem. *O. arabicum* can only be grown in the warmest parts of the kingdom, and then requires protection in winter. Other species, all bulbous, are *O. nutans*, *O. pyramidale*, *O. pyrenaicum*, and the common Star of Bethlehem, *O. umbellatum*; all are easily grown, and have white flowers.

Ostrowskya magnifica.—A magnificent bellflower from Bokhara, 4 to 5 ft. high, and white flowers tinted and veined with lilac, 3 to 5 in. across. Requires rich, gritty loam of good depth, as it produces tuberous roots 1 to 2 ft. long.

Ourisia.—Handsome scrophulariaceous plants, from Chile, thriving in moist, well-drained peaty soil, and in moderate shade. *O. coccinea*, 1 ft., has erect racemes of pendent crimson flowers.

Papaver.—The Poppy. Very showy plants, often of strong growth, and of easy culture in ordinary garden soil. *P. orientale*, 3 ft., has crimson-scarlet flowers, 6 in. across, and the variety *bracteatum* closely resembles it, but has leafy bracts just beneath the blossom. *P. alpinum*, 6 in., white with yellow centre; *P. nudicaule*, 1 ft., yellow, scented, and *P. pilosum*, 1 to 2 ft., deep orange, are ornamental smaller kinds.

Pentstemon.—The popular garden varieties have sprung from *P. Hartwegii* and *P. Cobaea*. Other distinct kinds are *P. campanulatus*, 1½ ft., pale rose, of bushy habit; *P. humilis*, 9 in., bright blue; *P. speciosus*, *cyananthus* and *Jaffrayanus*, 2 to 3 ft., all bright blue; *P. barbatus*, 3 to 4 ft., scarlet, in long terminal panicles; *P. Murrayanus*, 6 ft., with scarlet flowers and connate leaves; and *P. Palmeri*, 3 to 4 ft., with large, wide-tubed, rose-coloured flowers.

Petasites.—P. fragrans, the Winter Heliotrope, though of weedy habit, with ample cordate coltsfoot-like leaves, yields in January and February its abundant spikes, about 1 ft. high, of greyish flowers scented like heliotrope; it should have a corner to itself.

Phlomis.—Bold and showy labiates, growing in ordinary soil. *P. Russelliana* (*lunariaefolia*), 4 ft., yellow, and *P. tuberosa*, 3 ft., purplish-rose, both with downy hoary leaves, come in well in broad flower borders.

Phygelius.—P. capensis from South Africa is hardy south of the Thames and in favoured localities. Flowers tubular scarlet, on branching stems, 2 to 3 ft. high. Requires light, rich soil.

Physalis.—P. Alkekengi from South Europe has long been known in gardens for its bright orange-red globular calyxes. It has been surpassed by the much larger and finer *P. Francheti* from Japan; the brilliant calyxes are often 3 in. in diameter in autumn. Grows in any garden soil.

Physostegia.—Tall, autumn-blooming labiates, of easy growth in ordinary garden soils. *P. imbricata*, 5 to 6 ft., has pale purple flowers in closely imbricated spikes.

Phytolacca.—Ornamental strong-growing perennials requiring much space. *P. acinosa*, from the Himalayas, 3 to 4 ft., with whitish flowers in erect spikes. *P. decandra*, the North American Poke Weed or Red Ink plant, grows 5 to 10 ft. high, has fleshy poisonous roots, erect purple stems and white flowers. *P. icosandra*, from Mexico, 2 to 3 ft., pinky white. The foliage in all cases is handsome. Ordinary garden soil.

Platycodon.—P. grandiflorum, 6 to 24 in. high, is a fine Chinese perennial with flattish, bell-shaped flowers, 2 to 3 in. across, and purple in colour. The variety *Mariesi* (or *pumilum*) is dwarf, with larger, deeper-coloured flowers. Requires rich sandy loam.

Podophyllum.—Ornamental herbs with large lobed leaves. *P. Emodi*, 6 to 12 in. high, from the Himalayas, has large white or pale-rose flowers, and in autumn bright red, hen's-egg-like fruits. *P. peltatum*, the North American mandrake, has large umbrella-like leaves and white flowers; *P. pleianthum*, from China, purple. They all require moist, peaty soil in warm, sheltered nooks.

Polemonium.—Pretty border flowers. *P. coeruleum* (Jacob's Ladder), 2 ft., has elegant pinnate leaves, and long panicles of blue rotate flowers. The variety called variegatum has very elegantly marked leaves, and is sometimes used as a margin or otherwise in bedding arrangements. Good garden soil.

Polygonatum.—Elegant liliaceous plants, with rhizomatous stems. *P. multiflorum* (Solomon's Seal), 2 to 3 ft., with arching stems, and drooping white flowers from the leaf axils, is a handsome border plant, doing especially well in partial shade amongst shrubs, and also well adapted for pot culture for early forcing. Good garden soil.

Polygonum.—A large family, varying much in character, often weedy, but of easy culture in ordinary soil. *P. vacciniifolium*, 6 to 10 in., is a pretty prostrate subshrubby species, with handsome rose-pink flowers, suitable for rockwork, and prefers boggy soil; *P. affine* (*Brunonis*), 1 ft., deep rose, is a showy border plant, flowering in the late summer; *P. cuspidatum*, 8 to 10 ft., is a grand object for planting where a screen is desired, as it suckers abundantly, and its tall spotted stems and handsome cordate leaves have quite a noble appearance. Other fine species are *P. baldschuanium*, a climber, *P. sphaerostachyum*, *P. lanigerum*, *P. polystachyum* and *P. sachalinense*, all bold and handsome.

Potentilla.—The double varieties are fine garden plants obtained from *P. argyrophylla atrosanguinea* and *P. nepalensis*. The colours include golden-yellow, red, orange-yellow, crimson, maroon and intermediate shades. They all flourish in rich sandy soil.

Primula.—Beautiful and popular spring flowers, of which many forms are highly esteemed in most gardens. *P. vulgaris*, 6 in., affords numerous handsome single- and double-flowered varieties, with various-coloured flowers for the spring flower-beds and borders. Besides this, *P. Sieboldii* (*cortusoides amoena*), 1 ft., originally deep rose with white eye, but now including many varieties of colour, such as white, pink, lilac and purple; *P. japonica*, 1 to 2 ft., crimson-rose; *P. denticulata*, 1 ft., bright bluish-lilac, with its allies *P. erosa* and *P. purpurea*, all best grown in a cold frame; *P. viscosa*, 6 in., purple, and its white variety nivalis, with *P. pedemontana* and *P. spectabilis*, 6 in., both purple; and the charming little Indian *P. rosea*, 3 to 6 in., bright cherry-rose colour, are but a few of the many beautiful kinds in cultivation.

Pulmonaria.—Handsome dwarf, boraginaceous plants, requiring good deep garden soil. *P. officinalis*, 1 ft., has prettily mottled leaves and blue flowers; *P. sibirica* is similar in character, but has broader leaves more distinctly mottled with white.

Pyrethrum.—Composite plants of various character, but of easy culture. *P. Parthenium eximium*, 2 ft., is a handsome double white form of ornamental character for the mixed border; *P. uliginosum*, 5 to 6 ft., has fine large, white, radiate flowers in October; *P. Tchihatchewii*, a close-growing, dense evergreen, creeping species, with long-stalked, white flower-heads, is adapted for covering slopes in lieu of turf, and for rockwork.

Ramondia.—R. pyrenaica, 3 to 6 in., is a pretty dwarf plant, requiring a warm position on the rockwork and a moist, peaty soil more or less gritty; it has rosettes of ovate spreading root-leaves, and large purple, yellow-centred, rotate flowers, solitary, or two to three together, on naked stalks.

Ranunculus.—The florists' ranunculus is a cultivated form of *R. asiaticus* (see RANUNCULUS). *R. amplexicaulis*, 1 ft., white; *R. aconitifolius*, 1 to 2 ft., white, with its double variety *R. aconitifolius flore-pleno* (Fair Maids of France); and *R. acris flore-pleno* (Bachelor's Buttons), 2 ft., golden yellow, are pretty. Of dwarfer interesting plants there are *R. alpestris*, 4 in., white; *R. gramineus*, 6 to 10 in., yellow; *R. parnassifolius*, 6 in., white; and *R. rutaefolius*, 4 to 6 in., white with orange centre.

Rodgersia.—Handsome herbs of the saxifrage family. *R. podophylla* with large bronzy-green leaves cut into 5 large lobes, and tall branching spikes 3 to 4 ft. high—the whole plant resembling one of the large meadow sweets. *R. aesculifolia*, yellowish-white; *R. Henrici*, deep purple; *R.*

pinnata, fleshy pink; and *R. sambucifolia*, white, are recently introduced species from China. They require rich sandy peat and warm sheltered spots.

Romneya.—*R. Coulteri*, a fine Californian plant, with large white flowers on shoots often as high as 7 ft.; *R. trichocalyx* is similar. Both require very warm, sunny spots and rich, sandy soil, and should not be disturbed often.

Rudbeckia.—Bold-habited composite plants, well suited for shrubbery borders, and thriving in light loamy soil. The flower-heads have a dark-coloured elevated disk. *R. Drummondii*, 2 to 3 ft., with the ray-florets reflexed, yellow at the tip and purplish-brown towards the base; *R. fulgida*, 2 ft. golden-yellow with dark chocolate disk, the flower-heads 2 to 3 in. across; and *R. speciosa*, 2 to 3 ft., orange-yellow with blackish-purple disk, the flower-heads 3 to 4 in. across, are showy plants.

Sagittaria.—Graceful water or marsh plants with hastate leaves, and tuberous, running and fibrous roots. *S. japonica plena*; *S. lancifolia*, *S. macrophylla* and *S. sagittifolia*, are among the best kinds, all with white flowers.

Salvia.—The Sage, a large genus of labiates, often very handsome, but sometimes too tender for English winters. *S. Sclarea*, 5 to 6 ft., is a very striking plant little more than a biennial, with branched panicles of bluish flowers issuing from rosy-coloured bracts; *S. patens*, 2 ft., which is intense azure, has tuberous roots, and may be taken up, stored away and replanted in spring like a dahlia. *S. pratensis*, 2 ft., blue, a showy native species, is quite hardy; the variety lupinoides has the centre of the lower lip white.

Saxifraga.—A very large genus of rock and border plants of easy culture. The Megasea group, to which *S. ligulata*, *S. cordifolia* and *S. crassifolia* belong, are early-flowering kinds of great beauty, with fleshy leaves and large cymose clusters of flowers of various shades of rose, red and purple. Another very distinct group with silvery foliage—the crustaceous group—contains some of our choicest Alpines. Of these *S. caesia*, *S. calyciflora*, *S. Cotyledon* are among the best known. Some of the species look more like lichens than flowering plants. The green moss-like saxifrages are also a very distinct group, with dense tufted leaves which appear greener in winter than in summer. The flowers are borne on erect branching stems and are chiefly white in colour. *Saxifraga umbrosa* (London Pride) and *S. Geum* belong to still another group, and are valuable alike on border and rockery. *S. peltata* is unique owing to its large peltate leaves, often 1 ft. to 18 in. across, with stalks 1 to 2 ft. long. Flowers in April, white or pinkish. Likes plenty of water and a moist peaty soil or marshy place. *S. sarmentosa*, the well-known “mother of thousands,” is often grown as a pot plant in cottagers’ windows.

Scilla.—Beautiful dwarf bulbous plants, thriving in well-worked sandy loam, or sandy peat. *S. bifolia*, 3 in., and *S. sibirica*, 4 in., both intense blue, are among the most charming of early spring flowers; *S. patula*, 6 to 8 in., and *S. campanulata*, 1 ft., with tubular greyish-blue flowers, freely produced, are fine border plants, as is the later-blooming *S. peruviana*, 6 to 8 in., dark blue or white.

Sedum.—Pretty succulent plants of easy growth, and mostly suitable for rockwork. They are numerous, varied in the colour of both leaves and foliage, and mostly of compact tufted growth. *S. spectabile*, 1 to 1½ ft., pink, in great cymose heads, is a fine plant for the borders, and worthy also of pot-culture for greenhouse decoration. Mention may also be made of the common *S. acre* (Stonecrop), 3 in., yellow, and its variety with yellow-tipped leaves.

Sempervivum.—House-Leek. Neat-growing, succulent plants, forming rosettes of fleshy leaves close to the ground, and rapidly increasing by runner-like offsets; they are well adapted for rockwork, and do best in sandy soil. The flowers are stellate, cymose, on stems rising from the heart of the leafy rosettes. *S. arachnoideum*, purplish, *S. arenarium*, yellow, *S. globiferum* and *S. Laggeri*, rose, grow when in flower 3 to 6 in. high; *S. calcareum*, rose colour, and *S. Boutignianum*, pale rose, both have glaucous leaves tipped with purple; *S. Heuffelii*, yellow, with deep chocolate leaves, and *S. Wulfeni*, sulphur-yellow, are from 8 to 12 in. high.

Senecio.—A large genus with comparatively few good garden plants. Large and coarse-growing kinds like *S. Doria*, *S. macrophyllus* and *S. sarracenicus* are good for rough places; all yellow-flowered. *S. pulcher* is a charming plant, 2 to 3 ft. high, with rosy-purple flower-heads, having a bright orange centre. It likes a warm corner and moist soil. *S. clivorum*, from China, has large roundish leaves and orange-yellow flowers. It flourishes near water and in damp places.

Shortia.—*S. galacifolia*, a beautiful tufted plant 2 to 3 in. high, with roundish crenate leaves, on long stalks, and white funnel-shaped flowers in March and April. *S. uniflora* from Japan is closely related. The leaves of both assume rich purple-red tints in autumn. Warm sunny situations and rich sandy loam and peat are required.

Silene.—Pretty caryophyllaceous plants, preferring sandy loam, and well adapted for rockwork. *S. alpestris*, 6 in., white, and *S. quadridentata*, 4 in., white, are beautiful tufted plants for rockwork or the front parts of borders; *S. maritima flore-pleno*, 6 in., white, *S. Elizabethae*, 4 in., bright rose, and *S. Schafta*, 6 in., purplish-rose, are also good kinds.

Sisyrinchium.—Pretty dwarf iridaceous plants, thriving in peaty soil. *S. grandiflorum*, 10 in., deep purple or white, blooms about April, and is a fine plant for pot-culture in cold frames.

Sparaxis.—Graceful bulbous plants from South Africa. *S. grandiflora*, with deep violet-purple, and

S. tricolor, with rich orange-red, flowers are best known. *S. pulcherrima*, a lovely species, 3 to 6 ft. high, with drooping blood-red blossoms, is now referred to the genus *Dierama*. A warm, light, but rich soil in sheltered spots required.

Spiraea.—Vigorous growing plants of great beauty, preferring good, deep, rather moist soil; the flowers small but very abundant, in large corymbose or spicate panicles. *S. Aruncus*, 4 ft., white; *S. astilbioides*, 2 ft., white; *S. Filipendula*, 1½ ft., and *S. Ulmaria*, 3 ft., both white; *S. palmata*, 2 ft., rosy-crimson; and *S. venusta*, 3 ft., carmine rose, are some of the best.

Statice.—Pretty plants with broad, radical leaves, and a much-branched inflorescence of numerous small flowers. *S. latifolia*, 2 ft., greyish-blue; *S. tatarica*, 1 ft., lavender-pink; *S. speciosa*, 1½ ft., rose colour; and *S. eximia*, 1½ ft., rosy-lilac—are good border plants. *S. bellidifolia*, 9 in., lavender; *S. emarginata*, 6 in., purple; *S. globulariaefolia*, 9 in., white; and *S. nana*, 4 in.—are good sorts for the rockery.

Stenactis.—*S. speciosa*, 1 to 2 ft., is a showy composite, of easy culture in good garden soil; it produces large corymbs of flower-heads, with numerous narrow blue ray-florets surrounding the yellow disk. Now more generally known as Erigeron.

Stipa.—*S. pennata* (Feather Grass), 1½ ft., is a very graceful-habited grass, with stiff slender erect leaves, and long feathery awns to the seeds.

Stokesia.—*S. cyanea*, 2 ft., is a grand, autumn-flowering, composite plant, with blue flower-heads, 4 in. across. Sandy loam and warm situation.

Symphytum.—Rather coarse-growing but showy boraginaceous plants, succeeding in ordinary soil. *S. caucasicum*, 2 ft., with blue flowers changing to red, is one of the finer kinds for early summer blooming.

Thalictrum.—Free-growing but rather weedy ranunculaceous plants, in many cases having elegantly cut foliage. *T. aquilegifolium*, 2 ft., purplish from the conspicuous stamens, the leaves glaucous, is a good border plant; and *T. minus* has foliage somewhat resembling that of the Maidenhair fern. Ordinary garden soil.

Tiarella.—*T. cordifolia*, the foam flower, is very ornamental in border or rockery. Leaves heart-shaped lobed and toothed; flowers white starry; ordinary garden soil.

Tigridia.—Lovely bulbous plants called tiger flowers, useful in the warmest parts of the kingdom for the border in rich but gritty soil. *T. Pavonia*, the peacock tiger flower, from Mexico, grows 1 to 2 ft. high, with plaited sword-like leaves, and large flowers about 6 in. across, having zones of violet and yellow blotched with purple and tipped with scarlet. There are many varieties, all charming.

Trillium.—*T. grandiflorum*, the wood-lily of North America, is the finest. It has large white flowers and grows freely in peaty soil in shady borders. There are several other species, some with purplish flowers.

Tritonia.—A genus of South African plants with fibrous-coated corms or solid bulbs, often known as montbretas. *T. crocata*, 2 ft., orange-yellow, *T. crocosmiaeflora*, 2 to 2½ ft., orange-scarlet, and *T. Pottsi*, 3 to 4 ft., bright yellow, are the best-known varieties, of which there are many subsidiary ones, some being very large and free in flowering. A rich, gritty soil, and warm, sunny situations are best for these plants.

Triteleia.—Charming spring-flowering bulbs, thriving in any good sandy soil. *T. Murrayana*, 8 in., lavender-blue, and *T. uniflora*, 6 in., white, are both pretty plants of the easiest culture, either for borders or rockeries.

Tritoma.—Splendid stoutish-growing plants of noble aspect, familiarly known as the Poker plant, from their erect, rigid spikes of flame-coloured flowers; sometimes called Kniphofia. *T. Uvaria*, 3 to 4 ft., bright orange-red, passing to yellow in the lower flowers, is a fine autumnal decorative plant. They should be protected from frosts by a covering of ashes over the crown during winter.

Trollius.—Showy ranunculaceous plants, of free growth, flowering about May and June. *T. europaeus*, 18 in., lemon globular; *T. asiaticus*, 2 ft., deep yellow; and *T. napellifolius*, 2 to 2½ ft., golden yellow, are all fine showy kinds. Rich and rather moist soil.

Tulipa.—Splendid dwarfish bulbs, thriving in deep, sandy, well-enriched garden soil, and increased by offsets. They bloom during the spring and early summer months. *T. Gesneriana*, the parent of the florists' tulip, 12 to 18 in., crimson and other colours; *T. Eichleri*, 1 ft., crimson with dark spot; *T. Greigi*, 1 ft., orange with dark spot edged with yellow, and having dark spotted leaves; *T. oculus solis*, 1 ft., scarlet with black centre; and *T. sylvestris*, 12 to 18 in., bright yellow, are showy kinds.

Veratrum.—Distinct liliaceous plants with bold ornamental leaves regularly folded and plaited. *V. album*, 3 to 5 ft., has whitish blossoms in dense panicles, 1 to 2 ft. long. *V. nigrum*, 2 to 3 ft., has blackish-purple flowers, also *V. Maacki*, 2 ft. Rich sandy loam and peat.

Verbascum.—Showy border flowers of erect spire-like habit, of the easiest culture. *V. Chaixii*, 4 to 5 ft., yellow, in large pyramidal panicles; *V. phoeniceum*, 3 ft., rich purple or white; and *V. formosum*, 6 ft., golden yellow in dense panicles, are desirable species.

Veronica.—The Speedwell family, containing many ornamental members; all the hardy species

are of the easiest cultivation in ordinary garden soil. The rotate flowers are in close, erect spikes, sometimes branched. *V. crassifolia*, 2 ft., dark blue; *V. incarnata*, 1½ ft., flesh-colour; *V. corymbosa*, 1½ ft., pale blue in corymbosely-arranged racemes; *V. gentianoides*, 2 ft., grey with blue streaks; *V. spicata*, blue, and its charming white variety *alba*; and *V. virginica*, 5 ft., white, are distinct.

Vinca.—Periwinkle. Pretty rock plants, growing freely in ordinary soil. *V. herbacea*, of creeping habit, with purplish-blue flowers; *V. minor*, of trailing habit, blue; and *V. major*, 1 to 2 ft. high, also trailing, are suitable for the rock garden. The last two are evergreen, and afford varieties which differ in the colour of their flowers, while some are single and others double.

Viola.—Violet. Charming dwarf plants, mostly evergreen and of tufted habit, requiring well-worked rich sandy soil. *V. calcarata*, 6 in., light blue; *V. cornuta*, 6 to 8 in., blue; *V. lutea*, 4 in., yellow; *V. altaica*, 6 in., yellow or violet with yellow eye; *V. palmaensis*, 6 to 8 in., lavender-blue; *V. pedata*, 6 in., pale blue; and *V. odorata*, the Sweet Violet, in its many single and double flowered varieties, are all desirable.

Yucca.—Noble subarborescent liliaceous plants, which should be grown in every garden. They do well in light, well-drained soils, and have a close family resemblance, the inflorescence being a panicle of white, drooping, tulip-shaped flowers, and the foliage rosulate, sword-shaped and spear-pointed. Of the more shrubby-habited sorts *Y. gloriosa*, *recurvifolia* and *Treculeana* are good and distinct; and of the dwarfer and more herbaceous sorts *Y. filamentosa*, *flaccida* and *angustifolia* are distinct and interesting kinds, the first two flowering annually.

The taste for cultivation of the class of plants, of which the foregoing list embraces some of the more prominent members, is on the increase, and gardens will benefit by its extension.

Hardy Trees and Shrubs.—Much of the beauty of the pleasure garden depends upon the proper selection and disposition of ornamental trees and shrubs. We can only afford space here for lists of some of the better and more useful and ornamental trees and shrubs, old and new.

The following list, which is not exhaustive, furnishes material from which a selection may be made to suit various soils and situations. The shrubs marked * are climbers.

Hardy Deciduous Trees.

Acer—Maple.
Aesculus—Horse-Chestnut.
Ailantus—Tree of Heaven.
Alnus—Alder.
Amygdalus—Almond.
Betula—Birch.
Carpinus—Hornbeam.
Carya—Hickory.
Castanea—Sweet Chestnut.
Catalpa.
Celtis—Nettle Tree.
Cercis—Judas Tree.
Cotoneaster (some species).
Crataegus—Thorn.
Davidia.
Diospyros.
Fagus—Beech.
Fraxinus—Ash.
Ginkgo—Maidenhair Tree.
Gleditschia—Honey Locust.
Gymnocladus—Kentucky Coffee Tree.
Juglans—Walnut.
Kolreuteria.
Laburnum.
Larix—Larch.
Liriodendron—Tulip-tree.
Magnolia.
Morus—Mulberry.
Negundo—Box-Elder.
Ostrya—Hop Hornbeam.
Paulownia.
Planera.
Platanus—Plane.
Populus—Poplar.
Prunus (Plums, Cherries, &c.).
Ptelea—Hop Tree.
Pyrus—Pear, &c.
Quercus—Oak.
Rhus—Sumach.
Robinia—Locust Tree.
Salix—Willow.
Sophora.
Taxodium—Deciduous Cypress.
Tilia—Lime.
Ulmus—Elm.
Virgilia.
Xanthoceras.

Hardy Evergreen Trees.

Abies—Silver Fir.
Araucaria—Chili Pine.
Arbutus—Strawberry Tree.
Biota—Arbor Vitae.
Buxus—Box.
Cedrus—Cedar.
Cephalotaxus.
Cryptomeria—Japan Cedar.
Cupressus—Cypress.
Ilex—Holly.
Juniperus—Juniper.
Libocedrus.
Magnolia grandiflora.
Picea—Spruce Fir.
Pinus—Pine.
Quercus Ilex—Holm-Oak.
Retinospora.
Sciadopitys—Umbrella Pine.
Sequoia (Wellingtonia).
Taxus—Yew.
Thuiopsis.
Thuya—Arbor Vitae.

Laurus—Bay Laurel. Tsuga.

Hardy Deciduous Shrubs.

Abelia.
Acer—Maple.
Amelanchier.
Ampelopsis.*
Amygdalopsis.
Aralia.
Aristolochia.*
Berberis—Berberry.
Bignonia*—Trumpet Flower.
Buddleia.
Calophaca.
Calycanthus—Carolina Allspice.
Caragana.
Chimonanthus.
Clematis.*
Colutea—Bladder Senna.
Cornus—Dogwood.
Cotoneaster (some species).
Crataegus—Thorn.
Cydonia—Japan Quince.
Cytisus—Broom, &c.
Daphne.
Deutzia.
Edwardsia.
Euonymus europaeus—Spindle Tree.
Forsythia.
Fremontia.
Genista.
Halesia—Snowdrop Tree.
Hamamelis—Wych Hazel.
Hibiscus—Althaea frutex, &c.
Hippophaë—Sea Buckthorn.
Hypericum—St John's Wort.
Jasminum*—Jasmine.
Kerria.
Lonicera*—Honeysuckle.
Lycium.*
Magnolia.
Menispermum*—Moonseed.
Periploca.*
Philadelphus—Mock Orange.
Rhus—Wig Tree, &c.
Ribes—Flowering Currant.
Robinia—Rose Acacia, &c.
Rosa—Rose.
Rubus*—Bramble.
Spartium—Spanish Broom.
Spiraea.
Staphylaea—Bladder-Nut.
Symphoricarpus—Snowberry.
Syringa—Lilac.
Tamarix—Tamarisk.
Viburnum—Guelder Rose, &c.
Vitis*—Vine.
Weigela.

Hardy Evergreen Shrubs.

Akebia.*
Arbutus.
Aucuba—Japan Laurel.
Azara.
Bambusa—Bamboo.
Berberidopsis.*
Berberis—Berberry.
Buddleia.
Bupleurum.
Buxus—Box.
Ceanothus.
Cerasus—Cherry-Laurel, &c.
Cistus-Sun-Rose.
Cotoneaster.
Crataegus Pyracantha—Fire Thorn.
Daphne.
Desfontainea.
Elaeagnus—Oleaster.
Erica—Heath.
Escallonia.
Euonymus.
Fabiana.
Fatsia (Aralia).
Garrya.
Griselinia.
Hedera*—Ivy.
Hypericum—St John's Wort.
Ilex—Holly.
Jasminum*—Jasmine.
Kadsura.*
Lardizabala.*
Laurus—Sweet Bay.
Ligustrum—Privet.
Lonicera*—Honeysuckle.
Osmanthus.
Pernettya.
Phillyrea.
Photinia.
Rhamnus Alaternus.
Rhododendron—Rose-Bay.
Rosa*—Rose.
Ruscus.
Skimmia.
Smilax.*
Stauntonia.*
Ulex—Furze.
Viburnum—Laurustinus.
Vinca—Periwinkle.
Yucca—Adam's Needle.

Bedding Plants.—This term is chiefly applied to those summer-flowering plants, such as ivy-leaved and zonal pelargoniums, petunias, dwarf lobelias, verbenas, &c., which are employed in masses for filling the beds of a geometrical parterre. Of late years, however, more attention has been bestowed on arrangements of brilliant flowering plants with those of fine foliage, and the massing also of hardy early-blooming plants in parterre fashion has been very greatly extended. Bedding plants thrive best in a light loam, liberally manured with thoroughly rotten dung from an old hotbed or thoroughly decomposed cow droppings and leaf-mould.

Spring Bedding.—For this description of bedding, hardy plants only must be used; but even then the choice is tolerably extensive. For example, there are the Alyssums, of which *A. saxatile* and *A. gemonense* are in cultivation; *Antennaria tomentosa*; the double white *Arabis albida*; Aubrietias, of which the best sorts are *A. Campbelliae* and *A. grandiflora*; the double *Bellis perennis* or Daisy; the Wallflowers, including *Cheiranthus Cheiri* (the Common Wallflower), *C. alpina* and *C. Marshallii*; Hepaticas, the principal of which are the varieties of *H. triloba*, and the blue *H. angulosa*; Iberis or Candytuft; *Lithospermum fruticosum*; Myosotis or Forget-me-not, including *M. alpestris*, *M. dissitiflora*, *M. azorica* and *M. sylvestris*; Phloxes, like *P. subulata*, with its varieties *setacea*, *Nelsoni*, *nivalis*; the single-flowered varieties of the Primrose, *Primula vulgaris*; the Polyanthuses; *Pyrethrum Parthenium aureum*, called Golden Feather; *Sempervivum calcareum*; the pink-flowered *Silene pendula*; self-coloured varieties of the Pansy, *V. tricolor*, and of *V. lutea* and *V. cornuta*, as well as some recent hybrids. Besides these there are the various spring-flowering bulbs, such as the varieties of Hyacinthus, Tulipa, Narcissus, Fritillaria, Muscari or Grape Hyacinth, Crocus, Scilla, Chionodoxa and Galanthus or Snowdrop.

Summer Bedding.—There is great variety amongst the plants which are used for bedding-out in the garden during the summer months, but we can note only some of the most important of them. Amongst them are the Ageratums, the old tall-growing sorts of which have been superseded by dwarfer blue and white flowered varieties; Alternantheras, the principal of which are *A. amoena*, *amoena spectabilis*, *magnifica*, *paronychioides major aurea* and *amabilis*; *Alyssum maritimum variegatum*; some of the dwarf varieties of *Antirrhinum majus*; *Arundo Donax variegata*; Begonias; Calceolarias; Cannas; *Centaurea ragusina*; Clematises, of which the hybrids of the *Jackmanni* type are best; *Dahlia variabilis*, and the single-flowered forms of *D. coccinea*; Echeverias, of which *E. secunda* and *E. metallica* are much employed; Gazanias; Heliotropes; Iresines; Lantanas; Lobelias; *Mesembryanthemum cordifolium variegatum*; Pelargoniums, of which the various classes of zonal or bedding varieties are unapproachable for effect and general utility; Petunias; Phloxes; *Polemonium coeruleum variegatum*; *Pyrethrum Parthenium aureum*, the well-known Golden Feather, especially useful as an edging to define the outline of beds upon grass; Tropaeolums, especially some of the varieties of *T. Lobbianum*; and Verbenas, the offspring of *Tweedieana*, *chamaedrifolia* and others. Few bulbs come into the summer flower gardens, but amongst those which should always be well represented are the Gladiolus, the Lilium, the Tigridia and the Montbretia.

Subtropical Bedding.—Foliage and the less common flowering plants may be used either in masses of one kind, or in groups arranged for contrast, or as the centres of groups of less imposing or of dwarfer-flowering subjects; or they may be planted as single specimens in appropriate open spaces, in recesses, or as distant striking objects terminating a vista.

Carpet Bedding consists in covering the surface of a bed, or a series of beds forming a design, with close, low-growing plants, in which certain figures are brought out by means of plants of a different habit or having different coloured leaves. Sometimes, in addition to the carpet or ground colour, individual plants of larger size and handsome appearance are dotted symmetrically over the beds, an arrangement which is very telling. Some of the best plants for carpeting the surface of the beds are: *Antennaria tomentosa* and *Leucophytum Browni*, white; *Sedum acre*, *dasyphyllum*, *corsicum* and *glaucum*, grey; and *Sedum Lydium*, *Mentha Pulegium gibraltarica*, *Sagina subulata* and *Herniaria glabra*, green. The Alternantheras, Amaranthuses, Iresines and *Coleus Verschaffelti* furnish high and warm colours; while *Pyrethrum Parthenium aureum* yields greenish-yellow: *Thymus citriodorus aureus*, yellowish; *Mesembryanthemum cordifolium variegatum*, creamy yellow; Centaureas and others, white; *Lobelia Erinus*, blue; and the succulent Echeverias and Sempervivums, glaucous rosettes, which last add much to the general effect. In connexion with the various designs such fine plants as *Agave americana*, *Dracaena indivisa* are often used as centre-pieces.

Greenhouse Plants.—These are plants requiring the shelter of a glass house, provided with a moderate degree of heat, of which 45° Fahr. may be taken as the minimum in winter. The house should be opened for ventilation in all mild weather in winter, and daily throughout the rest of the year. The following is a select list of genera of miscellaneous decorative plants (orchids, palms and ferns excluded; climbers are denoted by *; bulbous and tuberous plants by †):

Abutilon	Coleus	Lachenalia†
Acacia	Coprosma	Lantana
Agapanthus	Cordyline	Lapageria*
Agathaea	Correa	Lilium†
Agave	Cuphea	Lophospermum*
Alonsoa	Cyclamen†	Mandevillea*
Aloysia	Cyperus	Manettia*
Amaryllis†	Cytisus	Mutisia*
Ardisia	Darwinia (Genetyllis)	Myrsiphyllum*
Asparagus	Diosma	Maurandya*
Aspidistra	Dracaena	Nerine†
Asystasia (Mackaya)	Eccremocarpus*	Nerium
Azalea	Epacris	Pelargonium
Bauera	Epiphyllum	Petunia
Begonia†	Erica	Pimelia

Blandfordia
Bomarea*
Boronia
Bougainvillea*
Bouvardia
Brugmansia
Calceolaria
Camellia
Campanula
Canna
Celosia
Cestrum*
Chorizema*
Chrysanthemum
Cineraria
Clianthus
Clivia
Cobaea*
Eriostemon
Erythrina
Eucalyptus
Eupatorium
Eurya
Ficus
Fuchsia
Grevillea
Haemanthus†
Heliotropium
Hibiscus
Hoya*
Hydrangea
Impatiens
Jasminum*
Justicia
Kalosanthes
Plumbago*
Polianthes†
Primula
Rhododendron
Richardia (Calla)†
Salvia
Sarracenia
Solanum
Sparmannia
Statice
Strelitzia
Streptocarpus
Swainsonia
Tacsonia*
Tecoma
Tradescantia
Vallota†

Stove Plants.—For the successful culture of stove plants two houses at least, wherein different temperatures can be maintained, should be devoted to their growth. The minimum temperature during winter should range at night from about 55° in the cooler to 65° in the warmer house, and from 65° to 75° by day, allowing a few degrees further rise by sun heat. In summer the temperature may range 10° higher by artificial heat, night and day, and will often by sun heat run up to 90° or even 95°, beyond which it should be kept down by ventilation and frequent syringing and damping down of the pathways. During the growing period the atmosphere must be kept moist by damping the walls and pathways, and by syringing the plants according to their needs; when growth is completed less moisture will be necessary. Watering, which, except during the resting period, should generally be copious, is best done in the forenoon; while syringing should be done early in the morning before the sun becomes too powerful, and late in the afternoon to admit of the foliage drying moderately before night. The following is a select list of genera of stove plants (climbers are denoted by *, bulbous and tuberous plants by †):

Acalypha
Achimenes†
Aeschynanthus
Allamanda*
Alocasia†
Amaryllis†
Anthurium
Aphelandra
Aralia
Ardisia
Arisaema†
Aristolochia*
Ataccia
Begonia
Bertolonia
Bignonia*
Bromeliads
Cactus
Caladium†
Calathea
Centropogon
Cissus*
Clerodendron*
Crinum†
Codiaeum (Croton)
Cyanophyllum (Miconia)
Cycas
Dieffenbachia
Dipladenia*
Dracaena
Eranthemum
Eucharis†
Euphorbia
Ficus
Franciscea
Gardenia
Gesnera
Gloriosa*
Gloxinia†
Heliconia†
Hoffmannia
Ipomaea*
Ixora
Jacobinia
Jasminum*
Luculia
Maranta
Medinilla
Meyenia
Musa
Nelumbium†
Nepenthes
Nymphaea†
Oxera*
Pancratium†
Pandanus
Passiflora*
Pavetta
Petraea*
Pleroma*
Poinsettia
Rondeletia
Sanchezia
Schubertia*
Scutellaria
Stephanotis
Tabernaemontana
Terminalia
Thunbergia
Torenia
Thyrsacanthus
Tydaea
Vinca

Orchids.—For the successful cultivation of a mixed collection of tropical orchids, it is necessary that two or three houses, in which different temperatures can be maintained, should be provided. The greater number of them are epiphytes or plants that grow on others without absorbing nourishment from them, and heat and moisture afford all or nearly all the nourishment they require. At one time it was thought the plants themselves were better for being associated with such objects as ferns and palms, but they are best grown by themselves.

The East Indian orchid house takes in those species which are found in the warm parts of the eastern hemisphere, as well as those from the hottest parts of the western, and its temperature should range from about 70° to 80° during the summer or growing season and from 65° to 70° during winter. The Mexican or Brazilian orchid house accommodates the plants from the warm parts of South America, and its temperature should range from about 65° to 75° during summer and from 60° to 65° in winter. A structure called the cool orchid house is set apart for the

accommodation of the many lovely mountain species from South America and India, such as *odontoglossums*, *masdevallias*, &c., and in this the more uniform the temperature can be kept the better, that in summer varying between 60° and 65°, and in winter from 45° to 60°. A genial moist atmosphere must be kept up in the hottest houses during the growing season, with a free circulation of air admitted very cautiously by well-guarded ventilators. In winter, when the plants are at rest, little water will be necessary; but in the case of those plants which have no fleshy pseudobulbs to fall back upon for sustenance, they must not be suffered to become so dry as to cause the leaves to shrivel. In the Mexican house the plants will generally be able to withstand greater drought occasionally, being greatly assisted by their thick pseudobulbs. In the cool or odontoglossum house a considerable degree of moisture must be maintained at all times, for in these the plants keep growing more or less continuously.

For potting or basketing purposes, or for plants requiring block-culture, the materials used are light fibrous peat, special leaf-mould, osmunda or polypodium fibre and living sphagnum moss, which supply free drainage for the copious supply of water required. Good turfy loam is also used for some, such as *cypripediums* and *calanthes*. Indeed the composts now used are varied considerably according to the particular group of orchids. The water should, however, be so used as not to run down into the sheathing bases of the leaves. While in flower, orchids may with advantage be removed to a drier and cooler situation, and may be utilized in the drawing-room or boudoir. Of late years not only have many fine hybrids been raised artificially between various species, but some remarkable bigeneric hybrids (between what are considered two distinct genera) have also been produced (indicated in the list below by *). To keep a valuable collection of orchids in good condition requires the services of an expert orchid grower.

The following is a select list of genera in cultivation:—

Acineta	Cymbidium	Peristeria
Ada	Cypripedium	Pescatorea
Aërides	Cyrtopodium	Phajus
Angraecum	Dendrobium	Phaio-calanthe*
Anguloa	Diacrium	Phalaenopsis
Anoectochilus	Disa	Pilumna
Ansellia	Epidendrum	Platyclinis
Arachnanthe	Eulophia	Pleione
Arpophyllum	Eulophiella	Pleurothallis
Barkeria	Galeandra	Polystachya
Batemannia	Gongora	Promenaea
Bifrenaria	Grammatophyllum	Renanthera
Brassavola	Habenaria	Restrepia
Brassia	Houlletia	Rodriguezia
Brasso-Cattleya*	Ionopsis	Saccolabium
Broughtonia	Ipsea	Schomburgkia
Bulbophyllum	Laelia	Scuticaria
Burlingtonia	Laelio-Cattleya*	Sobralia
Calanthe	Leptotes	Sophro-cattleya*
Catasetum	Lissochilus	Sophronitis
Cattleya	Lycaste	Spathoglottis
Chysis	Masdevallia	Stanhopea
Cirrhopetalum	Miltonia	Thunia
Cochlioda	Mormodes	Trichopilia
Coelia	Odontoglossum	Trichosma
Coelogyne	Odontioda*	Vanda
Comparettia	Oncidium	Zygo-colax*
Cycnoches	Pachystoma	Zygopetalum

Palms.—These form charming table and drawing-room plants when quite young. When more fully developed, and long before their full growth is attained, they are among the most decorative plants known for the conservatory and for subtropical gardening. They are easily cultivated, but should not be allowed to become dry. The soil should consist of about 3 parts turfy loam, 1 part leaf mould, 1 part coarse silver sand, with enough chemical or other manure added to render the whole moderately rich. The older plants will occasionally require the roots pruned in order to keep them in as small pots as possible without being starved. This should be done early in the spring, and the plants heavily shaded until feeding roots are again produced. It is of advantage to afford stove culture while the plants are quite young. A little later most of the genera succeed well under moderately cool conditions.

The following genera are among those most commonly cultivated:

Acanthophoenix	Chamaerops	Martinezia
Acanthorhiza	Cocos	Oreodoxa
Areca	Corypha	Phoenix
Bactris	Geonoma	Pritchardia
Brahea	Hyophorbe	Rhapis

Calamus	Kentia	Sabal
Caryota	Latania	Stevensonia
Ceroxylon	Livistonia	Thrinax
Chamaedorea		

FERNS.—These popular plants are usually increased by means of their spores, the “dust” produced on the back of their fronds. The spores should be sown in well-drained pots or seed pans on the surface of a mixture of fibrous sifted peat and small broken crocks or sandstone; this soil should be firmly pressed and well-watered, and the spores scattered over it, and at once covered with propagating glasses or pieces of sheet glass, to prevent water or dry air getting to the surface. The pots should be placed in pans full of water, which they will absorb as required. A shady place is desirable, with temperature of 50° to 55° by night and 65° to 70° by day, or they may be set on a shelf in an ordinary propagating pit. The spores may be sown as soon as ripe, and when the young plants can be handled, or rather can be lifted with the end of a pointed flat stick, they should be pricked out into well-drained pots or pans filled with similar soil and should be kept moist and shady. As they become large enough, pot them singly in 3-in. pots, and when the pots are fairly filled with roots shift on into larger ones.

The best time for a general repotting of ferns is in spring, just before growth commences. Those with creeping rhizomes can be propagated by dividing these into well-rooted portions, and, if a number of crowns is formed, they can be divided at that season. In most cases this can be performed with little risk, but the gleichenias, for example, must only be cut into large portions, as small divisions of the rhizomes are almost certain to die; in such cases, however, the points of the rhizomes can be led over and layered into small pots, several in succession, and allowed to remain unsevered from the parent plant until they become well-rooted. In potting the well-established plants, and all those of considerable size, the soil should be used in a rough turfy state, not sifted but broken, and one-sixth of broken crocks or charcoal and as much sand as will insure free percolation should be mixed with it.

The stove ferns require a day temperature of 65° to 75°, but do not thrive in an excessively high or close dry atmosphere. They require only such shade as will shut out the direct rays of the sun, and, though abundant moisture must be supplied, the atmosphere should not be overloaded with it. Ferns should not be allowed to become quite dry at the root, and the water used should always be at or near the temperature of the house in which the plants are growing. Some ferns, as the different kinds of Gymnogramme and Cheilanthes, prefer a drier atmosphere than others, and the former do not well bear a lower winter temperature than about 60° by night. Most other stove ferns, if dormant, will bear a temperature as low as 55° by night and 60° by day from November to February. About the end of the latter month the whole collection should be turned out of the pots, and redrained or repotted into larger pots as required. This should take place before growth has commenced. Towards the end of March the night temperature may be raised to 60°, and the day temperature to 70° or 75°, the plants being shaded in bright weather. Such ferns as Gymnogrammes, which have their surface covered with golden or silver powder, and certain species of scaly-surfaced Cheilanthes and Nothochlaena, as they cannot bear to have their fronds wetted, should never be syringed; but most other ferns may have a moderate sprinkling occasionally (not necessarily daily), and as the season advances, sufficient air and light must be admitted to solidify the tissues.

Hardy British ferns belonging to such genera as Asplenium, Nephrodium, Aspidium, Scolopendrium, have become fairly popular of late years, and many charming varieties are now used in borders and rockeries. Spores may be sown as above described, but in a much lower temperature.

The following is a select list of genera:—

Acrostichum	Davallia	Osmunda
Actiniopteris	Dicksonia	Onoclea
Adiantum	Gleichenia	Phlebodium
Alsophila	Gymnogramme	Platycerium
Aspidium	Hymenophyllum	Polypodium
Asplenium	Lastrea	Pteris
Blechnum	Lomaria	Scolopendrium
Cheilanthes	Lygodium	Todea
Cibotium	Nephrodium	Trichomanes
Cyathea	Nephrolepis	Woodwardia

VI. *Fruits.*

Fruit-Tree Borders.—No pains should be spared, in the preparation of fruit-tree borders, to secure their thorough drainage. In case of adhesive clayey subsoil this can generally be secured by placing over the sloping bottom a good layer of coarse rubbly material, communicating with a drain in front to carry off the water, while earthenware drain tubes may be laid beneath the rubble from 8 to 10 ft. apart, so as to form air drains, and provided with openings both at the side of the walk

and also near the base of the wall. Over this rubbly matter, rough turfy soil, grass-side downwards, should be laid, and on this the good prepared soil in which the trees are to be planted.

The borders should consist of 3 parts rich turfy loam, the top spit of a pasture, and 1 part light gritty earth, such as road-grit, with a small portion (one-sixth) of fine brick rubbish. They should not be less than 12 ft. in breadth, and may vary up to 15 or 18 ft., with a fall from the wall of about 1 in. in 3 ft. The border itself should be raised a foot or more above the general level. The bottom of the border as well as that of the drain must be kept lower than the general level of the subsoil, else the soakage will gather in all the little depressions of its surface. Fruit-tree borders should not be at all cropped with culinary vegetables, or very slightly so, as the process of digging destroys the roots of the trees, and drives them from near the surface, where they ought to be.

Shallow planting, whether of wall trees or standards, is generally to be preferred, a covering of a few inches of soil being sufficient for the roots, but a surface of at least equal size to the surface of the hole should be covered with dung or litter so as to restrain evaporation and preserve moisture. In the case of wall trees, a space of 5 or 6 in. is usually left between the stem at the insertion of the roots and the wall, to allow for increase of girth. Young standard trees should be tied to stakes so as to prevent their roots being ruptured by the wind-waving of the stems and to keep them erect. The best time for planting fruit trees in the open air is from the end of September till the end of November in open weather.

In the selection and distribution of fruit trees regard must of course be had to local situation and climate. The best walls having a south or south-east aspect are devoted to the peach, nectarine, apricot, dessert pears, plums and early cherries. Cherries and the generality of plums succeed very well either on an east or a west aspect. Morello cherries, apples and stewing pears succeed well on a north wall. In Scotland the mulberry requires the protection of a wall, and several of the finer apples and pears do not arrive at perfection without this help and a tolerably good aspect. The wall-trees intended to be permanent are called dwarfs, from their branches springing from near the ground. Between these, trees with tall stems, called riders, are planted as temporary occupants of the upper part of the wall. The riders should have been trained in the nursery into good-sized trees, in order that when planted out they may come into bearing as speedily as possible.

Standard Fruit Trees should not be planted, if it can be avoided, in the borders of the kitchen garden, but in the outer slips, where they either may be allowed to attain their full size or may be kept dwarfed. Each sort of fruit should be planted by itself, for the sake of orderly arrangement, and in order to facilitate protection when necessary by a covering of nets. Their produce is often superior in flavour to that of the same kind of fruit grown on walls.

Orchard-house Trees.—Peaches, nectarines, apricots, figs and dessert plums, cherries, apples and pears are commonly cultivated in the orchard-house. Peaches and nectarines are generally planted out, while the rest are more commonly cultivated in pots. This allows of the hardier pot plants being removed out of doors while those planted out are in need of the room. The pot plants are overhauled in the autumn, the roots pruned, a layer being cut off to allow new soil to be introduced. Surface dressing and feeding by liquid manure should also be afforded these plants while the fruit is swelling. Every effort should be made to complete the growth of peaches and nectarines while the sun is sufficiently strong to ripen them. Tomatoes are frequently employed to fill gaps in the orchard-house. Should it be provided with a central path, requiring shade, Hambro and Sweet-water grapes serve the purpose well, and in favourable seasons afford excellent crops of fruit.

VII. *Vegetables.*

Under this head are included those esculents which are largely eaten as “vegetables” or as “salads.” The more important are treated under their individual headings (see Artichoke, Asparagus, Bean, &c. &c.). The culinary herbs used for flavouring and garnishing are for the most part dwarf perennial plants requiring to be grown on a rich soil in an open sunny aspect, or annuals for which a warm sheltered border is the most suitable place; and they may therefore be conveniently grown together in the same compartment—a herb garden. The perennials should be transplanted either every year or every second year. For winter use the tops of the most useful kinds of herbs should be cut when in flower or full leaf and quite dry, and spread out in an airy but shady place so as to part slowly with the moisture they contain and at the same time retain their aromatic properties. When quite dry they should be put into dry wide-mouthed bottles and kept closely corked. In this way such herbs as basil, marjoram, mint, sage, savory, thyme, balm, chamomile, horehound, hyssop and rue, as well as parsley, may be had throughout the season with almost the full flavour of the fresh herb.

Intensive Cultivation.—This name has been applied to the method of forcing early vegetables and salads during the winter and spring months in the market gardens in the neighbourhood of Paris. The system is now popularly known in England as “French gardening.” Although a few assert that it is an old English one that has been discarded in favour of superior methods, there seems to be little or no evidence in support of this contention. The system itself has been practised for about

300 years in the “marais” gardens round Paris. At one time these gardens were in the centre of the city itself, but owing to modern improvements they have been gradually pushed out beyond the city boundaries farther and farther. Most of these gardens are small—not more than a couple of acres in extent, and the rent paid by the *maraîcher*, or market gardener, is very high—as much as £30 to £40 per acre.

The French *maraîcher* does not use hot-water apparatus for forcing his plants into early growth. He relies mainly upon the best stable manure, a few shallow frames about 4½ ft. wide covered with lights, and a number of large bell glasses or “cloches.” The work is carried on from October till the end of March and April, after which, with the exception of melons, the cultures are carried on in the open air.

The chief crops grown for early supplies, or “primeurs” as they are called, are special varieties of cos and cabbage lettuces, short carrots, radishes, turnips, cauliflowers, endives, spinach, onions, corn salad and celery. To these is added a very important crop of melons, a special large-fruited variety known as the Prescott Canteloup being the most favoured.

It is astonishing how much produce is taken off one of these small intensive gardens during the year, and especially during the worst months when prices usually run fairly high. The fact that rents are so heavy around Paris is in itself an indication of the money that is realized by the growers not only in the Paris markets, but also in Covent Garden.

During the winter season narrow beds are made up of manure, either quite fresh or mixed with old manure, according to the amount of heat required. These beds are covered with a few inches of the fine old mould obtained from the decayed manure of previous years. In the early stages seeds of carrots and radishes are sown simultaneously on the same beds, and over them young lettuces that have been raised in advance are planted. In this way three crops are actually on the same beds at the same time. Owing, however, to the difference in their vegetative growth, they mature one after the other instead of simultaneously. Thus with the genial warmth and moisture of the hotbeds, all crops grow rapidly, but the radishes mature first, then the lettuces are taken off in due course, thus leaving the beds to finish up with the carrots by themselves. Later on in the season, perhaps small cauliflowers will be planted along the margins of the beds where the carrots are growing, and will be developing into larger plants requiring more space by the time all the carrots have been picked and marketed. So on throughout the year with other crops, this system of intercropping or overlapping of one crop with another is carried out in a most ingenious manner, not only under glass lights, but also in the open air. Spinach, corn salad, radishes and carrots are the favourite crops for sowing between others such as lettuces and cauliflowers.

Although enormous quantities of water are required during the summer season, great care must be exercised in applying water to the winter crops. When severe frost prevails the lights or cloches are rarely taken off except to gather mature specimens; and no water is given directly overhead to the plants for fear of chilling them and checking growth. They must secure their supply of moisture from the rain that falls on the glass, and flows into the narrow pathways from 9 in. to 12 in. wide between each range of frames. As the beds are only about 4½ ft. wide, the water from the pathways is soaked up on each side by capillary attraction, and in this way the roots secure a sufficient supply.

Besides an abundance of water in summer there must also be an enormous quantity of good stable manure available during the winter months. This is necessary not only to make up the required hotbeds in the first place, but also to fill in the pathways between the frames, wherever it is considered advisable to maintain the heat within the frames at a certain point. As it is impossible to use an ordinary wheelbarrow in these narrow pathways, the workman carries a specially made wicker basket called a “hotte” on his shoulders by means of two straps. In this way large quantities of manure are easily transported to any required spot, and although the work looks hard to an English gardener, the Frenchman says he can carry more manure with less fatigue in half a day than an Englishman can transport in a day with a wheelbarrow.

This is merely an outline of the system, which is now being taken up in various parts of the United Kingdom, but not too rapidly. The initial expenses for frames, lights, cloches, mats and water-supply are in many cases prohibitive to men with the necessary gardening experience, while on the other hand those who have the capital lack the practical knowledge so essential to success.

For full details of this system see *French Market-Gardening, with details of Intensive Cultivation*, by John Weathers (London, 1909).

VIII.—*Calendar of Garden Operations* (A) *for Great Britain.*

January

Kitchen Garden.—Wheel out manure and composts during frosty weather; trench vacant ground not turned up roughly in autumn. Sow early peas in a cold frame for transplanting. Sow also first-crop peas, early in the month, and William I. towards the end; Early Seville and Early Longpod beans; and short-topped radish in two or three sowings, at a week’s interval, all on a warm border;

also Hardy Green and Brown cos lettuce in a frame or on south border. Plant shallots and Ashleaf potatoes on a warm border. Protect broccoli as it becomes fit for use, or remove to a dry shed or cellar; lettuces and endive, which are best planted in frames; and parsley in frames so as to be accessible.

Fruit Garden.—Plant fruit trees in open weather, if not done in autumn, which is the proper season, mulching over the roots to protect them from frost, and from drought which may occur in spring. Prune fruit trees in mild weather or in moderate frosts, nailing only in fine weather. Wash trees infested with insects with one of the many insecticides now obtainable. Take off grafts, and lay them aside in moist earth in a shady place.

Forcing.—Prepare manure for making up hotbeds for early cucumbers and melons, where pits heated with hot water are not in use; also for Ashleaf potatoes. Sow also in heat mustard and cress for salads, onions for salads; tomatoes, celery to be pricked out for an early crop; and Early Horn carrot and kidney-beans on slight hotbeds. Force asparagus, sea-kale and rhubarb, in hotbeds, in pits, in the mushroom-house or in the open garden by the use of covers surrounded with warm litter; for cucumbers a top heat of 70°; for vines in leaf and flower a temperature ranging from 65° to 70°. Keep forced strawberries with swelling fruit well watered. Plant vine eyes for propagation in a brisk heat.

Plant Houses.—Give abundance of air to the greenhouse, conservatory and alpine frame in mild weather, but use little water. A supply of roses, kalmias, rhododendrons, &c., and of hardy flowers and bulbs, as lily of the valley, hyacinths, tulips, daffodils, &c., should be kept up by forcing.

Flower Garden.—Plant out tubers and bulbs of border flowers, where neglected in autumn, deferring the finer florists' flowers till next month. Transplant herbaceous plants in light soils, if not done in autumn; also deciduous trees, shrubs and hedges. Lay edgings in fine weather. Sow mignonette, stocks, &c., in pots; sow sweet peas and a few hardy annuals on a warm border. Give auriculas and carnations abundance of air, but keep the roots rather dry to prevent damping off.

February

Kitchen Garden.—Sow successional crops of Early Seville beans, and William I., American Wonder or other peas in the beginning and end of the month; early cabbages to follow the last sowing in August; red cabbages and savoys towards the end. Sow also Early Horn carrot; Early Purple-top Munich turnip; onions for a full crop in light soils, with a few leeks and some parsley. Sow lettuce for succession, with radishes and Round-leaved spinach, twice in the course of the month; and small salads every fortnight. Plant Jerusalem artichokes, shallots, garlic, horse-radish and early potatoes. Transplant to the bottom of a south wall a portion of the peas sown in pots in frames in November and January for the first crop. Sow Brussels sprouts in gentle heat for an early crop.

Fruit Garden.—Prune apricots, peaches, nectarines and plums, before the buds are much swelled; finish pruning apples, pears, cherries, gooseberries, currants and raspberries, before the end of the month; also the dressing of vines. Keep the fruit-room free from spoiled fruit, and shut it close. Cut down the double-bearing raspberries to secure strong autumn-fruiting shoots. Head back stocks preparatory to grafting.

Forcing.—Sow melons and cucumbers on hotbeds and in pits. Sow carrots, turnips, early celery, also aubergines or egg-plants, capsicums, tomatoes and successional crops of kidney-beans; cauliflower and Brussels sprouts, in gentle heat, to be afterwards planted out. Plant early potatoes on slight hotbeds. Continue the forcing of asparagus, rhubarb and sea-kale. Commence or continue the forcing of the various choice fruits, as vines, peaches, figs, cherries, strawberries, &c. Pot roots of mint and place in heat to produce sprigs for mint sauce. Be careful to protect the stems of vines that are outside the forcing-houses.

Plant Houses.—Let the greenhouse and conservatory have plenty of air in mild weather. Pot and start tuberous-rooted begonias and gloxinias. Pot young plants of Hippeastrum, and start the established ones. Propagate chrysanthemums in cool-house or vinery under hand lights or frames. Put plants of fuchsias, petunias, verbenas, heliotropes, salvias and other soft-wooded subjects, into a propagating house to obtain cuttings, &c., for the flower garden. Sow stocks, dahlias and a few tender and half-hardy annuals, on a slight hotbed, or in pots. Propagate old roots of dahlias by cuttings of the young shoots in a hotbed. Sow petunias in heat, and prick out and harden for bedding out; also gloxinias to be grown on in heat till the flowering season.

Flower Garden.—In dry open weather plant dried roots, including most of the finer florists' flowers; continue the transplanting of hardy biennial flowers and herbaceous plants. Sow in the last week mignonette, and hardy annuals, in a warm border, for subsequent transplanting.

March

Kitchen Garden.—Sow main crops of wrinkled marrow peas; Longpod and Windsor beans; cabbage, onions, leeks, Early Horn carrots, parsnips, salsafy, scorzonera, Brussels sprouts, borecoles, lettuces and spinach. In the beginning and also at the end of the month sow Early Strap-leaf and Early Snowball turnips and savoys. In the last fortnight sow asparagus, cauliflower and the various sweet and savoury herbs; also sea-kale, radishes, celery, celeriac and parsley. Small salads

should be sown every ten days. Make up beds for mushrooms with well-prepared dung towards the end of the month. Plant early potatoes in the first week, and a main crop during the last fortnight. Sea-kale, asparagus and peas raised in frames may now be planted; also garlic and shallots. Full crops of cabbages should be planted out; also cauliflowers under hand-glasses. Propagate by slips, or by earthing up the old stems, the various pot-herbs.

Fruit Garden.—Finish the pruning of fruit trees before the middle of the month. Protect those coming into blossom. Begin grafting in the third week; dig and dress between the rows of gooseberries, currants and other fruit trees, if not already done. Kill wasps assiduously as soon as they appear.

Forcing.—Continue the forcing of melons, cucumbers, tomatoes and the various fruits. In the vinery and peach-house, attend to the keeping down of insects by syringing; and promote the growth of the young shoots, by damping the walls and paths morning and evening. Sow capsicum and tomato; also in slight heat such tender herbs as basil and marjoram.

Plant Houses.—More water may be given than formerly. Sow seeds of greenhouse and hothouse plants; also the different sorts of tender annuals; pot off those sown last month; sow cineraria for the earliest bloom; also Chinese primulas. Shift heaths and other hard-wooded subjects and stove-plants; plant tuberoses in pots for forcing. Begin to propagate greenhouse plants by cuttings; also coleuses by cuttings in heat, potting them off as soon as rooted.

Flower Garden and Shrubbery.—In the last week, sow hardy annuals in the borders, with biennials that flower the first season, as also perennials. Plant anemone and ranunculus roots and the corms of gladiolus. Transplant from the nursery to their final sites annuals sown in autumn, with biennials and herbaceous plants. Propagate perennials from root-slips and offsets. Continue to propagate the finer sorts of dahlias, both by cuttings and by division of the roots. Finish the pruning of all deciduous trees and hedges as soon as possible. Attend to the dressing of shrubberies; lay turf-edgings, and regulate the surface of gravel walks.

April

Kitchen Garden.—Sow asparagus, sea-kale, Turnip-rooted beet, salsafy, scorzonera, skirret, carrots and onions on heavy soils; also marrow peas, Longpod and Windsor beans, turnips, spinach, celery, cabbage, savoys and Brussels sprouts for succession. Sow broccoli and kidney-beans both in the second and in the last week, and lettuces and small salads twice or thrice during the month; sow all herbs, if not done last month. Sow vegetable marrow. Plant cauliflower, cabbages, sea-kale, lettuce; and finish the planting of the main crops of potatoes; divide and replant globe-artichokes. Propagate all sorts of pot-herbs, and attend to the hoeing and thinning of spinach, onions, turnips, carrots, beet, &c. Earth up cabbages, cauliflower, peas, beans and early potatoes. Stake up peas; blanch sea-kale and rhubarb in the open air by covering with straw or leaves.

Fruit Garden.—If vines have been neglected to be pruned, rub off the buds that are not wanted; this is safer than pruning now. Protect the finer sorts of fruit trees on the walls. The hardier orchard-house fruits should now be moved outdoors under temporary awnings, to give the choicer fruits more space,—the roots being protected by plunging the pots. Mulch all newly-planted fruit trees, watering abundantly in dry weather.

Forcing.—Continue the preparation of succession beds and pits for cucumbers and melons. Sow; pot tomatoes and capsicums for succession. Pollinate tomatoes by hand to ensure early fruit on plants intended for outdoor culture. In the forcing-houses, from the variable state of the weather, considerable vigilance is required in giving air. Keep down red spider (Acarus) in the more advanced houses by frequent syringings and a well-moistened atmosphere. Continue the usual operations of disbudding and thinning of fruit, and take care to keep up the proper temperatures.

Plant Houses.—Still sow tender annuals if required; also cinerarias and primulas. Proceed with all necessary shiftings. Propagate rare and fine plants by cuttings or grafting; increase bouvardias by cuttings, and grow on for winter flowering. Pot off tender annuals, and cuttings of half-hardy greenhouse plants put in during February to get them well established for use in the flower garden. Transfer chrysanthemums to sheltered positions out of doors, and provide means of protecting them from frost and cutting winds.

Flower Garden and Shrubbery.—Sow main or successional crops of annuals of all sorts—half-hardy annuals in warm borders, or on slight hotbeds. Biennials and perennials should be sown before the middle of the month. Plant out gladioli, if not done, tigridias and fine stocks. Finish the transplanting of herbaceous plants by the end of the first week. Cuttings of border chrysanthemums may now be dibbled in a warm spot out of doors. Protect stage auriculas and hyacinths from extremes of every description of weather; and tulips from hoar-frosts and heavy rains. Plant out tender deciduous trees and shrubs raised in pots; plant out tea-roses, mulching the roots. Remove part of the coverings of all tender shrubs and plants in the first week, and the remainder at the end of the month. Form and repair lawns and grass walks by laying turf and sowing perennial grass-seeds; mow the lawns frequently; plant evergreens.

May

Kitchen Garden.—Sow main crop of beet in the first week, small salads every week, radishes and

lettuces thrice, spinach once a fortnight, carrots and onions for late drawing, kidney-beans in the first week and together with scarlet runners in the last fortnight; endive for an early crop; also peas and Longpod and Windsor beans, cauliflowers, Early York or Little Pixie cabbages, Brussels sprouts, borecole, broccoli, savoys and kale for late crops. Sow vegetable marrows and hardy cucumbers on a warm border in the last week; sow cardoons in trenches, or (in the north) in pots under glass shelter; sow chicory for salading. Continue hoeing and earthing up the several crops.

Fruit Garden.—Disbud peaches, nectarines and other early trees against the walls; also attend to the thinning of fruit. Give occasional washings with the engine to keep down insects. Pick caterpillars from gooseberries and wall trees on their first appearance. Remove from raspberries and strawberries all suckers and runners that are not wanted.

Forcing.—Plant melons and cucumbers on the hotbeds prepared for vegetables in February, and now free. Plant out vegetable marrows and pumpkins on dung-ridges, under hand-glasses. Sow late crops of cucumbers and melons.

Plant Houses.—Turn out hardy plants about the middle, and the more tender at the latter end of the month. Sow tender annuals for succession, potting and shifting those sown at an earlier period; sow cinerarias for succession; and a few hardy annuals and ten-week stock, &c., for late crops. Pot off all rooted cuttings. Put in cuttings of the different desirable species which are now fit for that purpose. Plant out in rich soil Richardias, to be potted up in autumn for flowering. Bedding plants should be placed to harden in sheltered positions out of doors towards end of month. Towards the end of the month many of the main stock of chrysanthemums will be ready for the final potting.

Flower Garden.—Sow annuals for succession in the last week, also biennials and perennials in the nursery compartment, for planting out next year. Propagate plants of which more stock is required either by cuttings or by dividing the roots. Plant out, during the last week, dahlias, hardy pelargoniums, stocks and calceolarias, protecting the dahlias from slight frosts. By the end of the month, masses of the following plants may be formed with safety in warm localities:—pelargonium, heliotropium, fuchsia, petunia, nierembergia, salvia, verbena, bouvardia and lobelia. Protect tulips, ranunculuses and anemones from the mid-day sun, and from rains and winds. Remove the coverings from all tender plants in the open air.

Shrubbery.—Transplant all kinds of evergreens, this month and September being the proper seasons. The rarer conifers should be planted now and in June, after they have commenced to grow. Proceed with the laying down of lawns and gravel-walks, and keep the former regularly mown.

June

Kitchen Garden.—Sow kidney-beans for succession; also the wrinkled marrow peas and Seville Longpod and Windsor beans for late crops. Sow salading every ten days; also carrots, onions and radishes for drawing young; and chicory for salads; sow endive for a full crop. In the first week sow Early Munich and Golden Ball turnips for succession, and in the third week for a full autumn crop. Sow scarlet and white runner beans for a late crop, and cabbages for coleworts. Make up successional mushroom beds early in the month. Plant full crops of broccoli, Brussels sprouts, savoys, kales, leeks and early celery, with successional crops of cabbage and cauliflower. In the first fortnight of the month, plant hardy cucumbers for pickling, in a warm border, placing hand-glasses over them towards the end of the month. Plant out capsicums and tomatoes in sunny positions, and stake and tie securely. Pull and store winter onions, if ripe.

Fruit Garden.—Train and prune the summer shoots of wall and trellis and other trained trees. Mulch and water fruit trees and strawberries in dry weather, desisting when the fruit begins to ripen. Net over cherry-trees. Destroy aphides and other insects by syringing with tobacco water, or by fumigating, or by dusting with tobacco powder.

Forcing.—Proceed with planting melons, cucumbers and tomatoes. Keep up the necessary temperatures for the ripening of the various fruits. Ventilation will still require constant care. Tomatoes will now be fruiting freely; thin out judiciously, avoiding excessive pruning at one time. Attend to the gathering of fruit as it ripens.

Plant Houses.—These will now be occupied with tender greenhouse plants and annuals, and the more hardy plants from the stove. Shift, repot and propagate all plants that are desirable. Sow fragrant or showy annuals to flower in pots during winter; and grow on a set of decorative plants for the same object. Continue the final potting of chrysanthemums as the plants become ready.

Flower Garden.—Plant out dahlias and other tender subjects, if risk of frost is past. Take up bulbs and tuberous roots and dry them in the shade before removing them to the store-room. Fill up with annuals and greenhouse plants those beds from which the bulbs and roots have been raised. After this season, keep always a reserve of annuals in pots, or planted on beds of thin layers of fibrous matter, so as to be readily transplanted. Layer carnations and pipe pinks in the end of the month. Keep the lawns closely mown.

July

Kitchen Garden.—Watering will be necessary in each department, if the weather is hot and dry. In the first week, sow peas for the last crop of the season; also Longpod beans and French beans. In the last week, sow red globe or Chirk Castle turnip for a full winter crop, spinach for an early

winter supply and Enfield Market cabbage for early summer use. Sow endive, for autumn and winter use, in the beginning and end of the month; also successional crops of lettuce and small salads. Make up successional mushroom beds. Plant full crops of celery, celeriac, endive about the middle and end of the month; late crops of broccoli, cauliflower and coleworts in the last week. Gather and dry herbs; also propagate these by slips and cuttings.

Fruit Garden.—Continue the pruning and training of wall and espalier trees, and the destruction of noxious insects. Pot strawberries for forcing next winter, and make new beds out of doors as soon as well-rooted runners can be obtained. Propagate the different sorts of stone fruit trees by budding on other trees or on prepared stocks. Gather fruits of all kinds as they ripen.

Forcing.—Prune melons and cucumbers, giving air and water and maintaining heat, &c. Continue the routine treatment in the tomato-houses. Feed the plants artificially as soon as good crops are set; do not wait for signs of distress. The forcing-houses ought to have abundance of fresh air and moisture where required, along with the necessary heat.

Plant Houses.—Ventilation will be necessary to keep down excessive heat; and attention must be paid to potting, shifting and putting in cuttings, and giving abundance of water to the potted plants, both indoors and out. Sow seed of herbaceous calceolarias; shift heaths, if they require it; cut down pelargoniums past flowering, and plant the cuttings.

Flower Garden and Shrubbery.—Take up the remaining tuberous roots, such as anemones, ranunculuses, &c., by the end of the first week; fill up their places, and any vacancies that may have occurred, with annuals or bedding plants from the reserve ground. Repot auriculas, and sow auricula seed in boxes under glass. Propagate herbaceous and other plants that have gone out of flower, by means of cuttings and slips, especially those required for spring bedding; propagate also the various summer bedding plants increased by cuttings. Increase roses and American shrubs, by layering, budding or cuttings, and go on with the layering of carnations and picotees. Stake and tie up dahlias and strong herbaceous plants.

August

Kitchen Garden.—Sow winter and spring spinach in the beginning and about the end of the month; parsley and winter onions, for a full crop, in the first week; cabbages about the middle of the month, for planting out in spring; cauliflower in the first half (Scotland) and in the second half (England) of the month; Hardy Hammersmith and Brown Cos lettuce in the first and last week; small salads occasionally; and Black Spanish radish, for winter crops. Plant out kales and broccoli for late crops; plant celery (earthing up the advancing crops as required), endive for succession, and a few coleworts. Take up shallots, garlic, &c.

Fruit Garden.—Proceed in training and regulating the summer shoots of all fruit trees as directed for the last three months. Net up, in dry weather, gooseberry and currant bushes, to preserve the fruit till late in the autumn. Make new strawberry beds if required. Preserve the ripening fruits on the wall and other trees from insects, and destroy wasp nests. Gather fruits as they ripen.

Forcing.—The routine of cultivation in hotbeds and pits may be continued. Sow tomatoes and cucumbers for a winter crop. Make up mushroom beds. In the forcing-houses, where the crops are past, part of the sashes may be removed, so as to permit thorough ventilation.

Plant Houses.—Attend to the propagation of all sorts of greenhouse plants by cuttings, and to the replacing in the greenhouse and stoves the more tender species, by the end of the month in ordinary seasons, but in wet weather in the second week. Sow half-hardy annuals, as Nemophila, Collinsia, Schizanthus, Rhodanthe, &c., to flower during winter.

Flower Garden and Shrubbery.—Sow in the second and the last week, on a warm border of a light sandy soil, with an east aspect, any free-flowering hardy annuals as *Silene pendula*, Nemophila, &c., for planting in spring; and auricula and primula seeds in pots and boxes. Propagate, all sorts of herbaceous plants by rooted slips or suckers; take off layers of carnations, picotees and pansies. Plant cuttings of bedding plants, and of bedding pelargoniums in boxes for convenience of removal. Layer the tops of chrysanthemums, to obtain dwarf flowering plants. Transplant evergreens in moist weather, about the end of the month; and propagate them by layers and cuttings. Pot Neapolitan violets for forcing; or plant out on a mild hotbed. Clip box edgings.

September

Kitchen Garden.—Sow small salading for late crops; and lettuce and spinach, if not done last month, for spring crops. Plant endive and lettuce at the foot of a south wall to stand the winter; plant out cabbages from the chief autumn sowing. Plant cauliflowers on a warm border in spaces such as can be protected by hand-lights. Thin the winter spinach, when large enough, that it may have space to grow. If broccoli be too rank or tall to withstand the winter, lift and lay nearly up to the neck in the earth, the heads sloping towards the north. Lift onions, and lay them out to ripen on a dry border or gravel-walk. Lift potatoes and store them.

Fruit Garden.—Finish the summer pruning and training. Where the walls are heated, assist the maturing of peaches and nectarines, and the ripening of the young wood for next year, by fires during the day. Gather and lay up in the fruit-room with care the autumnal sorts of apples and pears. Prepare borders and stations for fruit trees during dry weather. Plant strawberries for a

main crop. Repot orchard-house trees, disrooting if necessary.

Forcing.—Take care that late melons, cucumbers and tomatoes be not injured by getting too much water and too little air. Sow a few kidney beans for an early forced crop. Expel damp, and assist the ripening of late grapes and peaches with fires during the day. Prune early vines and peaches.

Plant Houses.—The various pot plants should now be put in their winter quarters. Keep up moderate temperatures in the stove, and merely repel frosts in the greenhouse, guarding against damp, by ventilation and by the cautious use of water. Pot hyacinths, tulips and other bulbs for forcing; and propagate half-hardy plants by cuttings. Begin the housing of the main stock of chrysanthemums.

Flower Garden, &c.—Sow in the beginning of this month all half-hardy annuals required for early flowering; also mignonette in pots, thinning the plants at an early stage; the different species of primula; and the seeds of such plants as, if sown in spring, seldom come up the same season, but if sown in September and October, vegetate readily the succeeding spring. Put in cuttings of bedding pelargoniums in boxes, which may stand outdoors exposed to the sun, but should be sheltered from excessive rains. Continue the propagation of herbaceous plants, taking off the layers of carnations, picotees, pansies and chrysanthemums, by the end of the month; choice carnations and picotees may be potted and wintered in cold frames if the season is wet and ungenial. Plant evergreens; lay and put in cuttings of most of the hard-wooded sorts of shrubby plants.

October

Kitchen Garden.—Sow small salading and radishes in the first week, and lettuces in frames on a shallow hotbed for planting out in spring. If the winter prove mild they will be somewhat earlier than those sown next month or in January. Plant parsley in pots or boxes to protect under glass in case very severe weather occurs. Plant cabbages in beds or close rows till wanted in spring; and cauliflowers in the last week, to receive the protection of frames, or a sheltered situation. Store potatoes, beet, salsafy, scorzonera, skirret, carrots and parsnips, by the end of the month. Band and earth up cardoons.

Fruit Garden.—Such fruit trees as have dropped their leaves may be transplanted; this is the best season for transplanting (though with care it may be done earlier), whether the leaves have fallen or not. Protect fig-trees, if the weather proves frosty, as soon as they have cast their leaves. Plant out raspberries. The orchard-house trees should be got under glass before the end of the month. Gather and store all sorts of apples and pears, the longest-keeping sorts not before the end of the month, if the weather be mild.

Forcing.—Maintain the heat in hotbeds and pits by means of fresh dung linings. Give abundance of air in mild bright weather. Dress vines and peaches. Clean and repair the forcing-houses, and overhaul the heating apparatus to see it is in good working condition. Plant chicory in boxes or on hotbeds for blanching. Sow kidney beans. Make up successional winter mushroom beds.

Plant Houses.—Replace all sorts of greenhouse plants. Fill the pits with pots of stocks, mignonette and hardy annuals for planting out in spring, along with many of the hardy sorts of greenhouse plants; the whole ought to be thoroughly ventilated, except in frosty weather. From this time till spring keep succulent plants almost without water. Begin to force roses, hyacinths and a few other bulbs, for winter and early spring decoration. Plant hyacinths in glasses for windows. The last of the pot chrysanthemums should be housed by the end of the first week.

Flower Garden.—Sow a few pots of hardy annuals in a frame, or on a sheltered border, for successional spring use if required. Plant the greater part of the common border bulbs, as hyacinths, narcissi, crocuses and early tulips, about the end of the month, with a few anemones for early flowering. Transplant strong plants of biennials and perennials to their final situations; also the select plants used for spring bedding. Protect alpine plants, stage auriculas, and choice carnations and picotees with glass frames; and tea roses and other tender plants with bracken or other protective material. Take up, dry and store dahlias and all tender tubers at the end of the month; pot lobelias and similar half-hardy plants from the open borders. Transplant all sorts of hardy evergreens and shrubs, especially in dry soils, giving abundance of water. Put in cuttings of all sorts of evergreens, &c. Plant out the hardier sorts of roses.

November

Kitchen Garden.—Trench up all vacant ground as soon as cleared of its crops, leaving the surface as rough as possible. Sow early peas and Early Dwarf Prolific beans in the second week, for an early crop; also in frames for transplanting. Protect endive, celery, artichoke and sea-kale with stable-litter or fern, or by planting the former in frames; take up late cauliflower, early broccoli and lettuces, and place them in sheltered pits or lay them in an open shed; earth up celery; manure and dress up asparagus beds.

Fruit Garden.—Plant all sorts of fruit trees in fine weather—the earlier in the month the better. Protect fig-trees. Commence pruning and nailing. Gather and store the latest apples and pears. Examine the fruit-room and remove all decayed fruit.

Forcing.—Keep up the requisite degree of heat in hotbeds and pits. Cucumbers and tomatoes will

require more than ordinary attention. Force asparagus, rhubarb and sea-kale, in the mushroom-house, in pits, or in the open border under boxes or cases surrounded and covered by well-fermented stable dung and leaves. Sow Early Horn carrot; also kidney beans and radishes, on hotbeds. In the forcing-houses prune and train the trees; fork over and dress the borders of such houses as have not been already done.

Plant Houses.—The directions for the greenhouse and conservatory in January apply also to this month generally. Continue the forcing of roses, hyacinths, &c. Houses containing large-flowered Japanese chrysanthemums will require to be kept dry, airy and moderately warm to prevent "damping-off" of petals.

Flower Garden, &c.—Plant dried tubers of border flowers, but the finer sorts had better be deferred till spring. Plant tulips in the early part of the month. Put in cuttings of bedding calceolarias, choosing the shoots that will not run up to flower. Protect such half-hardy plants as are not already sheltered. Plant deciduous trees and shrubs so long as the weather continues favourable, and before the soil has parted with the solar heat absorbed during summer. Dig and dress such flower borders and shrubberies as may now be cleared of annuals and the stems of herbaceous plants.

December

Kitchen Garden.—Collect and smother-burn all vegetable refuse, and apply it as a dressing to the ground. Sow a few peas and beans, in case of accident to those sown in November, drawing up the soil towards the stems of those which are above ground as a protection; earth up celery; blanch endive with flower-pots; sow radishes in a very sheltered place. Attend to trenching and digging in dry weather.

Fruit Garden.—Plant all sorts of fruit trees in mild weather. Proceed with pruning and nailing wall-trees. Examine the fruit-room every week, removing promptly all decaying fruit.

Forcing.—The same degree of attention to hotbeds and pits will be necessary as in the last month. Continue the forcing of asparagus, rhubarb and sea-kale, in pits and in the mushroom-house. Proceed with the usual routine of culture commenced last month. Make the necessary preparations to begin forcing early or succession crops by the last week of this or the first of next month.

Plant Houses, Frames, &c.—Carnations and picotees in pots must be kept rather dry to prevent damping off. Heaths and Australian plants must be very sparingly watered, and kept with only fire heat enough to repel frost. Cut down plants of chrysanthemums, which should be placed in a cool pit, near the glass, in order to afford hard sturdy cuttings in February. Shy plants should be given gentle bottom heat to induce growth, which should be gently hardened by exposure under cooler conditions.

Flower Garden, &c.—Plant shrubs in open weather. Prune shrubs. Sweep and roll the lawns, and put in repair the gravel-walks, keeping the surface frequently rolled.

(J. Ws.; W. R. W.)

(B) *For the United States* (*chiefly for the latitude of New York*).

January

Flower Garden and Greenhouse.—Little is to be done in either. In the greenhouse care must be used to protect against frost. Ventilate but little, and with care; raise the ventilating sash only high enough to let the heated air from the greenhouse drive back the outer air so as not to chill the plants. To destroy the red spider, syringe the plants copiously at night, and splash the paths with water. The aphis, or "green fly," must also be destroyed; tobacco may be used. Various new preparations are coming on the market for the destruction of greenhouse pests. Several new effective preparations of tobacco have been brought into use. The white-fly is now a common pest in greenhouses, the nymphs being greenish scale-like objects on the under sides of the leaves, and adults very small white flies. The remedy is to spray with kerosene emulsion or whale-oil soap; or if on cucumbers or tomatoes, it is best to fumigate with hydrocyanic acid gas, using one ounce of potassium cyanide to each 1000 cubic ft. of space. (This material is very poisonous.) Many greenhouse insects can be kept more or less in check by careful and effective hosing of the plants at proper times. At this season roses, grape vines and other plants are often affected by mildew; an effectual remedy is to paint the hot-water pipes with a mixture of sulphur and lime, put on as thick as ordinary whitewash, once each week until it is checked; but care must be taken not to apply it on any surface at a higher temperature than 212°. Hyacinths and other bulbs that have been kept in a cellar or other dark cool place may now be brought into the light of the greenhouse or sitting-room, provided they have filled the pots with roots. If they are not well rooted, leave them until they are, or select such of them as are best, leaving the others. In the outside flower garden little can be done except that shrubs may be pruned, or new work, such as making walks or grading, performed, if weather permits. See that the ornamental plants and trees are not injured by heavy weights of ice or snow.

Fruit Garden.—Pruning, staking up or mulching can be done if the weather is such that the workmen can stand out. In all warm or comfortable days the fruit trees may be pruned.

Grapery.—Graperies used for the forcing of foreign grapes may be started, beginning at a temperature of 50° at night, with 10° or 15° higher during the day. The borders must be covered sufficiently deep with leaves or manure to prevent the soil from freezing, as it would be destruction to the vines to start the shoots if the roots were frozen; hence, when forcing is begun in January, the covering should be put on in November, before severe frosts begin.

Vegetable Garden.—But little can be done in the northern states except to prepare manure, and get sashes, tools, &c., in working order; but in sections of the country where there is little or no frost the hardier kinds of seeds and plants may be sown and planted, such as asparagus, cabbage, cauliflower, carrot, leek, lettuce, onion, parsnip, peas, spinach, turnip, &c. In any section where these seeds can be sown in open ground, it is an indication that hotbeds may be started for the sowing of such tender vegetables as tomatoes, egg and pepper plants, &c.; though, unless in the extreme southern states, hotbeds should not be started before the beginning or middle of February. Make orders for the spring seeds.

February

Flower Garden and Greenhouse.—The directions for January will in the main apply to this month, except that now some of the hardier annuals may be sown in hotbed or greenhouse, and also the propagation of plants by cuttings may be done rather better now than in January, as the greater amount of light gives more vitality to the cutting.

Fruit Garden.—But little can be done in most of the northern states as yet, and in sections where there is no frost in the ground it is likely to be too wet to work; but in many southern states this will be the best month for planting fruit trees and plants of all kinds, particularly strawberries, raspberries, blackberries, pear and apple trees, while grape vines will do, though they will also do well quite a month later. Continue the pruning. Fruit trees for spring planting should be ordered, if not already done.

Grapery.—The graperies started last month at 50° at night may now be increased to 60°, with a correspondingly higher day temperature. Great care must be taken to syringe the leaves thoroughly at least once a day, and to deluge the paths with water, so as to produce a moist atmosphere. Paint the hot-water pipes with sulphur mixture, as recommended in January.

Vegetable Garden.—Leaves from the woods, house manure or refuse hops from breweries may be got together towards the latter part of this month, and mixed and turned to get “sweetened” preparatory to forming hotbeds. Cabbage, lettuce and cauliflower seeds, if sown early this month in hotbed or greenhouse, will make fine plants if transplanted into hotbed in March. This is preferable to the use of fall-sown plants. Manure that is to be used for the crop should be broken up as fine as possible, for the more completely manure of any kind can be mixed with the soil the better the crop will be, and, of course, if it is dug or ploughed in in large unbroken lumps it cannot be properly commingled.

March

Flower Garden and Greenhouse.—The long days and bright sunshine will now begin to tell on the plants under glass. Examine all plants that are vigorous and healthy; if the roots have matted the “ball” of earth they must be shifted into a larger-sized pot. Plants from cuttings struck last month may now be shifted, and the propagation of all plants that are likely to be wanted should be continued. Hardier kinds of annuals may be sown; it is best done in shallow boxes, say 2 in. deep.

Lawns can be raked off and mulched with short manure, or rich garden earth where manure cannot be obtained. Flower-beds on light soils may be dug up so as to forward the work of the coming busy spring season. Lawns may be benefited by a good dressing, in addition to the manure, of some reliable commercial fertilizer. If the lawn is thin in spots, these places may be raked over heavily and new grass seed sown.

Fruit Garden.—In many sections, planting may now be done with safety, provided the soil is light and dry, but not otherwise. Although a tree or plant will receive no injury when its roots are undisturbed in the soil should a frost come after planting, the same amount of freezing will, and very often does, greatly injure the plant if the roots are exposed.

Grapery.—The grapery started in January will have set its fruit, which should be thinned by one-third. The temperature may now be further advanced to 70° at night, with 15° higher in the daytime. The same precautions must be used against mildew and insects as given in January. Graperies wanted for succession may be started in February or this month.

Vegetable Garden.—This is a busy month. In localities where the frost is out of the ground, if it is not wet, seeds of the hardier vegetables can be sown. The list of seeds given for the southern states in January may now be used at the north, while for most of the southern states tender vegetables, such as egg plant, okra, sweet potatoes, melon, squash, potatoes, tomatoes, &c., may be sown and planted. Hotbeds must now be all started. In March flower seeds and vegetable seeds may be sown in boxes or flats in the greenhouse, or in residence windows, or near the kitchen stove. Unless one has space under glass, or in hotbeds, in which the plants may be transplanted before they are set in the open ground, it is well not to start the seeds too early, inasmuch as the plants are likely to become too large or to be pot-bound, or to become drawn.

April

Flower Garden and Greenhouse.—Window and greenhouse plants require more water and ventilation. Due attention must be paid to shifting well-rooted plants into larger pots; and, if space is desired, many kinds of hardier plants can be safely put out in cold frames. Towards the end of the month it may be necessary slightly to shade the glass of the greenhouse. All herbaceous plants and hardy shrubs may be planted in the garden. The covering of leaves or litter should be taken off bulbs and tender plants that were covered up for winter, so that the beds can be lightly forked and raked. Sow tender annual flower seeds in boxes inside.

Fruit Garden.—Strawberries that have been covered up with straw or leaves should be relieved around the plants, leaving the covering between them. Special care must be exercised that the mulch be not left on too long; the plants should not become whitened or "drawn." Raspberries, grape vines, &c., that have been laid down may now be uncovered and tied up to stakes or trellises, and all new plantations of these and other fruits may now be made. Fruit trees may be grafted.

Vegetable Garden.—Asparagus, rhubarb, spinach, &c., should be uncovered., and the beds hoed or dug lightly. Hardier sorts of vegetable seeds and plants, such as beets, cabbage, cauliflower, celery, lettuce, onions, parsley, parsnips, peas, potatoes, radishes, spinach, turnip, &c., should all be sown or planted by the middle of the month if the soil is dry and warm, and in all cases, where practicable, before the end of the month. It is essential, in sowing seeds now, that they be well firmed in the soil. Any who expect to get early cabbage, cauliflower, lettuce or radishes, while planting or sowing is delayed until the time of sowing tomato and egg plant in May, are sure to be disappointed of a full crop. Frequent rotation of crops should be practised in the vegetable garden, in order to head off insects and diseases; and also to make the best use of the land. Every three or four years the vegetable garden should be laid out in some new place; but if this cannot be done, the crops should be rotated on different parts of the old garden.

May

Flower Garden and Greenhouse.—Window and greenhouse plants should be in their finest bloom. Firing may be entirely dispensed with, though care must still be exercised in ventilating. If weather is cold and backward, however, and in very northern regions, care must be taken not to stop firing too soon, or the plants will mildew and become stunted. Every precaution must be used to keep the air moist. "Moss culture" may be tried, the common sphagnum or moss of the swamps, mixed with one-twentieth of its bulk of bone-dust, being laid as a mulch on the top of the earth of the flower-pots; its effect is to shield the pots from the sun, and at the same time stimulate the roots to come to the surface. By the end of the month all of the plants that are wanted for the summer decoration of the flower border may be planted out, first loosening a little the ball of earth at the roots. If the weather is dry, water freely after planting. When the greenhouse is not to be used during the summer months, camellias, azaleas and plants of that character should be set out of doors under partial shade; but most of the other plants usually grown in the conservatory or window garden in winter may be set in the open border. Flower-beds should be kept well hoed, and raked, to prevent the growth of weeds next month.

Pelargoniums, pinks, monthly roses and all the half-hardy kinds of flowering plants should be planted early, but coleus, heliotrope and the more tender plants should be delayed until the end of the month. Annuals that have been sown in the greenhouse or hotbed may be planted out, and seeds of such sorts as mignonette, sweet alyssum, Phlox Drummondii, portulaca, &c., may be sown in the beds or borders. The china aster is now one of the most popular of summer and fall plants. The seed may be sown in the north as late as the middle of May, or even the first of June, with good results for fall blooming. If the plants are started early in the greenhouse, they are likely to spend themselves before fall, and therefore a later sowing should be provided.

Lawns should be mown, and the edgings trimmed.

Fruit Garden.—The hay or leaf mulching on the strawberry beds should be removed and the ground deeply hoed (if not removed in April in the more forward places), after which it may be placed on again to keep the fruit clean and the ground from drying. Where it has not been convenient before, most of the smaller fruits may yet be planted during the first part of the month. Tobacco dust will dislodge most of the numerous kinds of slugs, caterpillars or worms that make their appearance on the young shoots of vines or trees. Fruit trees may be planted this month, if they were not planted in March or April. If they have been kept fresh and dormant, they should still be in good condition. The broken roots should be cut back to fresh wood, and the tops should be headed back in proportion.

Vegetable Garden.—Attention should be given to new sowings and plantings for succession. Crops sown last month will have to be thinned out if large enough. Hoe deeply all transplanted crops, such as cabbage, cauliflower, lettuce, &c. Tender vegetables, such as tomatoes, egg and pepper plants, sweet potatoes, &c., can be planted out. Seeds of Lima beans, sweet corn, melon, okra, cucumbers, &c., should be sown; and sow for succession peas, spinach, lettuce, beans, radishes, &c., every ten days.

June

Flower Garden and Greenhouse.—Tropical plants can now be used to fill up the greenhouse

during the summer months. It should be well shaded, and fine specimens of fancy caladiums, dracaenas, coleus, crotons, palms, ferns and such plants as are grown for the beauty of their foliage, will make a very attractive show. If these cannot be had, common geraniums may be used. The “moss culture” will be found particularly valuable for these plants. Hyacinths, tulips and other spring bulbs may be dug up, dried and placed away for next fall’s planting, and their places filled with bedding plants, such as coleus, achyranthes, pelargoniums, and the various white and coloured leaf plants. It will be necessary to mow the lawn once a week, and sometimes oftener.

Fruit Garden.—The small fruits should be mulched about the roots, if this has not yet been done. If the fruit garden is large enough to admit of horse culture, it is best to keep the bush-fruits well cultivated during the season; this tillage conserves the moisture and helps to make a full and plump crop of berries. In small areas the mulching system is sometimes preferable.

Vegetable Garden.—Beets, beans, carrots, corn, cucumbers, lettuce, peas and radishes may be sown for succession. This is usually a busy month, as many crops have to be gathered, and, if hoeing is not promptly seen to, weeds are certain to give great trouble. Tomatoes should be tied up to trellises or stakes if fine-flavoured and handsome fruit is desired, for if left to ripen on the ground they are apt to have a gross earthy flavour.

July

Flower Garden and Greenhouse.—Watering, ventilating and fumigating (or the use of tobacco in other forms for destruction of aphides) must be attended to. The atmosphere of the greenhouse must be kept moist. Watch the plants that have been plunged out of doors, and see if any require repotting. All plants that require staking, such as dahlias, roses, gladioli and many herbaceous plants, should now be looked to. Carnations and other plants that are throwing up flower stems, if wanted to flower in winter, should be cut back, that is, the flower stems should be cut off to say 5 in. from the ground.

Fruit Garden.—If grape vines show any signs of mildew, dust them over with dry sulphur, selecting a still warm day. The fruit having now been gathered from strawberry plants, if new beds are to be formed, the system of layering the plants in small pots is the best. In general, field strawberries are not grown from potted layers, but from good strong layers that strike naturally in the field. In the north, spring planting of strawberries is generally advised for market conditions; although planting in early fall or late summer is successful when the ground is well prepared and when it does not suffer from drought. Where apples, pears, peaches, grapes, &c., have set fruit thickly, thin out at least one-half to two-thirds of the young fruit.

Vegetable Garden.—The first ten days of this month will yet be time enough to sow sweet corn, beets, lettuce, beans, cucumbers and ruta-baga turnips. Such vegetables as cabbage, cauliflower, celery, &c., wanted for fall or winter use, are best planted this month, though in some sections they will do later. Keep sweet potatoes hoed to prevent the vines rooting at the joints.

August

Flower Garden and Greenhouse.—But little deviation is required in these departments from the instructions for July. See that sufficient water is applied; the walks may be wet in the houses.

Fruit Garden.—Strawberries that have fruited will now be making “runners,” or young plants. These should be kept cut off close to the old plant, so that the full force of the root is expended in making the “crowns” or fruit buds for next season’s crop. If plants are required for new beds, only the required number should be allowed to grow, and these may be layered in pots as recommended in July. The old stems of raspberries and blackberries that have borne fruit should be cut away, and the young shoots thinned to three or four canes to each hill or plant. If tied to stakes and topped when 4 or 5 ft. high, they will form three or four branches on a cane, and will make stronger fruiting plants for next year.

Vegetable Garden.—Hoe deeply such crops as cabbage, cauliflower and celery. The earthing up of celery this month is not to be recommended, unless a little very early supply is wanted. Onions in many sections can be harvested. The proper condition is when the tops are turning yellow and falling down. They are dried best by placing them in a dry shed in thin layers. Sow spinach for fall use, but not yet for the winter crop. Red top, white globe, and yellow Aberdeen turnips should now be sown; ruta-baga turnips sown last month will need thinning, and in extreme southern states they may yet be sown.

September

Flower Garden and Greenhouse.—The flower-beds in the lawn should be at their best. If planted in “ribbon lines” or “massing,” strict attention must be given to pinching off the tops, so that the lines or masses will present an even surface. Tender plants will require to be put in the greenhouse or housed in some way towards the end of this month; but be careful to keep them as cool as possible during the day. Cuttings of bedding plants may now be made freely if wanted for next season, as young cuttings rooted in the fall make better plants for next spring’s use than old plants, in the case of such soft-wooded plants as pelargoniums, fuchsias, verbenas, heliotropes, &c.; with roses and plants of a woody nature, however, the old plants usually do best. Dutch bulbs, such as hyacinths, tulips, crocus, &c., and most of the varieties of lilies, may be planted. Violets that are

wanted for winter flowering will now be growing freely, and the runners should be trimmed off. Sow seeds of sweet alyssum, candytuft, daisies, mignonette, pansies, &c. Visit the roadsides and woods for interesting plants to put in the hardy borders.

Fruit Garden.—Strawberry plants that have been layered in pots may yet be planted, or in southern districts the ordinary ground layers may be planted. The sooner in the month both are planted the better crop they will give next season; and, as these plants soon make runners, it will be necessary to trim them off. Attend to raspberries and blackberries as advised for last month, if they have not already been attended to. All fruit trees should be gone over for borers before cold weather sets in; they also should have been gone over for the same purpose in May and June.

Vegetable Garden.—If cabbage, cauliflower and lettuce are wanted to plant in cold frames, the seed should be sown from about the 10th to the 20th of this month; but judgment should be exercised, for, if sown too early, cabbage and cauliflower are apt to run to seed. The best date for latitude of New York is September 15th. The main crop of spinach or sprouts that is wanted for winter or spring use should be sown about the same date. The earth should be drawn up to celery with a hoe preparatory to earthing up with a spade. Onions that were not harvested and dried last month must now be attended to. Turnips of the early or flat sorts may yet be sown the first week of this month in the northern states, and in the south from two to four weeks later.

October

Flower Garden and Greenhouse.—In northern sections of the United States, tender plants that are still outside should be got under cover as early as possible. Delay using fire heat as long as possible, unless the nights become so cold as to chill the plants inside the house. Roses, carnations, camellias, azaleas, pelargoniums and the hardier sorts of plants will do better if placed in a cold frame or pit until the middle of November than they would in an ordinary greenhouse. Look out for insects. Fall bulbs of all kinds may be planted. Take up summer-flowering bulbs and tubers, such as dahlias, tuberoses, gladioli, cannas, caladiums, tigridias, and dry them off thoroughly, stowing them away afterwards in some place free from frost and moisture during the winter. Before winter sets in see that the lawn is freely top-dressed. Be careful not to mow the grass too short in fall.

Fruit Garden.—Strawberries that have been grown from pot-grown layers may yet be planted in southern states; keep the runners trimmed off. Fruit trees and shrubs may be set out; but, if planting is deferred to the last of the month, the ground around the roots should be mulched to the thickness of 3 or 4 in. with straw, leaves or rough manure, as a protection against frost. The fruit garden must be protected from the ravages of mice in winter. Mice will nest about the plants if there is straw or other litter around them. Before winter, all tall grass and loose litter should be taken away; if this is not done, then the first snow should be tramped heavily around the plants, in order to destroy any nesting-places.

Vegetable Garden.—Celery will now be in full growth, and will require close attention to earthing up, and during the last part of the month the first lot may be stored away in trenches for winter. All vegetable roots not designed to be left in the ground during the winter should be dug up, such as beets, carrots, parsnips, sweet potatoes, &c. The cabbage, cauliflower and lettuce plants grown from seed sown last month should be pricked out in cold frames. If lettuce is wanted for winter use, it may now be planted in the greenhouse or cold frame, and will be ready for use about Christmas. If asparagus or rhubarb is wanted for winter use, it should be taken up and stowed away in pit, frame, shed or cellar for a month or two. It may then be taken into the greenhouse and packed closely together under the stage, and will be fit for use from January to March, according to the temperature of the house. Vegetable gardens often become infested with diseases that are carried over from year to year in the old plants and litter; this is specially true of water-melons and of some diseases of tomatoes. It is well, therefore, to burn the tops of the plants in the fall, rather than to plough them under or to throw them on the compost heap.

November

Flower Garden and Greenhouse.—Plants intended to be grown inside should now all be indoors. Keep a sharp look-out for cold snaps, as they come very unexpectedly in November, and many plants are lost thereby. In cases where it is not convenient to use fire heat, 5° to 10° of cold can be resisted by covering the plants over with paper, and by using this before frost has struck the plants valuable collections may be saved. When fire heat is freely used, be careful to keep up the proper amount of moisture by sprinkling the paths with water. Little can be done in the flower garden, except to clean off all dead stalks, and straw up tender roses, vines, &c., and, wherever there is time, to dig up and rake the borders, as it will greatly facilitate spring work. Cover up all beds in which there are hyacinths, tulips and other bulbs with a litter of leaves or straw to the depth of 2 or 3 in. If short, thoroughly-decayed manure can be spared, a good sprinkling spread over the lawn will help it to a finer growth next spring.

Fruit Garden.—Strawberry beds should be covered (in cold sections) with hay, straw or leaf mulching, to a depth not exceeding 2 in. Fruit trees and grape vines generally should be pruned; and, if the wood of the vine is wanted for cuttings, or scions of fruit trees for grafts, they should be tied in small bundles and buried in the ground until spring. They may be taken in December or January if preferred.

Vegetable Garden.—Celery that is to be stored for winter use should be put away before the end

of the month in all sections north of Virginia; south of that it may be left in most places where grown throughout the winter if well covered up. The stalks of the asparagus bed should be cut off, and burned if there are berries on them, as the seeds scattered in the soil sometimes produce troublesome weeds. Mulch the beds with 2 or 3 in. of rough manure. All vegetable roots that are yet in the ground, and not designed to be left there over winter, must be dug up in this latitude before the middle of the month or they may be frozen in. Cover up onions, spinach, sprouts, cabbage or lettuce plants with a covering of 2 or 3 in. of leaves, hay, or straw, to protect them during the winter. Cabbages that have headed may usually be preserved against injury by frost until the middle of next month, by simply pulling them up and packing them closely in a dry spot in the open field with the heads down and roots up. On approach of cold weather in December they should be covered up with leaves as high as the tops of the roots, or, if the soil is light, it may be thrown over them, if leaves are not convenient. Cabbages will keep this way until March if the covering has not been put on too early. Plough all empty ground if practicable, and, whenever time will permit, do trenching and subsoiling. Cabbage, cauliflower and lettuce plants that are in frames should be regularly ventilated by lifting the sash on warm days, and on the approach of very cold weather they should be covered with straw mats or shutters. In the colder latitudes, and even in the middle states, it is absolutely necessary to protect cauliflower in this way, as it is much more tender than cabbage and lettuce plants.

December

Flower Garden and Greenhouse.—Close attention must be paid to protecting all tender plants, for it is not uncommon to have the care of a whole year spoiled by one night's neglect. Vigilance and extra hot fires will have to be kept up when the thermometer falls to 34° or 35° in the parlour or conservatory. It is well to set the plants under the benches or on the walks of the greenhouses; if they are in the parlour move them away from the cold point and protect them with paper; this will usually save them even if the thermometer falls to 24° or 26°. Another plan in the greenhouse is to dash water on the pipes or flues, which causes steam to rise to the glass and freeze there, stopping up all the crevices. With plants outside that require strawing up or to be mulched, this will have now to be finished.

Fruit Garden.—In sections where it is an advantage to protect grape vines, raspberries, &c., from severe frost, these should be laid down as close to the ground as possible, and covered with leaves, straw or hay, or with a few inches of soil. Grapes may be pruned. Fruit trees may be pruned from now till March in the north.

Vegetable Garden.—Celery in trenches should receive the final covering for the winter, which is best done by leaves or light stable litter; in the latitude of New York it should not be less than 12 in. thick. Potatoes, beets, turnips or other roots in pits, the spinach crop in the ground, or any other article in need of protection, should be attended to before the end of the month; manure and compost heaps should be forwarded as rapidly as possible, and turned and mixed so as to be in proper condition for spring. Remove the snow that accumulates on cold frames or other glass structures, particularly if the soil which the glass covers was not frozen before the snow fell; it may remain on the sashes longer if the plants are frozen in, since they are dormant, and would not be injured if deprived of light for eight or ten days. If roots have been placed in cellars, attention must be given to ventilation, which can be done by making a wooden box, say 6 by 8 in., to run from the ceiling of the cellar to the eaves of the building above.

(L. H. B.; P. H.)

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(J. Ws.; W. R. W.)

HORTON, CHRISTIANA (*c.* 1696-*c.* 1756), English actress, first appeared in London as Melinda in *The Recruiting Officer* in 1714 at Drury Lane. Here she remained twenty years, followed by fifteen at Covent Garden. At both houses during this long career she played all the leading tragedy and comedy parts, and Barton Booth (who "discovered" her) said she was the best successor of Mrs. Oldfield. She was the original Mariana in Fielding's *Miser* (1733).

HORTON, ROBERT FORMAN (1855-), British Nonconformist divine, was born in London on the 18th of September 1855. He was educated at Shrewsbury school and New College, Oxford, where he took first classes in classics. He was president of the Oxford Union in 1877. He became a fellow of his college in 1879, and lectured on history for four years. In 1880 he accepted an influential invitation to become pastor of the Lyndhurst Road Congregational church, Hampstead, and subsequently took a very prominent part in church and denominational work generally. He delivered the Lyman Beecher lectures at Yale in 1893; in 1898 he was chairman of the London Congregational Union; and in 1903 of the Congregational Union of England and Wales. In 1909 he took a prominent part in the 75th anniversary celebration of Hartford Theological Seminary. His numerous publications include books on theological, critical, historical, biographical and devotional subjects.

HORTON, SAMUEL DANA (1844-1895), American writer on bimetallism, was born in Pomeroy, Ohio, on the 16th of January 1844. He graduated at Harvard in 1864, and at the Harvard Law School in 1868, studied Roman law in Berlin in 1869, and in 1871 was admitted to the Ohio bar. He practised law in Cincinnati, and then in Pomeroy until 1885, when he gave up law for the advancement of bimetallism. His attention had been turned to monetary questions by the "greenback campaign" of 1875 in Ohio, in which, as in former campaigns, he had spoken, particularly effectively in German, for the Republican party. He was secretary of the American delegation to the Monetary Conference which met in Paris in 1878, and edited the report of the delegation. To the conference of 1881 he was a delegate, and thereafter he spent much of his time in Europe, whither he was sent by President Harrison in 1889 as special commissioner to promote the international restoration of silver. He died in Washington, D.C., on the 23rd of February 1895. Horton's principal works were *The Silver Pound* (1887) and *Silver in Europe* (1890), a volume of essays.

HORUS (Egyptian *Hōr*), the name of an Egyptian god, if not of several distinct gods. To all forms of Horus the falcon was sacred; the name Hōr, written with a standing figure of that bird,  is connected with a root signifying "upper," and probably means "the high-flyer." The tame sacred falcon on its perch  is the commonest symbol of divinity in early hieroglyphic writing; the commonest title of the king in the earliest dynasties, and his first title later, was that which named him Horus. Hawk gods were the presiding deities of Poi (Pe) and Nekhen, which had been the royal quarters in the capitals of the two primeval kingdoms of Upper and Lower Egypt, at Buto and opposite El Kab. A principal festival in very early times was the "worship of Horus," and the kings of the prehistoric dynasties were afterwards called "the worshippers of Horus." The Northern Kingdom in particular was under the patronage of Horus. He was a solar divinity, but appears very

early in the Osiris cycle of deities, a son of Isis and probably of Osiris, and opponent of Sēth. On monuments of the Middle Kingdom or somewhat later we find besides Hōr the following special forms: Har-behtet, *i.e.* Hōr of Beht, the winged solar disk, god of Edfu (*Apollinopolis Magna*); Har-khentekthai, god of Athribis; Har-mesen (whose principal sacred animal was a lion), god of the Sethroite (?) nome; Har-khentemna, *i.e.* the blind (?) Horus (with a shrew-mouse) at Letopolis; Har-mert ("of two eyes") at Pharbaethus; Har-akht, Ra-har-akht, or Har-m-akhi (Harikakhis, "Hor of the horizon"), the sun-god of Heliopolis.

As a sun-god Horus not only worsted the hostile darkness and avenged his father, but also daily renewed himself. He was thus identical with his own father from one point of view. In the mythology, especially that of the New Kingdom, or of quite late times, we find the following standing epithets applied to more or less distinct forms or phases: Harendotes (Har-ent-yotf), *i.e.* "Hōr, avenger of his father (Osiris)"; Harpokhrates (Har-p-khrat), *i.e.* "Hōr the child," with finger in mouth, sometimes seated on a lotus-flower; Harsiesis (Har-si-Ēsi), *i.e.* "Hōr, son of Isis," as a child; Har-en-khēbi, "Hōr in Chemmis," a child nursed by Isis in the papyrus marshes; Haroeris (Har-uēr), *i.e.* "the elder Hōr," at Ombos, &c., human-headed or falcon-headed; Harsemteus (Har-sem-teu), *i.e.* "Hōr, uniter of the two lands," and others.

In the judgment scene Horus introduces the deceased to Osiris. To the Greeks Horus was equivalent to Apollo, but in the name of Hermopolis Parva (see Damanhur), which must have been among the first of the Egyptian cities to be known to them, he was apparently identified with Hermes. Although the falcon was the bird most properly sacred to Horus, not only its varieties, but also the sparrow-hawk, kestrel and other small hawks were mummified in his honour in late times.

See Egypt: section *Religion*; Meyer, art. "Horos" in Röscher, *Lexicon der Griech. und Rom. Mythologie*.

(F. Ll. G.)

HORWICH, an urban district in the Westhoughton parliamentary division of Lancashire, England, 4 m. W.N.W. of Bolton, on the Lancashire and Yorkshire railway. Pop. (1901) 15,084. It lies beneath the considerable elevation of Rivington Pike, where formerly was a great forest. It has extensive locomotive works, and there are large stone quarries in the district. Bleaching and cotton-spinning and the manufacture of fire-bricks and tiles are carried on.

HOSANNA, the cry of praise or adoration shouted in recognition of the Messiahship of Jesus on his entry into Jerusalem (Matt. xxi. 9, 15; Mark xi. 9 sq.; John xii. 13), and since used in the Christian Church. It is also a Jewish liturgical term, and was applied specifically to the "hosanna" branches carried in procession in the Feast of Booths or Tabernacles, the seventh day of which was called the Hosanna-day (so also in Syrian usage; cf. "Palm" Sunday). This festival (for which see Lev. xxiii. 39 sqq.; 2 Macc. x. 7; Jos. *Ant.* xii. 10. 4, xiii. 13. 15; and the Talmudic tractate *Sukkah*) already suggested a Dionysiac celebration to Plutarch (*Symp.* iv. 6), and was associated with a ceremonial drawing of water which, it was believed, secured fertilizing rains in the following year; the penalty for abstinence was drought (cf. Zech. xiv. 16 seq.). The evidence (see further *Ency. Bib.* cols. 3354, 4880 seq.; I. Levy, *Rev. des Ét. juives*, 1901, pp. 192 sqq.) points to rites of nature-worship, and it is possible that in these the term Hosanna had some other application.

The old interpretation "save, now!" which may be a popular etymology, is based on Ps. cxviii. 25 (Heb. *hōshī'ah-nnā*), but this does not explain the occurrence of the word in the Gospels, a complicated problem, on which see the articles of J. H. Thayer in Hastings's *Dict. Bib.*, and more especially T. K. Cheyne, *Ency. Bib.* s.v.

HOSE (a word common to many Teutonic languages; cf. Dutch, *hoos*, stocking, Ger. *Hose*, breeches, tights; the ultimate origin is unknown), the name of an article of dress, used as a covering for the leg and foot. The word has been used for various forms of a long stocking covering both the foot and leg (see Hosiery), and this is the usual modern sense. But it also formerly meant a kind of gaiter covering the leg from the knee to the ankle only, of the long tight covering for the

whole of the lower limbs, and later of the short puffed or slashed breeches worn with the doublet—at this period, from the early part of the 16th century onwards, comes the distinction between the "hose" or "trunk hose" and the stocking (see Costume). The term is applied to certain objects resembling such a covering, as in its application to flexible rubber or canvas piping used for conveying water (see Hosepipe), and in botany, to the "sheath" covering, *e.g.* the ear of corn. The term "hose-in-hose" is thus used in botany for a flower in which the corolla has become doubled, as though a second were inserted in the throat of the first; it occurs sometimes in the primrose.

HOSEA, the son of Beëri, the first in order of the minor prophets of the Old Testament. The name Hosea (הושע, LXX. Ὡσηέ, Vulg. *Osee*, and so the English version in Rom. ix. 25) ought rather to be written Hoshea, and is identical with that borne by the last king of Ephraim, and by Joshua in Num. xiii. 16, Deut. xxxii. 44. Of the life of Hosea[1] we know nothing beyond what can be gathered from his prophecies. That he was a citizen of the northern kingdom appears from the whole tenor of the book, but most expressly from i. 2, where "the land," the prophet's land, is the realm of Israel, and vii. 5, where "our king" is the king of Samaria. The date at which Hosea flourished is given in the title, i. 1, by the reigning kings of Judah and Israel. He prophesied (i) in the days of Uzziah, Jotham, Ahaz and Hezekiah, kings of Judah; (2) in the days of Jeroboam the son of Joash, king of Israel. The dates indicated by the title, which may be regarded as editorial, are, for the four kings of the southern kingdom, 789-740, 739-734, 733-721 and 720-693 B.C. respectively; and, for Jeroboam II., 782-743 (cf. *Ency. Bib.* col. 797-798). The book itself, however, plainly belongs to the period prior to 734 B.C. since, in that year, (*a*) the Syro-Ephraimitic war began, to which there is here no reference, nor is Assyria yet the open foe it then became; (*b*) Gilead became Tiglath-Pileser's (2 Kings xv. 29), whereas it is here described as still part of the territory of Israel (vi. 8; xii. 11; cf. the included place-names of v. 1). On the other hand, the prophet connects with the birth of his eldest child the approaching fall of the house of Jehu (i. 4), thus anticipating the death of Jeroboam II. in 743, and the period of anarchy which followed (2 Kings xv.). Thus the prophetic work of Hosea may be dated, with practical certainty, as beginning from some point previous to 743 and extending not later than 734.[2] This is corroborated by the general character of the book. Of its two parts, i.-iii. reflects the wealth and prosperity of the reign of Jeroboam II., whilst iv.-xiv. contains frequent references to the social disorder and anarchy of the subsequent years.

The first part of Hosea's prophetic work, corresponding to chs. i.-iii., lay in the years of external prosperity immediately preceding the catastrophe of the house of Jehu in or near the year 743. The second part of the book is a summary of prophetic teaching during the subsequent troublous reign of Menahem, and, perhaps, that of his successor, Pekahiah, and must have been completed before 734 B.C. Apart from the narrative in chs. i.-iii., to which we shall presently recur, the book throws little or no light on the details of Hosea's life. It appears from ix. 7, 8, that his prophetic work was greatly embarrassed by opposition: "As for the prophet, a fowler's snare is in all his ways, and enmity in the house of his God." The enmity which had its centre in the sanctuary probably proceeded from the priests (comp. Amos vii.), against whose profligacy and profanation of their office our prophet frequently declaims—perhaps also from the degenerate prophetic gilds which had their seats in the holy cities of the northern kingdom, and with whom Hosea's elder contemporary Amos so indignantly refuses to be identified (Amos vii. 14). In ch. iv. 5 Hosea seems to comprise priests and prophets in one condemnation, thus placing himself in direct antagonism to all the leaders of the religious life of his nation. He is not less antagonistic to the kings and princes of his day (vii. 3-7, viii. 4, viii. 10 Septuagint, x. 7-15, xiii. 11).[3] In view of the familiarity shown with the intrigues of rulers and the doings of priests, it has been conjectured that Hosea held a prominent position, or even (by Duhm) that he was himself a priest (Marti, p. 2).

The most interesting problem of Hosea's history lies in the interpretation of the story of his married life (chs. i.-iii.). We read in these chapters that God's revelation to Hosea began when in accordance with a divine command he married a profligate wife, Gomer, the daughter of Diblaim. Three children were born in this marriage and received symbolical names, illustrative of the divine purpose towards Israel, which are expounded in ch. i. In ch. ii. the faithlessness of Israel to Jehovah (Yahweh), the long-suffering of God, the moral discipline of sorrow and tribulation by which He will yet bring back His erring people and betroth it to Himself for ever in righteousness, love and truth, are depicted under the figure of the relation of a husband to an erring spouse. The suggestion of this allegory lies in the prophet's marriage with Gomer, but the details are worked out quite independently, and under a rich multiplicity of figures derived from other sources. In the third chapter we return to the personal experience of the prophet. His faithless wife had at length left him and fallen, under circumstances which are not detailed, into a state of misery, from which Hosea, still following her with tender affection, and encouraged by a divine command, brought her back and restored her to his house, where he kept her in seclusion, and patiently watched over her for many days, yet not readmitting her to the privileges of a wife.

In these experiences the prophet again recognizes a parallel to Yahweh's long-suffering love to Israel, and the discipline by which the people shall be brought back to God through a period in which all their political and religious institutions are overthrown. Throughout these chapters personal narrative and prophetic allegory are interwoven with a rapidity of transition very puzzling to the modern reader; but an unbiassed exegesis can hardly fail to acknowledge that chs. i. and iii. narrate an actual passage in the prophet's life. The names of the three children are symbolical, but Isaiah in like manner gave symbolical names to his sons, embodying prominent points in his 785
prophetic teaching (Shear-jashub, Isa. vii. 3, comp. x. 21; Maher-shalal-hash-baz, viii. 3). And the name of Gomer bath Diblaim is certainly that of an actual person, upon which all the allegorists, from the Targum, Jerome and Ephraem Syrus downwards, have spent their arts in vain, whereas the true symbolical names in the book are perfectly easy of interpretation.[4] That the ancient interpreters take the whole narrative as a mere parable is no more than an application of their standing rule that everything in the Biblical history is allegorical which in its literal sense appears offensive to propriety (comp. Jerome's proem to the book). But the supposed offence to propriety seems to rest on mistaken exegesis and too narrow a conception of the way in which the Divine word was communicated to the prophets.[5] There is no reason to suppose that Hosea knowingly married a woman of profligate character. The point of the allegory in i. 2 is plainly infidelity after marriage as a parallel to Israel's departure from the covenant God, and a profligate wife (אשת זנונים) is not the same thing with an open prostitute (זונה). The marriage was marred by Gomer's infidelity; and the struggle of Hosea's affection for his wife with this great unhappiness—a struggle inconceivable unless his first love had been pure and full of trust in the purity of its object—furnished him with a new insight into Yahweh's dealings with Israel. Then he recognized that the great calamity of his life was God's own ordinance and appointed means to communicate to him a deep prophetic lesson. The recognition of a divine command after the fact has its parallel, as Wellhausen observes, in Jer. xxxii. 8.

It was in the experiences of his married life, and in the spiritual lessons opened to him through these, that Hosea first heard the revealing voice of Yahweh (i. 2).[6] Like Amos (Amos iii. 8), he was called to speak for God by an inward constraining voice, and there is no reason to think that he had any connexion with the recognized prophetic societies, or ever received such outward adoption to office as was given to Elisha. His position in Israel was one of tragic isolation. Amos, when he had discharged his mission at Bethel, could return to his home and to his friends; Hosea was a stranger among his own people, and his home was full of sorrow and shame. Isaiah in the gloomiest days of Judah's declensions had faithful disciples about him, and knew that there was a believing remnant in the land. Hosea knows no such remnant, and there is not a line in his prophecy from which we can conclude that his words ever found an obedient ear.

As already stated, this prophecy falls into two clearly distinguished sections,[7] the former (i.-iii.), already dealt with, accounting for the general standpoint of the latter (iv.-xiv.). It is not possible to make any convincing subdivisions of this latter section (cf. G. A. Smith, i. p. 223) which is best regarded as a series of separate discourses on certain recurrent topics, viz. (*a*) the cultus, (*b*) the social disorder and immorality, (*c*) political tendencies (alliance with either Assyria or Egypt sought).[8] In regard to each of these topics, the attitude of the prophet involves the discernment of present guilt, and the assertion of future punishment. For him the present condition of the people contained no germ or pledge of future amendment, and he describes the impending judgment, not as a sifting process (Amos ix. 9, 10) in which the wicked perish and the righteous remain, but as the total wreck of the nation which has wholly turned aside from its God. In truth, while the idolatrous feasts of Ephraim still ran their joyous round, while the careless people crowded to the high places, and there in unbridled and licentious mirth flattered themselves that their many sacrifices ensured the help of their God against all calamity, the nation was already in the last stage of internal dissolution. To the prophet's eye there was "no truth, nor mercy, nor knowledge of God in the land—nought but swearing, and lying, and killing, and stealing and adultery; they break out, and blood toucheth blood" (iv. 1, 2). The root of this corruption lay in total ignorance of Yahweh, whose precepts were no longer taught by the priests, while in the national calf-worship, and in the local high places, this worship was confounded with the service of the Canaanite Baalim. Thus the whole religious constitution of Israel was undermined. And the political state of the realm was in Hosea's eyes not more hopeful. The dynasty of Jehu, still great and powerful when the prophet's labours began, is itself an incorporation of national sin. Founded on the bloodshed of Jezreel, it must fall by God's vengeance, and the state shall fall with it (i. 4, iii. 4). This sentence stands at the head of Hosea's predictions, and throughout the book the civil constitution of Ephraim is represented as equally lawless and godless with the corrupt religious establishment. The anarchy that followed on the murder of Zachariah appears to the prophet as the natural decadence of a realm not founded on divine ordinance. The nation had rejected Yahweh, the only helper. And now the avenging Assyrian[9] is at hand. Samaria's king shall pass away as foam on the water. Fortress and city shall fall before the ruthless invader, who spares neither age nor sex, and thistles shall cover the desolate altars of Ephraim.

In our present book of Hosea, this condemnatory judgment on contemporary Israel culminates in a chapter of appeal for penitence, with promise of divine forgiveness. The question of the authenticity of this and of other "restoration" passages[10] forms the chief problem for literary 786

criticism presented by the book.[11] Amongst the more recent commentators, Davidson, G. A. Smith and Nowack regard Hosea xiv. as written by the prophet, though the second admits its chronological misplacement and the third its later expansion. On the other hand, it is altogether rejected by Cheyne, Wellhausen, Marti and Harper. These claim that the passage reflects the later standpoint of completed punishment, and is therefore inconsistent in the prophet who anticipates that punishment. But the case is different from that of the epilogue to Amos, since Hosea's personal experience covers forgiveness as well as discipline (Marti consistently, though without ground, rejects this experience also). There seems, therefore, to be no sufficient evidence for denying thoughts of restoration to Hosea, whilst it is highly probable that such passages would be amplified in a later age. Indeed, the importance of these passages for the interpretation of Hosea is apt to be overrated, for, as one of those rejecting them remarks, though Hosea "promised nothing," yet he "contributed a conception of Yahweh which made such a future not only possible but even probable" (Harper, p. cliii.). We may therefore read the closing chapter as, at least, the explicit statement of a hope implicit in Hosea's teaching.

Hosea could discern no faithful remnant in Ephraim, yet Ephraim in all his corruption is the son of Yahweh, a child nurtured with tender love, a chosen people, whose past history declares in every episode the watchful and patient affection of his father. And that father is God and not man, the Holy One who will not and cannot sacrifice His love even to the justest indignation (chap. xi.). To the prophet who knows this love of Yahweh, who has learned to understand it in the like experience of his own life, the very ruin of the state of Israel is a step in the loving guidance which makes the valley of trouble a door of hope (ii. 15), and the wilderness of tribulation as full of promise as the desert road from Egypt to Canaan was to Israel of old. Of the manner of Israel's repentance and conversion Hosea presents no clear image—nay, it is plain that on this point he had nothing to tell. The certainty that the people will at length return and seek Yahweh their God rests, not on any germ of better things in Israel, but on the invincible supremacy of Yahweh's love. And so the two sides of his prophetic declaration, the passionate denunciation of Israel's sin and folly, and the not less passionate tenderness with which he describes the final victory of divine love, are united by no logical bond. The unity is one of feeling only, and the sob of anguish in which many of his appeals to a heedless people seem to end turns once and again with sudden revulsion into the clear accents of evangelical promise, which in the closing chapter swell forth in pure and strong cadence out of a heart that has found its rest with God from all the troubles of a stormy life.

The strongly emotional temperament of Hosea suggests comparison with that of Jeremiah, who like himself is the prophet of the decline and fall of a kingdom. The subsequent influence of Hosea on the literature of the Old and New Testaments is very marked. Not only is it seen in the conception of the relation between God and His people as a marriage, which he makes current coin (cf. Marti, p. 15), but still more in the fact that his conception of the divine character becomes the inspiration of the book of Deuteronomy and so of the whole canon of Scripture. "In a special degree, the author of Deuteronomy is the spiritual heir of Hosea."[12]

Recent Literature (where references to older works will be found): Cheyne, "Hosea" in *Cambridge Bible* (1884); W. R. Smith, *The Prophets of Israel*,[2] with Cheyne's introduction (1895); G. A. Smith, "The Book of the Twelve," i., in *The Expositor's Bible* (1896); Nowack, *Die Kleinen Propheten* (1897); Wellhausen, *Die Kleinen Propheten*[3] (1898); Smend, *Alttest. Religionsgeschichte*,[2] pp. 204 f. (1899); Davidson, art. "Hosea" in Hastings' *Dictionary of the Bible*, ii. pp. 419 f. (1900); Marti, art. "Hosea" in *Ency. Biblica*, ii. c. 2119 (1901) (a revision of the original article by W. R. Smith, in the *Ency. Britannica*, partially reproduced above); Marti, *Dodekapropheton* (1903); W. R. Harper, "Amos and Hosea" in *Inter. Critical Commentary* (1905) (with copious bibliography).

(W. R. S.; H. W. R.*)

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1 *Traditions about Hosea.*—Beērī, the prophet's father, is identified by the Rabbins with Beērah (1 Chron. v. 6), a Reubenite prince carried captive by Tiglath-Pileser. This view is already expressed by Jerome, *Quaest. in Paralip.*, and doubtless underlies the statement of the Targum to Chronicles that Beērah was a prophet. For it is a Jewish maxim that when a prophet's father is named, he, too, was a prophet, and accordingly a tradition of R. Simon makes Isa. viii. 19, 20 a prophecy of Beērī (Ḳimchi in loc.; *Leviticus Rabba*, par. 15). According to the usual Christian tradition, however, Hosea was of the tribe of Issachar, and from an unknown town, Belemoth or Belemon (pseudo-Epiphanius, pseudo-Dorotheus, Ephraem Syr. ii. 234; *Chron. Pasch.*, Bonn ed., i. 276). As the tradition adds that he died there, and was buried in peace, the source of the story lies probably in some holy place shown as his grave. There are other traditions as to the burial-place of Hosea. A Jewish legend in the *Shalshelet haqqabala* (Carpzov, *Introd.*, pt. iii. ch. vii. § 3) tells that he died in captivity at Babylon, and was carried to Upper Galilee, and buried at צפת, that is, Safed (Neubauer, Géog. *du Talmud*, p. 227); and the Arabs show the grave of Nebi 'Osha, east of the Jordan, near Es-Salt (Baedeker's *Palestine*, p. 337; Burckhardt's *Syria*, p. 353).

2 The supposed reference of viii. 9-10 to the tribute paid by Menahem to Tiglath-Pileser (2 Kings xv. 19), and dated, on the monuments, 738 B.C., depends on a corrupt text: read v. 10 with Septuagint.

3 Some scholars hold that his attack is directed against the very principle of monarchy (Nowack, p. 8; Smend, p. 209: "Hosea rejects the kingship in itself"; Wellhausen, p. 125: "The making of kings in Israel is for him, together with the heathen cultus, the fundamental evil"). This view depends on a disputed interpretation of the reference to Gibeah (x. 9; cf. ix. 9); and on the words: "I give thee kings in mine anger, and I take them away in my wrath" (xiii. 11), which may refer to the rise and fall of contemporary

kings (cf. Marti, ad loc). In any case, as Wellhausen himself says (p. 132): “He does not start from a dogmatic theory, but simply from historical experience.”

4 Theodorus Mops. remarks very justly, καὶ τὸ ὄνομα καὶ τὸν πατέρα λέγει, ὡς μὴ πλάσμα ψιλόν τι δοκοίη τὸ λεγόμενον, ἱστορία δὲ ἀληθὴς τῶν πραγμάτων.

5 This explanation of the narrative, which is essentially Ewald’s, is now generally accepted. It has the great advantage of supplying a psychological key to the conception of Israel or the land of Israel (i. 2) as the spouse of Yahweh, which dominates these chapters, but in the later part of the book gives way to the personification of the nation as God’s son. This conception has, indeed, formal points of contact with notions previously current, and even with the ideas of Semitic heathenism. On the one hand, it is a standing Hebrew usage to represent the land as mother of its people, while the representation of worshippers as children of their god is found in Num. xxi. 29, where the Moabites are called children of Chemosh, and is early and widespread throughout the Semitic field (cf. *Trans. Bib. Arch.* vi. 438; *Jour. of Phil.* ix. 82). The combination of these two notions gives at once the conception of the national deity as husband of the land. On the other hand, the designation of Yahweh as Baal, which, in accordance with the antique view of marriage, means husband as well as lord and owner, was current among the Israelites in early times, perhaps, indeed, down to Hosea’s age (ii. 16). Now it is highly probable that among the idolatrous Israelites the idea of a marriage between the deity and individual worshippers was actually current and connected with the immorality which Hosea often condemns in the worship of the local Baalim whom the ignorant people identified with Yahweh. For we have a Punic woman’s name, ארשתבעל, “the betrothed of Baal” (Euting, Punische Steine, pp. 9, 15), and a similar conception existed among the Babylonians (Herod. i. 181, 182). But Hosea takes the idea of Yahweh as husband, and gives it an altogether different turn, filling it with a new and profound meaning, based on the psychical experiences of a deep human affection in contest with outraged honour and the wilful self-degradation of a spouse. It can hardly be supposed that all that lies in these chapters is an abstract study in the psychology of the emotions. It is actual human experience that gives Hosea the key to divine truth.

6 Davidson (*D.B.* ii. 422) remarks that “it was not his misfortunes that gave Hosea his prophetic word. Israel’s apostasy was plain to him, and he foreshadowed her doom in Jezreel, the name of his first child, before any misfortunes overtook him. At most, his misfortunes may at a later time have given a complexion to his prophetic thoughts.” Wellhausen (p. 108) objects to the emergence of the call from the experience, on the ground that the name given to the first child gives no indication that Hosea had yet reached his specific message, the infidelity of his wife and of Israel, though it shows him already as a prophet. Marti (p. 15) agrees with Davidson in making the order (*a*) call, (*b*) marriage and birth of three children, (*c*) comprehension of the significance of the marriage for himself and for Israel. The statement made above must be interpreted of Hosea’s *specific* message from Yahweh, as recorded in his book.

7 Marti disregards this generally accepted division, arguing that (*a*) i.-iii. was not written earlier than iv.-xiv., (*b*) iii. is not Hoseanic, (*c*) ii. is much more akin to iv.-xiv. than to i.-iii. (*Comm.* p. 1; cf. *Enc. Bib.* 2123 n.[3]). He holds that another wife, not Gomer, is intended in iii., which is an allegory referring to Israel, as Gomer referred to Judah. His arguments are not convincing.

8 So, practically, Davidson, *D.B.* ii. p. 423 seq., where the detailed references will be found.

9 This is too definite for the data; cf. Davidson, *l.c.* “Hosea has no clear idea of the instrument or means of Israel’s destruction. It is ‘the sword’ (vii. 16, xi. 6), the ‘enemy’ (viii. 3, v. 8-9); or it is natural, internal decay (vii. 8-9, ix. 16), the moth and rottenness (v. 12).”

10 *e.g.* i. 10-ii. 1, ii. 14 f., iii. 5, v. 15-vi. 3, xi. 10-11.

11 Apart from glosses and minor alterations, the only other critical problem of importance is that of the references to *Judah* scattered throughout the book (i. 7, iv. 15, v. 5, v. 10 f., vi. 4, 11, viii. 14, x. 11, xi. 12). There is no inherent improbability in some mention of the sister kingdom; but some of the actual references do suggest interpolation, especially i. 7, where the deliverance of Judah from Sennacherib in 701 B.C. seems intended. Each case, as Wellhausen implies, is to be considered on its merits. On these and other suspected passages, cf. Cheyne, Intro. to W. R. Smith’s *Prophets of Israel*, pp. xvii.-xxii.; Marti, p. 8; Harper, p. clix.

12 Driver, *Deuteronomy*, p. xxvii.

HOSE-PIPE, or simply “hose,” the name given to flexible piping by means of which water may be conveyed from one place to another. One end of the pipe is connected to the source of the water, while the other end is free, so that the direction of the stream of water which issues from the pipe may be changed at will. The method of manufacture and the strength of the materials used depend naturally upon the particular use to which the finished article is to be put. Simple garden hose is often made of india-rubber or composition, but the hose intended for fire brigade and similar important purposes must be of a much more substantial material. The most satisfactory material is the best long flax, although cotton is also extensively used for many types of this fabric.

The flax fibre, after having been carefully spun into yarn, is boiled twice and then beetled; these two processes remove all injurious matter, and make the yarn soft and lustrous. The yarn is then wound on to large bobbins, and made into a chain; the number of threads in the chain depends upon the size of the hose, which may be anything from half an inch to 15 in. or even more in

diameter. When the chain is warped, it is beamed upon the weaver's beam, and the ends—either double or triple—are drawn through the leaves of the cambs of heddles, passed through the reed and finally tied to the cloth beam. The preparation of the warp for any kind of loom varies very little, but the weaving may vary greatly. In all cases the hose fabric is essentially circular, although it appears quite flat during the weaving operation.

There are very few hand-made fabrics which can compete with the machine-made article, but the very best type of hose-pipe is certainly one of the former class. The cloth can be made much more cheaply in the power-loom than in the hand-loom, but, up to the present, no power-loom has been made which can weave as substantial a cloth as the hand-loom product; the weak part in all hose-pipes is where the weft passes round the sides from top to bottom of the fabric or vice versa, that is, the side corresponding to the selvages in an ordinary cloth; the hand-loom weaver can draw the weft tighter than is possible in the power-loom, hence the threads at the sides can be brought close together, and by this means the fabric is made almost, but not quite, as perfect here as in other parts. It is essential that the warp threads be held tightly in the loom, and to secure this, they pass alternately over and under three or four back rests before reaching the heddles or cambs, which are almost invariably made of wire. Although the warp yarn is made very soft and pliable by boiling and beetling, the weaver always tallows it in order to make it work more easily.

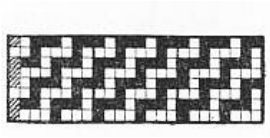


FIG. 1.

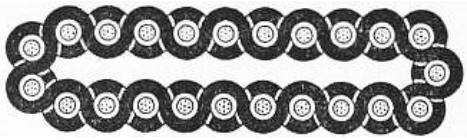


FIG. 2.

FIG. 3.—Section through the Warp.

The commonest type of hose-pipe is made on the double-plain principle of weaving, the cloth being perfectly plain but woven in such a manner that the pipe is without seams of any kind. Fig. 1 is a design showing two repeats or eight shots in the way of the weft, and six repeats or twenty-four-threads in the way of the warp, consequently the weave is complete on four threads, or leaves, and four picks. Fig. 2 illustrates the method of interlacing the threads and the picks: this figure shows that twenty-three threads only are used, the first thread—shown shaded in fig. 1—having been left out. It is necessary to use a number of threads which is either one less or one more than some multiple of four—the number of threads in the unit weave. The sectional view (fig. 2), although indicating the crossings of the warp and the weft, is quite different from an actual section through the threads: the warp is almost invariably two or three ply, and in addition two or more of these twisted threads pass through the same heddle-eye in the camb; moreover, they are set very closely together—so closely, indeed, that the threads entirely conceal the weft; it is, therefore, impossible to give a correct sectional view with satisfactory clearness, as the threads are so very rank, but fig. 3 gives some idea of the structure of the fabric. This view shows ninety-nine threads and one complete round of weft; this round is, of course, equal to two picks or shots—one pick for the top part of the cloth and one for the bottom part. A comparison of this figure with fig. 2 will, perhaps, make the description clearer. The weft in fig. 3 is thinner than the warp, but, in practice, it is always much thicker, and may consist of from two to seventy threads twisted together.

Hose-pipes are also woven with the three-leaf twill on both sides, and occasionally with the four-leaf twill. These pipes, woven with the twill weaves, are usually lined with a pure rubber tube which is fixed to the inside of the cloth by another layer of rubber after the cloth leaves the loom. Such pipes have usually, but not invariably, a smoother inner surface than those which are unlined, hence, when they are used, less friction is presented to the flow of water, and there is less tendency for the pipe to leak. They are, therefore, suitable for hotels, public buildings and similar places where their temporary use will not result in undue damage to articles of furniture, carpets and general decoration.

The greatest care must be observed in the weaving of these fabrics, the slightest flaw in the structure rendering the article practically useless. After the cloth has been woven, it is carefully examined, and then steeped in a chemical solution which acts as an antiseptic. The cloth is thus effectively preserved from mildew, and is, in addition, made more pliable. Finally the hose-pipe is dried artificially, and then fitted with the necessary couplings and nozzles.

For a more detailed description of circular weaving see Woodhouse and Milne, *Textile Design: Pure and Applied*.

(T. WO.)

HOSHANGABAD, a town and district of British India, in the Nerbudda division of the Central Provinces. The town stands on the left bank of the Nerbudda, 1009 ft. above the sea, and has a railway station. Pop. (1901), 14,940. It is supposed to have been founded by Hoshang Shah, the second of the Ghori kings of Malwa, in the 15th century; but it remained an insignificant place till the Bhopal conquest about 1720, when a massive stone fort was constructed, with its base on the river, commanding the Bhopal road. It sustained several sieges during the 18th century, and passed alternately into the hands of the Bhopal and Nagpur rulers. Since 1818 it has been the residence of the chief British officials in charge of the district. It has a government high school, and agricultural school and a brass-working industry.

The DISTRICT OF HOSHANGABAD has an area of 3676 sq. m. Pop. (1901), 449,165, showing a decrease of 10% in the decade, due to famine. It may be described as a valley of varying breadth, extending for 150 m. between the Nerbudda river and the Satpura mountains. The soil consists chiefly of black basaltic alluvium, often more than 20 ft. deep; but along the banks of the Nerbudda the fertility of the land compensates for the tameness of the scenery. Towards the west, low stony hills and broken ridges cut up the level ground, while the Vindhyas and the Satpuras throw out jutting spurs and ranges. In this wilder country considerable regions are covered with jungle. On the south the lofty range which shuts in the valley is remarkable in mountain scenery, surpassing in its picturesque irregularity the Vindhyan chain in the north. Many streams take their rise amid its precipices, then, winding through deep glens, flow across the plain between sandy banks covered with low jungle till they swell the waters of the Nerbudda. None is of any importance except the Tawa, which is interesting to the geologist on account of the many minerals to be found along its course. The boundary rivers, the Nerbudda and Tapti, are the only considerable waters in Hoshangabad. The principal crops are wheat, millets and oil-seeds. The district is traversed throughout its length by the Great Indian Peninsula railway.

HOSHEA (Heb. for "deliverance"), the last king of Israel, in the Bible. The attempt of his predecessor Pekah to take Jerusalem with the help of his ally Rasun (Rezin) of Damascus was frustrated by the intervention of Tiglath-Pileser IV. (see AHAZ), who attacked Gilead, Galilee and the north frontier, and carried off some of its population (cp. 1 Chron. v. 26). Pekah's resistance to Assyria led to a conspiracy in which he lost his life, and Hoshea the son of Elah became king (2 Kings xv. 27-30). The Assyrian king held him as his vassal (and indeed claims to have set him on the throne), and exacted from him a yearly tribute. Meanwhile, Damascus was besieged (733-732 B.C.), Raṣun was slain and the inhabitants deported (2 Kings xvi. 9; LXX. omits "to Kir," but see Amos i. 5). The impending fate of Damascus is illustrated by Isaiah (vii. 16, viii. 4, xvii. 1-11), who also gives a vivid description of the impression left by the Assyrian army (v. 26-30). After the death of Tiglath-Pileser, Israel regained confidence (Isa. ix. 8-x. 4) and took steps to recover its independence. Its policy vacillated—"like a silly dove" (Hos. vii. 11), and at length negotiations were opened with Mizraim. The annual payment of tribute ceased and Shalmaneser IV. (who began to reign in 727 B.C.) at once laid siege to Samaria, which fell at the end of three years (722-721 B.C.). The achievement is claimed by his successor Sargon. Hoshea was killed, the land was again partly depopulated and a governor appointed (2 Kings xviii. 9-12; cp. xvii. 1 sqq.). For other allusions to this period see HOSEA, ISAIAH.

2 Kings xvii. 3 and 5 imply *two* attacks by Shalmaneser: in the first of which Hoshea was imprisoned and perhaps blinded (Cheyne, emending, "shut him up" in *v.* 4), although in v. 6 he is still reigning; see on this Winckler, *Keilinschr. u. Alte Test.*[3] p. 268; Burney, *Kings*, p. 328 seq.; Skinner, *Kings*, p. 372 seq. The chronological notes, moreover, are extremely confused; contrast xv. 30 with xvii. 1. The usual identification of So (or Seve), king of Mizraim, with Shabaka of Egypt is difficult, partly on chronological grounds (which Petrie, *History of Egypt*, pp. 277, 281 sqq. does not remove), and partly because the Ethiopian dominion in Egypt appears to be still weak and divided. The Assyrian records name a certain Sibi as *officer*, and also Piru (Pharaoh!) as *king* of Musri, and it is doubtful whether Hoshea's ally was a petty prince of Egypt or of a N. Arabian district (see MIZRAIM). If the latter, Hoshea's policy becomes more intelligible; see Whitehouse, *Isaiah*, p. 17 seq.; JEWS: *History*; PHILISTINES. On the depopulation of Samaria and the introduction of colonists, see Winckler's objections, *Alttest. Untersuch.* pp. 95-107, with Burney's criticisms, *Kings*, p. 334 seq.

(S. A. C.)

HOSHIARPUR, a town of British India, in the Jullundur division of the Punjab. Pop. (1901), 17,549. It was founded, according to tradition, about the early part of the 14th century. In 1809 it

was occupied by Ranjit Singh. The maharaja and his successors maintained a considerable cantonment 1 m. S.E. of the town, and the British government kept it up for several years after the annexation of the Punjab in 1849. There are manufactures of cotton goods, inlaid woodwork, lacquered ware, shoes and copper vessels.

The District of Hoshiarpur comprises an area of 2244 sq. m.; pop. (1901) 989,782, showing a decrease of 2% in the decade, compared with an increase of 12% during the previous decade. It falls into two nearly equal portions of hill and plain country. Its eastern face consists of the westward slope of the Solar Singhi Hills; parallel with that ridge, a line of lower heights belonging to the Siwalik range traverses the district from south to north, while between the two chains stretches a valley of uneven width, known as the Jaswan Dun. Its upper portion is crossed by the Sohan torrent, while the Sutlej sweeps into its lower end through a break in the hills, and flows in a southerly direction till it turns the flank of the central range, and debouches westwards upon the plains. This western plain consists of alluvial formation, with a general westerly slope owing to the deposit of silt from the mountain torrents in the sub-montane tract. The Beas has a fringe of lowland, open to moderate but not excessive inundations, and considered very fertile. A considerable area is covered by government woodlands, under the care of the forest department. Rice is largely grown, in the marshy flats along the banks of the Beas. Several religious fairs are held, at Anandpur, Mukerian and Chintpurni, all of which attract an enormous concourse of people. The district, owing to its proximity to the hills, possesses a comparatively cool and humid climate. Cotton fabrics are manufactured, and sugar, rice and other grains, tobacco and indigo are among the exports.

The country around Hoshiarpur formed part of the old Hindu kingdom of Katoch In Jullundur. 788
The state was eventually broken up, and the present district was divided between the rajas of Ditarpur and Jaswan. They retained undisturbed possession of their territories until 1759, when the rising Sikh chieftains commenced a series of encroachments upon the hill tracts. In 1815 the aggressive maharaja, Ranjit Singh, forced the ruler of Jaswan to resign his territories in exchange for an estate on feudal tenure; three years later the raja of Ditarpur met with similar treatment. By the close of the year 1818 the whole country from the Sutlej to the Beas had come under the government of Lahore, and after the first Sikh war in 1846 passed to the British government. The deposed rajas of Ditarpur and Jaswan received cash pensions from the new rulers, but expressed bitter disappointment at not being restored to their former sovereign position. Accordingly the outbreak of the second Sikh war, in 1848 found the disaffected chieftains ready for rebellion. They organized a revolt, but the two rajas and the other ringleaders were captured, and their estates confiscated.

HOSIERY, a term used to designate all manufactured textile fabrics which in their process of manufacture have been built on the principle of looping or loop structure. The origin of the term is obvious, being derived from “hose” or stocking, this being one of the earliest garments made by the process of knitting (*q.v.*). While it still forms one of the staples of the trade, it is only one of a very numerous and diversified range of applications of the entire industry. The elastic structure of knitting makes it very adaptable for all kinds of body or underwear. There is scarcely a single textile article manufactured but can be reproduced on the knitting or loop structure principle. The art of knitting is of very modern origin as compared with that of weaving. No certain allusion to the art occurs before the beginning of the 15th century. In an act of parliament of Henry VII. (1488) knitted woollen caps are mentioned. It is supposed that the art was first practised in Scotland, and thence carried into England, and that caps were made by knitting for some period before the more difficult feat of stocking-making was attempted. In an act of Edward VI. (1553) “knitte hose, knitte peticotes, knitte gloves and knitte sleeves” are enumerated, and the trade of hosiers, among others, included in an act dated 1563. Spanish silk stockings were worn on rare occasions by Henry VIII., and the same much-prized articles are also mentioned in connexion with the wardrobe of Edward VI.

Knitting, or loop formation by mechanical means, is divided into two distinct principles—frame-work knitting and warp knitting. Both principles may be employed in the formation of a large variety of plain and fancy stitches or a combination of the two.

Frame-work Knitting in its simplest form consists of rows of loops supporting each other—built from one continuous thread of yarn and running from one side of the fabric to the other and back (fig. 1). It is on this principle of stitch that the greatest amount of hosiery is built (hose, shirts, pants).

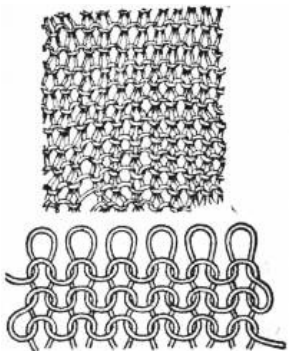


FIG. 1.—The Stitch or Loop Structure of Plain Knitting (back of fabric).

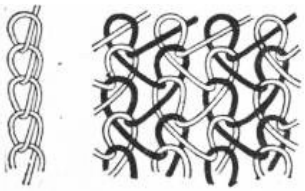


FIG. 2.—A Single Thread formed into a Chain of Crocket Work, showing the Loop Structure of the plain Warp-knitted Fabric. It is built up as shown in the diagram by a number of threads running up the fabric.

Warp Knitting in its simplest form consists of rows of loops, but the number of threads employed are equal to the number of loops in the width of the fabric. Thus it will be seen that the threads run lengthwise of the fabric (fig. 2). This principle gives greater scope for reproducing designs in openwork and colour than that of frame-work knitting. For this reason it is largely used in the shawl, glove and fancy hosiery industries.

Machinery.—In hand knitting the implements employed (a few needles or wires) are very simple and inexpensive. In the manufacturing industry the most complex and ingenious machinery is used. In 1589 the Rev. William Lee, a graduate of St John's College, Cambridge, while acting as curate (or vicar) of Calverton, Nottinghamshire, introduced his stocking-frame. This machine was the first mechanical means employed to produce a looped or knitted fabric. This frame or machine of Lee's was the origin of all the hosiery and lace machines at present in use. One of the most remarkable points about his invention was its completeness and adaptability for the work for which its inventor intended it. The main principles of Lee's frame are embodied in most of the rotary or power frames of the present day. Fig. 3 shows a hand frame of the present day.

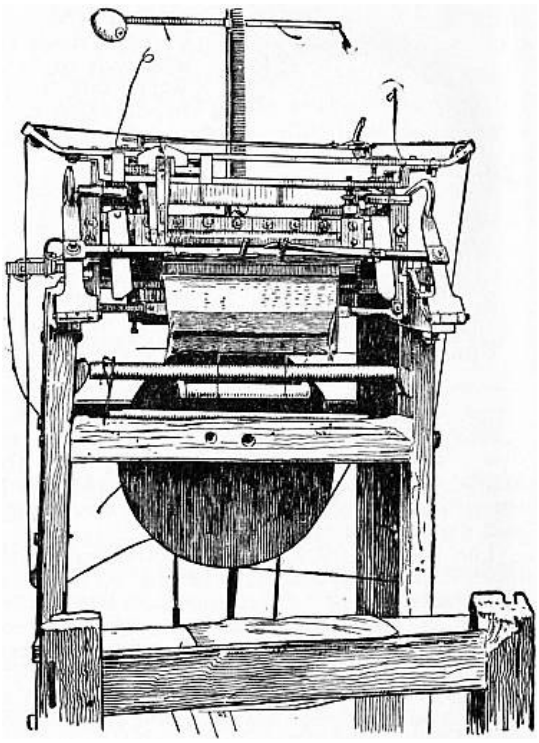


FIG. 3.—Hand Stocking Frame.

In hand knitting an indefinite number of loops are skewered on a wire or pin, but, in Lee's frame, an individual hooked or bearded needle is employed for the support and formation of each loop in the breadth of the fabric. This needle consists of a shank with a terminal spring-pointed hook (or beard), the point of which can be pressed at will into a groove or eye in the shank. For method by which the loops are formed on the needles of the frame see fig. 4. This shows a few of Lee's hooked or bearded needles having the old loops or work hanging round the needle shanks. The thread of yarn which is to form the new row of loops is laid over the needle shanks and waved or looped between each pair of needles. This waving or looping ensures sufficient yarn being drawn and loops of a uniform size being made, so that a regular and level fabric will be produced. The looping or waving is obtained by having thin plates of shaped metal, called sinkers, which have a nose-shaped point and hang between the needles. When looping they have an individual movement downwards between the needles, and as they fall the nose-shaped point carries the yarn down, thus forming the new loop (fig. 5). The size of the loop is regulated by the distance the sinker

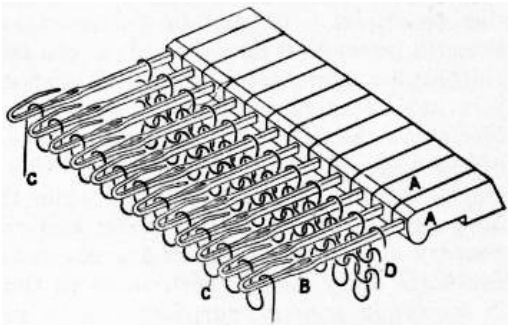


FIG. 4.

A, The leads into which the needles (B) are cast.
D, The old loops or work.
C, The new loops formed and brought under the beards.

is allowed to fall. After the thread of yarn has been looped between the needle shanks by the sinkers, the loops are brought forward under the needle beards or hooks. A presser bar is now brought down to close or press all the points of the needle beards into the eye in the shank. Thus all the hook ends of the needles are temporarily closed, with the newly formed loops under them. While in this position, the old loops hanging round the shank are brought forward and landed on to the top of the needle beard and off the needle altogether, being thus left hanging round, or supported by the loops newly formed. The needle beards are now released, and the loops drawn back along the shanks to be in position for next new course of loops. The foregoing is only an outline of how the loops are formed on the needles. It is not necessary here to enter into a description of the complex mechanical movements of Lee's stocking-frame. The first fabric made by Lee was of a flat, even-selvedged nature, so that garments had to be cut to shape from the fabric. He soon learned to fashion or shape the garment at will, during the process of making, by transferring loops at the edges, inwards to narrow, or outwards to widen. This process at the present day is known as fashioning, and all garments of the best make are shaped or fashioned in this manner. After Lee had practised his new art for a few years at Calverton he removed to London, but on his receiving no help or encouragement from Queen Elizabeth or her successor, King James, he was induced to cross over to France with his frames. There he built up a flourishing industry at Rouen, under the patronage of the French king, Henry IV. Through the murder of this monarch he lost his patronage and died of want about the year 1610. He was buried in an unknown grave in Paris.

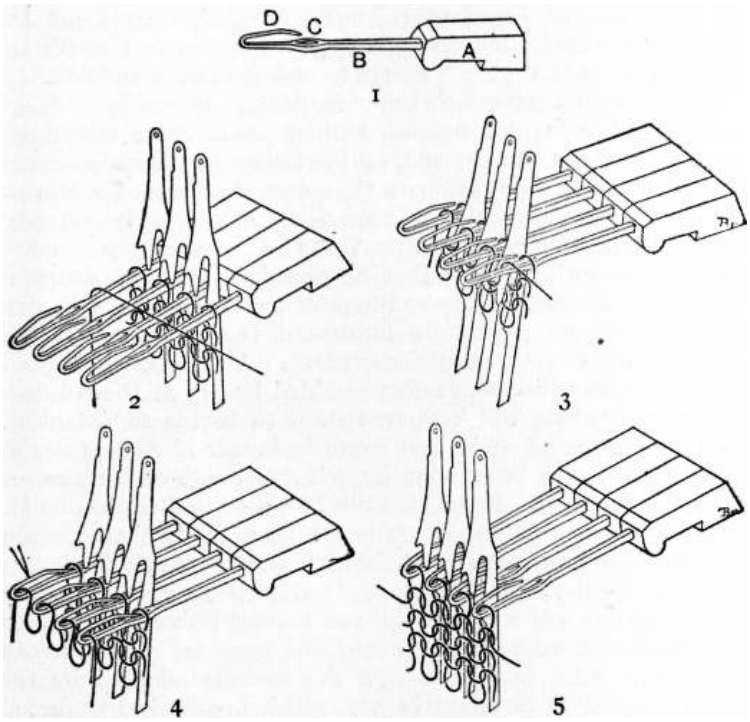


FIG. 5.—Formation of a Loop on a Hand Frame.

1, Bearded needle cast in the lead. A, Lead; B, Shank; C, Eye; D, Beard.
2, The thread is laid over the needles and formed into loops between the needles by means of the sinkers, those new-formed loops being brought under the needle beards (as at 3).
4, The beards pressed or closed to allow the old loops to be passed on to the top.
5, The old loops knocked off the needles and left hanging round the newly formed loops.

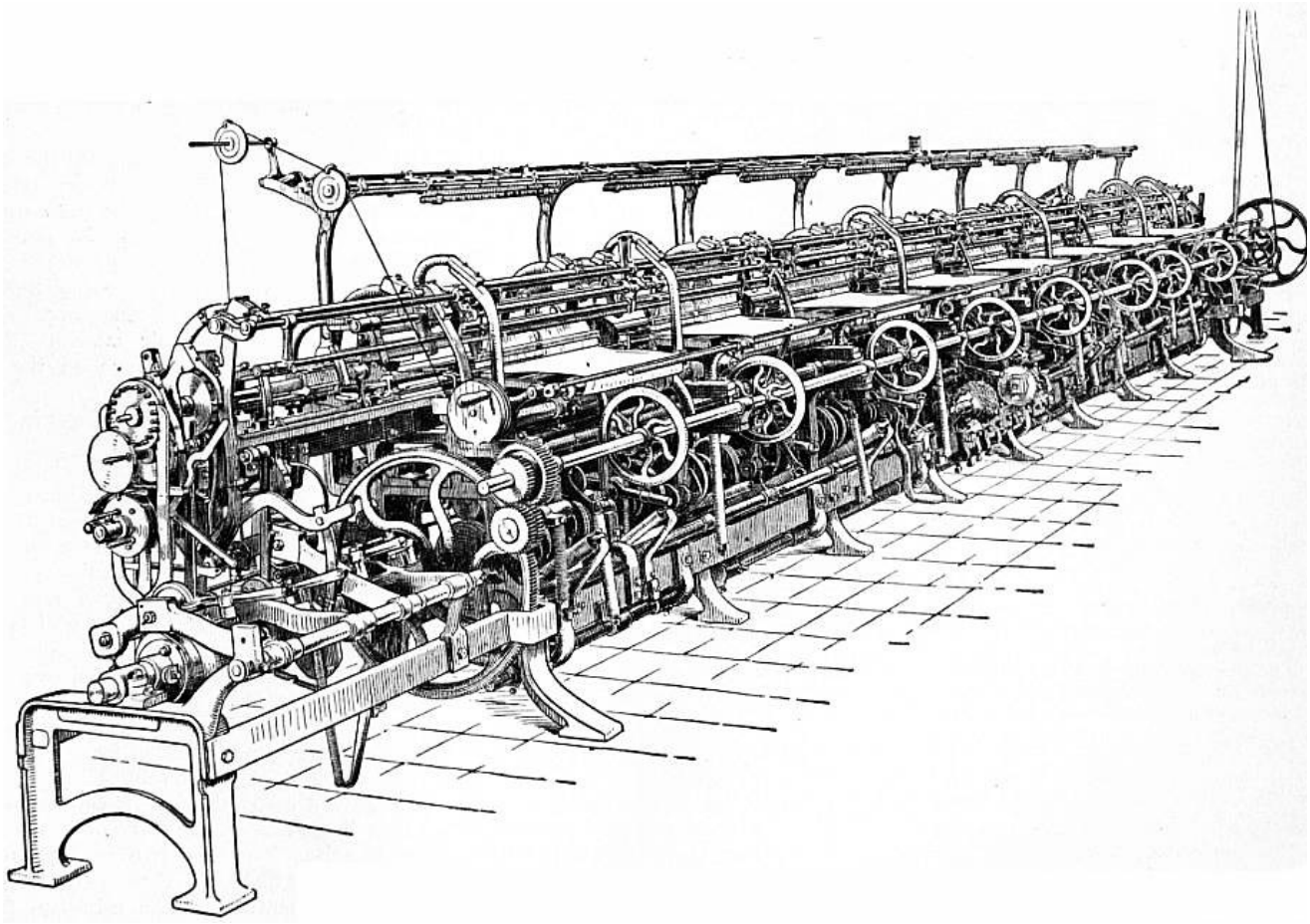


FIG. 7.—Eight at once, 130 gauge, full-fashioned, seamless bosom, sloped shoulder underwear frame, Cotton's patents. (William Cotton, Ltd., Loughborough.)

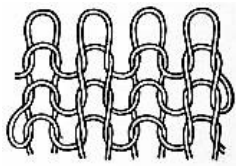


FIG. 6.—A 1/1 Rib Stitch.

A number of improvements had been made on Lee's frame during the 18th century. The one of greatest importance was the rib machine invented by Jedediah Strutt of Belper in 1758. It was not what could be actually termed an improvement on Lee's frame, but an addition to it. Lee's frame was not altered in any way, Strutt's machine being added to it, and the two being worked in conjunction produced a fabric of a more elastic nature and alike on both sides (fig. 6). Strutt's machine consisted of a set of needles placed at right angles to and between Lee's plain needles, with the result that, when knitting, the frame needles drew their loops to one side and the machine needles their loops to the opposite side of the fabric. The first offshoot from frame-work knitting was the invention of the hand warp loom in 1775. It was improved by the addition of the Dawson wheel by William Dawson in 1791. This machine is the origin of the various complex machines now working on this principle. Some of these have Jacquard mechanism attached, and nearly all of them are driven by motive power. About the middle of the 19th century close on 50,000 of Lee's hand frames were in use, finding employment for nearly 100,000 persons. Many attempts had been made previously to transform Lee's frame into a power or rotary frame. One of the first and most successful was that invented by Luke Barton in 1857. This frame was fitted with self-acting mechanism for fashioning, and was practically Lee's frame having rotary shafts with cams added to give the various movements, this type of frame being known as straight bar rotary frames. In 1864 William Cotton of Loughborough altered this frame by reversing the positions of the needles and sinkers. Although made by various builders it is still known as the "Cotton Patent Rotary Frame" (fig. 7). Since 1864 a great number of important improvements and additions have been made to this frame. Single frames are built which will turn off one dozen pairs of hose at once, with the attention of one person. One of the most important inventions in connexion with the hosiery trade was the latch, tumbler, or self-acting needle invented by Matthew Townsend and David Moulding of Leicester in 1858. Previous to this Lee's type of needle was the only one in use. This latch-needle (fig. 8) consists of a stem having a butt at lower end by which it receives its knitting action from cams, the upper end being turned into a hook. Near the hook end and attached to the stem by a pin is the spoon-shaped latch, which closes over the hook as required. Machines fitted with latch-needles have grooves in which the stem of the needle works. Cams, which act on the needle butts, give the needles their individual knitting action in rotation. This needle is self-acting, in that it is made to draw its own loop, sinkers being dispensed with.

Fig. 9 shows the looping action of this needle. The needles when not knitting have a loop round their shank, thus holding the latch open. When about to knit, they are raised individually and in rotation (by the cams acting on the needle butts) to receive the new

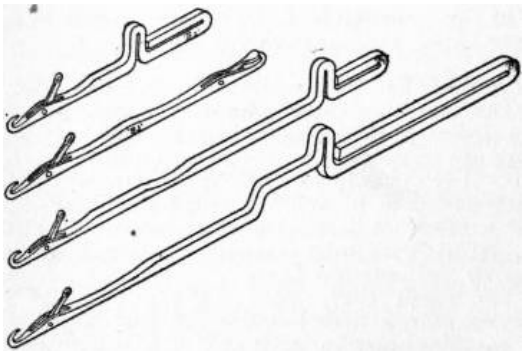


Fig. 8.—Various Shapes of the Latch Needle.

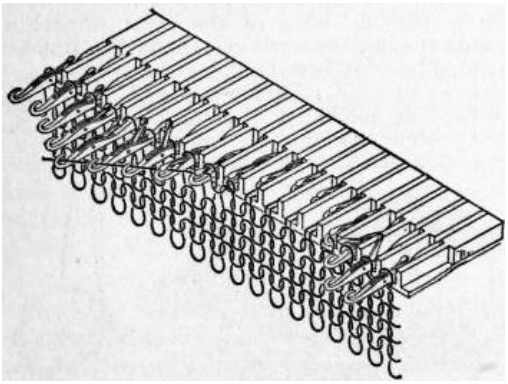


Fig. 9.—Individual Action of the Latch Needle.

loop of yarn.

Down till almost the middle of the 19th century only a flat web could be knitted in the machines in use, and for the finishing of stockings, &c., it was necessary to seam up the selvedges of web shaped on the frame (fashioned work), or to cut and seam them from even web (cut work). The introduction of any device by which seamless garments could be fabricated was obviously a great desideratum, and it is a singular fact that a machine capable of doing this was patented in 1816 by Sir Marc I. Brunel. This frame was the origin of the French-German loop-wheel circular frame of the present day. Brunel's frame was greatly improved by Peter Claussen of Brussels and was shown at an exhibition in Nottingham in 1845. This frame had horizontal placed needles fixed on a rotating rim. A few years later Moses Mellor of Nottingham transformed this type of frame by altering the position of the needles to perpendicular. This is now known as the English loop-wheel circular frame. After the invention of the latch-needle there was a revolution in the hosiery machine-building industry, new types of machines being invented, fitted to work with latch-needles. Among others there was the latch-needle circular frame, invented by Thomas Thompson, which was the origin of the English latch-needle circular frame, a frame largely used for the production of wide circular fabric.

A circular knitting machine of American origin is the type of machine on which is produced the seamless hosiery of to-day. Like the sewing machine it is largely used in the home as well as in the factory. From this machine all the circular automatic power machines for making plain and rib seamless hose and half hose have been developed. The "flat" or "lamb" type of machine, an American invention, was introduced by J. W. Lamb in 1863. This machine has two needle beds or rows of needles sloping at an angle of nearly 90°.

A great many varieties of this type of machine have been invented for the production of all kinds of plain and fancy hosiery. It is built in small sizes to be wrought by hand or in large power machines. A large variety of sewing, seaming and linking machines are employed in the hosiery industry for the purpose of putting together or joining all kinds of hosiery and knitted goods. These machines have almost entirely superseded the sewing or joining of the garments by hand.

The principle centres in Great Britain of the hosiery industry are Leicester and Nottingham and the surrounding districts. It is also an industry of some extent in the south of Scotland.

(T. B.*)

HOSIUS, or Osius (*c.* 257-359), bishop of Cordova, was born about A.D. 257, probably at Cordova, although from a passage in Zosimus it has sometimes been conjectured that he was believed by that writer to be a native of Egypt. Elected to the see of Cordova before the end of the 3rd century, he narrowly escaped martyrdom in the persecution of Maximian (303-305). In 305 or 306 he attended the council of Illiberis or Elvira (his name appearing second in the list of those present), and upheld its severe canons concerning such points of discipline as the treatment of the lapsed and clerical marriages. In 313 he appears at the court of Constantine, being expressly mentioned by name in a constitution directed by the emperor to Caecilianus of Carthage in that year. In 323 he was the bearer and possibly the writer of Constantine's letter to Bishop Alexander of Alexandria and Arius his deacon, bidding them cease disturbing the peace of the church; and, on the failure of the negotiations in Egypt, it was doubtless with the active concurrence of Hosius that the council of Nicaea was convened in 325. He certainly took part in its proceedings, and was one of the large number of "confessors" present; that he presided is a very doubtful assertion, as also that he was the principal author of the Nicene Creed. Still he powerfully influenced the judgment of the emperor in favour of the orthodox party. After a period of quiet life in his own diocese, Hosius presided in 343 at the fruitless synod of Sardica, which showed itself so hostile to Arianism; and afterwards he spoke and wrote in favour of Athanasius in such a way as to bring upon himself a sentence of banishment to Sirmium (355). From his exile he wrote to Constantius II. his only extant

composition, a letter not unjustly characterized by the great French historian Sebastian Tillemont as displaying gravity, dignity, gentleness, wisdom, generosity and in fact all the qualities of a great soul and a great bishop. Subjected to continual pressure the old man, who was near his hundredth year, was weak enough to sign the formula adopted by the second synod of Sirmium in 357, which involved communion with the Arians but not the condemnation of Athanasius. He was then permitted to return to his diocese, where he died in 359.

See S. Tillemont, *Mémoires*, vii. 300-321 (1700); Hefele, *Conciliengeschichte*, vol. i.; H. M. Gwatkin, *Studies of Arianism* (Cambridge, 1882, 2nd ed., 1900); A. W. W. Dale, *The Synod of Elvira* (London, 1882); and article *s.v.* in Herzog-Hauck, *Realencyklopädie* (3rd ed., 1900), with bibliography.

HOSIUS, STANISLAUS (1504-1579), Polish cardinal, was born in Cracow on the 5th of May 1504. He studied law at Padua and Bologna, and entering the church became in 1549 bishop of Kulm, in 1551 bishop of Ermland, and in 1561 cardinal. Hosius had Jesuit sympathies and actively opposed the Protestant reformation, going so far as to desire a repetition of the St Bartholomew massacre in Poland. Apart from its being “the property of the Roman Church,” he regarded the Bible as having no more worth than the fables of Aesop. Hosius was not distinguished as a theologian, though he drew up the *Confessio fidei christiana catholica* adopted by the synod of Piotrkow in 1557. He was, however, supreme as a diplomatist and administrator. Besides carrying through many difficult negotiations, he founded the lyceum of Braunsberg, which became the centre of the Roman Catholic mission among Protestants. He died at Capranica near Rome on the 5th of August 1579.

A collected edition of his works was published at Cologne in 1584. Life by A. Eichhorn (Mainz, 1854), 2 vols.

HOSKINS, JOHN (d. 1664), English miniature painter, the uncle of Samuel Cooper, who received his artistic education in Hoskins’s house. His finest miniatures are at Ham House, Montagu House, Windsor Castle, Amsterdam and in the Pierpont Morgan collection. Vertue stated that Hoskins had a son, and Redgrave added that the son painted a portrait of James II. in 1686 and was paid £10, 5s, although it is not supported by any reference in the State Papers. Some contemporary inscriptions on the miniatures at Ham House record them as the work of “Old Hoskins,” but the fact of the existence of a younger artist of the same name is settled by a miniature in the Pierpont Morgan collection, signed by Hoskins, and bearing an authentic engraved inscription on its contemporary frame to the effect that it represents the duke of Berwick at the age of twenty-nine in 1700. The elder Hoskins was buried on the 22nd of February 1664, in St Paul’s, Covent Garden, and as there is no doubt of the authenticity of this miniature or of the signature upon it, it is evident that he had a son who survived him thirty-six years and whose monogram we find upon this portrait. The frame of it has also the royal coat of arms debruised, the batons of a marshal of France, the collar of the Golden Fleece and the ducal coronet.

(G. C. W.)

HOSMER, HARRIET GOODHUE (1830-1908), American sculptor, was born at Watertown, Massachussetts, on the 9th of October 1830. She early showed marked aptitude for modelling, and studied anatomy with her father, a physician, and afterwards at the St Louis Medical College. She then studied in Boston until 1852, when, with her friend Charlotte Cushman, she went to Rome, where from 1853 to 1860 she was the pupil of the English sculptor John Gibson. She lived in Rome until a few years before her death. There she was associated with Nathaniel Hawthorne, Thorwaldsen, Flaxman, Thackeray, George Eliot and George Sand; and she was frequently the guest of the Brownings at Casa Guidi, in Florence. Among her works are “Daphne” and “Medusa,” ideal heads (1853); “Puck” (1855), a spirited and graceful conception which she copied for the prince of Wales, the duke of Hamilton and others; “Oenone” (1855), her first life-sized figure, now in the St Louis Museum of Fine Arts; “Beatrice Cenci” (1857), for the Mercantile Library of St Louis; “Zenobia, Queen of Palmyra, in Chains” (1859), now in the Metropolitan Museum of Art,

New York City; “A Sleeping Faun” (1867); “A Waking Faun”; a bronze statue of Thomas H. Benton (1868) for Lafayette Park, St Louis; bronze gates for the earl of Brownlow’s art gallery at Ashridge Hall; a Siren fountain for Lady Marian Alford; a fountain for Central Park, New York City; a monument to Abraham Lincoln; and, for the Columbian Exposition, Chicago, 1893, statues of the queen of Naples as the “heroine of Gaëta,” and of Queen Isabella of Spain. Miss Hosmer died at Watertown, Mass., on the 21st of February 1908.

HOSPICE (Lat. *hospitium*, entertainment, hospitality, inn, *hospes*, host), the name usually given to the homes of rest and refuge kept by religious houses for pilgrims and guests. The most famous hospices are those of the Great and Little St Bernard Passes in the Alps.

HOSPITAL (Lat. *hospitalis*, the adjective of *hospes*, host or guest), a term now in general use for institutions in which medical treatment is given to the sick or injured. The place where a guest was received, was in Lat. *hospitium* (Fr. *hospice*), but the terms *hospitalis* (sc. *domus*), *hospitale* (sc. *cubiculum*) and *hospitalia* (sc. *cubicula*) came into use in the same sense. Hence were derived on the one hand the Fr. *hospital*, *hôpital*, applied to establishments for temporary occupation by the sick for the purpose of medical treatment, and *hospice* to places for permanent occupation by the poor, infirm, incurable or insane; on the other, the form *hôtel*, which became restricted (except in the ease of *hôtel-Dieu*) to private or public dwelling-houses for ordinary occupation. In English, while “hostel” retained the earlier sense and “hotel” has become confined to that of a superior inn (*q.v.*), “hospital” was used both in the sense of a permanent retreat for the poor infirm or for the insane, and also for a regular institution for the temporary reception of sick cases; but modern usage has gradually restricted it mainly to the latter, other words, such as almshouse and asylum, being preferred in the former cases.

The Origin of Hospitals.—In spite of contrary opinions the germ of the hospital system may be seen in pre-Christian times (see Charity and Charities). Pinel goes so far as to declare that there were asylums distinctly set apart for the insane in the temples of Saturn in ancient Egypt. But this is probably an exaggeration, the real historical facts pointing to the existence of medical schools in connexion with the temples generally, to the knowledge that the priests possessed what medical science existed, and finally to the rite of “Incubation,” which involved the visit of sick persons to the temple, in the shade of which they slept, that the god might inform them by dreams of the treatment they ought to follow. The temples of Saturn are known to have existed some 4000 years before Christ; and that those temples were medical schools in their earliest form is beyond question. The reason why no records of these temples have survived is due to the fact that they were destroyed in a religious revolution which swept away the very name of Saturn from the monuments in the country. Professor Georg Ebers of Leipzig, whose possession of that important handbook of Egyptian medicine called the *Papyrus Ebers* constitutes him an authority, says the Heliopolis certainly had a clinic united to the temple. The temples of Dendera, Thebes and Memphis, are other examples. Those early medical works, the Books of Hermes, were preserved in the shrines. Patients coming to them paid contributions to the priests. The most famous temples in Greece for the cure of disease were those of Aesculapius at Cos and Trikka, while others at Rhodes, Cnidus, Pergamum and Epidaurus were less known but frequented. Thus it is clear that both in Egypt and in Greece the custom of laying the sick in the precincts of the temples was a national practice.

Alexandria again was a famous medical centre. Before describing the European growth of the hospital system in modern times, to which its development in the Roman Empire is the natural introduction, it will be well to dispose very briefly of the facts relating to the hospital system in the East. Harun al-Rashid (A.D. 763-809) attached a college to every mosque, and to that again a hospital. He placed at Bagdad an asylum for the insane open to all believers; and there was a large number of public infirmaries for the sick without payment in that city. Benjamin, the Jewish traveller, notes an efficient scheme for the reception of the sick in A.D. 1173, which had long been in existence. The Buddhists no less than the Mahommedans had their hospitals, and as early as 260 B.C. the emperor Asoka founded the many hospitals of which Hindustan could then boast. The one at Surat, made famous by travellers, and considered to have been built under the emperor’s second edict, is still in existence. These hospitals contained provision so extensive as to be quite comparable to modern institutions. In China the only records that remain are those of books of very early date dealing with the theory of medicine. To return to India, the hospitals of Asoka were swept away by a revival of Brahmanism, and a practical hiatus exists between the hospitals he

introduced and those that were refounded by the British ascendancy. Hadrian's reign contains the first notice of a military hospital in Rome. At the beginning of the Christian era we hear of the existence of open surgeries (of various price and reputation), the specialization of the medical profession, and the presence of women practitioners, often as obstetricians. Iatria, or *tabernae-medicae*, are described by Galen and Placetus: many towns built them at their own cost. These iatria attended almost entirely to out-patients, and the system of medicine fostered by them continued without much development down to the middle of the 18th century. It is to be noted that these out-patients paid reasonable fees. In Christian days no establishments were founded for the relief of the sick till the time of Constantine. A law of Justinian referring to various institutions connected with the church mentions among them the Nosocomia, which correspond to our idea of hospitals. In A.D. 370 Basil had one built for lepers at Caesarea. St Chrysostom founded a hospital at Constantinople. At Alexandria an order of 600 Parabolani attended to the sick, being chosen for the purpose for their experience by the prelate of the city (A.D. 416). Fabiola, a rich Roman lady, founded the first hospital at Rome possessed of a convalescent home in the country. She even became a nurse herself. St Augustine founded one at his see of Hippo. These Nosocomia fell indeed almost entirely into the hands of the church, which supported them by its revenues when necessary and controlled their administration. Salerno became famous as a school of medicine; its rosiest days were between A.D. 1000 and 1050. Frederick II. prescribed the course for students there, and founded a rival school at Naples. At this period the connexion between monasteries and hospitals becomes a marked one. The crusaders also created another bond between the church and hospital development, as the route they traversed was marked by such foundations. Lepers were some of the earliest patients for whom a specialized treatment was recognized, and in 1118 a leprosarium was built in London for isolation purposes. Russia seems the one country where the interconnexion of hospital and monastery was not to be observed. After the period already reached, the 13th century, hospitals became common enough to demand individual or at any rate national treatment.

History of the Hospital Movement.—We have now to consider the principles upon which the provision of the best form of medical care in hospitals can be secured for all classes of people. Though hospitals cannot be claimed as a direct result of Christianity, no doubt it softened the relations between men, and gradually tended to instil humanitarian views and to make them popular with the civilized peoples of the world. These principles, as civilization grew, education improved, and the tastes and requirements of the common people were developed, made men and women of many races realize that the treatment of disease in buildings set apart exclusively for the care of the sick was, in fact, a necessity in urban districts. The establishment of a hospital freed the streets of the abuses attendant upon beggars and other poor creatures, who made their ailments the chief ground of appeal for alms. As the knowledge of hygiene and of the doctrine of cleanliness and purity in regard not only to dwellings and towns, but also in relation to food of all descriptions, including water, became known and appreciated, hospitals were found to be of even greater importance, if that is possible, to the healthy in crowded communities, than to the sick. It took many centuries before sound hygiene really began to occupy the position of importance which it is now known to possess, not only in regard to the treatment and cure of disease, but to its prevention and eradication. So the history of the world shows, that, whereas a few of the larger towns in most countries contained hospitals of sorts, up to and including the middle ages, it was not until the commencement of the 18th century that inhabitants of important but relatively small towns of from 50,000 to 100,000 inhabitants began to provide themselves with a hospital for the care of the sick. Thus, twenty-three of the principal English counties appear to have had no general hospital prior to 1710, while London itself at that date, so far as the relief of the sick was concerned, was mainly, if not entirely, dependent upon St Bartholomew's and St Thomas's Hospitals. These facts are interesting to note, because we are enabled from them to deduce from recent events that hospital buildings in the past, though the planning of most of them was faulty to begin with and became more and more faulty as extensions were added to the original buildings, did in fact suffice to satisfy the requirements of the medical profession for nearly two centuries. In other words, under the old condition of affairs the life of a building devoted to the care of the sick might be considered as at least 150 years. To-day, under the conditions which modern science impose upon the management, probably few hospital buildings are likely to be regarded as efficient for the purpose of treating the sick for more than from 30 to 50 years.

The foregoing statement is based upon the history of British hospitals of importance throughout the country, but the same remark will apply in practice to hospital buildings almost everywhere throughout the world. In truth, hospitals have been more developed and improved in Great Britain than in other countries, though, since the last quarter of the 19th century, German scientists especially have added much to the efficiency of the accommodation for the sick, not only at hospitals but in private clinics, and many German ideas have been accepted and copied by other countries. In Great Britain hospitals for the treatment of general and special diseases are mainly maintained upon what is known as the voluntary system. On the European continent, hospitals as a rule are maintained by the state or municipalities, and this system is so fully developed in Sweden and elsewhere that a sound economical principle has been embroidered upon the hospital system, to the great physical and moral advantage of all classes of the community. The system referred to confers great benefits upon inhabitants in large towns by bringing the poor-law and voluntary institutions into more intimate association, although they may be managed by separate governing

bodies. The plan pursued is to demand payment from all patients who are admitted to the hospital under a scale of charges divided into three or four grades. The first grade pays a substantial sum and obtains anything or everything the patient may care to have or to pay for, subject to the control of the medical attendant. The second pays much less, but a remunerative rate, for all they receive at the hospital; and the third and fourth classes are very poor people or paupers, who are paid for on a graduated scale by the poor-law authorities, or the communal government, or the municipality. Under this system well-to-do thrifty artisans and improvident paupers are all treated by one staff, controlled by one administration, and are located in immediate proximity to each other though in separate pavilions. We have no doubt, as the result of many years' investigation and an accurate knowledge of the working of the system, that this is the true principle to enforce in providing adequate medical relief for large urban populations everywhere throughout the world. It should be accompanied by a system of government insurance, whereby all classes who desire to be thrifty may pay a small annual premium in the days of health, and secure adequate hospital treatment and care when ill. Provided that pay wings were added to the existing voluntary and municipal hospitals, it should be found that the relatively small annual premium of £3 per annum should enable the policyholders to defray the cost of medical treatment in a pay ward or at a consultation department of a great hospital as a matter of business. In the United States of America most large towns have great hospitals, usually known as city hospitals, administered and mainly supported by the municipality. Many such institutions have pay wards, but nowhere, so far as we have been able to discover, has the system of medical relief in its entirety been organized as yet upon the business system we have just referred to.

As to the relative merits and demerits of the systems of government of municipal hospitals and voluntary hospitals a few words may be useful. There can be no doubt that the voluntary hospital in Great Britain has had a remarkable effect for good upon all classes in the making of modern England. The management of these institutions is frequently representative of all classes of the people, while the voluntary system, as the Hospital Sunday collections all over the country, and all over the English-speaking world, prove, has united all creeds in the good work of caring and providing for the sick and injured members of each community. Again the voluntary system makes for efficiency in the administration of all hospitals. Each voluntary hospital is dependent upon its popularity and efficiency, in large measure, for the financial support it receives. In this way an ill-managed voluntary hospital, or one which has ceased to fulfil any useful public purpose, is sure to disappear in due course under the voluntary system. Voluntary hospitals are always open to, as well as supported by, the public, and, owing largely to the example so prominently set by King Edward VII. and members of the royal family, more people every year devote some time in some way to the cause of the hospitals. Attached to the voluntary hospitals are the principal medical and nursing schools upon which the public depend for the supply of doctors and nurses. The education of students and nurses in a clinical hospital makes that hospital the most desirable place for everybody when they are really ill. In such a hospital no patient can be overlooked, no wrong or imperfect diagnosis can long remain undiscovered and unrectified, and nowhere else have the patients so continuous a guarantee that the treatment they receive will be of the best, while the provision made for their comfort and welfare, owing to the unceasing and ever varying quality of the criticism to which the work of everybody, from the senior physician to the humblest official, is subjected in a clinical hospital, is unequalled anywhere else. At a great voluntary hospital, not only do hundreds of medical students and nurses work in the wards, but thousands of people, in the persons of the patients' friends, and those members of the public who take an interest in hospitals, pass through the wards in the course of every year. Again, each voluntary hospital has to live by competition, a fact which guarantees that everything in the way of new treatment and scientific development shall in due course find its proper place within the walls of such an establishment. Open as they are to the full inspection of everybody whose knowledge and presence can promote efficiency, the voluntary hospitals have shown, especially since the last quarter of the 19th century, a continuous development and improvement. Here the patients are treated with invariable kindness and consideration, as human beings rather than cases, to the great benefit of the whole human family as represented by the officials, the patients and the students, with their relations and friends, the honorary medical officers, hundreds of medical practitioners and nurses, who receive their medical training in the hospitals, and the ever-increasing number of governors and supporters by whose contributions voluntary hospitals live. The great missionary and social value of the voluntary hospitals to the whole community cannot be questioned, and they have been of inestimable value to the churches by inculcating the higher principles of humanity, while removing the many acerbities which might otherwise prevail between rich and poor in large cities.

The voluntary hospitals are attended, however, by certain disadvantages which do not attach to municipal institutions. A municipality which undertakes the provision of hospitals for the entire community is largely able to plan out the urban area, and to provide that each hospital site selected shall not only be suitable for the purpose, but that it shall be so chosen as to contribute to make the whole system of hospital provision easily accessible to all classes who may require its aid. The voluntary hospitals, on the contrary, have grown up without any comprehensive plan of the districts or any real regard to the convenience or necessities of their poorer inhabitants. Voluntary hospital sites were almost invariably selected to suit the convenience of the honorary medical staff and the general convenience of the hospital economy rather than to save the patients and their friends long

journeys in search of medical aid. The best of the municipal systems too enables economy to be enforced in the administration by a plan which provides a central office in every town where the number of vacant beds in each hospital is known, so that the average of occupied beds in all the hospitals can be well maintained from an economical point of view. This speedy and ready inter-communication between all hospitals in a great city, which might perfectly well be secured under the voluntary system if the managers could only be brought into active co-operation, prevents delay in the admission of urgent cases, promotes the absence of waste by keeping the average of beds occupied in each establishment high and uniform, and has often proved a real gain to the poor by the diminution in cost to the patients and their friends, who under the best municipal systems can find a hospital within reasonable distance of their home in a large city wherever it may be placed. Another advantage of the municipal system should be that central control makes for economical administration. Unfortunately a close study of this question tends to prove that municipal hospitals for the most part have resulted in a dead monotony of relative inefficiency, often entailing great extravagance in buildings, and accompanied by much waste in many directions. Existing municipal hospital systems are attended by several grave disadvantages. The administration shows a tendency to lag and grow sleepy and inert. The absence of competition, and the freedom from continuous publicity and criticism such as the voluntary hospitals enjoy, make for inefficiency and indifferent work. Rate-supported hospitals, as a rule, are administered by permanent officials who reside in houses usually situated on the hospital sites, and who are paid salaries which attract the younger men, who, once appointed, tend to continue in office for a long period of years. This fixture of tenure is apt to cause a decline in the general interest in the work of the municipal hospital, due mainly to the absence of a continuous criticism from outside, and so the average of efficiency, both in regard to treatment and other important matters, may become lower and lower. Those who have habitually inspected great rate-supported hospitals must have met instances over and over again where a gentleman who has held office for twenty or thirty years has frankly stated that his income is fixed, that his habits have become crystallized, that he finds the work terribly monotonous, and yet, as he hopes ultimately to retire upon a pension, he has felt there was no course open to him but to continue in office, even though he may feel conscientiously that a change would be good for the patients, for the hospital and for himself. Under the voluntary system evils of this kind are seldom or never met with, nor have these latter establishments, within living memory, ever been so conducted as to exhibit the grave scandals which have marred the administration of rate-supported hospitals not only in Great Britain but in other parts of the world. We believe that the more thoroughly the advantages and disadvantages of rate-supported and voluntary hospitals for the care of the sick are weighed and considered, and the more accurate and full the knowledge which is added to the judgment upon which a decision can be based, the more certain will it be that every capable administrator will come to the conclusion that on the whole it is good for the sick and for the whole community that these establishments should, at any rate in Great Britain, be maintained upon the voluntary system. Of course it is essential to have rate-supported hospitals where cases of infectious disease and the poorest of the people who are dependent largely upon the poor-law for their maintenance can be cared for. It is satisfactory to be able to state that of late years the administration of both these types of rate-supported hospitals has greatly improved. The added importance now given all over the country to medical officers of health, and the disposition exhibited, both by parliament and government departments, to make the position of these officers more important and valuable than ever before, have tended largely to improve the administrative efficiency of hospitals for infectious diseases. No doubt the whole community would benefit if residents in every part of the country could be moved to take a personal interest in the infectious hospital in their immediate neighbourhood. Amongst the smaller of these establishments there has been so marked an inefficiency at times as to cause much avoidable suffering. The existence of such inefficiency casts a grave reflection upon the local authorities and others who are responsible for the evils which undoubtedly exist in various places at the present time. Unfortunately knowledge has not yet sufficiently spread to enable the public to overcome its fear and dread of infectious maladies. It is therefore very difficult to induce people to take an active interest in one of these hospitals, but we look forward to the time when, owing to the activity of the medical officers of health who have immediate charge of buildings of this kind, this difficulty may be overcome, when the avoidable dangers and risks and the appalling discomfort which a poor sufferer from a severe infectious disease in a rural district may suddenly have to encounter under existing circumstances, would be rendered impossible.

The poor-law infirmary in large cities, so far as the buildings and equipment are concerned, very often leaves little to desire. Poor-law infirmaries lack, however, the stimulus and the checks and advantages which impartial criticism continuously applied brings to a great voluntary hospital. Such disadvantages might be entirely removed if parliament would decide to throw open every poor-law infirmary for clinical purposes, and to have connected with each such establishment a responsible visiting medical staff, consisting of the best qualified men to be found in the community which each hospital serves. The old prejudice against hospital treatment has disappeared, for the least intelligent members of the population now understand that, when a citizen is sick, there is no place so good as the wards of a well-administered hospital. Looking at the question of hospital provision in Great Britain, and indeed in all countries at the present time, it may be said, that there is everywhere evidence of improvement and development upon the right lines, so that never before in the history of the world has the lot of the sick man or woman been so relatively fortunate and

safe as it is in the present day. Probably it is not too much to say that to-day hospitals occupy the most important position in the social economy of nations.

Classification of Hospitals.—Having dealt with hospitals as a whole it may be well very briefly to classify them in groups, and explain as tersely as possible what they represent and how far it may be desirable to eliminate by consolidation or to increase by disintegration the number of special hospitals.

General Hospitals.—These establishments consist of two kinds, (*a*) clinical and (*b*) non-clinical, each of which, under the modern system, should include every department of medicine and surgery, and every appliance and means for the alleviation of suffering, the healing of wounds, the reduction of fractures, the removal of mal-formations and foreign growths, the surgical restoration of damaged and diseased organs and bones, and everything of every kind which experience and knowledge prove to be necessary to the rapid cure of disease. The clinical hospital means an institution to which a medical school is attached, where technical instruction is given by able and qualified teachers to medical students and others. A non-clinical hospital is one which is not attached to a medical school, and where no medical instruction is organized.

Special Hospitals.—Up to about 1840 the general hospital was, speaking generally, the only hospital in existence. Twenty years later, as the population increased and medical science became more and more active, some of the more ardent members of the medical profession, especially amongst the younger men, pressed continuously for opportunities to develop the methods of treatment in regard to special diseases for which neither accommodation nor appliances were at that time forthcoming in general hospitals. In a few cases, where the managers of the great general hospitals were men of action and initiative special departments were introduced, and an attempt was made to make them efficient. The conservative spirit which, on the whole, represents the British character for the most part, resulted, however, in a steady resistance being offered by the older members of the medical staffs and existing committees to the advocates of special departments. In the result, especially as such special departments as there were in connexion with general hospitals were too often starved for want of means and men for their development and improvement, the younger spirits called their friends together and began to start special hospitals. To-day every really efficient clinical general hospital has within its walls special departments of almost every description, which have been made as efficient and up-to-date as money and knowledge can make them. Unfortunately the causes already referred to led to the establishment of hundreds of the smaller special hospitals, many of which were started in unsuitable buildings, and some of which have ever since maintained a struggling existence. Others, on the contrary, through the energy of their original promoters and the excellence of the work they have done, have obtained a position of authority and reputation which has had a very important bearing for good upon the development of medical science in the treatment of disease. If the world had to-day to organize the very best system of hospital accommodation which could be evolved, there is no doubt that few or none of the special hospitals would find any place in that system. As matters stand, however, the special hospital has had to be accepted, and nothing which King Edward’s Hospital Fund has done in London has met with greater popularity and professional approval than the labours which its council have undertaken in promoting the amalgamation of the smaller special hospitals of certain kinds, so as to secure the provision of one really efficient special hospital for each speciality. No doubt this policy of amalgamation will be steadily pursued, and in the course of years every great city will gradually reorganize its hospital methods so as to secure that, whether the patients are treated in a general hospital or in a special hospital, the average efficiency in every institution shall be as high and as good as possible.

We will take now the special hospitals in detail.

Cancer Hospitals.—The justification for efficient cancer hospitals must be found in the circumstance that most scientific men of experience believe that, if adequate resources were placed at the disposal of the medical profession, the origin of cancer might be discovered, and so the human race would be freed from one of the most awful diseases which affect humanity. Pending such a discovery the experience of the cancer department connected with the Middlesex Hospital in London proves to demonstration that the provision of adequate and special accommodation for the exclusive treatment of cases of cancer is not only desirable but necessary on humanitarian grounds alone.

Hospitals for Consumption.—For many years it was held that this group of hospitals was not a necessity, and the patients were treated in the ordinary medical wards of the general hospitals. Since the contagious character of tuberculosis became known, and improved methods of treatment have been developed, every one agrees that this type of special hospital is desirable, though it is believed by the more advanced school of scientists that before long it may be happily rendered obsolete owing to the discovery of methods of treatment which will stay the disease at its commencement and restore the patient to health.

Children’s Hospitals.—These hospitals were very much opposed at the outset. There can be no doubt that the children’s ward or wards in a big voluntary hospital is a most valuable asset to the managers, so long as the children are treated in separate wards. There is no reason of course why a hospital should confine its work to the treatment of children, exclusively. Still this special hospital

is popular with the public; it has led to many discoveries and developments in the treatment of children's diseases; on the whole the administration of these establishments has been good; and we believe they will continue to flourish, however many children's wards may be provided in general hospitals. Children's hospitals with country branches for the treatment of chronic ailments, such as hip disease, are a valuable addition to the relief of suffering in cities.

Cottage Hospitals.—These hospitals, established originally in 1859 by Mr Albert Napper at Cranleigh, Surrey, have fulfilled a most useful function. Many of them are very efficient both in regard to equipment and treatment. They have become essential to the well-being and adequate medical care of rural populations, as they attract to the country some of the best members of the profession, who are able, with the aid of the cottage hospital, to keep themselves efficient and up-to-date, so that all classes of the community are benefited in this way by this type of hospital.

Ear, Throat and Nose Hospitals.—The history of this type of hospital bears out in every particular the reason we have given above for the establishment of special hospitals in the first instance. There can be no doubt that the best conducted throat hospitals have been beneficial to the poorer inhabitants of great cities.

Fever Hospitals.—Incidentally we have dealt with these institutions, which are usually supported out of the rates and administered by the medical officers of health, who are paid by the county or municipal authorities.

Maternity and Lying-in Hospitals.—This is one of the oldest types of special hospitals, and has done a great deal of good in its time. Owing to modern methods of treatment and hygienic developments the maternity hospital never occupied a stronger position than it does to-day.

Mental Hospitals.—In Great Britain the insane are provided for in asylums (see INSANITY, ad fin.), though such establishments, if properly conducted, are essentially hospitals. Scientific and public opinion tend towards the establishment of mental hospitals to which all acute cases of mental disease should be first relegated for treatment and diagnosis before they are consigned to a permanent lunatic hospital. Too little attention on an organized plan has been given to the continuous study of mental disease in its clinical and pathological aspects. It is probable, therefore, that the advent of the mental hospital may lead to important developments in treatment in many ways.

Ophthalmic Hospitals.—Of all special hospitals this is one which would probably be the least necessary, providing general hospitals everywhere were properly equipped and organized. No special hospital has probably been so abused in the material sense by the free relief of patients who could well afford to pay for their treatment at the ophthalmic hospital. Several of the existing ophthalmic hospitals have entailed an enormous expenditure, and their modern equipment is wonderfully efficient.

Orthopaedic Hospitals.—It is very doubtful whether this type o£ hospital is really desirable or necessary. Its necessity may be advocated on the ground that orthopaedic cases may require prolonged treatment, and that the pressure upon the beds of general hospitals by acute cases is nowadays so great as to render the orthopaedic hospital more necessary than ever before.

Paralysis and Epileptic Hospitals.—Seeing that the percentage of those who are at present attacked by paralysis and nervous disease shows a continued tendency to increase under modern conditions of life in large cities, hospitals of this type are necessary, and London at any rate, like most foreign towns of importance, possesses, at present, far too little accommodation for this class of case.

Skin and Photo-Therapy.—Up to the end of the 19th century hospitals for diseases of the skin were a constant cause of scandal and criticism. The introduction of modern methods of treatment by light and electricity, including photo-therapy, has given an importance to this department and treatment which it did not previously possess. We are of opinion that, on the whole, it is better and more economical to treat these cases in properly equipped departments of general hospitals than in separate institutions.

Women's Hospitals.—These hospitals are not absolutely necessary, but considering their popularity with the women themselves, and that several of them have done excellent work, remembering too that women constitute the majority of the population, there seems to be some reason for their continuance.

The Evolution of the Modern Hospital.—The evolution of the modern hospital affords one of the most marvellous evidences of the advance of scientific and humanitarian principles which the world has ever seen. At the outset hospitals were probably founded by the healthy more for their own comfort than out of any regard for the sick. Nowadays the healthy, whilst they realize that the more efficient they can make the hospital, the more certain, in the human sense, is their own chance of prolonged life and health, are, as the progress of the League of Mercy has shown in recent years, genuinely anxious for the most part to do something as individuals in the days of health in the cause of the sick. Formerly the hospital was merely a building or buildings, very often unsuitable for the purposes to which it was put, where sick and injured people were retained and more frequently than not died. In other words the hygienic condition, the methods of treatment and the hospital atmosphere were all so relatively unsatisfactory as to yield a mortality in serious cases of 40%. Nowadays, despite, or possibly because of, the fact that operative interference is the rule

rather than the exception in the treatment of hospital patients, and in consequence of the introduction of antiseptic and aseptic methods, the mortality in hospitals is, in all the circumstances, relatively less, and probably materially less, than it is even amongst patients who are attended in their own homes. Originally hospitals were unsystematic, crowded, ill-organized necessities which wise people refused to enter, if they had any voice in the matter. At the present time in all large cities, and in crowded communities in civilized countries, great hospitals have been erected upon extensive sites which are so planned as to constitute in fact a village with many hundreds of inhabitants. This type of modern hospital has common characteristics. A multitude of separate buildings are dotted over the site, which may cover 20 acres or upwards. In one such institution, within an area of 20 acres, there are 6 m. of drains, 29 m. of water and steam pipes, 3 m. of roof gutters, 42 m. of electric wires, and 42 separate buildings, which to all intents and purposes constitute a series of distinct, isolated hospitals, in no case containing more than forty-six patients. On the continent of Europe buildings of this class are usually of one storey; in the United States, owing to the difficulty of obtaining suitable sites and for reasons of economy, some competent authorities strenuously advocate high buildings with many storeys for town hospitals. In England the majority have two to three storeys each, the ward unit containing a ward for twenty beds and two isolation wards for one and two beds respectively. The two storeys in modern fever hospitals, however, are absolutely distinct—that is, there is no internal staircase going from one ward to the others, for each is entered separately from the outside. This system carries to its extreme limits the principle of separating the patients as much as possible into small groups; the acute cases are usually treated in the upper ward, and as they become convalescent are removed downstairs. In this way the necessity for an entirely separate convalescent block is done away with and the patients are kept under the same charge nurse, an arrangement which promotes necessary discipline. The unit of these hospitals is the pavilion, not the ward, and consists of an acute ward, a convalescent ward, separation wards, nurses' duty rooms, store-rooms for linen, an open-air balcony upstairs into which beds can be wheeled in suitable weather, and a large airing-ground for convalescent patients directly accessible from the downstairs ward. Each of the pavilions is raised above the ground level, so that air can circulate freely underneath. The wall, floor and air spaces in the scarlet fever wards of one of these hospitals are respectively 12 ft., 156 ft. and 2028 ft. per bed; and in the enteric and diphtheria wards they have been increased to 15 ft., 195 ft. and 2535 ft. respectively. The provision of so large a floor and linear space, especially in the diphtheria wards, is an experiment the effect of which will be watched with considerable interest. A building of this type is a splendid example of the separate pavilion hospital, and is doing great service in the treatment of fevers wherever it has been introduced. Some idea of a hospital village, some of the wards of which we have been describing, may be gathered from the circumstances that it costs from £300,000 to £400,000, that it usually contains from 500 to 700 beds, and that the staff numbers from 350 to 500 persons. The medical superintendent lives in a separate house of his own. The nurses are provided with a home, consisting of several blocks of buildings under the control of the matron; the charge nurses usually occupy the main block; where the dining and general sitting-rooms are placed; the day assistant-nurses another block; and lastly, by a most excellent arrangement, the night nurses, 80 to 120 in number, have one whole block entirely given up to their use. The female servants have a second home under the control of the housekeeper, and the male servants occupy a third home under the supervision of the steward. The two main ideas aimed at are to disconnect the houses occupied by the staff from the infected area, and to place the members of each division of the staff together, but in separate buildings, under their respective heads. These objects are highly to be commended, as they have important bearings upon the well-being and discipline of the whole establishment and constitute a lesson for all who have to do with buildings where a great number of people are constantly employed.

The Hospital City.—We have shown that the modern hospital where an adequate site is available under the most favourable conditions has developed into a hospital village. No one who is familiar with the existing disadvantages of many of the sites and their surroundings of town hospitals in many a large city can have any doubt that, if the well-being of the patients and the good of the whole community, combined with economical and administrative reasons, together with the provision of an adequate system for the instruction and training of medical students and nurses, are to be the first considerations with those responsible for the hospitals of the future, the time will come, and is probably not far distant, when each great urban community will provide for the whole of its sick by removing them to a hospital city, which will be situated upon a specially selected and most salubrious site some distance from the town itself. The atmosphere of a great city grows less and less suitable to the rapid and complete recovery of patients who may undergo the major operations or be suffering from the severe and acute forms of disease. Asepsis, it is true, has reduced the average residence in hospital from about 35 to less than 20 days. It has thereby added quite one million working days each year to the earning power of the artisan classes in London alone. Medical opinion is more and more favouring the provision of convalescent and suburban hospitals, to which patients suffering from open wounds may be removed from the city hospitals. This course, which entails much additional expenditure, is advocated to overcome the difficulty arising from the fact that, in operation and other cases, the patients cease to continue to make rapid progress towards recovery after the seventh or ninth day's residence in a city hospital. A change of such cases to the country restores the balance and completes the recovery with a rapidity often remarkable.

Thinking out the problem here presented in all its bearings, realizing the great and ever-increasing cost of sites for hospitals in great cities, the heavy consequential taxes and charges which they have to meet there, and all the attendant disadvantages and drawbacks, the present writer has ventured upon an anticipation which he hopes may prove intelligent and well-founded. Nearly every difficulty in regard to the cost of hospitals and in respect to all the many problems presented by securing the material required, under present systems, for the efficient training of students and nurses, would be removed by the erection of the Hospital City, which, he foresees, must ultimately be recognized by intelligent communities throughout the civilized world. Why should we not have, on a carefully selected site well away from the contaminations of the town, and adequately provided with every requisite demanded from the site of the most perfect modern hospital which the mind of man can conceive, a “Hospital City”? Here would be concentrated all the means for relieving and treating every form of disease to the abiding comfort of all responsible for their adequacy and success. At the present time all the traffic and all the citizens give way to fire engines and the ambulance in the public streets. Necessarily the means of transit to and from the “Hospital City,” and its rapidity, would be the most perfect in the world. So the members of the medical staff, the friends of the patients, and all who had business in the “Hospital City,” would find it easier and less exacting in time and energy to be attached to one of the hospitals located therein than to one situated in the centre of a big population in a crowded town. To meet the urgent and accident cases a few receiving houses, or outpost relief stations, with a couple of wards, would be situated in various quarters of the working city, where patients could be temporarily treated, and whence they could be removed to the “Hospital City” by an efficient motor ambulance service. The writer can see such a “Hospital City” established, can realize the comfort it will prove in practice to the medical profession, to the patients’ friends, to those who have to manage the hospitals and train the medical and nursing students, and indeed to all who may go there as well as to the whole community. The initial cost of hospital buildings should be reduced at once to a quarter or less of the present outlay. They could then be built of the cheapest but most suitable material, which would have many advantages, whilst the actual money forthcoming from the realization and sale of the existing hospital sites in many cities would, in all probability, produce a sum which in the whole might prove adequate, or nearly adequate, or even in some cases more than adequate, to defray the entire cost of building the “Hospital City” and of equipping it too. The cost of administration and working must be everywhere reduced to a minimum. The hygienic completeness of the whole city, its buildings and appliances, must expedite recovery to the maximum extent. In all probability the removal of the sick from contact with the healthy would tend in practice so to increase the healthiness of the town population, *i.e.* of the workers of the city proper, as to free them from some of the most burdensome trials which now cripple their resources and diminish materially the happiness of their lives. Probably the United States (where a city has sometimes sprung up in twelve months) may be the home where this idea may first find its realization in accomplished fact. The writer may never live to see such a city in actual working or in its entirety, but he makes bold to believe its adoption will one day solve the more difficult of the problems involved in providing adequately for the sick in crowded communities. He has formulated the idea because it seems desirable to encourage discussion as to the best method of checking the growing tendency to make hospital buildings everywhere too costly. If the idea of the “Hospital City” commends itself to the profession and the public, the practice of treating all the hospital accommodation in each city as a whole will gradually increase and spread, until most of the present pressing difficulties may disappear altogether. That is a consummation devoutly to be wished.

The Problem of Hospital Administration.—A study of the hospital problem in various countries, and especially in different portions of the English-speaking world, convinces the writer that, apart from local differences, the features presented are everywhere practically identical. A number of hospitals under independent administration, dependent in whole or in part on voluntary contributions, administered under different regulations originally representing the idiosyncracies of individual managers for the time being, without any standard of efficiency or any system of co-operation, which would bring the whole of the medical establishments of each or all of the great cities of the world under one administration which the combined wisdom and experience of hospital managers as a whole might agree to be the best, must mean in practice a material gain in every way to each and all of the hospitals and their supporters on economical, scientific and other grounds. Such an absence of system throughout the world has everywhere led to overlapping, to the perpetuation of many abuses, to the admission of an increasing number of patients whose social position does not entitle them to claim free medical relief at all, and, often too, to the admission of patients belonging to a humbler grade of society who are already provided for by the rates in institutions which they do not care to enter and who find their way to the wards of hospitals which were established to provide for patients of an entirely different social grade. These evils have continued to grow and increase almost everywhere, despite many and varied attempts to grapple with and remove them. Amongst these attempts we may mention the assembling of hospital conferences, the establishment of special funds and committees, and the holding of inquiries of various kinds in London and other British cities and also in the United States. The most remarkable proof of the impossibility of inducing those responsible to act together and enforce the necessary reforms is afforded by the historical fact that the famous Commission on Hospital Abuse, known as Sir William Fergusson’s Commission, in 1871, after an exhaustive inquiry, made the following recommendations: (1) to improve the administration of poor-law medical relief; (2) to place all free

dispensaries under the control of the poor-law authorities; (3) to establish an adequate system of provident dispensaries; (4) to curtail the unrestricted system of gratuitous relief, partly by the selection of cases possessing special clinical interest and partly by the exclusion of those who on social grounds are not entitled to gratuitous medical advice; (5) the payment of the medical staff engaged in both in- and out-patient work, and the payment of fees by patients in the pay wards and in the consultation departments of the voluntary hospitals. Other commissions have since been appointed, have reported, and have disappeared, with the result that nothing practical had been done up to 1910 in the way of reform. Yet it is an undoubted fact that, if the foregoing recommendations of Sir William Fergusson's Commission had been carried out in their entirety at the time they were made, practically all the abuses from which British hospitals afterwards suffered would have been removed, and the charitable public might have been saved several millions of pounds sterling. It may be well, therefore, briefly to indicate exactly what these changes amount to, and how they can be made effective at any time by those responsible for the working of a hospital.

There is no doubt that all the facts available tend to prove that the voluntary hospitals are used to an increasing extent by persons able to make payment or partial payment for the treatment which they receive. The evidence and statistics demonstrating these facts may be readily gathered from a study of the Report (1909) and Evidence of the Royal Commission on the Poor Laws and Relief of Distress (Lord George Hamilton's Commission) and in the authorities mentioned at the end of this article. The underlying cause of the abuse was that no means existed whereby persons of moderate income could obtain efficient treatment and hospital care when ill at a rate which they could afford to pay. The system, or want of system, whereby medical relief is granted to practically all applicants by the voluntary hospitals grew up without any combined attempt to organize it efficiently or to check abuses. Such a system rests upon a wrong basis, and the best interests of every class of the population demand its abolition in favour of one which shall afford the maximum of justice (1) to the poor, (2) to those who can afford to pay in part or in whole the cost of their medical treatment and care at a hospital, (3) to the medical profession, (4) to the subscribers and supporters of voluntary hospitals, whose gifts should be strictly applied to the purposes they were intended to serve, and (5) to the ratepayers, who are entitled to a guarantee that the maximum efficiency is secured by the poor-law system of medical relief. The remedy is very simple and easy of application. Every voluntary hospital, while admitting all accidents and urgent cases needing immediate attention, should institute a system whereby each applicant would be asked to prove that he or she was a fit object of charity. The only real attempt at reform, up to 1909, was the appointment by many of the larger hospitals of almoners to ascertain whether certain selected patients were in a position to pay or not. By putting the burden of proof of eligibility to receive free medical relief upon the patients and their friends, all abuse of every kind must speedily cease. There would be no hardship entailed upon the patients by such a system, as experience has proved, but, to make it effective, the system of providing for in- and out-patients in Great Britain requires radical change, for, in existing circumstance, if a voluntary hospital attempted to enforce this simple method, it would be met with the difficulty that, where it was found that a patient or his friends could pay at any rate something, no department connected with British hospitals existed—as is the case in regard to hospitals in the United States—enabling such in-patients to be transferred to accommodation provided in paying wards. In the same way, directly the out-patients were dealt with under such a system, it would be made apparent, where a case could be properly treated, under the poor law, that no plan of co-operation to secure this was organized under existing conditions. If the patient, being of a better class, were suffering from a minor ailment, and could be properly dealt with at a provident dispensary, the fees of which he could easily pay, the same absence of co-operation must make it practically impossible readily to enforce the system. When, again, an out-patient of the better class was entitled, from the severity of his ailment, to receive the advantages of a consultation by the medical staff, no method existed whereby this aid could be rendered to him, and his transfer afterwards to the care of a medical practitioner attached to some provident dispensary, or resident near the patient's home, could be properly carried out. It follows that adequate reform required that methods should be adopted with a view to some part or all the cost of treatment being provided by the patient or his friends through an entire reorganization of the system of medical relief not only at the voluntary hospitals, but under the poor-law system. The reforms required in regard to voluntary hospitals are that every large hospital shall have connected with the in-patient department, in separate buildings, but under the administration of the managers, pay wards for the reception of those patients who are able to pay some part or all of the cost of treatment; that, as regards out-patients, the existing out-patient department should be abolished; that in substitution for it each hospital should have a casualty department and a department for consultation. In the casualty department every applicant should be seen once, and be there disposed of by being handed on to the consultation department; if his case was sufficiently important, he should then be transferred to some provident or poor-law dispensary, or be referred to a private medical attendant. It would no doubt take time to overcome the incidental difficulties which would necessarily arise in effecting so radical a reform as is here contemplated, but if all voluntary hospitals adopted the same system, and were to be brought into active co-operation with provident dispensaries and poor-law dispensaries and private medical practitioners, the new system might be successfully introduced and made effective within twelve months, and probably within six months, from the date of its commencement. This opinion is based

upon the assumption that the provident dispensaries would be standardized, and that every one of them would be brought up to a state of the highest efficiency. In the town of Northampton the Royal Victoria Dispensary has been worked with the maximum of success, so far as the patients and the medical practitioners are concerned. In London and in other large towns like Manchester and elsewhere the provident dispensary has not succeeded as it has done in Northampton, because so many members of the medical profession are not alive to the importance of making it their first business to provide that every patient connected with the provident dispensary who attends at the surgery of a private medical practitioner shall receive at least equal attention and accommodation to that afforded to every other private patient, whatever the fee he may pay. In the same way, poor-law dispensaries must be radically reformed. Everything which tends to excite a feeling of shame on the part of the patient attending the poor-law dispensary, such as the printing of the word "pauper" at the beginning of the space on which the patient's name is entered, must be abolished, and the class of medical service and all the arrangements for the treatment of the patients, however poor, at the poor-law dispensary, must be made at least as efficient as those provided by voluntary hospitals. There undoubtedly is considerable overlapping between the voluntary hospitals and the poor law in Great Britain. The Royal Commission on the Poor Laws and Relief of Distress (1909) deals with this point with a view to set up a standard of medical relief to be granted by each class and type of hospitals, provides for adequate co-operation between all classes of institutions; and these reforms may be commended. It is too often forgotten that the function of the poor law is the relief of destitution, while it should be the object and duty of each voluntary hospital and indeed of all hospitals other than poor-law institutions to apply their resources entirely to the prevention of destitution, by stepping in to grant free medical relief to the provident and thrifty when, through no fault of their own, they meet with an accident or are overtaken by disease. An adequate system of co-operation would preserve the privilege of the voluntary hospitals, which save such patients from the necessity of requiring the relief which it is the object of the poor law to supply.

We have dealt with the relative advantages and disadvantages of rate-supported hospitals and voluntary hospitals. We should regard the establishment of a complete state-provided or rate-provided system of gratuitous medical relief, either for indoor patients or for out-door patients, or for both, as a grave evil. Such a system must eventually lead to the extinction of voluntary hospitals. If this disaster ever happens, it must result in the gravest evils, for it could not fail to injure the morale of all classes and tend to harden unnecessarily the relations between the rich and poor, who, under the voluntary system, have come to share each other's sufferings and to be animated by respect and confidence towards each other.

Hospital Construction. Locality and Site.—Hospitals are required for the use of the community in a certain locality, and to be of use they must be within reach of the centre of population. Formerly the greater difficulty of locomotion made it necessary that they should be actually in the midst of towns and cities, and to some extent this continues to prevail. It is now proved to demonstration that this is not the best plan. Fresh and pure air being a prime necessity, as well as a considerable amount of space of actual area in proportion to population, it would certainly be better to place hospitals as much in the outskirts as is consistent with considerations of usefulness and convenience. In short, the best site would be open fields; but if that be impracticable, a large space, "a sanitary zone" as it is called by Tollet, should be kept permanently free between them and surrounding buildings, certainly never less than double the height of the highest building. In the selection of a site various factors must be taken into consideration. If the hospital is to be used as the clinical school of a university or medical college, then the most suitable ground available within easy reach of the university or college must be secured. If, on the other hand, the hospital is not to be used as a teaching school, a site more in the country should be favoured. In any case ample ground must be purchased to permit of the wards receiving the maximum of sunlight, an abundant supply of fresh air, and leave room for possible future extensions. The site should be self-contained; it should be in such a position as to prevent the hospital being shadowed by other buildings in the neighbourhood, and, unless the site is alongside a public park, it should be entirely surrounded by streets of from 40 to 60 ft. in width. It is also necessary to secure that adequate water mains serve the site, and that the system of sewers be ample for all sewage purposes.

The difference between the expense of purchase of land in a town and in the environs is generally considerable, and this is therefore an additional reason for choosing a suburban locality. Even with existing hospitals it would be in most cases pecuniarily advantageous to dispose of the present building and site and retain only a receiving house in the town. St Thomas's in London, the Hôtel-Dieu in Paris and the Royal Infirmary in Manchester, are all good examples where this might have been carried out. In none, however, has this been done; these hospitals have been rebuilt, at enormous outlay, in the cities as before, although not exactly in the same locality.

As regards the actual site itself, where circumstances admit of choice, a dry gravelly or sandy soil should be selected, in a position where the ground water is low and but little subject to fluctuations of level, and where the means of drainage are capable of being effectually carried out. There should also be a cheerful sunny aspect and some protection from the coldest winds.

Form of Building.—A form of building must be selected which answers the following conditions: (*a*) the freest possible circulation of air round each ward, with no cul-de-sac or enclosed spaces where air can stagnate; (*b*) free play of sunlight upon each ward during some portion at least of the

day; (*c*) the possibility of isolating any ward, or group of wards, effectually, in case of infectious disease breaking out; (*d*) the possibility of ventilating every ward independently of any other part of the establishment. Those conditions can only be fulfilled by one system, viz. a congeries of houses or pavilions, more or less connected with each other by covered ways, so as to facilitate convenient and economical administration. The older plans of huge blocks of buildings, arranged in squares or rectangles, enclosing spaces without free circulation of air, are obviously objectionable. Even when arranged in single lines or crosses they are not desirable, as the wards either communicate with each other or with common passages or corridors, rendering separation impossible. On this point it may be remarked that some of the buildings of the 18th century were more wisely constructed than many of those in the first half of the 19th century, and that the older buildings have been from time to time spoilt by ignorant additions made in later times.

The question next arises, is it better to have pavilions of two or more storeys high, or to have single-storeyed huts or cottages scattered more widely? For the treatment of tuberculosis there can be no doubt that, for hygienic reasons, the *châlet* or single-patient hut is the best for the patients in the acute stages; for economical reasons the *châlet* has not been heretofore as popular as it deserves to be, but if the welfare of the patient is to be the first consideration there is no doubt that the *châlet* will ultimately prevail. It has the merit of being easily adapted to villages and houses where there is a garden, and in this way poor families may readily isolate and treat a member affected by tuberculosis at a cost within their means. For hospital purposes, so long as the system of placing hospital buildings in densely crowded areas prevails, many-storeyed buildings for hospital purposes are likely to continue. Should the proposal to institute a Hospital City ultimately prevail, then it is probable that the majority of the pavilions will be single-storeyed. Still some hospital authorities prefer the multiple-storeyed system for administrative reasons, contending that single-storeyed pavilions have no special advantages over two or three-storeyed buildings, whereas the difficulties in administration and service of a hospital building on the single-storey principle outweigh any argument against the two- or three-storey building, if it is properly designed and constructed. We hope that the time is approaching when architects and those members of the public who have to provide the money for hospital buildings will insist upon the erection of simple structures, costing little, so that the whole cost of hospital buildings may be, as it ought to be, reduced by at least half when compared with the expenditure of the past.

The pavilions may be arranged in various ways; they may be joined at one end by a corridor, or may be divided by a central corridor at right angles to them. In fact, the plan is very elastic, and adapts itself to almost any circumstances. A certain distance, not less than twice the height of the pavilions, ought to be preserved between them. By this means free circulation of air and plenty of light are secured, whilst separation or isolation may be at once accomplished if required.

Foundations, Building Materials, &c.—It is of the first consequence that a hospital should be dry; therefore the foundation and walls ought to be constructed so as to prevent the inroads of damp. An impervious foundation has the further advantage of preventing emanations from the soil rising up in consequence of the suction force produced by the higher temperature of the internal atmosphere of the building itself. There should be free ventilation in the basement, and the raising of the whole on arches is a good plan, now generally carried out in hot climates. If the pavilions are two or more storeys high, it is advisable to use fire-proof material as much as possible, but single-storeyed huts may be of wood. In any case effectual means of excluding damp must be employed. The interiors of wards ought to be rendered as non-absorbent as possible, by being covered with impervious coatings, such as glazed tiles (Parian, though much used, is apt to crack), silicate paint, which is preferable to tiles, or the like. The ceilings ought to be treated in the same way as the walls. There must be a concrete floor between each flat, experience showing that if a teak floor is laid hard on the concrete a very noisy floor is the result, but if the teak is laid on strips of wood, leaving a small space between the concrete and the floor, a more silent floor is obtained. For the floors themselves various materials have been suggested: in France there is a preference for flags (*dalles*), but in England wood is more liked; and indeed hard well-fitting wood, such as teak, oak or American willow, leaves nothing to be desired. The surface should be waxed and polished or varnished. Even deal floors can be rendered non-absorbent by waxing, by impregnating them with solid paraffin as recommended by Dr Langstaff.

Shape and Arrangement of Wards.—It is now generally agreed that wards should have windows on at least two opposite sides. Three main shapes have been proposed: (*a*) long wards with windows down each side, and (generally) one at the farther end with balcony; 26 ft. is a good width for a ward of twelve or fourteen beds, but for larger wards of more than fourteen beds the width should be not less than 28 ft.; (*b*) wards nearly square, with windows on three sides; and (*c*) circular wards with windows all round. The first (*a*) is the form usually adopted in pavilions; (*b*) is recommended by Dr C. F. Folsom (*Plans for the Johns Hopkins Hospital*); and (*c*) has been suggested by Mr John Marshall, F.R.S. (*Nat. Assoc. for Promotion of Social Science*, 1878). Of these (*b*) seems the least to be commended, and (*c*), now comparatively common, has distinct advantages in an administrative sense, when the wards are constructed as to floor space so as to allow the same proportion of superficial space per bed in a circular ward to that which is contained in a rectangular ward, as is the case at the Great Northern Central Hospital, London. Some authorities object to a chimney-stack up the centre of the circular ward, urging that it prevents the nurses from having complete supervision over all the beds. In practice this objection seems to us to have little force, and it can be avoided by placing the fireplaces at the side of the circular ward, if desirable, though this adds somewhat to the cost of building.

Each bed should be a little distance, say from 8 in. to 1 ft. from the wall, and each bed may be reckoned as 6½ ft. long; this gives 7½ ft. on each side. Between the ends of the beds about 10 ft. space is necessary, so that 25 or 26 ft. of total breadth may be taken as a favourable width. The wards of the Herbert Hospital are 26 ft.; but some exceed this, as, for instance, St Thomas's, London, and the New Royal infirmary, Edinburgh, 28; new Hôtel Dieu, 29; and Lariboisière, 30. There seems no necessity for exceeding 26 for a ward of twelve or fourteen beds, but if the breadth be greater there ought to be more window space—the great difficulty being to get a wide space thoroughly ventilated. There ought to be only two rows of beds, one down each wall, with a window on each side of each bed.

For ventilation two things are required—sufficient space and sufficiently frequent change or renewal of air. As regards space, this must be considered with reference both to total space and to lateral or floor space. Unless a minimum of floor space be laid down, we shall always be in danger of overcrowding, for cubic space may be supplied vertically with little or no advantage to the occupier. If we allow a minimum distance of 4 ft. between the beds and 10 ft. between the ends of the beds, this gives 100 sq. ft. of space per bed; less than this is undesirable. In severe surgical cases, fever cases and the like, a much larger space is required; and in the Edinburgh Infirmary 150 sq. ft. is allowed. Cubic space must be regulated by the means of ventilation; we can rarely change the air oftener than three times in an hour, and therefore the space ought to be at least one-third of the hourly supply. This ought not to be less than 4000 cubic ft. per bed, even in ordinary cases of sickness—and the third of that is 1333 cubic ft. of space. With 100 sq. ft. of floor space a ward of 13½ ft. high would supply this amount, and there is but little to be gained by raising the ceiling higher,—indeed 12 ft. is practically enough. The experiments of Drs Cowles and Wood of Boston (see *Report of State Board of Health of Massachusetts for 1879*) show that above 12 ft. there is little or no movement in the air except towards the outlet ventilator; the space above is therefore of little value as ventilation space. Authorities nowadays, however, fix 10 ft. 6 in. as the maximum, and any height above this may be disregarded for purposes of ventilation. Additional height adds also to the cost of construction, increases the expense of warming, makes cleaning more difficult, and to some extent hampers ventilation. Whatever be the height of wards, the windows must reach to the ceiling, or there must be ventilators in the ceiling or at the top of the side walls. If this be not arranged for, a mass of foul air is apt to stagnate near the ceiling, and sooner or later to be driven down upon the inmates. The reasons for a large and constant renewal of air are, of course, the immediate removal and dilution of the organic matter given off by the inmates; as this is greater in quantity and more offensive and dangerous in sickness than in health, the change of air in the former case must be greater than in the latter. Hence in serious cases an amount of air practically unlimited is desirable—the aim of true ventilation being to approach as near as possible to the condition of pure external air. Without going too much into details, a few general rules may be laid down. (1) Fresh air ought, if possible, to be brought in at the lowest part of the ward, warmed if necessary; (2) foul air ought to be taken out at the highest part of the ward; (3) fresh air should reach each patient without passing over the bed of any other; (4) the vitiated air should be removed from each patient without passing over the bed of any other; (5) 4000 cubic ft. of fresh air per head per hour should be the minimum in ordinary cases of sickness, to be increased without limit in severer cases; (6) the air should move in no part of a ward at a greater rate than 1½ ft. per second, except at the point of entry, where it should not exceed 5 ft. per second, and at the outlet, where the rate may be somewhat higher; about 64 sq. in. of inlet and outlet sectional area ought to be supplied per head as a minimum; (7) every opportunity ought to be taken of freely flushing the wards with air, by means of open windows, when this can be done with safety.

Warming is a question of great importance in most climates, especially in such a climate as that of Great Britain, where every system of ventilation must involve either the warming of some portion of the incoming air, or the contriving its delivery without too great lowering of temperature; at the same time it cannot be too strongly insisted upon that the tendency is too much in the direction of allowing warmth to supersede freshness of air. There are very few cases of disease (if any) that are not more injured by foul air than by low temperature; and in the zymotic diseases, such as typhus, enteric fever, smallpox, &c., satisfactory results have been obtained even in winter weather by almost open-air treatment. At the same time a reasonable warmth is desirable on all grounds if it can be obtained without sacrificing purity of atmosphere. For all practical purposes 60° to 63° F. is quite sufficient, and surgical and lying-in cases do well in lower temperatures. Various plans of warming have been recommended, but probably a combination is the best. It is inadvisable to do away altogether with radiant heat, although it is not always possible to supply sufficient warmth with open-air fire-places alone. A portion of the air may be warmed by being passed over a heating apparatus before it enters the ward, by having an air-chamber round the fire-place or stove, or by the use of radiators in the ward itself. In each case, however, the air must be supplied independently to each ward, so that no general system of air supply is applicable.

The lighting of the ward at night will be most conveniently done by means of electricity in the form of a lamp for each bed, where gas is used each jet should have a special ventilator to carry off combustion products, as in the Edinburgh Infirmary.

The Furniture of Wards should be simple, clean and non-absorbent; the bedsteads of iron, mattresses hair, laid on spring bottoms without sacking. No curtains should be permitted.

The water-supply ought to be on the constant system, and plentiful; 50 gallons per head per diem may be taken as a fair minimum estimate.

The closets ought to be of the simplest construction, the pans of earthenware all in one piece, the flushing arrangements simple but perfect, and the supply of water ample. Each ward should have its own closets, lavatories, &c., built in small annexes, with a cross-ventilated vestibule separating them from the ward. All the pipes should be disconnected from the drains, the closets by intercepting traps, the sink and waste pipes by being made to pour their contents over trapped gratings. The soil pipes should be ventilated, and placed outside the walls, protected as may be necessary from frost. Each ward should have a movable bath, which can be wheeled to the patient's bedside.

Each ward should have attached to it a small kitchen for any special cooking that may be required, a room for the physician or surgeon, and generally a room with one or two separate beds. No cooking should be done in the wards, nor ought washing, airing or drying of linen to be allowed there.

Hospital Economics.—There is no doubt that the voluntary system of hospital government is far more economical than any system of state or rate-supported hospitals. That the present condition of the voluntary hospitals in regard to economy is all that can be wished is not, of course, true. Still, resting as this system does upon the goodwill of the public for its continuance and maintenance, it is satisfactory to note that there is a continuous improvement in system and method, which makes for economy. It has taken many years to perfect and enforce the uniform system of hospital accounts, but this system with the co-operation of the great funds has produced economical results of the first importance. This system originated at the Queen's Hospital, Birmingham, in 1869, and was devised by an eminent Birmingham accountant, William Laundy, and Sir Henry Burdett. It proved so fruitful in practice that six years later it was introduced at the "Dreadnought" Seamen's Hospital, the first London hospital to use it, and was then adopted spontaneously by a few of the best-administered hospitals where the managers were keen in enforcing economy. In 1891, in order to secure for comparative purposes an identical classification of the items and charges included in the system, a glossary or index of classification was prepared and published in the *Hospital Annual* of that year. This index enabled the same classification of the many items included in the expenditure of a great institution to be adopted generally. In the same year a committee of hospital secretaries, at the instigation of the Metropolitan Hospital Sunday Fund, revised and elaborated the index of classification, and the new index was adopted by a general meeting of hospital secretaries in January 1892. The Council of the Metropolitan Hospital Sunday Fund approved it, and the Uniform System of Accounts was formulated by that body for the use of the metropolitan hospitals. In 1906 the whole of this system was inquired into on behalf of the King's Fund by Mr John G. Griffiths, F.C.A., when a committee of hospital secretaries and representatives of the King's Fund prepared a further revision of the system. This was completed in the course of the year and adopted by the King's, the Hospital Sunday and the Hospital Saturday Funds. The publication of a book by Sir Henry Burdett led to the adoption of the system in several of the British Colonies, and as a result of the action taken in the British Empire the Uniform System of Accounts has recently been set up and adopted by the principal hospitals of the United States of America. The prince of Wales (George V.) testified to the value of this system in enforcing control over expenditure, and Sir Henry Burdett adapted it for the use of the authorities of all charities of every class. It is probable that no single reform has had a greater influence for good upon the administration of charitable institutions than the evolution and enforcement of the uniform system of accounts.

Nursing.—The arrangements for nursing the sick have greatly improved in recent times, although controversy still goes on as to the best method of carrying it out. In arranging for the nursing in a hospital both efficiency and economy have to be considered. No ward in a general hospital for acute cases should contain more than 24 beds. In hospitals with clinical schools the proportion of nurses to patients should be about one nurse to every three patients, and if possible every ward should have a probationer on duty at night in addition to the night nurse. In all well-conducted hospitals it is now arranged that the nurses on night duty have a hot meal served in the general dining-room during the night, and this is only possible where a nurse and a probationer are allowed for each ward. The nurses' quarters should be separate from the hospital proper, and connected by a conservatory or covered way. Each nurse should have a separate bedroom, measuring not less than 12 ft. long, 9 ft. broad and 10 ft. high. A bath should be allowed for every eight rooms, and the water-closets and sinks should, if possible, be in sanitary towers cut off from the main block of buildings.

Circumstances must to a large extent determine the arrangement, but it seems desirable on the whole that the work of a nurse should be confined to a single ward at a time if possible. The duties of nurses ought also to be distinctly confined to attendance on the sick, and no menial work, such as scrubbing floors and the like, should be demanded of them; a proper staff of servants ought to be employed for such purposes. It is also desirable that a separate pavilion for lodging the nurses should be set apart, and that fair and reasonable time for rest and recreation should be allowed. Some discussion has taken place as to the advisability of placing the nursing of a hospital in the hands of a sisterhood or a separate corporation. It will, however, be admitted that the best plan is for the nursing staff of each hospital to be special and under one head within the establishment itself, even though it may be connected with some main institution outside. The nursing must, of course, be carried on in accordance with the directions and treatment of the physicians and surgeons.

General.—The kitchen, laundry, dispensary and other offices must be in a separate pavilion or pavilions, away from the wards, but within convenient access. A separate pavilion for isolation of

infectious cases is desirable. This may be a wooden hut, or in some cases even a tent; either is probably preferable to a permanent block of buildings. A disinfecting chamber ought to be provided where heat can be applied to clothes and bedding, for the destruction both of vermin and of the germs of disease. It is advisable to expose all bedding and clothing to its influence after each occasion of wear. Although this may entail additional expense from the deterioration of fabric, it is worth the outlay to secure immunity from disease. This plan is rigidly followed at the Royal South Hants Infirmary at Southampton. It is of great importance that the wards should be periodically emptied and kept unoccupied for not less than one month in each year, and longer if possible. During such period thorough cleansing and flushing with air could be carried out, so as to prevent any continuous deposit of organic matter.

Gate House or Admission Block.—If the efficiency of a hospital and the regular and smooth working of its departments are to be secured, the proper management and control of the admission department is of the greatest importance. When one considers for a moment the number of applicants of all ages in various stages of disease, and the number of accident cases of every degree of severity who present themselves every day seeking admission, it will be evident that the most careful supervision must be exercised on the very threshold. It is essential that every precaution be taken against the admission of an unsuitable case, or the refusal, without careful examination, of any patient seeking admission. It is only necessary to instance the case of a patient with delirium tremens being admitted to a general ward at a late hour, or a case of infectious disease admitted through an overlook, or a case refused admission and expiring on the way home, in order to illustrate the danger and trouble which might arise should the supervision exercised over this department not be systematic, stringent and thorough.

To secure this proper control it is necessary that the admission department should be designed on a definite plan suitable for the purposes in view. It is not sufficient to utilize any available rooms, say, in the basement of the building, where patients may be casually interviewed by a house surgeon or physician. This department should be as carefully designed and equipped as any other department of the hospital.

Within recent years much more attention has been devoted to the details of construction than was formerly considered necessary, but even in the best type of hospital there is still much to be desired in this respect. It is essential for an architect in designing any building to have before him an accurate idea of all the requirements, and the use to which each foot of space is to be put; for unless he is furnished with this information it is not possible for him to design his building so as to give effect to all the details which are so necessary. The following is an endeavour in a general way to enumerate the various points which an architect should have before him in designing the admission department of a general hospital:—

The admission department should be conveniently placed on the ground floor of the hospital—or it may be a detached building—with a large court where ambulance wagons or other vehicles may easily pass each other on approaching or retiring from the institution. The entrance to the admission department for patients should, if possible, be entirely separate and distinct from that for the staff and students. An additional entrance should be provided for patients' friends on visiting days, in order that they may be able to enter the hospital without passing through the patients' entrance, or coming into contact with an accident case or other patient seeking admission. The main entrance door should be protected by a covered porch so that patients may be removed from the ambulance or cab to the examination room without being exposed to the weather or the gaze of inquisitive onlookers. This door should be sufficiently wide to allow two hand ambulances or barrows to pass should they require to be brought out to the ambulance or cab, and to facilitate this the floor of the entrance hall should be as nearly as possible on a level with that of the outside porch. Adjoining the entrance vestibule, lavatory accommodation should be provided for males and females who may accompany the patient. Lavatory accommodation should also be provided for porters on duty, and all lavatories should have a cut-off ventilating passage.

A recess to store ambulance barrows should adjoin the entrance, and this recess must be in proportion to the size of the hospital, in order that a hand ambulance may always be available when an accident or urgent case arrives. The vestibule should lead into a large waiting-hall with an inquiry office at its entrance, provided with a telephone exchange, private exchange box, also letter and parcel racks. If possible a window of the inquiry office should command a view of the main entrance. A room should be provided for the medical officer on duty, so that a medical officer may be always at hand and that no delay will occur in attending to a patient on arrival.

Leading off from this waiting-hall, well-lit examination rooms should be available for the thorough examination of patients, both male and female, the number of rooms, of course, varying with the size of the hospital and the amount of work to be done. Each of these rooms should be fitted with a wash-hand basin and sink, and a plentiful supply of hot and cold water.

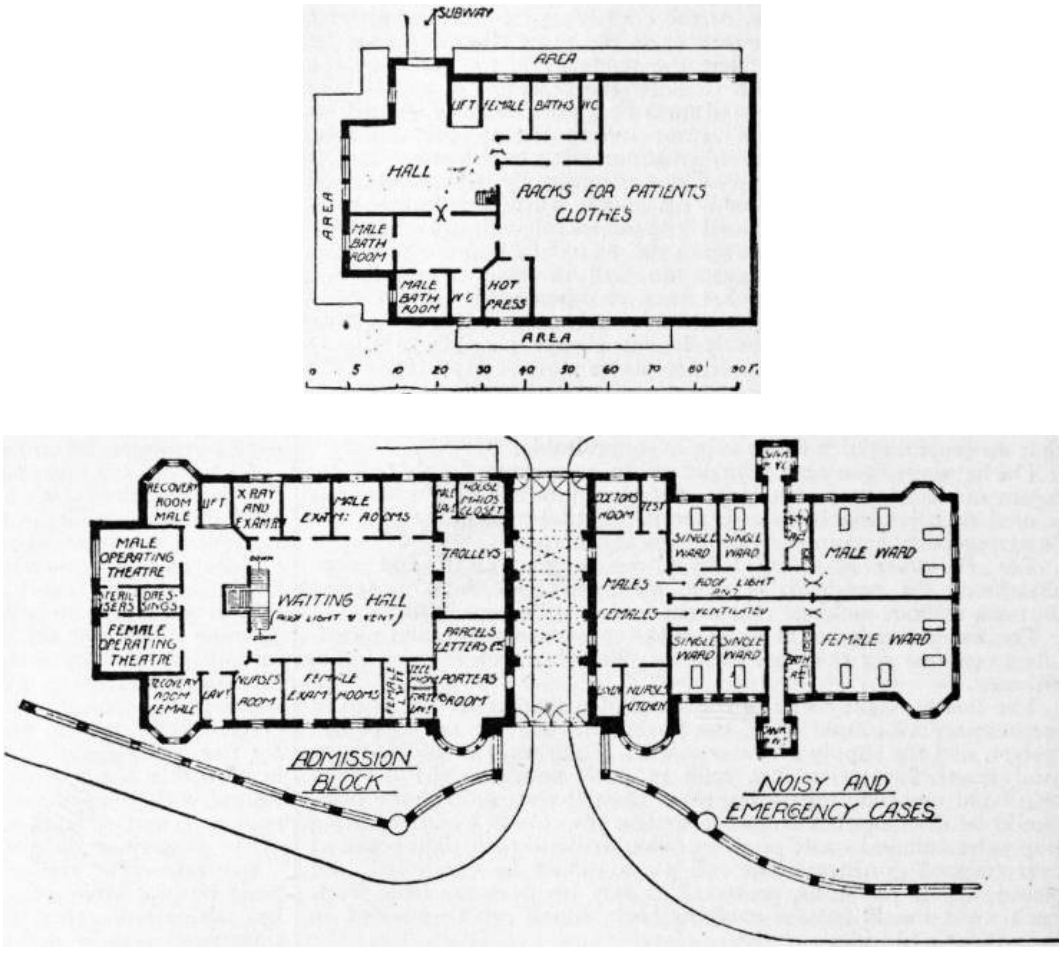
Two rooms, with recovery rooms adjoining, should be fitted up as small operating-rooms for the treatment of minor casualties. A special room should also be furnished with an X-ray outfit, and arrangements should be made whereby this room can be readily darkened so that suspected fractures, &c. may be examined with the fluorescent screen.

Adjoining the admission department two small wards should be provided for the accommodation of drunk or noisy cases unfit to be placed in the general wards. To these "emergency wards" must be attached the usual bathroom and lavatory accommodation, nurses' room, ward kitchen and

urine-test room or small lavatory. These wards should have double windows in order to prevent noise being heard outside if the wards are near other buildings.

The interior walls of the admission department should, as far as possible, have a smooth and impervious surface, in order that they may be easily cleaned. All angles should be avoided and all corners rounded. Although glazed tiles are open to the criticism that they have numerous joints, they probably make the most suitable wall yet devised, as they can be easily washed down at very small cost. The corridors and waiting-hall should be tiled to a height of 6 ft. 6 in., and the upper walls covered with Parian or Kean's cement, and be treated with three coats of flat paint and two coats of enamel, or, what is equally suitable and less costly, enamellette. The floors of the passages and corridors throughout the department should be covered with terrazzo, which is a mixture of Portland cement and marble chips. A margin of 1 ft. round the rooms should be treated in this way, and the terrazzo carried up this same distance on the wall to join the tiles. The remainder of the floors should be covered with hard wood, such as American maple or teak. As these floors require to be frequently washed, oak is not so suitable. Oak very soon becomes destroyed with water; the same trouble is experienced with pitch pine. The doors should also be made of a hard wood, preferably teak, and have no mouldings or grooves where dust can lodge. They should be wide enough to admit an ambulance barrow or bed with ease. In no case should the doors of an examination room be less than 3 ft. 6 in. in width.

As an aid to a complete understanding of the varied work which has to be provided for, and the most effective method of carrying it out, the accompanying plans are given of an admission block designed to embody the main principles which govern the construction of such a department.



Plans of Ground Floor and Basement of a Hospital.

All accidents and patients seeking admission to this hospital enter through the central gateway, and on the left is shown the porters' room, where a porter is always in readiness to attend to any applicant. This room has suitable accommodation for parcels, letters, telephones, &c., and adjoining it is a small lavatory for the use of porters. At the side of the porters' room is the entrance to the central waiting-hall, which is lit from the roof. On one side of this hall are examination and dressing-rooms for males, with lavatory accommodation; and on the other side similar provision for females, with the addition of a nurses' duty room. At the end of the central hall are two operating theatres, with recovery room adjoining each; one theatre for males, and the other for females. Between these theatres are rooms for sterilizers and dressings. An X-ray examination room is provided beyond the male examination room on the right of the hall. In the basement, under the entrance-hall and operating theatres are two bathrooms for males and two for females, with W.C.'s for each. The remainder of the basement is used as a store for patients' clothes, and a hot-air chamber is provided for purposes of disinfection. The basement can be reached by a lift or by a wide staircase which is situated at the end of the waiting-hall.

In the above plan provision is made for a sitting-room for the medical officer on duty. This is a new and essential feature in the admission block unit of all hospitals in large cities, for it should secure that no patient is kept waiting for many minutes before being seen. One of the blots on the management of many hospitals is that regrettable delays often take place, and much dissatisfaction and avoidable suffering may arise from this difficulty in the administration of a general hospital. We have given this plan of a model gatehouse or admission block for a modern general hospital, because the block as it stands contains all the elements necessary for a receiving-house block in cities in connexion with a great Hospital city situated outside its area, in fulfilment of the suggestion for a Hospital city made above. Apart from its interest as a new feature which all new hospitals should adopt, the gatehouse or admission block has an importance in the wider sense, that it may come to form the key to the solution of the problem of how best to provide hospital accommodation for the poor in great cities under the best hygienic conditions, while protecting them from the misery and danger of prolonged delay in first treatment, especially in connexion with accidents and other cases of urgency.

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(H. BT.)

HOSPITIUM (Gr. ξενία, προξενία), "hospitality," among the Greeks and Romans, was of a twofold character: (1) private; (2) public.

(1) In Homeric times all strangers without exception were regarded as being under the protection of Zeus Xenios, the god of strangers and suppliants. It is doubtful whether, as is commonly assumed, they were considered as *ipso facto* enemies; they were rather guests. Immediately on his arrival, the stranger was clothed and entertained, and no inquiry was made as to his name or antecedents until the duties of hospitality had been fulfilled. When the guest parted from his host he was often presented with gifts (ξένια), and sometimes a die (ἀστράγαλος) was broken between them. Each then took a part, a family connexion was established, and the broken die served as a symbol of recognition; thus the members of each family found in the other hosts and protectors in case of need. Violation of the duties of hospitality was likely to provoke the wrath of the gods; but it does not appear that anything beyond this religious sanction existed to guard the rights of a traveller. Similar customs seem to have existed among the Italian races. Amongst the Romans, private hospitality, which had existed from the earliest times, was more accurately and legally defined than amongst the Greeks, the tie between host and guest being almost as strong as that between patron and client. It was of the nature of a contract, entered into by mutual promise, the clasping of hands, and exchange of an agreement in writing (*tabula hospitalis*) or of a token (*tessera* or *symbolum*), and was rendered hereditary by the division of the tessera. The advantages thus obtained by the guest were, the right of hospitality when travelling and, above all, the protection of his host (representing him as his patron) in a court of law. The contract was sacred and inviolable, undertaken in the name of Jupiter Hospitalis, and could only be dissolved by a formal act.

(2) This private connexion developed into a custom according to which a state appointed one of the citizens of a foreign state as its representative (πρόξενος) to protect any of its citizens travelling or resident in his country. Sometimes an individual came forward voluntarily to perform these duties on behalf of another state (ἑθελοπρόξενος). The proxenus is generally compared to the modern consul or minister resident. His duties were to afford hospitality to strangers from the state whose proxenus he was, to introduce its ambassadors, to procure them admission to the assembly and seats in the theatre, and in general to look after the commercial and political interests of the state by which he had been appointed to his office. Many cases occur where such an office was hereditary; thus the family of Callias at Athens were proxeni of the Spartans. We find the office mentioned in a Corcyraean inscription dating probably from the 7th century B.C., and it continued to grow more important and frequent throughout Greek history. There is no proof that any direct emolument was ever attached to the office, while the expense and trouble entailed by it must often have been very great. Probably the honours which it brought with it were sufficient recompense. These consisted partly in the general respect and esteem paid to a proxenus, and partly in many more substantial honours conferred by special decree of the state whose representative he was,

such as freedom from taxation and public burdens, the right of acquiring property in Attica, admission to the senate and popular assemblies, and perhaps even full citizenship. Public hospitium seems also to have existed among the Italian races; but the circumstances of their history prevented it from becoming so important as in Greece. Cases, however, occur of the establishment of public hospitality between two cities (Rome and Caere, Livy v. 50), and of towns entering into a position of clientship to some distinguished Roman, who then became patronus of such a town. Foreigners were frequently granted the right of public hospitality by the senate down to the end of the republic. The public hospes had a right to entertainment at the public expense, admission to sacrifices and games, the right of buying and selling on his own account, and of bringing an action at law without the intervention of a Roman patron.

A full bibliography of the subject will be found in the article in Daremberg and Saglio, *Dictionnaire des antiquités*, to which may be added R. von Jhering, *Die Gastfreundschaft im Altertum* (1887); see also Smith's *Dictionary of Greek and Roman Antiquities* (3rd ed., 1890).

HOSPODAR, a term of Slavonic origin, meaning "lord" (Russ. *gospodar*). It is a derivative of *gospod*, "lord," and is akin to *gosudar*, which primarily means "sovereign," and is now also used in Russia as a polite form of address, equivalent to "sir." The pronunciation as *hospodar* of a word written *gospodar* in all but one of the Slavonic languages which retain the Cyrillic alphabet is not, as is sometimes alleged, due to the influence of Little Russian, but to that of Church Slavonic. In both of these *g* is frequently pronounced *h*. In Little Russian the title *hospodar* is specially applied to the master of a house or the head of a family. The rulers of Walachia and Moldavia were styled *hospodars* from the 15th century to 1866. At the end of this period, as the title had been held by many vassals of Turkey, its retention was considered inconsistent with the growth of Rumanian independence. It was therefore discarded in favour of *domn* (*dominus*, "lord"), which continued to be the official princely title up to the proclamation of a Rumanian kingdom in 1881.

HOST. (1) (Through the O. Fr. *oste* or *hoste*, modern *hôte*, from Lat. *hospes*, a guest or host; *hospes* being probably from an original *hostipes*, one who feeds a stranger or enemy, from *hostis* and the root of *pascere*), one who receives another into his house and provides him with lodging and entertainment, especially one who does this in return for payment. The word is thus transferred, in biology, to an animal or plant upon which a parasite lives. (2) (From Lat. *hostis*, a stranger or enemy; in Med. Latin a military expedition), a very large gathering of men, armed for war, an army, and so used generally of any multitude. In biblical use the word is applied to the company of angels in heaven; or to the sun, moon and stars, the "hosts of heaven," and also to translate "Jehovah Sabaoth," the Lord God of hosts, the lord of the armies of Israel or of the hosts of heaven. (3) (From Lat. *hostia*, a victim or sacrifice), the sacrifice of Christ's body and blood in the Eucharist, more particularly the consecrated wafer used in the service of the mass in the Roman Church (see EUCHARIST).

HOSTAGE (through Fr. *ostage*, modern *otage*, from Late Lat. *obsidaticum*, the state of being an obses or hostage; Med. Lat. *ostaticum*, *ostagium*), a person handed over by one of two belligerent parties to the other or seized as security for the carrying out of an agreement, or as a preventive measure against certain acts of war. The practice of taking hostages is very ancient, and has been used constantly in negotiations with conquered nations, and in cases such as surrenders, armistices and the like, where the two belligerents depended for its proper carrying out on each other's good faith. The Romans were accustomed to take the sons of tributary princes and educate them at Rome, thus holding a security for the continued loyalty of the conquered nation and also instilling a possible future ruler with ideas of Roman civilization. This practice was also adopted in the early period of the British occupation of India, and by France in her relations with the Arab tribes in North Africa.[1] The position of a hostage was that of a prisoner of war, to be retained till the negotiations or treaty obligations were carried out, and liable to punishment (in ancient times), and even to death, in case of treachery or refusal to fulfil the promises made. The practice of taking hostages as security for the carrying out of a treaty between civilized states is now obsolete. The

last occasion was at the treaty of Aix-la-Chapelle in 1748, when two British peers, Henry Bowes Howard, 11th earl of Suffolk, and Charles, 9th Baron Cathcart, were sent to France as hostages for the restitution of Cape Breton to France.

In modern times the practice may be said to be confined to two occasions: (1) to secure the payment of enforced contributions or requisitions in an occupied territory and the obedience to regulations the occupying army may think fit to issue; (2) as a precautionary measure, to prevent illegitimate acts of war or violence by persons not members of the recognized military forces of the enemy. During the Franco-Prussian War of 1870, the Germans took as hostages the prominent people or officials from towns or districts when making requisitions and also when foraging, and it was a general practice for the mayor and *adjoint* of a town which failed to pay a fine imposed upon it to be seized as "hostages" and retained till the money was paid. The last case where "hostages" have been taken in modern warfare has been the subject of much discussion. In 1870 the Germans found it necessary to take special measures to put a stop to train-wrecking by parties in occupied territory not belonging to the recognized armed forces of the enemy, an illegitimate act of war. Prominent citizens were placed on the engine of the train "so that it might be understood that in every accident caused by the hostility of the inhabitants their compatriots will be the first to suffer." The measure seems to have been effective. In 1900 during the Boer War, by a proclamation issued at Pretoria (June 19th), Lord Roberts adopted the plan for a similar reason, but shortly afterwards (July 29) it was abandoned (see *The Times' History of the War in S. Africa*, iv. 402). The Germans also, between the surrender of a town and its final occupation, took "hostages" as security against outbreaks of violence by the inhabitants. Most writers on international law have regarded this method of preventing such acts of hostility as unjustifiable, on the ground that the persons taken as hostages are not the persons responsible for the act;[2] that, as by the usage of war hostages are to be treated strictly as prisoners of war, such an exposure to danger is transgressing the rights of a belligerent; and as useless, for the mere temporary removal of important citizens till the end of a war cannot be a deterrent unless their mere removal deprives the combatants of persons necessary to the continuance of the acts aimed at (see W. E. Hall, *International Law*, 1904, pp. 418, 475). On the other hand it has been urged (L. Oppenheim, *International Law*, 1905, vol. ii., "War and Neutrality," pp. 271-273) that the acts, the prevention of which is aimed at, are not legitimate acts on the part of the armed forces of the enemy, but illegitimate acts by private persons, who, if caught, could be quite lawfully punished, and that a precautionary and preventive measure is more reasonable than "reprisals." It may be noticed, however, that the hostages would suffer should the acts aimed at be performed by the authorized belligerent forces of the enemy.

In France, after the revolution of Prairial (June 18, 1799), the so-called "law of hostages" was passed, to meet the insurrection in La Vendée. Relatives of *émigrés* were taken from disturbed districts and imprisoned, and were liable to execution at any attempt to escape. Sequestration of their property and deportation from France followed on the murder of a republican, four to every such murder, with heavy fines on the whole body of hostages. The law only resulted in an increase in the insurrection. Napoleon in 1796 had used similar measures to deal with the insurrection in Lombardy (*Correspondance de Napoléon I.* i. 323, 327, quoted in Hall, *International Law*).

In May 1871, at the close of the Paris Commune, took place the massacre of the so-called hostages. Strictly they were not "hostages," for they had not been handed over or seized as security for the performance of any undertaking or as a preventive measure, but merely in retaliation for the death of their leaders E. V. Duval and Gustave Flourens. It was an act of maniacal despair, on the defeat at Mont Valérien on the 4th of April and the entry of the army into Paris on the 21st of May. Among the many victims who were shot in batches the most noticeable were Monsignor Darboy, archbishop of Paris, the Abbé Deguery, curé of the Madeleine, and the president of the Court of Cassation, Louis Bernard Bonjean.

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1 The sultan of Bagiemi, in Central Africa, in 1906 sent his nephew to undergo military training with a squadron of Spahis, and at the same time to serve as a guarantee of his fidelity to the French (*Bulletin du Comité de l'Afrique française*, Oct. 1906).

2 Article 50 of the Hague War Regulations lays it down that "no general penalty, pecuniary or otherwise, can be inflicted on the population on account of the acts of individuals for which it cannot be regarded as collectively responsible." The regulations, however, do not allude to the practice of taking hostage.

HOSTE, SIR WILLIAM (1780-1828), British naval captain, was the son of Dixon Hoste, rector of Godwick and Tittleshill in Norfolk. He was born on the 26th of August 1780 at Ingoldsthorpe, and entered the navy in April 1793, under the special care of Nelson, who had a lively affection for him. He became lieutenant in 1798, and was appointed commander of the "Mutine" brig after the battle of the Nile, at which he was present as lieutenant of the "Theseus." In 1802 he was promoted post captain by Lord St Vincent. During all his active career, he was employed in the Mediterranean and

the Adriatic. From 1808 to 1814 he held the command of a detached force of frigates, and was engaged in operations against the French who held Dalmatia at the time, and in watching, or, when they came out, fighting, the ships of the squadron formed at Venice by Napoleon's orders. The work was admirably done, and was also lucrative; and Hoste, although he occasionally complained that his exertions did not put much money in his pocket, made a fortune of at least £60,000 by the capture of Italian and Dalmatian merchant ships. He also made many successful attacks on the French military posts on shore. His most brilliant feat was performed on the 13th of March 1811. A Franco-Venetian squadron of six frigates and five small vessels, under the command of a French officer named Dubourdieu, assailed Hoste's small force of four frigates near the island of Lissa. The French officer imitated Nelson's attack at Trafalgar by sailing down on the English line from windward with his ships in two lines. But the rapid manœuvring and gunnery of Hoste's squadron proved how little virtue there is in any formation in itself. Dubourdieu was killed, one of the French frigates was driven on shore, and two of the Venetians were taken. After the action, which attracted a great deal of attention, Hoste returned to England, but in 1812 he was back on his station, where he remained till the end of the war. During the peace he did not again go to sea, and he died on the 6th of December 1828. He married Lady Harriet Walpole in April 1817, and left three sons and three daughters.

In 1833 his widow published his *Memoirs and Letters*. See also Marshall, *Roy. Nav. Biog.* vol. iii., and James, *Naval History*.

HOSTEL, the old name for an inn (see HOSPITAL, ad init.); also employed at Oxford and Cambridge to designate the lodgings which were in ancient times occupied by students of the university and to a certain extent regulated by the authorities. In some English public schools what is known as the "hostel" system provides for an organization of the lodging accommodation under separate masterships.

HOSTIUS, Roman epic poet, probably flourished in the 2nd century B.C. He was the author of a *Bellum Histricum* in at least seven books, of which only a few fragments remain. The poem is probably intended to celebrate the victory gained in 129 by Gaius Sempronius Tuditanus (consul and himself an annalist) over the Illyrian Iapydes (Appian, *Illyrica*, 10; Livy, *epit.* 59). Hostius is supposed by some to be the "doctus avus" alluded to in Propertius (iv. 20. 8), the real name of Propertius's Cynthia, according to Apuleius (*Apologia* x.) and the scholiast on Juvenal (vi. 7), being Hostia (perhaps Roscia).

Fragments in E. Bährens, *Fragmenta poetarum Romanorum* (1884); A. Weichert, *Poetarum Latinorum reliquiae* (1830).

HOSUR, a town of British India, in the Salem district of Madras, 24 m. E. of Bangalore. Pop. (1901) 6695. It contains an old fort, frequently mentioned in the history of the Mysore wars, and a fine castellated mansion built by a former collector. Close by is the remount depôt, established in 1828, where Australian horses are acclimatized and trained for artillery and cavalry use in southern India.

HOTCH-POT, or HOTCH-POTCH (from Fr. *hocher*, to shake; used as early as 1292 as a law term, and from the 15th century in cookery for a sort of broth with many ingredients, and so used figuratively for any heterogeneous mixture), in English law, the name given to a rule of equity whereby a person, interested along with others in a common fund, and having already received something in the same interest, is required to surrender what has been so acquired into the common fund, on pain of being excluded from the distribution. "It seemeth," says Littleton, "that

this word *hotch-pot* is in English a pudding; for in a pudding is not commonly put one thing alone, but one thing with other things together." The following is an old example given in Coke on Littleton: "If a man seized of 30 acres of land in fee hath issue only two daughters, and he gives with one of them 10 acres in marriage to the man that marries her, and dies seized of the other 20; now she that is thus married, to gain her share of the rest of the land, must put her part given in marriage into hotch-pot; *i.e.* she must refuse to take the profits thereof, and cause her land to be so mingled with the other that an equal division of the whole may be made between her and her sister, as if none had been given to her; and thus for her 10 acres she shall have 15, or otherwise the sister will have the 20." In the common law this seems to have been the only instance in which the rule was applied, and the reason assigned for it is that, inasmuch as daughters succeeding to lands take together as coparceners and not by primogeniture, the policy of the law is that the land in such cases should be equally divided. The law of hotch-pot applies only to lands descending in fee-simple. The same principle is noticed by Blackstone as applying in the customs of York and London to personal property. It is also expressly enacted in the Statute of Distributions (§ 5) that no child of the intestate, except his heir-at-law, who shall have any estate in land by the settlement of the intestate, or who shall be advanced by the intestate in his lifetime by pecuniary portion equal to the distributive shares of the other children, shall participate with them in the surplus; but if the estate so given to such child by way of advancement be not equivalent to their shares, then such part of the surplus as will make it equal shall be allotted to him. It has been decided that this provision applies only to advancements by *fathers*, on the ground that the rule was founded on the custom of London, which never affected a widow's personal estate. The heir-at-law is not required to bring any land which he has by descent or otherwise from the deceased into hotch-pot, but advancements made to him out of the personal property must be brought in. The same principle is to be found in the *collatio bonorum* of the Roman law: emancipated children, in order to share the inheritance of their father with the children unemancipated, were required to bring their property into the common fund. It is also found in the law of Scotland.

HÔTEL-DE-VILLE, the town hall of every French municipality. The most ancient example still in perfect preservation is that at St-Antonin (Tarn-et-Garonne) dating from the middle of the 12th century. Other fine town halls are those of Compiègne, Orléans, Saumur, Beaugency and St Quentin. The Hôtel de Ville in Paris built in the 16th century was burnt by the Commune in 1871 and has since been rebuilt on an extended site, the central portion of the main front being a reproduction of the old design. There is only one town hall in a French town, those erected for the mayors of the different arrondissements in Paris being called *mairies*.

HÔTEL-DIEU, the name given to the principal hospital in any French town. The Hôtel-Dieu in Paris was founded in the year A.D. 660, has been extended at various times, and was entirely rebuilt between 1868-1878. One of the most ancient in France is at Angers, dating from 1153. The Hôtel-Dieu of Beaune (Côte-d'Or), founded 1443, is one of the most interesting, as it retains the picturesque disposition of its courtyard, with covered galleries on two storeys and large dormer windows; and the great hall of the Hôtel-Dieu at Tonnerre, Yonne (1338), nearly 60 ft. wide and over 300 ft. long, is still preserved as part of the chief hospital of the town.

HOTHAM, SIR JOHN (d. 1645), English parliamentarian, belonged to a Yorkshire family, and fought on the continent of Europe during the early part of the Thirty Years' War. In 1622 he was made a baronet, and he was member of parliament for Beverley in the five parliaments between 1625 and 1640, being sheriff of Yorkshire in 1635. In 1639 he was deprived by the king of his office of governor of Hull, and joining the parliamentary party refused to pay ship-money. In January 1642 Hotham was ordered by the parliament to seize Hull, where there was a large store of munitions of war; this was at once carried out by his son John. Hotham took command of Hull and in April 1642 refused to admit Charles I. to the town. Later he promised his prisoner, Lord Digby, that he would surrender it to the king, but when Charles appeared again he refused a second time and drove away the besiegers. Meanwhile the younger Hotham was taking an active part in the Civil War in Yorkshire and Lincolnshire, but was soon at variance with other parliamentary leaders, especially

with the Fairfaxes, and complaints about his conduct and that of his troops were made by Cromwell and by Colonel Hutchinson. Soon both the Hothams were corresponding with the earl of Newcastle, and the younger one was probably ready to betray Hull; these proceedings became known to the parliament, and in June 1643 father and son were captured and taken to London. After a long delay they were tried by court-martial, were found guilty and were sentenced to death. The younger Hotham was beheaded on the 2nd of January 1645, and in spite of efforts made by the House of Lords and the Presbyterians to save him, the elder suffered the same fate on the following day. Sir John Hotham had two other sons who were persons of some note: Charles Hotham (1615-*c.* 1672), rector of Wigan, a Cambridge scholar and author of *Ad philosophiam Teutonicam Manuductio* (1648); and Durant Hotham (1617-1691), who wrote a *Life of Jacob Boehme* (1654).

HOTHAM, WILLIAM HOTHAM, 1st Baron (1736-1813), British Admiral, son of Sir Beaumont Hotham (d. 1771), a lineal descendant of the above Sir John Hotham, was educated at Westminster School and at the Royal Naval Academy, Portsmouth. He entered the navy in 1751, and spent most of his midshipman's time in American waters. In 1755 he became lieutenant in Sir Edward Hawke's flagship the "St George," and he soon received a small command, which led gradually to higher posts. In the "Syren" (20) he fought a sharp action with the French "Télémaque" of superior force, and in the "Fortune" sloop he carried, by boarding, a 26-gun privateer. For this service he was rewarded with a more powerful ship, and from 1757 onwards commanded various frigates. In 1759 his ship the "Melampe," with H.M.S. "Southampton," fought a spirited action with two hostile frigates of similar force, one of which became their prize. The "Melampe" was attached to Keppel's squadron in 1761, but was in the main employed in detached duty and made many captures. In 1776, as a commodore, Hotham served in North American waters, and he had a great share in the brilliant action in the Cul de Sac of St Lucia (Dec. 15th, 1778). Here he continued till the spring of 1781, when he was sent home in charge of a large convoy of merchantmen. Off Scilly Hotham fell in with a powerful French squadron, against which he could effect nothing, and many of the merchantmen went to France as prizes. In 1782 Commodore Hotham was with Howe at the relief of Gibraltar, and at the time of the Spanish armament of 1790 he flew his flag as rear-admiral of the red. Some time later he was made vice-admiral. As Hood's second-in-command in the Mediterranean he was engaged against the French Revolutionary navy, and when his chief retired to England the command devolved upon him. On March 12th, 1794 he fought an indecisive fleet action, in which the brunt of the fighting was borne by Captain Horatio Nelson, and some months later, now a full admiral, he again engaged, this time under conditions which might have permitted a decisive victory; of this affair Nelson wrote home that it was a "miserable action." A little later he returned to England, and in 1797 he was made a peer of Ireland under the title of Baron Hotham of South Dalton, near Hull. He died in 1813. Hotham lacked the fiery energy and genius of a Nelson or a Jervis, but in subordinate positions he was a brave and capable officer.

As Hotham died unmarried his barony passed to his brother, Sir Beaumont Hotham (1737-1814), who became 2nd Baron Hotham in May 1813. Beaumont, who was a baron of the exchequer for thirty years, died on the 4th of March 1814, and was succeeded as 3rd baron by his grandson Beaumont Hotham (1794-1870), who was present at the battle of Waterloo, being afterwards a member of parliament for forty-eight years. He died unmarried in December 1870 and was succeeded by his nephew, Charles (1836-1872), and then by another nephew, John (1838-1907). In 1907 his cousin Frederick William (b. 1863) became the 6th baron.

Other distinguished members of this family were the 2nd baron's son, Sir Henry Hotham (1777-1833), a vice-admiral, who saw a great deal of service during the Napoleonic wars; and Sir William Hotham (1772-1848), a nephew of the 1st baron, who served with Duncan in 1797 off Camperdown and elsewhere.

See Charnock, *Biographia navalis*, vi. 236.

HOTHO, HEINRICH GUSTAV (1802-1873), German historian of art, was born at Berlin in 1802, and died in his native city on Christmas day 1873. During boyhood he was affected for two years with blindness consequent on an attack of measles. But recovering his sight he studied so hard as to take his degree at Berlin in 1826. A year of travel spent in visiting Paris, London and the Low Countries determined his vocation. He came home delighted with the treasures which he had seen, worked laboriously for a higher examination and passed as "docent" in aesthetics and art history. In 1829 he was made professor at the university of Berlin. In 1833 G. F. Waagen accepted him as

assistant in the museum of the Prussian capital; and in 1858 he was promoted to the directorship of the print-room. During a long and busy life, in which his time was divided between literature and official duties, Hotho's ambition had always been to master the history of the schools of Germany and the Netherlands. Accordingly what he published was generally confined to those countries. In 1842-1843 he gave to the world his account of German and Flemish painting. From 1853 to 1858 he revised and published anew a part of this work, which he called "The school of Hubert van Eyck, with his German precursors and contemporaries." His attempt later on to write a history of Christian painting overtasked his strength, and remained unfinished. Hotho is important in the history of aesthetics as having developed Hegel's theories; but he was deficient in knowledge of Italian painting.

HOTI-MARDAN, or MARDAN, a frontier cantonment of British India in the Peshawar district of the North-West Frontier Province, situated 15 m. N. of Nowshera. Pop. (1901) 3572. It is notable as the permanent headquarters of the famous corps of Guides, and also contains a cavalry brigade belonging to the 1st division of the northern army.

HOTMAN, FRANÇOIS (1524-1590), French publicist, eldest son of Pierre Hotman, was born on the 23rd of August 1524, at Paris, his family being of Silesian origin. His name is latinized by himself Hotomanus, by others Hotomannus and Hottomannus. His father, a zealous Catholic, and a counsellor of the parlement of Paris, destined him for the law, and sent him at the age of fifteen to the university of Orleans. He obtained his doctorate in three years, and became a pleader at Paris. The arts of the barrister were not to his taste; he turned to the study of jurisprudence and literature, and in 1546 was appointed lecturer in Roman Law at the university of Paris. The fortitude of Anne Dubourg under torture gained his adhesion to the cause of Reform. Giving up a career on which he had entered with high repute, he went in 1547 to Lyons, and thence to Geneva and to Lausanne, where, on the recommendation of Calvin, he was appointed professor of belles-lettres and history, and married Claudine Aubelin, a refugee from Orleans. On the invitation of the magistracy, he lectured at Strassburg on law in 1555, and became professor in 1556, superseding François Baudouin, who had been his colleague in Paris. His fame was such that overtures were made to him by the courts of Prussia and Hesse, and by Elizabeth of England. Twice he visited Germany, in 1556 accompanying Calvin to the Diet at Frankfort. He was entrusted with confidential missions from the Huguenot leaders to German potentates, carrying at one time credentials from Catherine de Medici. In 1560 he was one of the principal instigators of the conspiracy of Amboise; in September of that year he was with Antoine of Navarre at Nérac. In 1562 he attached himself to Condé. In 1564 he became professor of civil law at Valence, retrieving by his success the reputation of its university. In 1567 he succeeded Cujas in the chair of jurisprudence at Bourges. Five months later his house and library were wrecked by a Catholic mob; he fled by Orleans to Paris, where L'Hôpital made him historiographer to the king. As agent for the Huguenots, he was sent to Blois to negotiate the peace of 1568. He returned to Bourges, only to be again driven away by the outbreak of hostilities. At Sancerre, during its siege, he composed his *Consolatio* (published in 1593). The peace of 1570 restored him to Bourges, whence a third time he fled, in consequence of the St Bartholomew massacre (1572). In 1573, after publishing his *Franco-Gallia*, he left France for ever with his family, and became professor of Roman law at Geneva. On the approach of the duke of Savoy he removed to Basel in 1579. In 1580 he was appointed councillor of state to Henry of Navarre. The plague sent him in 1582 to Montbéliard; here he lost his wife. Returning to Geneva in 1584 he developed a kind of scientific turn, dabbling in alchemy and the research for the philosopher's stone. In 1589 he made his final retirement to Basel, where he died on the 12th of February 1590, leaving two sons and four daughters; he was buried in the cathedral.

Hotman was a man of pure life, real piety (as his *Consolatio* shows) and warm domestic virtues. His constant removals were inspired less by fear for himself than by care for his family, and by a temperament averse to the conditions of warfare, and a constitutional desire for peace. He did much for 16th-century jurisprudence, having a critical knowledge of Roman sources, and a fine Latin style. He broached the idea of a national code of French law. His works were very numerous, beginning with his *De gradibus cognationis* (1546), and including a treatise on the Eucharist (1566); a treatise (*Anti-Tribonien*, 1567) to show that French law could not be based on Justinian; a life of Coligny (1575); a polemic (*Brutum fulmen*, 1585) directed against a bull of Sixtus V., with many other works on law, history, politics and classical learning. His most important work, the

Franco-Gallia (1573), was in advance of his age, and found favour neither with Catholics nor with Huguenots in its day; yet its vogue has been compared to that obtained later by Rousseau's *Contrat Social*. It presented an ideal of Protestant statesmanship, pleading for a representative government and an elective monarchy. It served the purpose of the Jesuits in their pamphlet war against Henry IV.

See Bayle, Dictionnaire; R. Dareste, *Essai sur F. Hotman* (1850); E. Grégoire, in *Nouvelle Biog. générale* (1858).

(A. Go.*)

HOT SPRINGS, a city of Arkansas, U.S.A., the county-seat of Garland county, at the easterly base of the Ozark mountains, 55 m. by rail W.S.W. of Little Rock. Pop. (1880) 3554; (1890) 8086; (1900) 9973, of whom 3102 were of negro descent and 561 were foreign-born; (1910 census) 14,434. The transient population numbers more than 100,000 annually. Hot Springs is served by the Chicago, Rock Island & Pacific, the Little Rock & Hot Springs Western, and the St Louis, Iron Mountain & Southern railways. The city lies partly in several mountain ravines and partly on a plateau. A creek, flowing through the valley but walled over, empties into the Ouachita river several miles from Hot Springs. The elevation of the surrounding hills is about 1200 ft. above the sea and 600 above the surrounding country. The scenery is beautiful, and there is a remarkable view from a steel tower observatory, 150 ft. high, on the top of Hot Springs mountain. The climate is delightful. The average rainfall for the year is about 55 in. The springs are about forty-four in 805
number, rising within an area of 3 acres on the slope of Hot Springs mountain. They are all included within a reservation held by the United States government, which (since 1903) exercises complete jurisdiction. The daily flow from the springs used is more than 800,000 gallons. Their temperature varies from 95° to 147° F. The waters are tasteless and inodorous, and contain calcium and magnesium bicarbonates, combinations of hydrogen and silicon, and of iodides, bromides and lithium. The national government maintains at Hot Springs an army and navy hospital, and a bath-house open gratuitously to indigent bathers. The business of Hot Springs consists mainly in caring for its visitors. Fruit-raising and small gardening characterize its environs. There are sulphur, lithia and other springs near the city, and an ostrich farm and an alligator farm in the suburbs. The finest of the novaculite rocks of central Arkansas are quarried near the city. The total value of its factory product in 1905 was $597,029, an increase of 213.1% since 1900.

The Springs were first used by the itinerant trappers. They were visited about 1800 by French hunters; and by members of the Lewis and Clark party in 1804 under instructions from President Thomas Jefferson. The permanent occupation of the town site dates only from 1828, though as early as 1807 a temporary settlement was made. In 1876 Hot Springs was incorporated as a town, and in 1879 it was chartered as a city. In 1832 Congress created a reservation, but the right of the government as against private claimants was definitely settled only in 1876, by a decision of the United States Supreme Court. The city was almost destroyed by fire in 1878, and was greatly improved in the rebuilding.

HOT SPRINGS, a hamlet and health-resort in Cedar Creek District, Bath county, Virginia, U.S.A., 25 m. by rail (a branch of the Chesapeake & Ohio railway) N. by E. of Covington and near the N.W. border of the state. It lies in a narrow valley, about 2200-2500 ft. above the sea, with rugged mountains on either side. Pop. of the district (1900) 1761; (1910) 2472. The mean summer temperature is only 69° F., and the summer nights are always cool. There is a good golf-course. Mineral waters (with magnesia, soda-lithia and alum) issue from several springs, some at a temperature as high as 106° F., and are used both for drinking and for bathing. The Warm Sulphur Springs (about 98° F.) are 5 m. N.; Healing Springs (85° F.) are 2½ m. S. of Hot Springs; and a few miles to the S.E., in Rockbridge county, are Rockbridge and Jordan Alum Springs.

HOTTENTOTS, an African people of western Cape Colony and the adjoining German territory, formerly widely spread throughout South Africa. The name is that given them by the early Dutch

settlers at the Cape, being a Dutch word of an onomatopoeic kind to express stammering, in reference to the staccato pronunciation and clicks of the native language. Some early writers termed them Hodmadods or Hodmandods, and others Hot-nots and Ottentots—all corruptions of the same word. Their name for themselves was Khoi-Khoin (men of men), or Quae Quae, Kwekhena, t'Kuhkeub, the forms varying according to the several dialects. Early authorities believed them to be totally distinct from all other African races. The researches of Gustav Fritsch, Dr E. T. Hamy, F. Shrubsall and others have demonstrated, however, that they are not so much a distinct or independent variety of mankind as the result of a very old cross between two other varieties—the Bantu Negro (containing a distinct Hamitic element) and the Bushman. Hamy calls them simply "Bushman-Bantu half-breeds," the Bushman element being seen in the leathery colour, compared to that of the "sere and yellow leaf"; in the remarkably prominent cheekbones and pointed chin, giving the face a peculiarly triangular shape; and lastly, in such highly specialized characters as the *tablier* and the *steatopygia* of the women. The cranial capacity is also nearly the same (1331 c.c. in the Bushman, 1365 c.c. in the Hottentot), and on these anatomical grounds Shrubsall concludes that the two are essentially one race, allowing for the undeniable strain of Bantu blood in the Hottentot. This view is further strengthened by the vast range in prehistoric times of the Hottentot variety, which, since the time of Martin H. K. Lichtenstein (1800-1804), was known to have comprised the whole of Africa south of the Zambezi, and has since been extended as far north as the equatorial lake region.

Fritsch divides the Hottentots into three bodies; the Cape Hottentots, from the Cape peninsula eastward to Kaffraria, the Koranna, chiefly on the right bank of the Orange river, but also found on the Harts and the Vaal, and the Namaqua in the western portion of South Africa. Of these all save the last mentioned have ceased to exist in any racial purity. The name which the Namaqua give to themselves is *Khoi-Khoin*, and this name must be distinguished from that of the Berg-Damara or *Hau-Khoin*, since the latter are physically of Bantu origin though they have borrowed their speech from the Hottentots. While the Namaqua preserve the racial type and speech, the other so-called Hottentots are more or less Hottentot-Dutch or Hottentot-Bantu half-breeds, mainly of debased Dutch speech, although the Koranna still here and there speak a moribund Hottentot jargon flooded with Dutch and English words and expressions. When the Cape Colony became a part of the British empire the protection given to the natives arrested the process of extermination with which the Hottentots were then threatened, but it did not promote racial purity. Sir John Barrow, describing the condition of the Hottentots in 1798, estimated their number at about 15,000 souls. In 1806 the official return gave a Hottentot population of 9784 males and 10,642 females. In 1824 they had increased to 31,000. At the census of 1865 they numbered 81,589, but by this time the official classification "Hottentot" signified little more than a half-breed. The returns for 1904 showed a "Hottentot" population of 85,892. Very few of these were pure-bred Hottentots, while the official estimate of those in which Hottentot blood was strongly marked was 56,000.

Customs and Culture.—The primitive character of the race having greatly changed, the best information as to their original manners and customs is therefore to be found in the older writers. All these agree in describing the Hottentots as a gentle and friendly people. They held in contempt the man who could eat, drink or smoke alone. They were hospitable to strangers, even to the point of impoverishing themselves. Although mentally and physically indolent, they were active in the care of their cattle and, within certain limits, clever hunters. They were of a medium height, the females rather smaller than the men, slender but well proportioned, with small hands and feet. Their skin was of a leathery brown colour; their face oval, with prominent cheekbones; eyes dark brown or black and wide apart; nose broad and thick and flat at the root; chin pointed and mouth large, with thick turned-out lips. Their woolly hair grew in short thick curly tufts and the beard was very scanty. Amongst the women abnormal developments of fat were somewhat common; and cases occurred of extraordinary elongation of the *labia minora* and of the *praeputium clitoridis*.[1]

Their dress was a skin cloak (kaross) worn across the shoulders and a smaller one across the loins. They wore these cloaks all the year round, turning the hairy side inward in winter and outward in summer; they slept in them at night, and when they died they were buried in them. They had suspended around their necks little bags or pouches, containing their knives, their pipes and tobacco or dakka (*Cannabis*, or hemp), and an amulet of burnt wood. On their arms were rings of ivory. Sometimes they wore sandals and carried a jackal's tail fastened on a stick, which served as handkerchief and fan. The women wore, besides the kaross, a little apron to which were hung their ornaments; and underneath this one or two fringed girdles; and a skin cap. Both sexes smeared themselves and even their dress with an ointment made of soot, butter or fat, and the powdered leaves of a shrub called by them *bucchu* (*Diosma crenata*).

Their villages were usually on meadow grounds. They never entirely exhausted the grass but kept moving from one pasture to another. The huts were in circles, the area of which varied with the pastoral wealth of the community. In the centre of the huts a hole served for a fire-place, and at each side of this small excavations an inch or two deep were made in the ground in which both sexes, rolled up in their karosses, slept. A few earthen vessels, well-made bowls of wood, tortoise shells for spoons and dishes, calabashes, bamboos and skins for holding milk and butter, and mats of rushes interwoven with bast, were all their furniture. Their weapons were primarily bows and arrows, but they also possessed assegais, and knob-kerries. To women much respect was shown; the most sacred oath a Hottentot could take was to swear by his sister or mother; yet the females

ate apart from the men and did all the work of the kraal with the exception of the tending of cattle and of the curing of the hides; the men, however, assisted in the erection of the framework of the huts. The usual food of the Hottentots was milk, the flesh of the buffalo, hippopotamus, antelope or other game, and edible roots and bulbs or wild fruits. On the coast fish captured by hooks and lines or spears were also eaten. Cows' milk was commonly drunk by both sexes, but ewes' milk only by the women, and when cows' milk was scarce the women were obliged to keep to ewes' milk or water. Milk was drunk fresh, and not allowed to turn sour as among the Bantu. Meats were eaten either roasted or boiled, but for the most part half raw, without salt, spices or bread. From some meats they carefully abstained, such as swine's flesh. Hares and rabbits were forbidden to the men, but not to the women; the pure blood of beasts and the flesh of the mole were forbidden to the women, but not to the men.

In occupation they were essentially cattle-breeders, and showed great skill in this pursuit, especially the Namaqua, who were capable of training the horns of their cattle so that they grew in spirals. Their social pleasures consisted in feasting, smoking, dancing and singing. Dances were held every first quarter of the moon and lasted all night, often for eight days in succession. Every signal event of life, and every change of abode and condition was celebrated with a feast. On the formation of a new kraal an arbour was constructed in the centre, and the women and children adorned and perfumed it with flowers and branches of trees and odoriferous herbs. The fattened ox was killed and cooked, and the men ate of it in the arbour, while the women sitting apart regaled themselves with broth. Upon such occasions the only intoxicant was tobacco or dakka.

Circumcision, which is common to the Kaffir tribes, was unknown to the Hottentots, but when a youth entered upon manhood a ceremony was performed. One of the elders, using a knife of quartz, made incisions in the young man's body, afterwards besprinkling them with urine. When a man killed his first elephant, hippopotamus or rhinoceros, similar marks were made on his body, and were regarded as insignia of honour. Finger mutilation was common, especially among women; this consisted in the removal of one or two joints of the little finger, and, sometimes, the first joint of the next. The reason for this is doubtful; it may have been a sign of mourning, or, especially in the case of children, it may have been regarded as magically protective. Marriages were by arrangement between the man and the girl's parents, the consent of the girl herself being a matter of little consideration. If accepted, the suitor, accompanied by all his kindred, drove two or three fat oxen to the house of his bride. There her relations welcomed the visitors; the oxen were slain, and the bridal feast took place. The nuptial ceremony was concluded by an elder besprinkling the happy pair. Among the southern Hottentots these ancient usages have ceased; but they are continued among some tribes north of the Orange river. Polygamy was allowed: divorce was common. Family names were perpetuated in a peculiar manner—the sons took the family name of the mother, the daughters that of the father. The children were very respectful to their parents, by whom they were kindly and affectionately treated. Yet the aged father or mother was sometimes put in the bush and left to die. Namaqua says this was done by very poor people if they had no food for their parents. But even when there was food enough, aged persons, especially women, who were believed to be possessed of the evil spirit, were so treated.

The Hottentots had few musical instruments. One named the "gorah" was formed by stretching a piece of the twisted entrails of a sheep from end to end of a thin hollow stick about 3 ft. in length in the manner of a bow and string. At one end there was a piece of quill fixed into the stick, to which the mouth of the player was applied. The "rommel-pot" was a kind of drum shaped like a bowl and containing water to keep the membrane moist. Reeds several feet long were used as flutes.

Government and Laws.—The system of government was patriarchal. Each tribe had its hereditary "khu-khoi" or "gao-ao" or chief, and each kraal its captain. These met in council whenever any great matters had to be decided. The post was honorary, and the councillors were held in great reverence, and were installed in office with solemnities and feasting. In certain tribes the hind part of every bullock slaughtered was sent to the chief, and this he distributed among the males of the village. He also collected sufficient milk at the door of his hut to deal out amongst the poor. A part of every animal taken in hunting was exacted by the chief, even though it was in a state of putrefaction when brought to him. The captains, assisted by the men of each kraal, settled disputes regarding property and tried criminals. A murderer was beaten or stoned to death; but if one escaped and was at large for a whole year, he was allowed to go unpunished. Adultery seldom occurred; if any one found parties in the act and killed them he was no murderer, but on the contrary received praise for his deed. Women found offending were burnt. Theft, especially cattle-stealing, was severely punished. The thief was bound hand and foot, and left on the ground without food for a long time; then, if his offence was slight, he received some blows with a stick, but if the case was an aggravated one, he was severely beaten, and then unloosed and banished from the kraal. The family of even the worst criminal suffered nothing on his account in reputation, privilege or property. The duel was an institution. If any one was insulted he challenged his enemy by offering him a handful of earth. If the latter seized the hand and the dust fell to the ground, the challenge was accepted. If it was not accepted, the challenger threw the dust in his foe's face. The duel took place by kicking, with clubs, or with the spear and shield.

Religious Ideas.—The religious ideas of the Hottentots were very obscure. François le Vaillant says they had "neither priests nor temples, nor idols, nor ceremonials, nor any traces of the notion of a deity." Other authorities state that they believed in a benevolent deity or "Great Captain," whom they named Tik-guoa (*Tsu-goab*). There were other "captains" of less power, and a black captain named Gauna, the spirit of evil. The moon was a secondary divinity, supposed to govern the

weather; and its appearance each month was hailed with dancing and singing.[2] George Schmidt, the first missionary to the Hottentots, says they also celebrated the annual appearance of the Pleiades above the eastern horizon. As soon as the constellation appeared, all the mothers ascended the nearest hill, carrying their babies, whom they taught to stretch their arms towards the friendly stars. Some of the tribes are said to worship a being whom they name Tusib, the rain god. An old Namaqua was once heard to say "The stars are the souls of the deceased," and a Hottentot form of imprecation is "Thou happy one, may misfortune fall on thee from the star of my grandfather."

Such as it was, the Hottentot religion was largely ancestor-worship. Their deified hero was named *Heitsi-Eibib*; and of him endless stories are told. The one most generally accepted is that he was a notable warrior of great physical strength, who once ruled the Khoi-Khoin, and that in a desperate struggle with one of his enemies, whom he finally overcame, he received a wound in the knee, from which event he got the name of "Wounded knee." He had extraordinary powers during life, and after death he continued to be invoked as one who could still relieve and protect. According to the tradition preserved among the Namaqua, Heitsi-Eibib came from the east. Therefore they make the doors of their huts towards the east, and those who possess waggons and carts put their vehicles alongside the mat-house with the front turned towards the east. All the graves are in true west-easterly direction, so that the face of the deceased looks towards the east. The spirit of Heitsi-Eibib is supposed to exist in the old burial places, and, whenever a heathen Hottentot passes them, he throws stones on the spot as an offering, at the same time invoking the spirit's blessing and protection. Johann Georg von Hahn asserts that there are many proofs which justify the conclusion that Heitsi-Eibib and Tsu-goab (the supreme being) were identical. Both were benevolent. Both were believed to have died and risen again. They killed the bad beings and restored peace on earth; they promised men immortality, understood the secrets of nature, and could foretell the future.[3]

Various ceremonies were practised to ward off the evil influence of ghosts and spectres, and charms were freely employed. If a Khoi-Khoi went out hunting his wife kindled a fire, and assiduously watched by it to keep it alive; if the fire should be extinguished her husband would not be lucky. If she did not make a fire, she went to the water and kept on throwing it about on the ground, believing that thereby her husband would be successful in getting game. Charms, consisting of bones, burnt wood, and roots of particular shrubs cut into small pieces, were generally worn round the neck. There was also a belief that in every fountain there was a snake, and that as long as the snake remained there water would continue to flow, but that if the snake was killed or left the fountain it would cease. Offerings were sometimes made to the spirit of the fountain. In common with the Bushmen, the Hottentots venerated the *mantis fausta*, a local variety of the insect known as "the praying mantis" (*mantis religiosa*). P. Kolbe saw sacrifices made in its honour when it appeared inside a kraal; to kill it was strictly forbidden. The Hottentots had great faith in witch-doctors, or sorcerers. When called to a sick-bed these ordered the patient to lie on his back, and then pinched, cuffed, and beat him all over until they expelled the illness. After that they produced a bone, small snake, frog or other object which they pretended to have extracted from the patient's body. If the treatment did not succeed, the person was declared incurably bewitched. If death occurred, the corpse was interred on the day of decease. It was wrapt in skins, and placed in the ground in the same position it once occupied in the mother's womb. Death was generally regarded in a very stoical manner.

Language.—The existence of a fundamental connexion between the language of the Hottentot and that of the Bushman was suggested by Dr Bleek and is supported by further evidence advanced by Bertin.

The Hottentot language was regarded by the early travellers and colonists as an uncouth and barbarous tongue. The Portuguese called the native manner of speaking stammering; and the Dutch compared it to the "gobbling of a turkey-cock." These phonetic characteristics arose from the common use of "clicks,"—sounds produced by applying the tongue to the teeth or to various parts of the gums or roof of the mouth, and suddenly jerking it back. Three-fourths of the syllabic elements of the language begin with these clicks, and combined with them are several hard and deep gutturals and nasal accompaniments. The difficulty a European has in acquiring an accurate pronunciation is not so much in producing the clicking sound singly as in following it immediately with another letter or syllable. The four recognized clicks, with the symbols generally adopted to denote them, are as follows: dental = |; palatal = ǂ; lateral = ||; cerebral = !. According to Tindall, one of the best grammarians of the language, the dental click (similar to a sound of surprise or indignation) is produced by pressing the top of the tongue against the upper front teeth, and then suddenly and forcibly withdrawing it. The palatal click (like the crack of a whip) is produced by pressing the tongue with as flat a surface as possible against the termination of the palate at the gums, so that the top of the tongue touches the upper front teeth and the back of the tongue lies towards the palate, and then forcibly withdrawing the tongue. The cerebral click (compared to the popping of the cork of a bottle of champagne) is produced by curling up the tip of the tongue against the roof of the palate, and withdrawing it suddenly and forcibly. The lateral click (similar to the sound used in stimulating a horse to action) is articulated by covering with the tongue the whole of the palate and producing the sound as far back as possible; Europeans imitate it by placing the tongue against the side teeth and then withdrawing it. The easiest Hottentot clicks, the dental and cerebral, have been adopted by the Kaffirs; and it is a striking circumstance, in evidence of the past Hottentot influence upon the Kaffir languages, that the clicking decreases amongst these tribes almost in proportion to their distance from the former Hottentot domain.

The language in its grammatical structure is beautiful and regular. Dr Bleek describes it as having the distinctive features of the suffix-pronominal order or higher form of languages, in which the pronouns are identical with and borrowed from the derivative suffixes of the nouns. The words are mostly monosyllables, always ending, with two exceptions, in a vowel or nasal sound. Among the consonants neither *l*, nor *f* nor *v* is found. There are two *g*'s, *g* hard and *g* guttural, and a deeper guttural *kh*. Diphthongs abound. There is no article, but the definite or indefinite sense of a noun is determined by the gender. In the fullest known dialect (that spoken by the Namaqua) nouns are formed with eight different suffixes, which in nouns designating persons distinguish masc. sing. (-*b*), masc. plur. (-*ku*), masc. dual (*kha*), fem. sing, (-*s*), fem. plur. (-*ti*), com. sing. (-*i*), com. plur. (-*u*), com. dual (-*ra*). The adjective is either prefixed to a noun or referred to it by a suffixed pronoun. This grammatical division of the nouns according to gender led to the classification of the language as "sex-denoting," thus suggesting its relationship, in original structure, with the Galla and others.

There are four dialectical varieties of the language, each with well-marked characteristics: the Nama dialect, spoken by the Namaqua as well as by the Hau-Khoin or Hill Damara; the Kora dialect, spoken by the Koranna, or Koraqua, dwelling about the middle and upper part of the Orange, Vaal and Modder rivers; the Eastern dialect, spoken by the Gona or Gonaqua on the borders of Kaffirland; and the Cape dialect, now no longer spoken but preserved in the records of early voyagers and settlers. Of the Nama dialect there are three grammars: Wallmann's (1857) and Hahn's in German, and Tindall's (1871) in English, the last being the best; and the four Gospels, with a large amount of missionary literature, have been published in it.

The vocabulary is not limited merely to the expression of the rude conceptions that are characteristic of primitive races. It possesses such words as *koi*, human being; *khoi-si*, kindly or friendly; *koi-si-b*, philanthropist; *khoi-si-s*, humanity; ♯ *ei*, to think; ♯ *ei-s*, thought; *amo*, eternal; *amo-si-b*, eternity; *tsa*, to feel; *tsa-b*, feeling, sentiment; *tsa-kha*, to condole; *ama*, true; *ama-b*, the truth; *anu*, sacred; *anu-si-b*, holiness; *esa*, pretty; *anu-xa*, full of beauty.

Literature and History.—Much traditionary literature—fables, myths and legends—existed amongst the Hottentots,—a fact first made known by Sir James Alexander, who in his journeyings through Great Namaqualand in 1835 jotted down the stories told him around the camp fire by his Hottentot followers. These Hottentot tales generally have much of the character of fables; some are in many points identical with northern nursery tales, and suggestive of European origin or of contact with the white man; but the majority bear evidence of being true native products. Bleek's *Reynard the Fox in South Africa* (1864) contains a translation of a legend written down from the lips of the Namaqua by the Rev. G. Krönlein, which is regarded as an excellent specimen of the national style. Another legend relating to the moon and the hare conveys the idea of an early conception of the hope of immortality. It is found in various versions, and, like many other stories, occurs in Bushman as well as in Hottentot mythology.

The earliest accounts of the Hottentots occur in the narratives of Vasco da Gama's first voyage to India round the Cape in 1497-1498. In 1510 the Portuguese viceroy, Francisco d'Almeida, count of Abrantes, met his death in a dispute with the natives. Till the 17th century they were believed to be cannibals, but with the occupation of the Cape by the Dutch, in 1652, more accurate knowledge was obtained. A century of Dutch rule resulted in the Hottentots becoming a nation of slaves and in serious danger of extermination, and thus the arrival of the English in 1795 was welcomed by them. In 1828 an ordinance was passed declaring "all Hottentots and other free persons of colour" entitled to all and every right to which any other British subjects were entitled. (See CAPE COLONY: *History*; and SOUTH AFRICA.)

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1 See paper by Messrs Flower and Murie in *Journ. Comp. Anat. and Physiology* (1867); and Fritsch, *Die Eingebornen Süd-Afrikas* (Breslau, 1873).

2 An interesting notice of this form of worship occurs in the journal of an expedition which the Dutch governor, Ryk van Tulbagh, sent to the Great Namaqua in 1752, which reached as far as the Kamob or Lion river (about 27° S. lat.).

3 On the religion and antiquities see Theophilus Hahn's papers, "Graves of the Heitsi-Eibib," in *Cape Monthly Magazine* (1879). and "Der hottentottische Zai-goab und der griechische Zeus," in *Zeitschr. für Geogr.* (Berlin, 1870).

HOTTINGER, JOHANN HEINRICH (1620-1667), Swiss philologist and theologian, was born at Zürich on the 10th of March 1620. He studied at Geneva, Groningen and Leiden, and after visiting France and England was in 1642 appointed professor of church history in his native town. The chair of Hebrew at the Carolinum was added in 1643, and in 1653 he was appointed professor ordinarius of logic, rhetoric and theology. He gained such a reputation as an Oriental scholar that the elector palatine in 1655 appointed him professor of Oriental languages and biblical criticism at Heidelberg. In 1661, however, he returned to Zürich, where in 1662 he was chosen principal of the university. In 1667 he accepted an invitation to succeed Johann Hoornbeck (1617-1666) as professor in the university of Leiden, but he was drowned with three of his children by the upsetting of a boat while crossing the river Limmat. His chief works are *Historia ecclesiastica Nov. Test.* (1651-1667); *Thesaurus philologicus seu clavis scripturae* (1649; 3rd ed. 1698); *Etymologicon orientale, sive lexicon harmonicum heptaglotton* (1661). He also wrote a Hebrew and an Aramaic grammar.

His son, Johann Jakob Hottinger (1652-1735), who became professor of theology at Zürich in 1698, was the author of a work against Roman Catholicism, *Helvetische Kirchengeschichte* (4 vols., 1698-1729); and his grandson, Johann Heinrich Hottinger (1681-1750), who in 1721 was appointed professor of theology at Heidelberg, wrote a work on dogmatics, *Typus doctrinae christianae* (1714).

HOUBRAKEN, JACOBUS (1698-1780), Dutch engraver, was born at Dort, on the 25th of December 1698. All that his father, Arnold Houbraken (1660-1719), bequeathed to him was a fine constitution and a pure love for work. In 1707 he came to reside at Amsterdam, where for years he had to struggle incessantly against difficulties. He commenced the art of engraving by studying the works of Cornelis Cort, Suyderhoef, Edelinck and the Visschers. He devoted himself almost entirely to portraiture. Among his best works are scenes from the comedy of *De Ontdekte Schijndeugd*, executed in his eightieth year, after Cornelis Troost, who was called by his countrymen the Dutch Hogarth. He died on the 14th of November 1780.

See A. Ver Hull, *Jacobus Houbraken et son œuvre* (Arnhem, 1875), where 120 engraved works are fully described.

HOUDENC (or Houdan), **RAOUL DE,** 12th-century French trouvère, takes his name from his native place, generally identified with Houdain (Artois), though there are twelve places bearing the name in one or other of its numerous variants. It has been suggested that he was a monk, but from the scattered hints in his writings it seems more probable that he followed the trade of jongleur and recited his chansons, with small success apparently, in the houses of the great. He was well acquainted with Paris, and probably spent a great part of his life there. His undoubted works are: *Le Songe d'enfer*, *La Voie de paradis*, *Le Roman des eles* (pr. by A. Scheler in *Trouvères belges*, New Series, 1897) and the romance of *Méraugis de Portlesguez*, edited by M. Michelant (1869) and by Dr M. Friedwagner (Halle, 1897). Houdenc was an imitator of Chrétien de Troyes; and Huon de Méri, in his *Tournoi de l'antéchrist* (1226) praises him with Chrétien in words that seem to imply that both were dead. *Méraugis de Portlesguez*, the hero of which perhaps derives his name from Lesguez, the port of Saint Brieuc in Brittany, is a *roman d'aventures* loosely attached to the Arthurian cycle.

See Gaston Paris in *Hist. litt. de la France*, xxx. 220-237; W. Zingerlé, *Über Raoul de Houdenc und seine Werke* (Erlangen, 1880); and O. Boerner, *Raoul de Houdenc. Eine stilistische Untersuchung* (1885).

HOUDETOT, a French noble family, taking its name from the lordship of Houdetot, between Arques and St Valéry. Louis de Houdetot went with Robert, duke of Normandy, to Palestine in 1034, and the various branches of the family trace descent from Richard I. de Houdetot (fl. 1229), who married Marie de Montfort. Charles Louis de Houdetot received a marquisate in 1722, and on his son Claude Constance César, lieutenant-general in the French army, was conferred the

hereditary title of count in 1753. His wife (see below) was the Madame de Houdetot of Rousseau's *Confessions*. Their son César Louis Marie François Ange, comte de Houdetot (1749-1825), was governor of Martinique (1803-1809) and lieutenant-general (1814) under the Empire. His son Frédéric Christophe, comte de Houdetot (1778-1859), was director-general of indirect imposts in Prussia after Jena, and prefect of Brussels in 1813. He acquiesced in the Restoration, but had to resign from the service after the Hundred Days. He became a peer of France in 1819, and under the Second Empire he was returned by the department of Calvados to the Corps Législatif. His half-brother, Charles Île-de-France, comte de Houdetot (1789-1866), was wounded at Trafalgar and transferred to the army, in which he served through the Napoleonic wars. He retired at the Restoration, but returned to the service in 1823, and in 1826 became aide-de-camp to the duke of Orleans, becoming lieutenant-general in 1842. He sat in the Chamber of Deputies from 1837 to 1848, when he followed Louis Philippe into exile. A third brother, César François Adolphe, comte de Houdetot (1799-1869), was a well-known writer on military and other subjects.

HOUDETOT, ELISABETH FRANÇOISE SOPHIE DE LA LIVE DE BELLEGARDE, Comtesse de (1730-1813), was born in 1730. She married the comte de Houdetot (see above) in 1748. In 1753 she formed with the marquis de Saint Lambert (*q.v.*) a connexion which lasted till his death. Mme de Houdetot has been made famous by the chapter in Rousseau's *Confessions* in which he describes his unreciprocated passion for her. When questioned on the subject she replied that he had much exaggerated. A view differing considerably from Rousseau's is to be found in the *Mémoires* of Mme d'Epinay, Mme de Houdetot's sister-in-law.

For a discussion of her relations with Rousseau see Saint-Marc-Girardin in the *Revue des deux mondes* (September 1853).

HOUDON, JEAN ANTOINE (1740-1828), French sculptor, was born at Versailles on the 18th of March 1740. At the age of twelve he entered the École royale de Sculpture, and at twenty, having learnt all that he could from Michel Ange Slodtz and Pigalle, he carried off the prix de Rome and left France for Italy, where he spent the next ten years of his life. His brilliant talent, which seems to have been formed by the influence of that world of statues with which Louis XIV. peopled the gardens of Versailles rather than by the lessons of his masters, delighted Pope Clement XIV., who, on seeing the St Bruno executed by Houdon for the church of St Maria degli Angeli, said "he would speak, were it not that the rules of his order impose silence." In Italy Houdon had lived in the presence of that second Renaissance with which the name of Winckelmann is associated, and the direct and simple treatment of the Morpheus which he sent to the Salon of 1771 bore witness to its influence. This work procured him his "agrégation" to the Academy of Painting and Sculpture, of which he was made a full member in 1775. Between these dates Houdon had not been idle; busts of Catharine II., Diderot and Prince Galitzin were remarked at the Salon of 1773, and at that of 1775 he produced, not only his Morpheus in marble, but busts of Turgot, Gluck (in which the marks of small-pox in the face were reproduced with striking effect) and Sophie Arnould as Iphigeneia (now in the Wallace Collection, London), together with his well-known marble relief, "Grive suspendue par les pattes." He took also an active part in the teaching of the academy, and executed for the instruction of his pupils the celebrated Écorché still in use. To every Salon Houdon was a chief contributor; most of the leading men of the day were his sitters; his busts of d'Alembert, Prince Henry of Prussia, Gerbier, Buffon (for Catharine of Russia) and Mirabeau are remarkable portraits; and in 1778, when the news of Rousseau's death reached him, Houdon started at once for Ermenonville, and there took a cast of the dead man's face, from which he produced the grand and life-like head now in the Louvre. In 1779 his bust of Molière, at the Théâtre Français, won universal praise, and the celebrated draped statue of Voltaire, in the vestibule of the same theatre, was exhibited at the Salon of 1781, to which Houdon also sent a statue of Marshal de Tourville, commissioned by the king, and the Diana executed for Catharine II. This work was refused; the jury alleged that a statue of Diana demanded drapery; without drapery, they said, the goddess became a "suivante de Vénus," and not even the proud and frank chastity of the attitude and expression could save the Diana of Houdon (a bronze reproduction of which is in the Louvre) from insult. Three years later he went to America, there to carry out a statue of Washington. With Franklin, whose bust he had recently executed, Houdon left France in 1785, and, staying some time with Washington at Mount Vernon, he modelled the bust, with which he decided to go back to Paris, there to complete the statue destined for the capitol of the State of Virginia. After his return to his native country Houdon executed for the king of Prussia, as a companion to a statue of Summer, La Frileuse, a naif embodiment of shivering cold, which is one of his best as well as one of his best-

known works. The Revolution interrupted the busy flow of commissions, and Houdon took up a half-forgotten project for a statue of St Scholastica. He was immediately denounced to the convention, and his life was only saved by his instant and ingenious adaptation of St Scholastica into an embodiment of Philosophy. Under Napoleon, of whom in 1806 he made a nude statue now at Dijon, Houdon received little employment; he was, however, commissioned to execute the colossal reliefs intended for the decoration of the column of the "Grand Army" at Boulogne (which ultimately found a different destination); he also produced a statue of Cicero for the senate, and various busts, amongst which may be cited those of Marshal Ney, of Josephine and of Napoleon himself, by whom Houdon was rewarded with the legion of honour. He died at Paris on the 16th of July 1828.

See memoir by Émile Délerot and Arsène Legrelle in *Mémoires de la société des sciences morales ... de Seine-et-Oise*, iv. 49 et seq. (1857); Anatole de Montaiglon and Georges Duplessis in *Revue universelle des arts*, i. and ii. (1855-1856); Hermann Dierks, *Houdons Leben und Werke* (Gotha, 1887); Albert Terrade, *Autour de la statue de Jean Houdon* (Versailles, 1892); P. E. Mangeant, *Sur une statuette de Voltaire par J. Houdon* (Paris, 1896).

HOUFFALIZE, a small town occupying an elevated position (nearly 1100 ft.) in the extreme south-east of the province of Luxemburg, Belgium, much visited during the summer on account of its fine bracing air. There are the ruins of an old castle, and some remains of the still older abbey of Val Ste Catherine. The parish church dates from the 13th or 14th century. It contains two old black marble tombs to Thierry of Houffalize and Henri his son, the latter killed at Woeringen in 1288. Houffalize is on the eastern Ourthe, and is connected by a steam tramway with Bourcy on the line from Libramont to Bastogne, Spa and Liége. Pop. (1904) 1486.

HOUGHTON, RICHARD MONCKTON MILNES, 1ST BARON (1809-1885), English poet and man of letters, son of Robert Pemberton Milnes, of Fryston Hall, Yorkshire, and the Hon. Henrietta Monckton, daughter of the fourth Lord Galway, was born in London on the 19th of June 1809. He was educated privately, and entered Trinity College, Cambridge, in 1827. There he was at once drawn into a literary set, and became a member of the famous "Apostles" Club, which then included Tennyson, Hallam, Trench, J. W. Blakesley, afterwards dean of Lincoln, and others. After taking his degree, Milnes travelled abroad, spending some time at Bonn University. Thence he went to Italy and Greece, and published in 1834 a volume of *Memorials of a Tour in some Parts of Greece*, describing his experiences. He returned to London in 1837, and was in that year elected to Parliament as member for Pontefract. His parliamentary career was marked by much strenuous activity. He interested himself particularly in the question of copyright and the conditions of reformatory schools. He left Peel's party over the Corn Law controversy, and was afterwards identified in politics with Palmerston, at whose instance he was made a peer in 1863. His literary career was industrious and cultured, without being exceptionally distinguished. Church matters had always a claim upon him: he wrote a striking tract in 1841, which was praised by Newman; and took part in the discussion about "Essays and Reviews," defending the tractarian position in *One Tract More* (1841). He published two volumes of verse in 1838, *Memorials of Residence upon the Continent and Poems of Many Years*, *Poetry for the People in 1840* and *Palm Leaves* in 1844. He also wrote a *Life and Letters of Keats* in 1848, the material for which was largely provided by the poet's friend, Charles Armitage Brown. Milnes also contributed largely to the reviews. His poetry is meditative and delicate; some of his ballads were among the most popular of their day, and all his work was marked by refinement. But his chief distinctions were his keen sense of literary merit in others, and the judgment and magnanimity with which he fostered it. He was surrounded by the most brilliant men of his time, many of whom he had been the first to acclaim. His chief title to remembrance rests on the part he played, as a man of influence in society and in moulding public opinion on literary matters, in connexion with his large circle of talented friends. He secured a pension for Tennyson, helped to make Emerson known in Great Britain, and was one of the earliest champions of Swinburne. He helped David Gray and wrote a preface for *The Luggie*. He was, in the old sense of the word, a patron of letters, and one who never abused the privileges of his position. Milnes married in 1851 the Hon. Annabel Crewe (d. 1874). He died at Vichy on the 11th of August 1885, and was buried at Fryston. His son, the second Baron Houghton, was created Earl of Crewe (*q.v.*) in 1895.

See *The Life, Letters and Friendships of Richard Monckton Milnes, first Lord Houghton* (1890), by Sir T. Wemyss Reid.

HOUGHTON-LE-SPRING, an urban district in the Houghton-le-Spring parliamentary division of Durham, England, 6 m. N.E. of the city of Durham. Pop. (1901) 7858. It is well situated at the head of a small valley branching from that of the Wear. St Michael's church is a cruciform Early English and Decorated building, with a picturesque embattled rectory adjoining. Bernard Gilpin, "the Apostle of the North," was rector of this parish from 1556 to 1583, and the founder of the grammar school. The principal public buildings are a town hall, market house and church institute. Houghton Hall is a fine mansion of the late 16th century. In the orchard stands a tomb, that of the puritan Sir Robert Hutton (d. 1680), of whom a curious tradition states that he desired burial beside his war-horse, the body of which was denied interment in consecrated ground. The main road from Durham to Sunderland here passes through a remarkable cutting in the limestone 80 ft. deep. The district affords frequent evidence of ice activity in the glacial period. The town is the centre of a large system of electric tramways. The population is mainly dependent on the neighbouring collieries, but limestone quarrying is carried on to some extent.

HOUND, a dog, now used, except in poetry, only of dogs of the chase, and particularly of the breed used in hunting the fox, the "hound" *par excellence*. Other breeds have a defining word prefixed, *e.g.* boar-hound, stag-hound, &c. (see DOG). The O. Eng. *hund* is the common Teutonic name for the animal, cf. Du. *hond*, Ger. *Hund*, &c., and is cognate with Sansk. *çvan*, Gr. κύων, Lat. *canis*, Ir. and Gael. *cu*.

HOUNSLOW, a town in the Brentford parliamentary division of Middlesex, England, 12½ m. W. by S. of St Paul's Cathedral, London, on the District and London & South Western railways. Pop. (1901) 11,377. It has grown into an extensive residential suburb of London. Its situation at the junction of two great roads from the west of England made it an important coaching station, and some 500 coaches formerly passed through it daily. A priory of friars of the Holy Trinity was founded at Hounslow in 1296, and existed till the dissolution of the monasteries. The priory chapel was used as a church till 1830, after which its place was taken by the existing church of the Holy Trinity (1835). Hounslow Heath, west of the town, had, according to the survey of 1546, an area of 4293 acres. It was the site of Roman and British camps, and in the wars of the 17th century was the scene of several important military rendezvous. It was a favourite resort of highwaymen, whose bodies were exposed on gibbets along the road. In 1784 the base-line of the first trigonometrical survey in England was laid down on the heath. In 1793 large cavalry barracks were erected upon it, and it is also the site of extensive powder mills. It began to be enclosed towards the end of the reign of George III. In Osterley Park, N.E. of Hounslow, Sir Thomas Gresham built a mansion in 1577, and this was rebuilt with great magnificence by Francis and Robert Child *c.* 1770. Hounslow is divided between the parishes of Heston and Isleworth. Pop. of urban district of Heston and Isleworth (1901) 30,863.

HOUR, the twenty-fourth part of a civil day, the twelfth part of a natural day or night, a space of time of sixty minutes' duration. The word is derived through the O. Fr. *ure*, *ore*, *houre*, mod. *heure*, from Lat. *hora*, Gr. ὥρα, season, time of day, hour (see CALENDAR).

HOUR ANGLE, the angular distance of a heavenly body from the meridian, as measured around the celestial pole. It is equal to the angle at the pole between the hour circle through the body and

the meridian, but is usually expressed in time.

HOUR-GLASS, a device for measuring intervals of time, also known as sand-glass, and as log-glass when used in conjunction with the common log for ascertaining the speed of a ship. It consists of two pear-shaped bulbs of glass, united at their apices and having a minute passage formed between them. A quantity of sand (or occasionally of mercury) is enclosed in the bulbs, and the size of the passage is so proportioned that this sand will completely run through from one bulb to another in the time it is desired to measure—*e.g.* an hour or a minute. Instruments of this kind, which have no great pretensions to accuracy, were formerly common in churches. In the English House of Commons, as a preliminary to a division, a two-minute sand-glass is still turned, and while the sand is running the "division bells" are set in motion in every part of the building, to give members notice that a division is at hand.

HOURI, the term for a beautiful virgin who awaits the devout Mahommedan in Paradise. The word is the French representative of the Pers. *hūrī*, Arab, *hawrā'*, a black-eyed virgin, from *hawira*, to be black-eyed, like a gazelle.

HOURS, CANONICAL, certain portions of the day set apart by rule (canon) of the church for prayer and devotion. The Jewish custom of praying three times a day, *i.e.* at the third, sixth and ninth hours, was perpetuated in the early Christian Church (Acts ii. 15, iii. 1, x. 9), and to these were added midnight (when Paul and Silas sang in prison), and the beginning of day and of night. Ambrose, Augustine and Hilary commended the example of the psalmist who gave praise "seven times a day" (Ps. cxix. 164). The seventh (Compline, *Completorium*) was added by Benedict. These hours were adopted especially in the monasteries as a part of the canonical life, and spread thence to the cathedral and collegiate chapters.

Since the 6th century the number and order of the hours have been fixed thus: matins, lauds, prime, terce, sext, none, vespers, compline.

Matins theoretically belongs to midnight, but in Italy it is said about 7 or 8 A.M. and in France often on the preceding evening in accordance with the statement "evening and morning were one day." At matins is said the *Venite* (Ps. xcv.) and a hymn, followed by a *Nocturna* or night-watch (on Sundays three) which consists of twelve psalms. After the *nocturna* comes a lesson divided into three parts, one biblical and two patristic, and finally the *Te Deum*.

Lauds is proper to sunrise, but is mostly grouped with matins. It consists of four psalms, a canticle, psalms 148-150, a hymn, the Benedictus (Luke i. 68-79) and prayers.

Prime (6 A.M.), *Terce* (9 A.M.), *Sext* (noon) and *None* (3 P.M.) are called the Little Day Hours, are often said together, and are alike in character, consisting of a hymn and some sections of Ps. cxix., followed by a prayer. On Sundays the Athanasian Creed is said at prime.

Vespers or *Evensong* consists of five varying psalms, a hymn, the *Magnificat* (Luke i. 46-55) and prayers. It belongs theoretically to sunset.

Compline, technically 9 P.M., but usually combined with vespers, is a prayer for protection during the darkness. It consists of the general confession, four fixed psalms, a hymn, the *Nunc dimittis* (Luke ii. 29-32), prayers and a Commemoration of the Virgin.

The term "canonical hours" is also used of the time during which English marriages may be solemnized without special licence, *i.e.* between 8 A.M. and 3 P.M.

HOUSE (O. Eng. *hús*, a word common to Teutonic languages, cf. Dut. *huis*, Ger. *Haus*; in Gothic it is only found in *gudhûs*, a temple; it may be ultimately connected with the root of "hide," conceal), the dwelling-place of a human being (treated, from the architectural point of view, below), or, in a transferred sense, of an animal, particularly of one whose abode, like that of the beaver, is built by the animal itself, or, like that of the snail, resembles in some fancied way a human dwelling. Apart from the numerous compound uses of the word, denoting the purpose for which a building is employed, such as custom-house, lighthouse, bakehouse, greenhouse and the like, there may be mentioned the particular applications to a chamber of a legislative body, the Houses of Parliament, House of Representatives, &c.; to the upper and lower assemblies of convocation; and to the colleges at a university; the heads of these foundations, known particularly as master, principal, president, provost, rector, &c., are collectively called heads of houses. At English public schools a "house" is the usual unit of the organization. In the "houses" the boys sleep, have their "studies" and their meals, if the school is arranged on the "boarding-house" system. The houses have their representative teams in the school games, but have no place in the educational class-system of the school. It may be noticed that in Scotland the words "house" and "tenement" are used in a way distinct from the English use, "tenement" being applied to the large block containing "houses," portions, *i.e.*, occupied by separate families. "The House" is the name colloquially given to such different institutions as the London Stock Exchange, the House of Commons or Lords and to a workhouse.

In the transferred sense, "house" is used of a family, genealogically considered, and of the audience at a public meeting or entertainment, especially of a theatre. A "house-physician" and "house-surgeon" is a member of the resident medical staff of a hospital. In astrology the twelve divisions into which the heavens are divided, and through which the planets pass, are known as houses, the first being called the "house of life." The word "house," "housing," used of the trappings of a horse, especially of a covering for the back and flanks, attached to the saddle, is of quite distinct origin. In medieval Latin it appears as *hucia*, *houssia* and *housia* (see Ducange, *Glossarium*, s.v. *housia*), and comes into English from the O. Fr. *huche*, modern *housse*. It has been supposed to have been adopted, at the time of the crusades, from the Arabic *yushiah*, a covering.

Architecturally considered, the term "house" is given to a building erected for habitation, in contradistinction to one built for secular or ecclesiastical purposes. The term extends, therefore, to a dwelling of any size, from a single-room building to one containing as many rooms as a palace; thus in London some of the largest dwellings are those inhabited by royalty, such as Marlborough House, or others by men of rank, such as Devonshire House, Bridgewater House, Spencer House, &c.; and even those which, formerly built as habitations, have subsequently been devoted to other purposes, such as Somerset House and Burlington House, retain the term. In Paris the larger houses thus named would be called *hôtel*.

So far as the history of domestic architecture is concerned, the earliest houses of which remains have been found are those of the village of Kahun in Egypt, which were built for the workmen employed in the building of the pyramid at Illahun, and deserted on its completion. They varied in size from the habitations of the chief inspectors to the single room of the ordinary labourer, and were built in unburnt brick with open courts in the larger examples, to give light and air to the rooms round. The models found in 1907 at Deir-Rifa opposite Assiut in Upper Egypt, by Flinders Petrie, and assumed by him to be those of "soul-houses," suggest that the early type of building consisted of a hut, to which later a porch or lean-to, with two poles in front, has been added; subsequently, columns replaced the poles, and a flat roof with parapet, suggesting the primitive forms of the Egyptian temple.

The only remains of early houses found in Mesopotamia are those within the precincts of the Temple of Bel, at Nippur, occupied by the king; but beyond the fact that the walls were built in unburnt brick and were sometimes of great thickness, nothing is known.

The houses in Crete would seem to have been small in area, but this was compensated for in height, as the small plaques found in the palace at Cnossus show houses in two or three storeys, with gable roofs and windows subdivided by mullions and transomes, corresponding with those of the 15th to 17th centuries in England. The stone staircase in the palace rising through two storeys shows that even at this early period the houses in towns had floors superposed one above the other; to a certain extent the same extension existed in the later Greek houses found in Delos, in two of which there was clear evidence of wooden staircases leading within to the roof or to an upper storey. The largest series hitherto discovered is that at Priene in Asia Minor, where the remains of some thirty examples were found, varying in dimensions, but all based on the same plan; this consisted of an entrance passage leading to an open court, on the north side of which, and therefore facing south, was an open portico, corresponding to the *prostas* in Vitruvius (vi. 7), and in the rear two large rooms, one of which might be the oecus or sitting-room, and the other the thalamos or chief bedroom. Other rooms round the court were the triclinium, or dining room, and cubicula or bedchambers. The largest of these houses occupied an area measuring 75 × 30 ft. Those found in Delos, though fewer in number, are of much greater importance, the house in the street of the theatre having twelve rooms exclusive of the entrance passage and the great central court, surrounded on all four sides by a peristyle; in this house the oecus measured 26 × 18 ft. In a

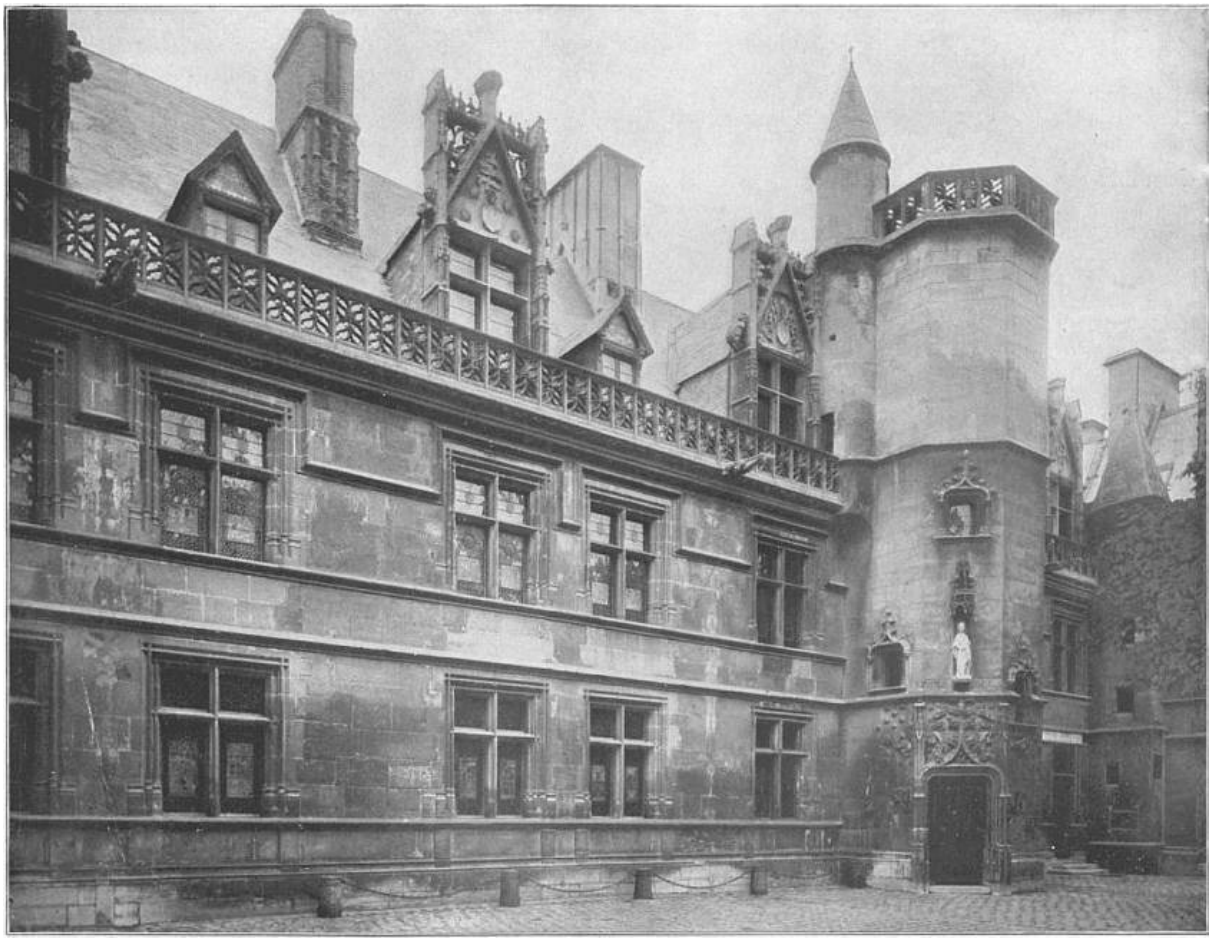
second example the prostas consisted of a long gallery, the whole width of the site, which was lighted by windows at each end, the sills of which were raised 8 ft. or 9 ft. from the floor.

Photo, Neurdein.

FIG. 4.—MUSICIAN'S HOUSE, REIMS.

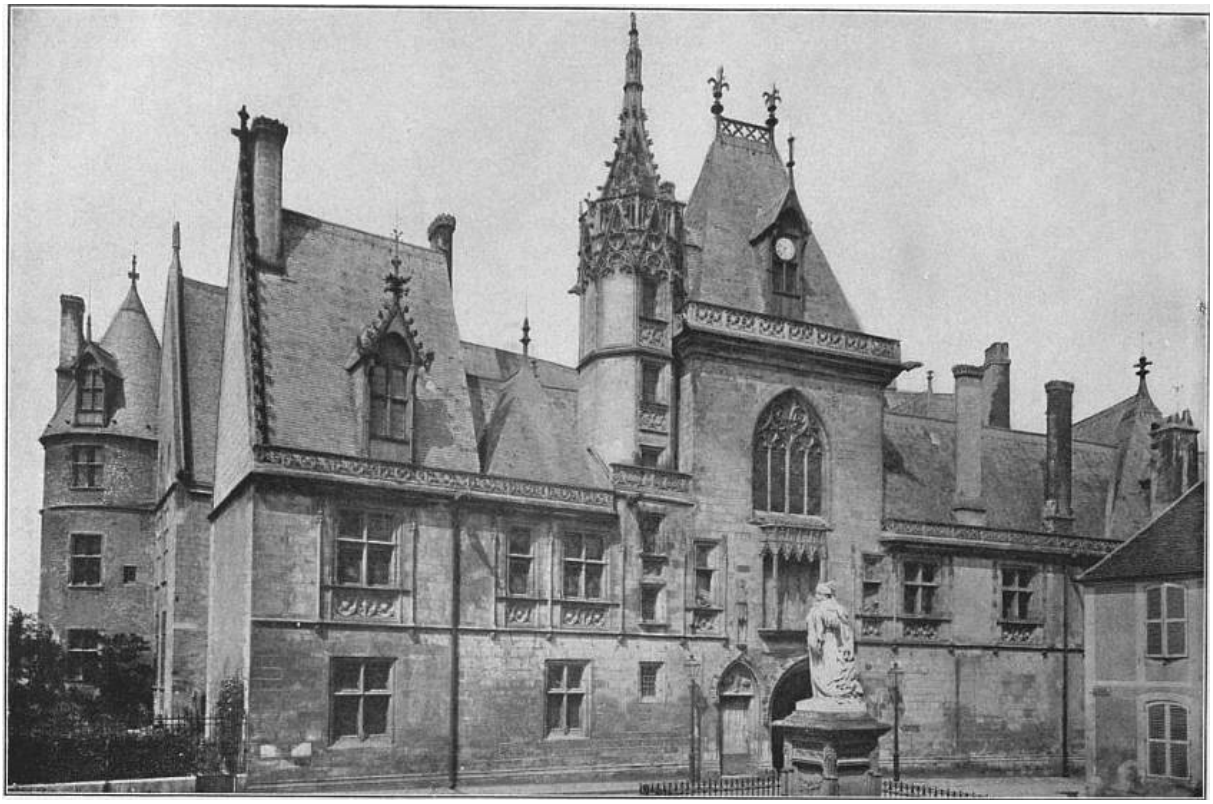
Photo, F. Frith & Co.

FIG. 5.—JEW'S HOUSE, LINCOLN.



Photo, Neurdein.

FIG. 6.—HÔTEL DE CLUNY, PARIS.



Photo, Neurdein.

FIG. 7.—HÔTEL DE JACQUES CŒUR, BOURGES, FAÇADE.

FIG. 8.—HALF-TIMBERED HOUSE AT HILDESHEIM.

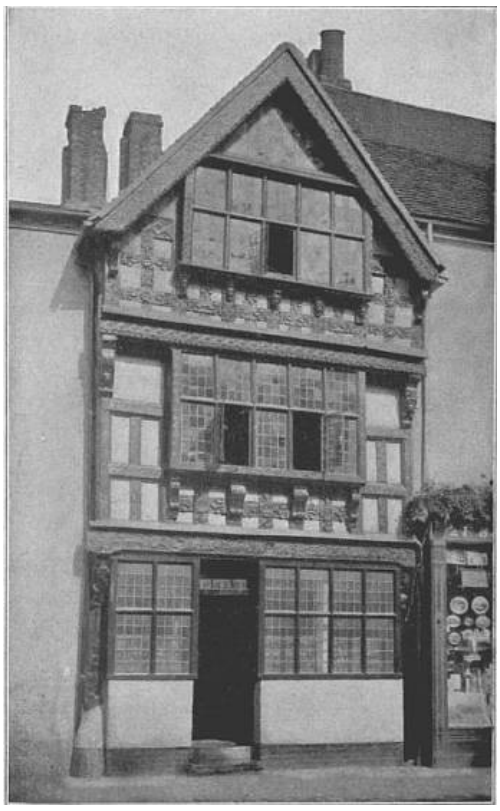


Photo. F. Frith & Co.

FIG. 9.—HOUSE OF JOHN HARVARD'S MOTHER, STRATFORD-ON-AVON.

The remains of the houses found in the Peiraeus are of the same simple plan as those at Priene, and suggest that the Greek house was considered to be the private residence only for the members of the family, and without any provision for entertaining guests as in Rome and Pompeii. From the descriptions given by Vitruvius (ii. 8) it may be gathered that in his time many of the houses in Rome were built in unburnt brick, the walls of which, if properly protected at the top with a course of burnt brick projecting over the face of the brickwork, and coated inside and outside with stucco, were considered to be more lasting than those built in soft stone. Vitruvius refers also to Greek houses thus built, and states that in the house of Mausolus, at Halicarnassus, the walls were of unburnt brick, and the plastering with which they were covered was so polished that they sparkled like glass. In Rome, however, he points out, such walls ought to be forbidden, as they are not fit to carry an upper storey, unless they are of great thickness, and as upper storeys become necessary

in a crowded city such walls would occupy too much space. The houses in Pompeii (*q.v.*) were built in rubble masonry with clay mortar, and their walls were protected at the top by burnt brick courses and their faces with stucco; they were, however, of a second- or third-rate class compared with those in Rome, the magnificence of which is attested in the descriptions given by various writers and substantiated by the remains occasionally found in excavations. Vitruvius refers to upper storeys, which were necessary in consequence of the limited area in Rome, and representations in mosaic floors and in bas-relief sculpture have been found on which two or three storeys are indicated. The plans of many Roman houses are shown on the *Marble Plan*, and they resemble those of Pompeii, but it is probable that the principal reception rooms were on an upper storey, long since destroyed. The house of Livia on the Palatine Hill was in two storeys, and the decoration was of a much finer character than those of Pompeii; this house and the House of the Vestals might be taken as representative of the Roman house in Rome itself. In those built in colder climates, as in England and Germany, account has to be taken of the special provision required for warming the rooms by hypocausts, of which numerous examples have been found, with rich mosaic floors over them.

Of the houses in succeeding centuries, those found in the cities of central Syria, described in the article Architecture, are wonderfully perfect, in consequence of their desertion at the time of the Mahommedan invasion in the 7th century. Very little is known of the houses in Europe during the dark ages, owing to the fact that they were generally built in wood, with thatched roofs. The only examples in stone which have been preserved are those in the island of Skellig Michael, Kerry, which were constructed like the beehive tombs at Mycenae with stone courses overlapping inside until they closed in at the top. These houses or cells were rectangular inside and round or oval outside, with a small low door at one end, and an opening above to let the smoke out.

The houses, even in large towns like London, were built mainly in wood, in some cases down to the 17th century; in the country, the smaller houses were constructed with trunks of trees in pairs, one end of the trunk being sunk in the ground, the other bent over and secured by a ridge piece, thus forming a pointed arch, the opening of which was about 11 ft. The pairs were fixed 16 ft. apart, and the space included constituted a bay, any requisite increase in the size of the house being made by doubling or trebling the bays. The roofs were thatched with straw on battens, and sometimes with a collar beam carrying a floor, which constituted an upper storey. The end walls were closed with wooden studs and wattle-and-daub filling. The pairs of trees were known as forks or crucks. Vitruvius (ii. 1) suggests a similar kind of building in ancient times, except that the interlaced twigs were covered with clay, so as to carry off the rain. In Yorkshire there was another type of house, known as a coit, which was a dwelling-house and barn (shippon) united; the latter contained the cow-stalls with loft above, and the former was in two storeys, with a ladder inside the room leading to the upper floor.[1]

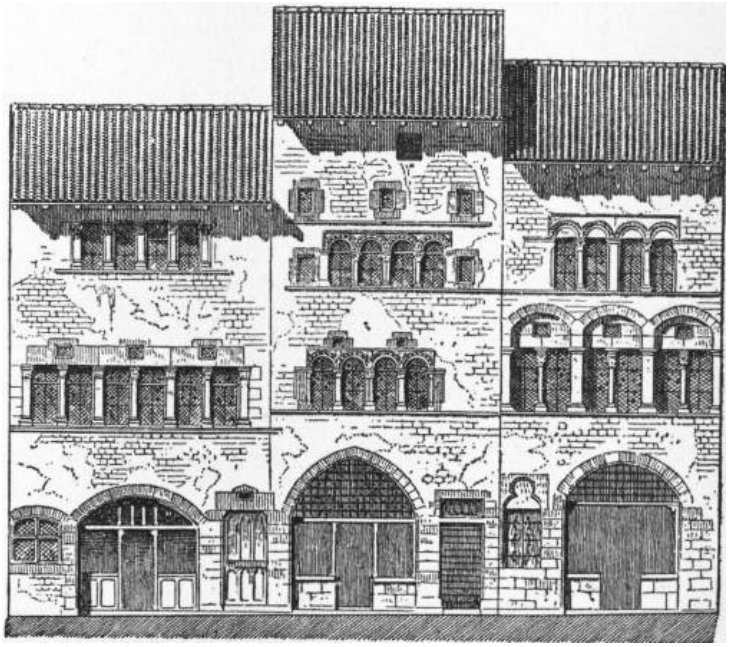


Fig. 1.—Houses at Cluny.

Passing now to structures of a less ephemeral character, the earliest houses of which there still remain substantial relics are those built in stone (see Manor House). The Jew's House at Lincoln, 12th century, is one of the best-known examples, and still preserves its street front in stone, with rich entrance doorway and first-floor windows lighting the principal room, which seems invariably in those early houses to have been on the first floor, the ground floor being used for service and stores (see Plate I. fig. 5). To the 13th century belongs the old Rectory House at West Dean, Sussex, and to the 14th century the Parsonage House at Market Deeping, Lincolnshire. The principal examples of the domestic architecture of this early period in the country are castles,

manor houses and farm buildings, as town houses occupied sites too valuable to be left untouched; this, however, is not the case in France, and particularly in the south, where streets of early houses are still to be found in good preservation, such as those at Cluny (fig. 1) and Cordes (Tarn), and others at Montferrand, Cahors, Figeac, Angers, Provins, Sarlat (fig. 2), St Emilion, Périgueux, Soissons and Beauvais, dating from the 12th to the 14th centuries. One of the most remarkable examples is the Musician's House at Reims (see Plate I., fig. 4), with large windows on the first floor, between which are niches with life-size figures of musicians seated in them. Generally speaking, the ground storeys of these houses, which in many cases were occupied by shops, have been transformed, but occasionally the old shop fronts remain, as in Dinan, Morlaix and other old towns in Brittany. Houses of the first Renaissance of great beauty exist in Orleans, such as the house of Agnes Sorel; and the example in the Market Place illustrated in fig. 3; in Tours, Tristan's house in brick with stone quoins and dressings to windows; in Rouen, Caen, Bayeux, Toulouse, Dijon and, in fact, in almost every town throughout France. Of houses of large dimensions, which in France are termed *hôtels*, there are also many other fine examples, the best known of which are the hôtel de Jacques Cœur (see Plate II., fig. 7), at Bourges, and the hôtel de Cluny at Paris (see Plate I., fig. 6). In the 15th and 16th centuries in France, owing to the value of the sites in towns, the houses rose to many storeys, the upper of which were built in half-timber, sometimes projecting on corbels and richly carved; of these numerous examples exist at Rouen, Beauvais, Bayeux and other towns in Normandy and Brittany. Of such structures in English towns (see Plate II. fig. 9) there are still preserved some examples in York, Southampton, Chester, Shrewsbury, Stratford-on-Avon, and many smaller towns; the greatest development in half-timber houses in England is that which is found more particularly throughout Kent, Sussex and Surrey, in houses of modest dimensions, generally consisting of ground and first floor only, with sometimes additional rooms in the roof; in these the upper storey invariably projects in front of the lower, giving increased dimensions to the rooms in the former, but adopted in order to protect the walls of the ground storey from rain, which in the upper storey was effected by the projecting eaves of the roof. In the north and west of England, where stone could be obtained at less cost than brick, and in the east of England, where brick, often imported from the Low Countries, was largely employed, the ordinary houses were built in those materials, and in consequence of their excellent construction many houses of the 16th and 17th centuries have remained in good preservation down to the present day; they are found in the Cotswolds generally, and (among small towns) at Broadway in Worcestershire and (of brick) throughout Essex and Suffolk. Among the larger half-timber houses built in the 15th and 16th centuries, mention may be made of Bramhall Hall, near Manchester; Speke Hall, near Liverpool (see Plate III., fig. 10); The Oaks; West Bromwich; and Moreton Old Hall, Cheshire, one of the most elaborate of the series (see Plate III., fig. 11).

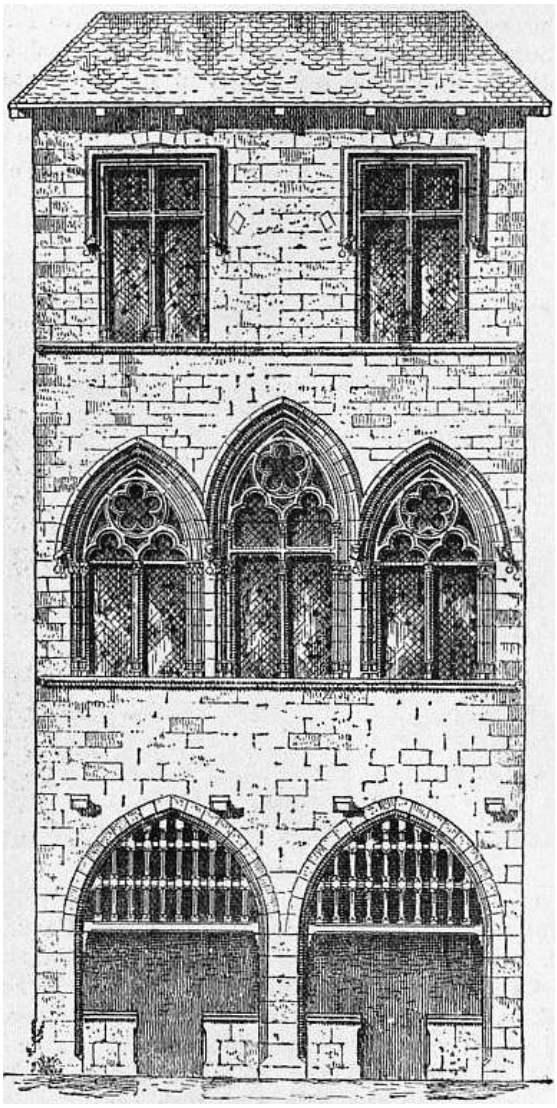


FIG. 2.—House at Sarlat.

On the borders of the Rhine, as at Bacharach and Rhense, and throughout Germany, hall-timber houses of the most picturesque character are found in every town, large and small, those of Hildesheim (see Plate II., fig. 8) dating from the 15th and 16th centuries, and in some cases rising to a great height with four or five storeys, not including those in the lofty roofs. Houses in stone from the 12th to the 16th century are found in Cologne, Metz, Trier, Hanover and Münster in Westphalia, where again there are whole streets remaining; and in brick at Rostock, Stralsund, Lübeck, Greifswald and Dantzig, forming a very remarkable series of 15th and 16th-century work.

Of half-timber work in Italy there are no examples, but sometimes (as at Bologna) the rooms of the upper floors are carried on arcades, and sometimes on corbels, as the casa dei Carracci in the same town. The principal feature of the Italian house is the courtyard in the rear, with arcades on one or more sides, the front in stone or brick, or both combined, being of the greatest simplicity (examples in San Gimignano and Pisa). At Viterbo are small houses in stone, two of which have external stone staircases of fine design, and the few windows on the ground floor suggest that the rooms there were used only for stores. Houses with external staircases, but without any architectural pretensions, are found throughout the Balkan provinces.

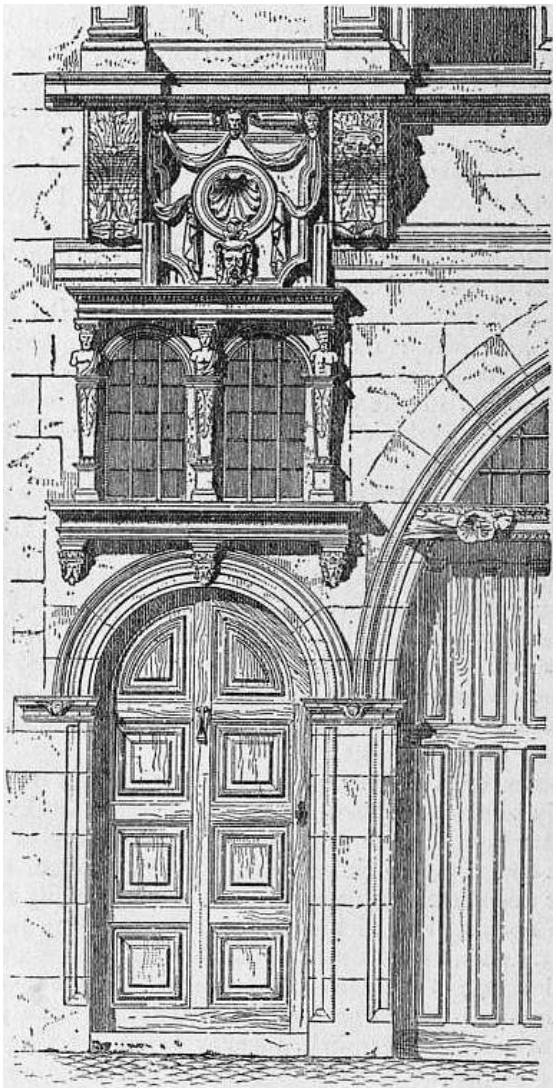


Fig. 3.—Detail of house at Orleans.

The introduction of the purer Italian style into England in the 17th century created a great change in domestic architecture. Instead of the projecting wings and otherwise picturesque contour of the earlier work the houses were made square or rectangular on plan, in two or three storeys, crowned with a modillion cornice carrying a roof of red tiles; the only embellishments of the main front were the projecting courses of stone on the quoins and architraves round the windows, and flat pilasters carrying a hood or pediment flanking the entrance doorway. In the larger mansions more thought was bestowed on the introduction of porticoes (scarcely necessary in the English climate), with sometimes great flights of steps up to the principal floor, which was raised above a basement with cold and dark passages; a great saloon in the centre of the block, lighted from above, took the place of the great entrance hall of the Tudor period, and the rooms frequently led one out of the other, without an independent entrance door. On the other hand, in the ordinary houses, the deficiency in external ornament was amply made up for by the comfort in the interior and the decoration of the staircase and other rooms. Towards the close of the century the square mullioned and transomed windows, with opening casements, gave way to sash windows, introduced from Holland, and these with moulded and stout sash-bars gave a certain character to the outside of the houses, which are valued now for their quiet unpretentious character and excellent construction. In the closes of many English cathedrals, on the outskirts of London, and in some of the older squares, as Lincoln’s Inn Fields and Queen Square, are examples of this style of house. The substitution of thin sash-bars in the 19th century, and their omission occasionally, in favour of plate-glass, deprived the house-front of one of its chief attractions; but the old English casements and oriels or bow-windows have been again introduced, and a return has been made to the style which prevailed in the beginning of the 18th century, commonly known as that of Queen Anne.

Plate III.

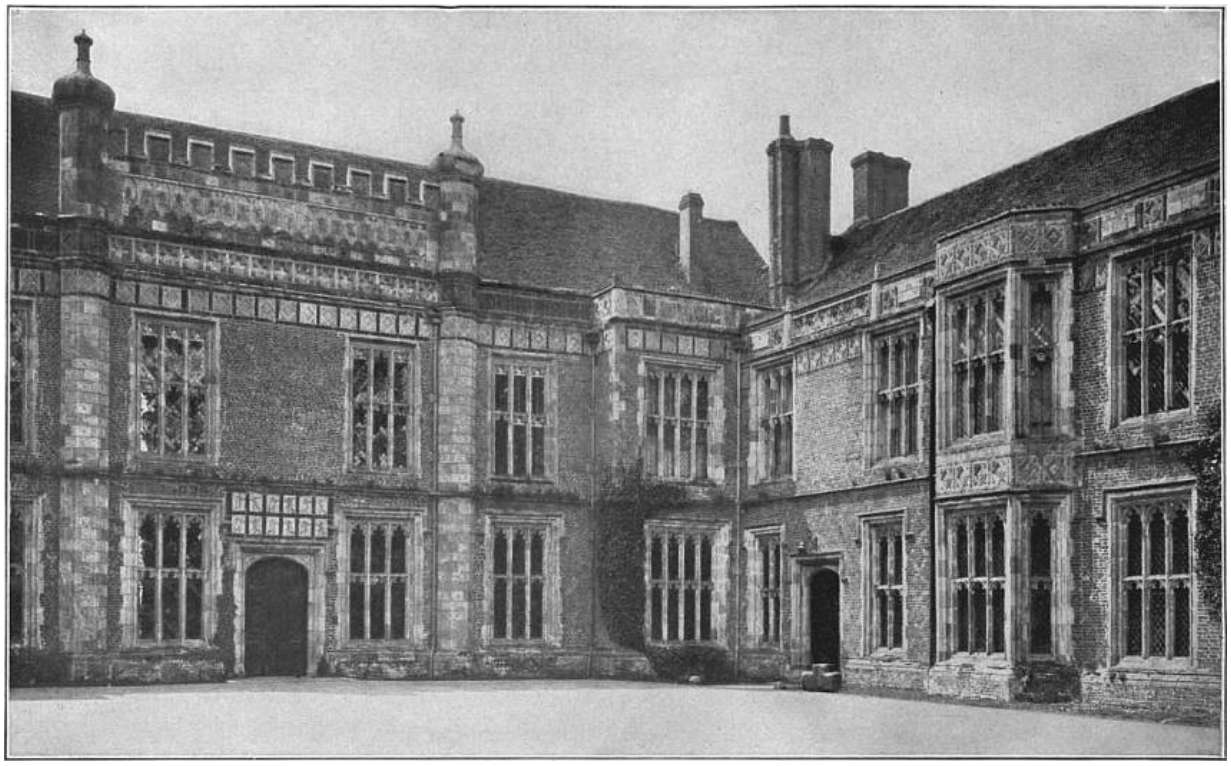
Photo, Frith & Co.

FIG. 10.—SPEKE HALL, NEAR LIVERPOOL.

Photo, F. Frith & Co.

FIG. 11.—MORETON OLD HALL, NEAR CONGLETON, CHESHIRE.

PLATE IV.



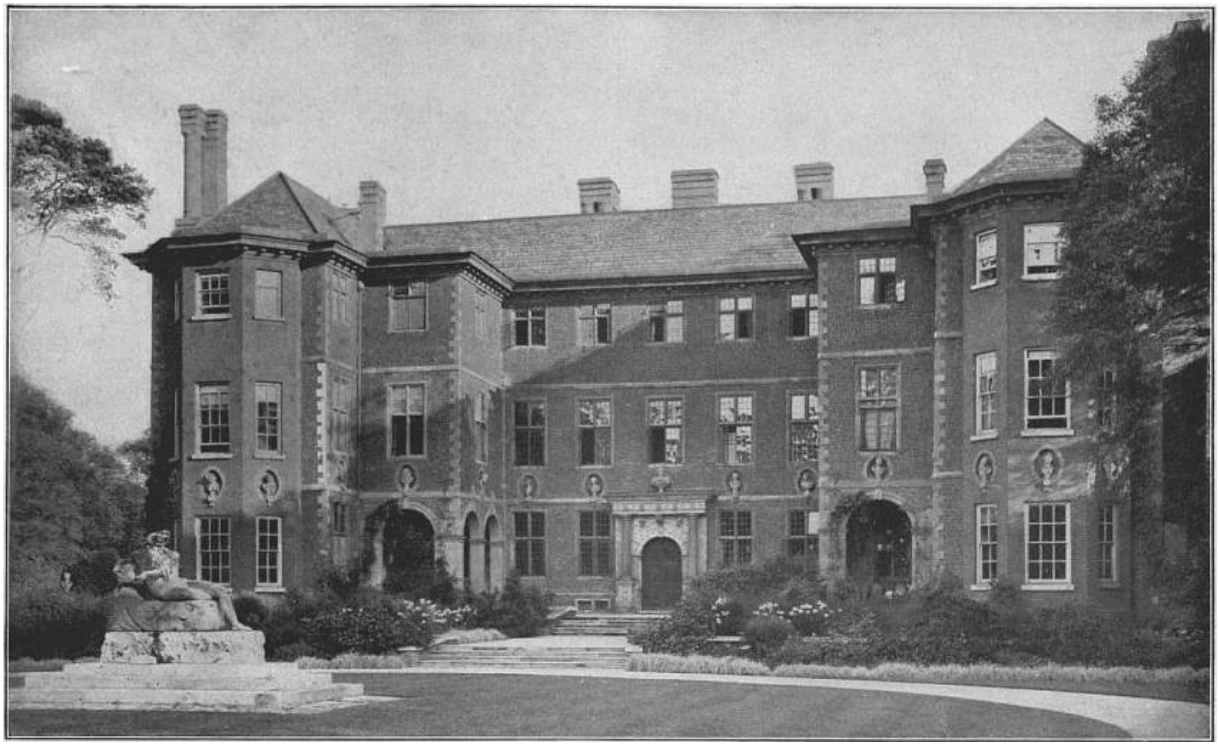
From Garner and Stratton, *Domestic Architecture of England during the Tudor Period*, 1910. By permission of B. T. Batsford.

FIG. 12.—SOUTH COURT OF SUTTON PLACE, SURREY, 1525.

From *Gotch, Architecture of the Renaissance in England*, 1894. By permission of B. T. Batsford.

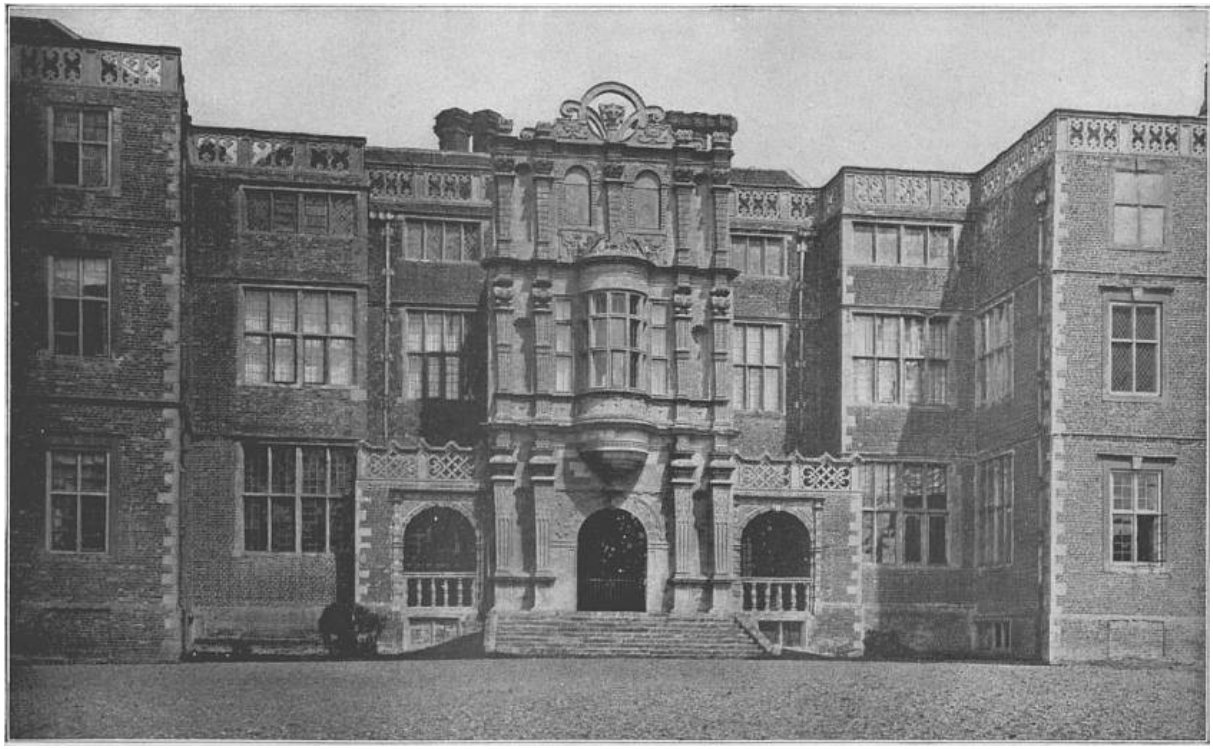
FIG. 13.—MOYNS PARK, ESSEX, 1580.

PLATE V.



From Belcher and Macartney, *Later Renaissance Architecture in England*, 1901. By permission of B. T. Batsford.

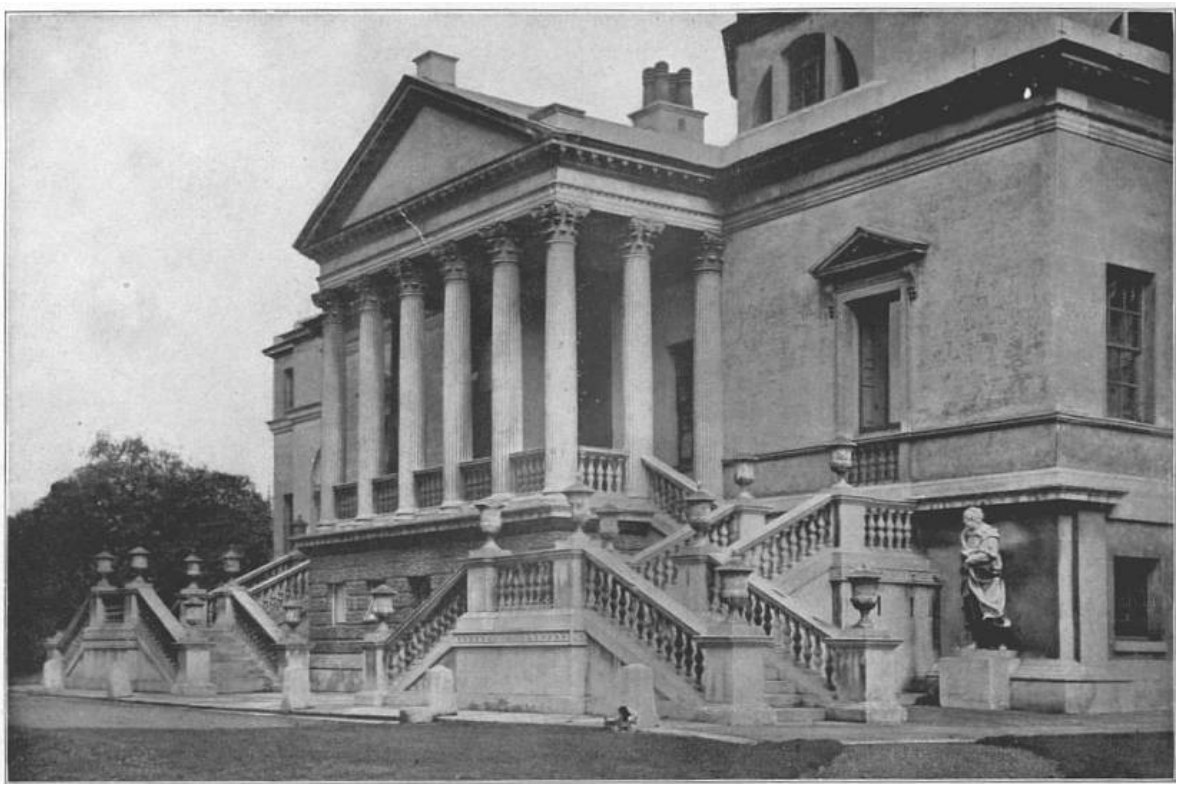
FIG. 14.—HAM HOUSE, PETERSHAM, 1610.



From Gotch, *Architecture of the Renaissance in England*, 1894. By permission of B. T. Batsford.

FIG. 15.—BRAMSHILL, HAMPSHIRE, 1612.

PLATE VI.



From Belcher and MaCartney, *Later Renaissance Architecture in England*, By permission of B. T. Batsford.

FIG. 16.—THE EARL OF BURLINGTON'S VILLA, CHISWICK. EIGHTEENTH CENTURY.

From the same source as above.

FIG. 17.—HOUSES IN CAVENDISH SQUARE, LONDON. EIGHTEENTH CENTURY.

Perhaps in one respect the greatest change which has been made in the English house is the adoption of "flats"; commenced some time in the 'fifties in Ashley Gardens, Westminster, they have spread throughout London. In consequence of the great value of the sites on which they are sometimes built, to which must be added the cost of the houses pulled down to make way for them, the question of expense in material and rich decoration has not always been worth considering, so that frontages in stone, with the classic orders brought in with many varieties of design, have given the character of a palace to a structure in which none of the rooms exceeds the modest height of 10 ft. The increasing demand for these, however, shows that they meet, so far as their accommodation and comfort are concerned, the wants and tastes of the upper and middle classes. In some of the London streets, where shops occupy the ground floor, a far finer type of house has been erected than that which could have been afforded for the shopkeeper's residence above, as in old times, so that London promises in time to become a city of palaces. The same change in the aspects of its streets has long been evident in Paris, but there is one feature in the latter city which has never yet found its way into London, much to the surprise of French visitors, viz. the *porte-cochère*, through

which the occupants of the house can in wet weather drive and be landed in a covered hall or vestibule. This requires, of course, a small court at the back, so small that one wonders sometimes how it is possible for the carriage to turn round in it. The *porte-cochère* also, from its dimensions, is a feature of more importance than the ordinary street doorway, even when a portico of some kind is added; on the other hand, the strict regulations in Paris as regards the projection of cornices and other decorative accessories gives to the stranger the appearance of monotony in their design, which certainly cannot be said of the houses in flats lately built in London. Within recent years an old English feature, known as the bow-window, has been introduced into Paris, the primary object of which does not seem yet to have been thoroughly understood by the French architect. An English bow-window, by its slight projection in front of the main wall, increases greatly the amount of light entering the room, and it is generally placed between solid piers of stone or brick. The French architects, however, project their piers on immense corbels, and then sink their windows with deep external reveals, so that no benefit accrues to the room, so far as the increased light is concerned. In Paris, since 1900, there has been a tendency to introduce a style of design in French houses which is known as "l'art nouveau," a style which commenced in furniture as a reaction against the revival of the Empire and Louis XIV. and XVI. periods, and was then extended to house fronts; this style has unfortunately spread through the various towns in France and apparently to Germany, again as a reaction against the formal classic style of the latter half of the 19th century. It is probable that in Italy and Spain "l'art nouveau" may meet with the same success, and for the same reasons, so that in the latter country it will be a revival, with modifications, of the well-known Churrigueresque style, the most debased Rococo style which has ever existed. In England it has never met with any response.

(R. P. S.)

1 A complete description of these houses will be found in *The Evolution of the English House*, by S. O. Addy.

HOUSEHOLD, ROYAL. In all the medieval monarchies of western Europe the general system of government sprang from, and centred in, the royal household. The sovereign's domestics were his officers of state, and the leading dignitaries of the palace were the principal administrators of the kingdom. The royal household itself had, in its turn, grown out of an earlier and more primitive institution. It took its rise in the *comitatus* described by Tacitus, the chosen band of *comites* or companions who, when the Roman historian wrote, constituted the personal following, in peace as well as in war, of the Teutonic chieftain. In England before the Conquest the *comitatus* had developed or degenerated into the thegnhood, and among the most eminent and powerful of the king's thegns were his dishthegn, his bowerthegn, and his horsethegn or staller. In Normandy at the time of the Conquest a similar arrangement, imitated from the French court, had long been established, and the Norman dukes, like their overlords the kings of France, had their seneschal or steward, their chamberlain and their constable. After the Conquest the ducal household of Normandy was reproduced in the royal household of England; and since, in obedience to the spirit of feudalism, the great offices of the first had been made hereditary, the great offices of the second were made hereditary also, and were thenceforth held by the grantees and their descendants as grand-serjeanties of the crown. The consequence was that they passed out of immediate relation to the practical conduct of affairs either in both state and court or in the one or the other of them. The steward and chamberlain of England were superseded in their political functions by the justiciar and treasurer of England, and in their domestic functions by the steward and chamberlain of the household. The marshal of England took the place of the constable of England in the royal palace, and was associated with him in the command of the royal armies. In due course, however, the marshalship as well as the constableship became hereditary, and, although the constable and marshal of England retained their military authority until a comparatively late period, the duties they had successively performed about the palace had been long before transferred to the master of the horse. In these circumstances the holders of the original great offices of state and the household ceased to attend the court except on occasions of extraordinary ceremony, and their representatives either by inheritance or by special appointment have ever since continued to appear at coronations and some other public solemnities, such as the opening of the parliament or trials by the House of Lords.[1]

The materials available for a history of the English royal household are somewhat scanty and obscure. The earliest record relating to it is of the reign of Henry II. and is contained in the *Black Book of the Exchequer*. It enumerates the various inmates of the king's palace and the daily allowances made to them at the period at which it was compiled. Hence it affords valuable evidence of the antiquity and relative importance of the court offices to which it refers, notwithstanding that it is silent as to the functions and formal subordination of the persons who filled them.[2] In addition to this record we have a series of far later, but for the most part equally meagre, documents bearing more or less directly on the constitution of the royal household, and

extending, with long intervals, from the reign of Edward III. to the reign of William and Mary.[3] Among them, however, are what are known as the *Black Book of the Household* and the *Statutes of Eltham*, the first compiled in the reign of Edward IV. and the second in the reign of Henry VIII., from which a good deal of detailed information may be gathered concerning the arrangements of the court in the 15th and 16th centuries. The *Statutes of Eltham* were meant for the practical guidance merely of those who were responsible for the good order and the sufficient supply of the sovereign's household at the time they were issued. But the *Black Book of the Household*, besides 814 being a sort of treatise on princely magnificence generally, professes to be based on the regulations established for the governance of the court by Edward III., who, it affirms, was "the first setter of certeynties among his domesticall meyne, upon a grounded rule" and whose palace it describes as "the house of very policie and flowre of England"; and it may therefore possibly, and even probably, take us back to a period much more remote than that at which it was actually put together.[4] Various orders, returns and accounts of the reigns of Elizabeth, James I., Charles I., Charles II., and William and Mary throw considerable light on the organization of particular sections of the royal household in times nearer to our own.[5] Moreover, there were several parliamentary inquiries into the expenses of the royal household in connexion with the settlement or reform of the civil list during the reigns of George III., George IV. and William IV.[6] But they add little or nothing to our knowledge of the subject in what was then its historical as distinguished from its contemporary aspects. So much, indeed, is this the case that, on the accession of Queen Victoria, Chamberlayne's *Present State of England*, which contains a catalogue of the officials at the court of Queen Anne, was described by Lord Melbourne the prime minister as the "only authority" which the advisers of the crown could find for their assistance in determining the appropriate constitution and dimensions of the domestic establishment of a queen regnant.[7]

In its main outlines the existing organization of the royal household is essentially the same as it was under the Tudors or the Plantagenets. It is now, as it was then, divided into three principal departments, at the head of which are severally the lord steward, the lord chamberlain and the master of the horse, and the respective provinces of which may be generally described as "below stairs," "above stairs" and "out of doors." The duties of these officials, and the various officers under their charge are dealt with in the articles under those headings. When the reigning sovereign is a queen, the royal household is in some other respects rather differently arranged from that of a king and a queen consort. When there is a king and a queen consort there is a separate establishment "above stairs" and "out of doors" for the queen consort. She has a lord chamberlain's department of her own, and all the ladies of the court from the mistress of the robes to the maids of honour are in her service. At the commencement of the reign of Queen Victoria the two establishments were combined, and on the whole considerably reduced. On the accession of Edward VII. the civil list was again reconstituted; and while the household of the king and his consort became larger than during the previous reign, there was a tendency towards increased efficiency by abolishing certain offices which were either redundant or unnecessary.

The royal households of such of the continental monarchies of Europe as have had a continuous history from medieval times resemble in general outlines that described above. There are, common to many, certain great offices, which have become, in course of time, merely titular and sometimes hereditary. In most cases, as the name of the office would suggest, they were held by those who discharged personal functions about the sovereign. Gradually, in ways or for reasons which might vary in each individual case, the office alone survived, the duties either ceasing to be necessary, or being transferred to officers of less exalted station and permanently attached to the sovereign's household. For example, in Prussia, there are certain great titular officers, such as the Oberstmarschall (great chamberlain); the Oberstjägermeister (grand master of the hunt); the Oberstschenk (grand cup-bearer) and the Obersttruchsess (grand carver), while, at the same time, there are also departments which correspond, to a great extent—both as to offices and their duties —to those of the household of the English sovereigns. This is a feature which must necessarily be reproduced in any monarchical country, whatever the date of its foundation, to a more or less limited extent, and varying in its constitution with the needs or customs of the particular countries.

See also Lord Steward; Lord Chamberlain; Master of the Horse; Privy Purse; and Civil List.

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1 The great officers of state and the household whom we have particularly mentioned do not of course exhaust the catalogue of them. We have named those only whose representatives are still dignitaries of the court and functionaries of the palace. If the reader consults Hallam (*Middle Ages*, i. 181 seq.), Freeman (*Norman Conquest*, i. 91 seq., and v. 426 seq.) and Stubbs (*Const. Hist.* i. 343, seq.), he will be able himself to fill in the details of the outline we have given above.

2 The record in question is entitled *Constitutio Domus Regis de Procurationibus*, and is printed by Hearne (*Liber Niger Scaccarii*, i. 341 sq.). It is analysed by Stubbs (*Const. Hist.* vol. i. note 2, p. 345).

3 *A Collection of Ordinances and Regulations for the Government of the Royal Household, made in Divers Reigns from King Edward III. to King William and Queen Mary*, printed for the Society of Antiquaries, (London, 1790). See also Pegge's *Curialia*, published partly before and partly after this volume; and Carlisle's *Gentlemen of the Privy Chamber*, published in 1829. Pegge and Carlisle, however, deal with small and insignificant portions of the royal establishment.

4 *Liber niger domus Regis Edward IV.* and *Ordinances for the Household made at Eltham in the*

seventeenth year of King Henry VIII., A.D. 1526, are the titles of these two documents. The earlier documents printed in the same collection are *Household of King Edward III. in Peace and War from the eighteenth to the twenty-first year of his reign*; *Ordinances of the Household of King Henry IV. in the thirty-third year of his reign, A.D. 1455*, and *Articles ordained by King Henry VII. for the Regulation of his Household, A.D. 1494*.

5 *The Book of the Household of Queen Elizabeth as it was ordained in the forty-third year of her Reign delivered to our Sovereign Lord King James, &c.*, is simply a list of officers' names and allowances. It seems to have been drawn up under the curious circumstances referred to in *Archaeologia* (xii. 80-85). For the rest of these documents see *Ordinances and Regulations, &c.*, pp. 299, 340, 347, 352, 368 and 380.

6 Burke's celebrated Act "for enabling His Majesty to discharge the debt contracted upon the civil list, and for preventing the same from being in arrear for the future, &c.," 22 Geo. III. c. 82, was passed in 1782. But it was foreshadowed in his great speech on "Economical Reform" delivered two years before. Since the beginning of the 19th century select committees of the House of Commons have reported on the civil list and royal household in 1803, 1804, 1815, 1831 and 1901.

7 Torrens's *Memoirs of William, second Viscount Melbourne*, ii-303.

HOUSEL, the English name, until the time of the Reformation, for the Eucharist. The word in O. Eng. was *húsel*. Its proper meaning is "sacrifice," and thus the word *hunsl* appears in Ulfilas' Gothic version of Matt. ix. 13, "I will have mercy and not sacrifice." The ultimate origin is doubtful. The *New English Dictionary* connects it with a Teutonic stem meaning "holy"; from which is derived the Lithuanian *szweńtas*, and Lettish *swéts*. Skeat refers it to a root meaning "to kill," which may connect it with Gr. καίνειν.

HOUSELEEK, *Sempervivum*, a genus of ornamental evergreen plants belonging to the natural order *Crassulaceae*. About 30 species are known in gardens, some of which are hardy perennial herbs, and grow well in dry or rocky situations; the others are evergreen shrubs or undershrubs, fit only for cultivation in the greenhouse or conservatory. The genus *Sempervivum* is distinguished from the nearly allied *Sedum* by having more than five (about 12) petals, and by the glands at the base of the ovary being laciniated if present. The common houseleek, *S. tectorum* (Ger. *Hauswurzel*, Fr. *joubarbe*), is often met with in Britain on roofs of outhouses and wall-tops, but is not a native. Originally it was indigenous in the Alps, but it is now widely dispersed in Europe, and has been introduced into America. The leaves are thick, fleshy and succulent, and are arranged in the form of a rosette lying close to the soil. The plant propagates itself by offsets on all sides, so that it forms after a time a dense cushion or aggregation of rosettes. The flowering stem, which is of rather rare occurrence, is about 1 ft. high, reddish, cylindrical and succulent, and ends in a level-topped cyme, reflexed at the circumference, of reddish flowers, which bloom from June to September. The houseleek has been known variously as the houselick, homewort or great houseleek. *Sedum acre* (stone-crop) is styled the little houseleek. In Germany it is sometimes called *Donnerkraut*, from being supposed to protect the house on which it grows from thunder. The leaves are said to contain malic acid in considerable quantity, and have been eaten as salad, like *Portulaca*. *S. glutinosum* and *S. balsamiferum*, natives respectively of Madeira and the Canary Islands, contain a very viscous substance in large quantity, and are used for the preparation of bird-lime; fishermen in Madeira, after dipping their nets in an alkaline solution, rub them with this substance, rendering them as tough as leather. *S. montanum*, indigenous in Central Europe, according to Gmelin, causes violent purging; *S. arboreum*, τὸ μέγα ἀείζωον of Dioscorides, is employed in Cyprus, the East, and northern Africa as an external remedy for malignant ulcers, inflammations and burns, and internally for mucous discharges.

HOUSING. The housing of the poorer classes has become a pressing problem in all populous Western countries, and has engaged, in a varying but constantly increasing measure, the attention of legislative and administrative bodies and of philanthropic individuals and societies. The general interest was signalized by an International Congress held in London in 1907. The recognition of the problem is due in the first instance to the science of public health, the rise of which dates from the

second quarter of the 19th century; and in the second instance to the growth of urban populations consequent on the development of manufacturing industries and of trading and transporting agencies, both of which tend to mass increasing numbers of people in convenient centres. To have a clear view of the subject it is necessary to distinguish these factors and their respective influence upon the problem. Urban congestion is quite secondary, and only important because and so far as it has a prejudicial effect upon health and strength. Further, the requirements on the scientific side, made on behalf of public health, are of very much wider application and more expansive than those which arise from the mere growth of urban population. That is obvious at once from the fact that they extend to rural housing, which has indeed become a prominent feature of the question in recent years. To ascribe the housing problem to the “factory system,” as some writers have done, is to put forward an inadequate and misleading view of it. It is, in fact, particularly acute in some places totally devoid of factories and least acute in some purely factory towns. If the factory system were abolished with all its effects the housing question would remain. But there is a more important distinction than extent of application. The requirements of public health are indeterminate and interminable; knowledge increases, or rather changes, and the standard constantly rises. It is the changing standard which gives most trouble; housing at one period thought good enough is presently condemned. Fifty years ago no house existed which would satisfy modern sanitary standards, and the mansions of the great were in some respects inferior to the worst quarters to-day. And to this process there is no end. It is quite conceivable that urban congestion might cease to be a difficulty at all. That actually happens in particular towns where the population is stationary or diminishing. One whole nation (France) has already reached that point, and others are moving towards it at varying rates. But even where the supply of houses exceeds the demand and many stand empty, the housing problem remains; condemnation of existing accommodation continues and the effort to provide superior houses goes on. In other words, there are two main aspects of the housing question, quality and quantity; they touch at various points and interact, but they are essentially distinct. The problem of quantity may be “solved,” that of quality has no finality.

The importance attached to housing is much enhanced by the general tendency to lay stress on the material conditions of life, which characterizes the present age. Among material conditions environment takes a leading place, largely under the influence of the theory of evolution in a popular and probably erroneous form; and among the factors of environment the home assumes a more and more prominent position. There is reason in this, for whatever other provision be made for work or recreation the home is after all the place where people spend most of their time. Life begins there and generally ends there. At the beginning of life the whole time is spent there and home conditions are of paramount importance to the young, whose physical welfare has become the object of increasing care. But the usual tendency to run to extremes has asserted itself. It may be admitted that it is extremely difficult to raise the character and condition of those who live in thoroughly bad home surroundings, and that an indispensable or preliminary step is to improve the dwelling. But if in pursuit of this object other considerations are lost sight of, the result is failure. Bad housing is intimately connected with poverty; it is, indeed, largely a question of poverty now that the difference between good and bad housing is understood and the effects of the latter are recognized. The poorest people live under the worst housing conditions because they are the cheapest; the economic factor governs the situation. Poverty again is associated with bad habits, with dirt, waste, idleness and vice, both as cause and as effect. These factors cannot be separated in real life; they act and react upon each other in such a way that it is impossible to disentangle their respective shares in producing physical and moral evils. To lay all responsibility upon the structural environment is an error constantly exposed by experience.

Defective quality embraces some or all of the following conditions—darkness, bad air, damp, dirt and dilapidation. Particular insanitary conditions independent of the structure are often associated; namely defects of water-supply, drainage, excrement and house refuse removal, back-yards and surrounding ground; they contribute to dirt, damp and bad air. Defective quantity produces high rents and overcrowding, both of which have a prejudicial effect upon health; the one by diminishing expenditure on other necessaries, the other by fouling the atmosphere and promoting the spread of infectious illness. The physical effects of these conditions have been demonstrated by comparative statistics of mortality general and special; among the latter particular stress is laid on the mortality of infants, that from consumption and from “zymotic” diseases. The statistical evidence has been especially directed to the effects of overcrowding, which can be stated with greater precision than other insanitary conditions. It generally takes the form of comparing the death-rates of different areas having widely contrasted densities of population or proportions of persons to a given space. It is not necessary to quote any of these figures, which have been produced in great abundance. They broadly establish a connexion between density and mortality; but the inference that the connexion can be reduced to a precise numerical statement and that the difference of mortality shown is all due to overcrowding or other housing conditions is highly fallacious. Many other factors ought to be taken into account, such as the age-distribution of the population, the birth-rate, the occupations, means, character and habits of the people, the geographical situation, the number of public institutions, hospitals, workhouses, asylums and so forth. The fallacious use of vital statistics for the purpose of proving some particular point has become so common that it is necessary to enter a warning against them; the subject of housing is a popular field for the exercise

of that art, though there is no need of it.

The actual state of housing in different countries and localities, the efforts made to deal with it by various agencies, the subsidiary points which arise in connexion with it and the results attained—all these heads embrace such a vast mass of facts that any attempt to treat them fully in detail would run to inordinate length. It must suffice to review the more salient points; and the most convenient way of doing so is to deal first with Great Britain, which has led the way historically in extent of need, in its recognition and in efforts to meet it, adding some notes upon other countries, in which the question is of more recent date and for which less information is available.

The United Kingdom

The importance of housing and the need of improvement had by 1909 received public recognition in England for nearly 70 years, a period coinciding almost exactly with the systematic study of sanitation or public health. The active movement definitely began about 1841 with voluntary effort in which Lord Shaftesbury was the most prominent and active figure. The motive was philanthropic and the object was to improve the condition of the working classes. It took the form of societies; one was the "Metropolitan Association for Improving the Dwellings of the Industrial Classes," incorporated in 1845 but founded in 1841; another was the "Society for Improving the Condition of the Labouring Classes," originally the "Labourers' Friend Society," of which the Prince Consort became president. That fact and the statement of the Society concerning improved housing that "the moral were almost equal to the physical benefits," sufficiently prove that public interest in the subject and a grasp of its significance already existed at that date. Legislation followed not long after and has continued at intervals ever since.

Legislation.—Twenty-eight Housing and Health Acts, passed between 1851 and 1903, are enumerated by Mr Dewsnup, whose monograph on *The Housing Problem in England* is the fullest account of the subject published. The first was the Shaftesbury Act of 1851 for the establishment of lodging-houses for the working classes; the last was the Housing of the Working Classes Act of 1903. The Shaftesbury Act had in view the provision by local authorities of good lodging-houses for the better class of artisans, and particularly of single persons, male and female, though families were also contemplated. It was accompanied in the same year by another act, not included in the list of twenty-eight, for the regulation and control of common lodging-houses, from which Mr Dewsnup reasonably infers that the object of Lord Shaftesbury, who inspired both acts, was the separation of the casual and disorderly class frequenting common lodging-houses from the more regularly employed and respectable workers who were sometimes driven to use them for lack of other accommodation. At any rate this early legislation embodied the principle of differential treatment and showed a grasp of the problem not always visible in later procedure. The most important of the subsequent acts were those of 1855 and 1866, both intended to encourage private enterprise in the provision of working-class dwellings; the Torrens Act of 1868 (Artisans' and Labourers' Dwellings Act) for the improvement or demolition of existing buildings; the Cross Act of 1875 (Artisans' and Labourers' Dwellings Improvement Act), for extending that process to larger areas; the Public Health Act of 1875; the Housing of the Working Classes Act of 1885 following the report of the Royal Commission on the Housing of the Working Classes, of which King Edward, then prince of Wales, was a member; the Housing of the Working Classes Act of 1890; the Public Health (London) Act of 1891. The acts of 1875 (Public Health), of 1890 and of 1891 are still in force. The story of this half-century of legislation (which also includes a number of Scotch and Irish acts, local private acts and others bearing on the question) is one of tentative efforts first in one direction then in another, of laws passed, amended, extended, consolidated, superseded. Many of the enactments, originally of limited application, were subsequently extended, and the principal laws now in force apply to the whole of the United Kingdom. Two main objects can be distinguished—(1) the treatment of existing dwellings by demolition or improvement; (2) the construction of new ones. The second head is further subdivided into (*a*) municipal action, (*b*) private action. These objects have been alternately promoted by legislative measures conceived and carried out on no systematic plan, but gradually and continuously developed into an effective body of law, particularly with regard to the means of dealing with existing insanitary dwellings. The advancing requirements of public health are clearly traceable in the series of enactments directed to that end. The Nuisances Removal Act of 1855 took cognizance of premises in such a state as to be "a nuisance or injurious to health," and made provision for obtaining an order to prohibit the use of such premises for human habitation. In the same act overcrowding obtained statutory recognition as a condition dangerous or prejudicial to health, and provision was made for compelling its abatement. The campaign against bad housing conditions thus inaugurated by the legislature was extended by subsequent acts in 1860, 1866 and 1868, culminating in the Cross Act of 1875 for the demolition (and reconstruction) of large insanitary areas and the extremely important Public Health Act of the same year. The constructive policy, begun still earlier in 1851 by Lord Shaftesbury's Act, was concurrently pursued, and for some years more actively than the destructive; but after 1866 the latter became more prominent, and though the other was not lost sight of it fell into the background until revived by the Royal Commission of 1885 and the housing legislation which followed, particularly the Housing of the Working Classes Act of 1890, amending and consolidating previous acts.

The laws in operation at the beginning of 1909 were the Public Health Acts of 1875 and 1891

(London), as amended by subsequent minor measures, and the Housing of the Working Classes Act of 1890, amended in 1894, 1900 and 1903. The Public Health Acts place upon the local sanitary authority the obligation of securing, under by-laws, the proper construction, draining and cleaning of streets, removal of house refuse and building of houses, including structural details for the prevention of damp and decay, the provision of sanitary conveniences and an adequate water-supply; also of inquiring into and removing nuisances, which include any premises in such a condition as to be a nuisance or injurious to health and any house so overcrowded as to be dangerous or injurious to health. For the purpose of carrying out these duties the local authority has the power of inspection, of declaring a building unfit for human habitation and of closing it by order. The Housing Acts give more extended power to the local authority to demolish insanitary dwellings and clear whole areas or "slums," and also to construct dwellings for the working classes with or without such clearance; they also retain the older provisions for encouraging private enterprise in the erection of superior dwellings for the working classes. The procedure for dealing with insanitary property under these Acts is too intricate to be stated in detail; but, briefly, there are two ways of proceeding. In the first the local authority, on receiving formal complaint of an unhealthy area, cause an inspection to be made by their medical officer, and if the report in their opinion justifies action, they may prepare an "improvement scheme," which is submitted to the Local Government Board. The Board holds an inquiry, and, if satisfied, issues a provisional order, which has to be confirmed by a special act of parliament, under which the local authority can proceed to demolish the houses concerned after paying compensation to the owners. This procedure, which is authorized by part i. of the act of 1890, is obviously both cumbrous and costly. The second way, provided for by part ii. of the act, is much simpler and less ambitious; it only applies to single houses or groups of houses. The medical officer in the course of his duty reports to the local authority any houses which are in his opinion unfit for human habitation; the local authority can then make an order to serve notices on the owners to repair the houses at their own expense. Failing compliance on the part of the owners, an order for closing the houses can be obtained; and if nothing is done at the end of three months an order for demolition can be made. Buildings injurious by reason of their obstructive character (*e.g.* houses built back to back so as to be without through ventilation and commonly called "back-to-back" houses) can be dealt with in a similar manner. Small areas containing groups of objectionable houses of either kind may be made the subject of an improvement scheme, as above. Where areas are dealt with under improvement schemes there is a certain obligation to re-house the persons displaced. Building schemes are provided for under part iii. of the act. Land may be compulsorily purchased for the purpose and the money required may be raised by loans under certain conditions. The provisions thus summarized were considerably modified by the "Housing, Town Planning, &c., Act," passed at the end of 1909. It rendered obligatory the adoption (previously permissive) of the housing provisions (part iii.) of the act of 1890 by local authorities, simplified the procedure for the compulsory purchase of land required for the purpose and extended the facilities for obtaining loans. It further gave power to the Local Government Board to compel local authorities to put in force the act of 1890 in regard both to existing insanitary housing and the provision of new housing. Power was also given to county councils to act in default of rural district councils in regard to new housing. The procedure for dealing with insanitary houses by closing and demolition under part ii. (see above) was rendered more stringent. The general intention of the new act was partly to facilitate the administration of the previous one by local authorities and partly to provide means of compelling supine authorities to take action. Its town-planning provisions are noted below.

Effects of Legislation.—The efficacy of laws depends very largely on their administration; and when they are permissive and dependent on the energy and discretion of local bodies their administration varies greatly in different localities. That has been the case with the British housing and health laws, and is one cause of dissatisfaction with them. But in the aggregate they have effected very great improvement. Public action has chiefly taken effect in sanitary reform, which includes the removal of the worst housing, through demolition or alteration, and general sanitary improvements of various kinds. In some large towns the worst parts have been transformed, masses of old, narrow, crowded, dilapidated and filthy streets and courts have been swept away at one blow or by degrees; other parts have been reconstructed or improved. The extent to which this has been accomplished is not generally recognized. It is not easily demonstrated, and to realize it local knowledge, observation and memory are needed. The details of the story are hidden away in local annals and official reports; and writers on the subject are usually more concerned with what has not than with what has been done. Both the Public Health and the Housing Acts have had a share in the improvement effected. The operation of the former is slow and gradual, but it is continuous and far more general than that of the latter. It embraces many details which are not usually taken into account in discussing housing, but which have as much bearing on the healthiness of the home as the structure itself. The Public Health Acts have further had a certain preventive influence in laying down a standard for the erection of new houses by the ordinary commercial agencies. Such houses are not ideal, because the commercial builder studies economy and the question of rent; but the standard has risen, and building plans involving insufficient light and air, such as once were general, have now for several years been forbidden almost everywhere. Supervision of commercial building is, in fact, vastly more important than the erection of dwellings by public or philanthropic agencies, because it affects a vastly larger proportion of the population. The influence of the Public Health Acts in improving the conditions of home life cannot be

estimated or summarized, but it is reflected in the general death-rate, which fell steadily in the United Kingdom from 21.1 per 1000 in 1878 to 15.4 per 1000 in 1907.

Insanitary Areas.—The operation of the Housing Acts is more susceptible of being stated in figures, though no fully comprehensive information is available. The original Shaftesbury Act of 1851 for erecting municipal lodging-houses appears to have been practically inoperative and little or nothing was done for a good many years. In 1864, however, Liverpool obtained a private act and entered on the policy of improvement by the demolition of insanitary dwellings on a considerable scale, following it up in 1869 by re-housing. In 1866 Glasgow, also under a private act, created an Improvement Trust, administered by the city council, and embarked on a large scheme of improvement. These seem to have been the earliest examples. The Torrens Act of 1868, which embodied the improvement policy, did not produce much effect. According to a parliamentary return, during the years 1883-1888, proceedings were only taken under this act in respect of about 2000 houses in London and four provincial towns. More advantage was taken of the Cross Act of 1875, which was intended to promote large improvement schemes. Between 1875 and 1885 23 schemes involving a total area of 51 acres and a population of about 30,000 were undertaken, in London; and 11 schemes in provincial towns. By far the most important of these, and the largest single scheme ever undertaken, was one carried out in Birmingham. It affected an area of 93 acres and involved a net cost of £550,000. Altogether between £4,000,000 and £5,000,000 were raised for improvement schemes under those acts. After the Housing Act of 1890 the clearance policy was continued in London and extended in the provinces. During the period 1891-1905 loans to the amount of about £2,300,000 were raised for improvement schemes by 28 provincial towns in England and Wales. The largest of these were Leeds (£923,000), Manchester (£285,000), Liverpool (£178,000), Sheffield (£131,000), Brighton (£112,000). The Leeds scheme affected an area of 75 acres, which was cleared at a cost of £500,000. In London the area cleared was raised to a total of 104 acres; the gross cost, down to March 31, 1908, was £3,417,337, the net cost £2,434,096, and the number of persons displaced 48,525. Glasgow has under its Improvement Trust cleared an area of 88 acres with a population of 51,000. At the same time the policy of dealing with houses unfit for habitation singly or in small groups by compelling owners to improve them has been pursued by a certain number of local authorities. In the six years 1899-1904 action was taken each year on the average in respect of about 5000 houses by some 400 local authorities large and small outside London. Representations were made against 33,746 houses, 17,210 were rendered fit for habitation, closing orders were obtained against 4220 and demolition orders against 748. These figures do not include cases in which action was taken under local acts and Public Health Acts. In Manchester, between 1885 and 1905, nearly 10,000 “back-to-back” houses were closed and about half of them reopened after reconstruction. Hull, an old seaport town with a great deal of extremely bad housing, has made very effective use of the method of gradual improvement and has transformed its worst areas without appearing in any list of improvement schemes. In recent years this procedure has been systematically taken up in Birmingham and other places, and has been strongly advocated by Mr J. S. Nettlefold (*Practical Housing*) in preference to large improvement schemes on account of the excessive expense involved by the latter in buying up insanitary areas. In the six years 1902-1907 Birmingham dealt with 4111 houses represented as unfit for habitation; 1780 were thoroughly repaired, 1005 were demolished; the rest were under notice or in course of repair at the end of the period. Among other towns which have adopted this policy are Liverpool, Cardiff, York, Warrington and two London boroughs.

Building.—On the constructive side the operation of the Housing Acts has been less extensive and much less general. In London alone has the erection of working-class dwellings by municipal action and organized private enterprise assumed large proportions. Philanthropic societies were first in the field and date from a period anterior to legislation, which however, stimulated their activity for many years by affording facilities. Fourteen organizations were in operation in London prior to 1890 and some of them on a large scale; others have since been formed. The earliest was the Metropolitan Association for Improving the Dwellings of the Industrial Classes, whose operations date from 1847; it has built 1441 tenements containing 5105 rooms. The largest of these enterprises are the Improved Industrial Dwellings Company (1864), which has built 5421 tenements containing 19,945 rooms; the Peabody Fund (1864) with 5469 tenements containing 12,328 rooms; the Artisans’, Labourers’ and General Dwellings Company (1867), with 1467 tenements containing 3495 rooms, and 6195 cottage dwellings; the East-End Dwellings Company (1885) with 2096 tenements containing 4276 rooms; the Guinness Trust (1889) with 2574 tenements containing 5338 rooms. The Artisans’ Dwellings Company alone has housed upwards of 50,000 persons. In addition to these there are the Rowton Houses (1892), which are hotels for working men, six in number, accommodating 5162 persons. So far as can be estimated, private enterprise has housed some 150,000 persons in improved dwellings in London on a commercial basis. The early activity of the building companies was largely due to the policy of the Metropolitan Board of Works, which adopted extensive improvement schemes and sold the cleared sites to the companies, who carried out the re-housing obligations imposed by the law. Since the London County Council, which replaced the Board of Works in 1889, adopted the policy of undertaking its own re-housing, their activity has greatly diminished. The buildings erected by them are nearly all in the form of blocks of tenements; the Artisans’ Dwellings Company, which has built small houses and shops in outlying parts of London, is an exception. The tenement blocks are scattered about London in many quarters. For instance the Peabody Fund has 18 sets of dwellings in different situations, the Metropolitan Association has 14; the Artisans’ Dwellings Company has 10; the Guinness Trust has 8. In 1909 an important addition to the list of philanthropic enterprises in

London was put in hand under the will of Mr W. R. Sutton, who left nearly £2,000,000 for the purpose of providing improved working-class dwellings. The erection of tenement blocks containing accommodation for 300 families was begun on a site in the City Road. In only a few provincial towns has private enterprise contributed to improved housing in a similar manner and that not upon a large scale; among them are Newcastle, Leeds, Hull, Salford and Dublin.

Municipal Building has been more generally adopted. The following details are taken from Mr W. Thompson's *Housing up to Date*, which gives comprehensive information down to the end of 1906. The number of local authorities which had then availed themselves of part iii. of the Housing Act of 1890, which provides for the erection of working-class dwellings, was 142. They were the London County Council, 12 Metropolitan Boroughs, 69 County Boroughs and Town Councils, 49 Urban District Councils and 12 Rural District Councils. The dwellings erected are classified as lodging-houses, block dwellings, tenement houses, cottage flats and cottages. Lodging-houses have been built by 12 towns, of which 8 are in England, 3 in Scotland (Glasgow, Aberdeen and Leith) and 1 in Ireland (Belfast). The total number of beds provided was 6218, of which Glasgow accounts for 2414, London for 1846, Manchester and Salford together for 648. Four other towns have built or are building municipal lodging-houses for which no details are available. The other municipal dwellings erected are summarized as follows:—

Kind of Dwelling.	No. of Dwellings.	No. of Rooms.
Blocks	12,165	27,523
Tenement Houses	2,507	6,068
Cottage flats	2,004	5,747
Cottages	3,830	17,611
Total	20,506	56,949

It appears from these figures that municipal building has provided for a smaller number of persons in the whole of the United Kingdom than private enterprise in London alone. The principal towns which have erected dwellings in blocks are London (7786), Glasgow (2300), Edinburgh (596), Liverpool (501), Dublin (460) and Manchester (420). The great majority of such dwellings contain either two or three rooms. Tenement houses have been built in Liverpool (1424), Manchester (308), Sheffield (192), Aberdeen (128), and in seven other towns on a small scale. Such tenements are generally somewhat larger than those built in blocks; the proportion of three- and four-roomed dwellings is higher and only a small number consist of a single room. Cottage flats have been built in Dublin (528), West Ham (401), Battersea (320), Plymouth (238), East Ham (212), and on a small scale in Liverpool, Birmingham, Newcastle and seven other places. The majority of the cottage flats contain three or more rooms, a considerable proportion have four rooms. Cottages have been built in 67 places, chiefly small towns and suburban districts. Of the large towns which have adopted this class of dwellings Salford stands first with 633 cottages; three London boroughs, all on the south side of the Thames, have built 234; Manchester has 228, Sheffield 173, Huddersfield 157, Birmingham 103. The number of rooms in municipal cottages ranges from three to eight, but the great majority of these dwellings have four or five rooms.

Some further details of municipal housing in particular towns are of interest. In London, the work of the London County Council down to March 31, 1908, not including three lodging-homes containing 1845 cubicles, is given in the official volume of London Statistics, published by the Council, as follows:—

Buildings Erected and in Course of Erection.

No. of Dwellings.	No. of Rooms.	Cost of Land and Building.	No. of Persons in Occupation.
8,373	22,939	£2,438,263	26,687

With regard to the cost, it is to be noted that the actual cost of the land purchased for improvement schemes was very much greater than that stated, having been written down to an arbitrary figure called "housing valuation." The financial accounts of L.C.C. dwellings for the year ending March 31, 1908, are thus summarized:—

London County Council Dwellings, Accounts 1907-1908.

Gross Rental.	Deductions for Empties, &c.	Net Receipts.	Expenditure including Interest.	Net Returns.
£180,169	£19,455	£160,714	£157,141	£3,573

It appears from this that if the actual commercial cost of the land were taken the housing of the Council would be run at a considerable annual loss. The occupations of the tenants are stated in the following proportions: labourers 789, clerks 312, policemen 251, shop assistants 202,

warehousemen 183, printers 182, charwomen 182, tailors 155, cabinetmakers 146, canvassers 122, cigarette makers 118, widows 116, tram drivers 110, postmen 107, packers 97, engineers 87, dressmakers 41, coachmen 31, motormen 26, milliners 19. These proportional figures show that though a considerable number of labourers have been housed, the great majority of the occupants of London municipal dwellings are of a superior class. The mean weekly rent in London County Council dwellings is 2s. 10½d. per room against 2s. 4d. in dwellings erected by other agencies. The most important feature of the County Council's policy in recent years has been the acquisition of suburban sites for the erection of cottages. There are four such sites, two on the south, one on the north and one on the west side of London; the total area is 349 acres, and the total accommodation contemplated is for 66,000 persons at an estimated cost of £3,105,840; the present accommodation is for about 8000. In addition to the housing provided by the County Council, fourteen London Borough Councils and the City Corporation had at the beginning of 1909 erected or adapted 3136 dwellings containing 7999 rooms.

In Liverpool, down to 1907, about £920,000 had been spent in clearing insanitary areas and building new dwellings; the demolition of about 8000 houses and purchase of land cost about £500,000; and the erection of 2046 dwellings, containing 4961 rooms, cost about £350,000. The size of the dwellings and the number of each class are: 1 room, 193; 2 rooms, 965; 3 rooms, 719; 4 rooms, 167. The great majority are in tenement houses of three storeys. The mean weekly rent is 1s. 6½d. per room, but a large number are let at less. The net return on the total outlay is just over 1%, on the building outlay it is 2⅔%. The principal classes of persons occupying the dwellings are labourers 675, carters 120, charwomen 103, firemen 93, porters 80, hawkers 64, sailors 45, scavengers 40. These all belong to the poorest classes, living by casual or irregular work. Liverpool has, in fact, succeeded more than any other town in providing municipal dwellings in which the really poor can afford to live.

In Manchester 956 dwellings have been built at a total cost for building and improvement of £451,932; of the whole number 420 are in blocks, 308 in tenement houses and 228 in cottages. The rents are much higher than in Liverpool; in the tenement houses the mean weekly rent is about 6d. per room more than in Liverpool. The gross profit on the block dwellings is 1⅓% on the capital outlay, on the tenement houses 3%, on the cottages 2⅔%. "The total loss during the last seven to ten years, including loan charges, has amounted to about £54,240" (Thompson).

In Glasgow the corporation has built under improvement schemes 2280 new dwellings containing 4013 rooms and 241 shops. The dwellings, which are all in blocks and centrally situated, are occupied chiefly by artisans; only 28% have been reserved for the poorest class of tenants. The total amount taken from the rates on this account in 30 years is £600,000. Dwellings valued at £400,000 for building and £300,000 for land give a net return of 3.06% on outlay; dwellings valued at £280,000 for land and building return 3.03% on outlay; leaving the sinking fund charges to be defrayed out of rates.

In Edinburgh insanitary areas have been bought for £107,023 and new dwellings containing 1032 rooms have been built for £87,970. Nearly all the dwellings are of one or two rooms only. The rents charged average about 2s. a week per room; actual rents received average 1s. 4d. per room and they have to be subsidized out of the rates to the extent of 2s. 3d. per room to meet the cost of site.

In Dublin provision has been or was in 1909 shortly to be made for housing 5394 families or 19,000 persons; of which 1041 families, or about one-fifth, are housed by the Corporation, the rest by companies and private persons. Altogether it was estimated that £500,000 would be spent under the act of 1890. Fifteen streets, containing 1665 houses, have been declared unhealthy areas by the medical officer, and between 1879 and 1909 more than 3000 houses were closed as unfit for habitation.

Co-operative Building.—Municipal and philanthropic housing by no means exhaust the efforts that have been made to provide working-class dwellings outside the ordinary building market. Their special function has been to substitute better dwellings for pre-existing bad ones, which is the most costly and difficult, as well as the most urgent, part of the problem in old towns. But in the provision of new dwellings alone they have been far surpassed by organized self-help in different forms. Down to 1906 there had been built 46,707 houses by 413 co-operative societies at a cost of nearly £10,000,000. They are most numerous in the manufacturing towns and particularly in the north-western district of England. Of the whole number 8530 were owned by the societies which built them; 5577 had been sold to members, and 32,600 had been built by members on money lent by the societies. These figures do not include the particular form of co-operative building known as co-partnership housing, which will be mentioned later on, or the operations of the so-called building societies, which are really companies lending money to persons on mortgage for the purpose of building. The difference between them and the co-operative societies which do the same thing is that the latter retain the element of co-operation by lending only to their own members, whereas the building societies deal in the open market. Their operations are on an immense scale; at the end of 1908 the invested funds of the registered building societies exceeded £72,000,000. An agency working on this scale, which far exceeds the operations of all the others put together, is obviously an important factor in housing. The number of houses built must help to relieve congestion, and since they are built to suit the owners or tenants they cannot be of the worst class. They also represent a form of thrift, and deserve notice on that account.

The Small Dwellings Acquisition Act of 1899, which has not previously been mentioned, was

intended to facilitate the building or purchase of small houses by their tenants by means of loans advanced by local authorities. Down to 1906 about £82,000 had been so advanced by 5 county boroughs, 17 urban councils and 1 rural district council.

Housing by Employers.—No comprehensive information is available on this head, but it has not been an important factor in towns, being chiefly confined to agricultural, mining and suburban manufacturing districts. The former two belong to the subject of Rural Housing, which is separately discussed below; the third has an interest of its own on account of its connexion with "model settlements." The building of houses for their workpeople by industrial employers has never been widely adopted in this country, but it has attracted considerable attention at two different periods. Sir Titus Salt was a pioneer in this direction, when he built his woollen mills at Saltaire, on the outskirts of Bradford, and housed his workpeople on the spot. That plan was maintained by his successors, who still own some 900 excellent and cheap cottages, and was adopted by a few other manufacturers in the same neighbourhood. Saltaire was a model settlement with many institutions for the benefit of the mill-hands, and as such it attracted much attention; but the example was not generally followed, and the interest lapsed. Recently it has been revived by the model settlements at Port Sunlight, near Liverpool, started about 1888, Bournville near Birmingham (1895), and Earswick, near York (1904), which are of a much more elaborate character. Elsewhere, employers setting down works in some new locality where no provision existed, have had to build houses for their workmen; but they have done so in a plain way, and this sort of housing has not assumed large proportions.

Conditions in 1909.—It has been said above that great improvements have been effected, and of that there is no doubt at all. Both quantity and quality are more satisfactory than they were, though both are still defective. The conditions vary greatly in different places, and no general indictment can be sustained. The common practice of citing some exceptionally bad cases, and by tacit inference generalizing from them to the whole country, is in nothing more misleading than in the matter of housing. Local differences are due to several causes—age, population, occupations and means of the people, public opinion and municipal energy. The first three chiefly determine the difficulty and extent of the problem, the last two influence its treatment. The difficulty is greatest in towns which are old, have large populations and a high percentage of poor. Such pre-eminently are the large seaports, where much casual labour is employed. London, Liverpool, Glasgow, the Tyne, Hull, Sunderland are examples. Old inland towns having a large trading as well as an industrial element present the same features. Such are Manchester, Birmingham, Leeds, Sheffield and Bradford. In all these, and some others like them, the past has left a heavy legacy of bad housing by malconstruction and dilapidation, which has been increased by growth of population and overcrowding. They have attacked it with varying degrees of energy according to the prevalent local spirit and with varying results.

Overcrowding.—The one condition which permits of precise and comprehensive statement is overcrowding. A standard has been officially adopted in England based on the number of persons to a room in each dwelling; and the facts in relation to this standard are embodied in the census returns. It is a much better criterion than that of "density" or number of persons per acre, which is very deceptive; for an apparently low density may conceal much overcrowding within walls and an apparently high one may be comparatively guiltless. The room-density is the important thing in actual life. Some light is also thrown on this question by the number of rooms contained in each dwelling, and that is also given in the census. The standard of overcrowding is more than two persons to a room. In 1901 there were in England and Wales 2,667,506 persons or 8.2% of the population living in a state of overcrowding according to this definition. Their distribution is extremely irregular and capricious. In rural districts the proportion was only 5.8%, in urban districts 8.9%; but these summary figures give no idea of the actual state of things in different localities. In both rural districts and in towns the proportion of overcrowding varies in different localities from less than 1% to over 30% of the population. The towns are the most important and we shall confine attention chiefly to them. A list of 84 having a population of 50,000 and upwards, exclusive of London, is given by Mr Dewsnup. The overcrowding ranges from 34.54% in Gateshead and 32.42% in South Shields to 0.97% in Northampton and 0.62% in Bournemouth. Of the whole number exactly one-half have less than 5%; 15 have less than 2% and 22 have 10% or more. Neither size nor character has much to do with the variation. Bournemouth, at the bottom of the list with 0.62%, is a residential place and health resort with a population of about 50,000; so is Tynemouth, which is nearly at the top, with 30.71%. The two largest towns, Liverpool and Manchester, are 26th and 32nd on the list, with only 7.94% and 6.28% respectively, or considerably less than the average; and on the other hand none of the first 17 towns with the highest proportion of overcrowding are of the largest size. Again, with regard to character, Leicester and Northampton, which are almost at the bottom of the list, with 1.04% and 0.97% respectively, are both purely industrial towns. The most striking facts are that the six towns, which alone have more than 20% of overcrowding, namely Gateshead (34.5), South Shields (32.4), Tynemouth (30.7), Newcastle (30.4), Sunderland (30.10), Plymouth (20.1) are all old seaports, that four of them at the head of the list are on the Tyne and the fifth on the Wear. This points strongly to special local conditions and it is borne out by the facts with regard to rural districts. Northumberland and Durham show a great excess of overcrowding over other counties; and some of their rural districts even surpass any of the towns. The highest of all is the district of Tynemouth, with 38.18% of

overcrowding. The explanation lies in a special combination of large families and small houses prevalent in this area. All the rural districts are seats of coal-mining, and miners are the most prolific section of the population. They also live in small houses of a traditional and antiquated character, often of one storey only or built back to back. Many are built by colliery proprietors. Large families and small houses also prevail in the towns. Some of them contain coal-pits and the rest of their industrial population is engaged chiefly in engineering and shipbuilding works, occupations also usually associated with a high birth-rate. The men live as near their work as possible and the practice of living in flats or occupying part of a house prevails extensively.

In London the number of persons living in overcrowded conditions in 1901 was 726,096 or 16.0% of the population. The proportion varied from 2.6% in Lewisham to 35.2% in Finsbury, but in 23 out of the 29 boroughs into which the county is divided it exceeded the urban mean for the whole country, and in 9 boroughs having an aggregate population of 1,430,000 it was more than double the mean. Conditions in London are evidently untypical of English towns.

In the light of the census figures it is clear that no large proportion of the English industrial population is living under conditions of serious overcrowding, outside the special districts mentioned and that the expression “house famine” cannot be properly applied to England or English towns in general. In the House of Commons, on the 16th of August 1909, the president of the Local Government Board, Mr John Burns, gave a list of the number of unoccupied houses and tenements in each of the London boroughs and in the eight largest provincial towns, including Glasgow; the total was 104,107. By a further analysis of the census returns Mr Dewsnup shows that a great deal of the overcrowding is of a comparatively mild character and that it is due to a relatively small excess of population. Bradford, for instance, is credited with 40,896 overcrowded persons, representing the high percentage of 14.61 of the population; but in the case of nearly 20,000 the excess over the standard is very slight, and the proportion of gross overcrowding comes down to 7.55%. Moreover, this serious overcrowding is produced by no more than 2.79 of the population, so that its cure presents no insuperable difficulty. The argument is confirmed by the very substantial diminution which actually took place between 1891 and 1901. The facts are so striking that they deserve to be presented in tabular form:—

Percentage of Population Overcrowded.

	1891	1901
England and Wales	11.23	8.20
Gateshead	40.78	34.54
Newcastle	35.08	30.47
Sunderland	32.85	30.10
Plymouth	26.27	20.19
Halifax	21.31	14.49
Bradford	20.61	14.61
Huddersfield	19.89	12.88
London	19.70	16.01
Leeds	16.46	10.08
St Helens	15.72	10.86
Birmingham	14.27	10.32
Burnley	12.74	7.14
Sheffield	11.58	9.50
Bolton	11.22	6.50
Liverpool	10.96	7.94
Oldham	10.13	7.42
Salford	9.39	7.54
West Ham	9.34	9.27
Wolverhampton	9.31	4.67
Swansea	9.25	5.57
Stockport	8.50	4.98
Manchester	8.25	6.28
Bristol	8.03	3.55
Hull	7.86	6.12
Blackburn	7.05	3.92
Birkenhead	6.80	5.02
Norwich	4.91	3.34
Brighton	4.56	3.07
Cardiff	4.31	2.92
Preston	4.13	2.64
Nottingham	3.62	3.65
Croydon	2.76	2.74
Derby	2.69	1.18
Leicester	2.22	1.04
Portsmouth	1.74	1.19

To what is this remarkable movement due? It is far too general to be attributed to the operation of the Housing Acts; for, though they have helped in some cases, a great diminution has occurred

in many places in which no use has been made of them. Towns of all kinds and in all parts of the country exhibit the same movement in some degree; those which had little and those which had much overcrowding, the worst and the best. In London the percentage fell by 3.7, and the number of persons overcrowded was reduced by 103,669 in spite of an increase of population of 324,798. In Gateshead a fall of 6.2%, in Newcastle one of 4.6% took place; while at the other end of the scale Leicester and Derby reduced their already very low proportions by more than one-half. Nottingham is the only exception in the whole list. And in 28 out of the 35 towns the decrease of overcrowding was absolute as well as relative in spite of a large increase of population. London has been cited. The other large towns may be tabulated with it, thus:—

Town.	Increase of Population.	Decrease of Overcrowded Persons.
London	324,898	103,669
Liverpool	166,978	2,381
Manchester	38,504	7,545
Birmingham	44,091	14,290
Leeds	61,463	17,252
Sheffield	56,550	1,388
Bristol	107,367	6,105
Bradford	63,406	3,696

The very divergencies make the uniform diminution of overcrowding the more remarkable. The large increase of population in Liverpool and Bristol no doubt means extension of boundaries, which might have the effect of reducing the proportions of overcrowding, but it cannot account for the actual decrease of overcrowded persons. The change seems to be due to three factors all of which have been in general operation though in varying degrees. They are (1) the centrifugal movement promoted by improved locomotive facilities, (2) the declining birth-rate, (3) public health administration. (1) The first is the most important and the chief element has been tramways, of which a great extension accompanied by electrification took place in the decade. Thus the process of urbanization has been modified by one of suburbanization. Bristol is a prominent case; its overcrowding has been reduced by more than one-half without any large and costly municipal interference, mainly through the operation of ordinary economic forces. Tramways have made the outskirts accessible and builders have utilized the opportunity. They have built good houses, too, under supervision, and Bristol, though an old seaport and industrial town with much poverty, has the lowest general death-rate and the lowest infantile death-rate of all the great towns. (2) The birth-rate and the size of families are conditions which affect overcrowding in a very marked degree, though no attention is paid to them in that connexion. The case of the mining districts and the towns on the Tyne has been mentioned above; the same thing is seen in London, where all the most overcrowded districts (Finsbury, Stepney, Shoreditch and Bethnal Green) have high birth-rates, ranging from 31.3 to 36.4 per 1000 in 1902-1906. The necessity imposed on poor parents of putting several children into a cheap and therefore small dwelling accounts for a large proportion of overcrowding, which automatically diminishes with a falling birth-rate. The ultimate advantage of this method of reducing overcrowding is a question on which opinions may differ, but there is no doubt about the fact. (3) Public health administration is the third general cause; it attracts no notice and works very gradually, but it does work. The last annual report (for 1907) of the medical officer to the London County Council says of overcrowding: “There is reason for thinking that in recent years greater attention has been paid by sanitary authorities to the abatement of the nuisance, and Dr Newman states that in Finsbury there has been an enormous reduction in overcrowding, the reduction having been effected mainly in the years 1901-1905.” The medical officers of the metropolitan boroughs reported in 1907 2613 dwellings overcrowded in 23 boroughs and 3216 such dwellings remedied in 27 boroughs. It should not be forgotten that a good deal of overcrowding is voluntary. Families which have not enough room for their own members nevertheless take in lodgers; and in some places, of which London is the most conspicuous but not the only example, foreigners herd together thickly in a very small space.

The improvement shown by the statistics of overcrowding is confirmed by those relating to the size of dwellings. Between 1891 and 1901 the percentage of the population living in very small dwellings appreciably diminished thus—in 1-roomed dwellings, from 2.2 to 1.6%; in 2-roomed dwellings, from 8.3 to 6.6%; in 3-roomed dwellings, from 11.1 to 9.8%; while the proportion living in dwellings of 5 rooms and upwards increased from 54.9 to 60.1%. This again is referable to the suburban movement and a higher standard of requirements. Six-roomed houses with a bathroom tend to replace the old four-roomed type. The general report accompanying the census says: “However the tenement figures for England and Wales are compared it is impossible to avoid the conclusion that the comparison affords satisfactory evidence of distinct improvement in the housing of the people during the ten years 1891-1901.” In short, the problem of quantity is only acute in a few places and steadily becoming less so.

The foregoing facts apply only to England and Wales. In Scotland the state of things is much less satisfactory. No statistics of overcrowding are available, but the following comparative table shows how different the housing conditions are in the two countries:—

Size of Dwellings, England and Scotland, 1901.

Dwelling.	Percentage of Population.	
	England.	Scotland.
1 room	1.6	11.1
2 rooms	6.6	39.5
3 rooms	9.8	19.9
4 rooms	21.9	9.1
5 rooms and over	60.1	20.4

Over 50% of the population of Scotland live in tenements of one or two rooms; only 8.2% in England. A comparison of the largest towns in the two countries gives the following result:—

Percentage of Population.

Scotland.			England.		
Town.	1 Room.	2 Rooms.	Town.	1 Room.	2 Rooms.
Glasgow	16.2	38.9	London	6.7	15.5
Edinburgh	8.9	32.4	Liverpool	2.7	5.9
Dundee	11.3	51.7	Manchester	0.8	4.01
Aberdeen	6.1	33.2	Birmingham	0.3	2.4
Greenock	11.3	47.6	Sheffield	0.4	4.0
Kilmarnock	18.9	43.3	Bristol	1.6	5.7
Mean	12.7	42.4	Mean	1.8	6.7

The conditions in Scottish towns where very tall tenement houses are common, resemble those in other countries, in which overcrowding is far greater than in England. All these matters are comparative, and the superiority of conditions in England ought to be recognized. Yet, in Scotland, too, great improvements have been effected. In 1861 there were 25,959 houses without windows; in 1901 only 130. These facts throw light on the long standing of the housing question, the change of standard and the improvement effected.

In Ireland there is more overcrowding than in England, though probably less than in Scotland, with the possible exception of Dublin, which has a larger proportion of one-roomed dwellings than any Scottish town, namely, 24.7%. The percentage of population living in overcrowded conditions in the principal towns is—Dublin 40.6, Limerick 31.7, Cork 23.4, Waterford 20.6, Londonderry 16.7, Belfast 8.2.

Sanitary Conditions.—With regard to the quality of existing housing reference has already been made to the effect of the Public Health Acts and the general improvement in sanitation. The only numerical measure is afforded by the death-rates, which have fallen in England from 20.9 per 1000 in 1871-1875 to 15.4 per 1000 in 1903-1907 and in the United Kingdom from 21.3 to 15.7 per 1000 in the same period. The condition of the dwelling must be credited with a considerable share in this fall. There have, in fact, been great changes and all in the direction of improvement. The rise and development of sanitation, of house and main drainage and sewage disposal, the purification of water and provision of a constant service in the house, the removal of refuse, the segregation of infectious illness, sanitary inspection—all these, apart from the demolition of the worst housing and the provision of better, have raised the general healthiness of the dwellings of the people. In face of these facts and of the vital statistics, to say that the people are physically deteriorating through the influence of bad housing is to talk obvious nonsense, for all conditions have been improving for more than a generation. If physical deterioration is going on, of which there is no proof, either it is not caused by bad housing or there is less than there was. Deterioration may be caused by the continued process of urbanization and the congregating of an ever larger proportion of the population in towns; but that is a different question. If the town has any injurious influence it is not due to the sanitary condition of the houses, which is in general superior to that of houses in the country, but to the habits and occupations of the people or to the atmosphere and the mere aggregation. But much misapprehension prevails with regard to towns. The most distinctive and the most valuable feature of English housing is the general predominance of the small house or cottage occupied by a single family. Only in London and a few other towns do blocks of large tenement houses of the continental type exist, and even there they are comparatively few. In England and Wales 84% of the population live in dwellings of 4 rooms and upwards, which means broadly separate houses. Now the prevalence of small houses involves spreading out and the covering of much ground with many little streets, which produce a monotonous effect; a smoky atmosphere makes them grimy and dull skies contribute to the general dinginess. The whole presents to the eye a vast area of dreary meanness and monotony. Thus the best feature of English national housing turns to its apparent disadvantage and the impression is gained by superficial observers that the bulk of our working-class populations lives in “slums.” The word “slum” has no

precise meaning, but if it implies serious sanitary defects it is not applicable to most of our town housing. There are real slums still, but the bulk of the working class population do not live in them; they live in small houses, often of a mean and dingy exterior but in essential respects more sanitary than the large and often handsome blocks to be seen in foreign towns, which are not put down as slums because they do not look dirty. A smoky atmosphere is injurious to health, but it must be distinguished from defects of housing. Ideal houses in a smoky place soon look bad; inferior ones in a clean air look brighter and deceive the eye. The worst of the old housing has disappeared; the filthy, dilapidated, airless and sunless rookeries—the real slums—and the underground dwellings have been swept away in most cases, and what remains of them is not so bad as what has gone. But reform has been very regularly applied. Some towns have done much, others little. The large towns, in which the evil was most intense and most conspicuous in bulk, have as a class done far more than smaller ones in which the need perhaps was less great, but in which also a less healthy public spirit prevailed. The worst housing conditions to-day are probably to be found in old towns of small and medium size, in which the ratepayers have a great disinclination to spend money on anything, and the control of local affairs is apt to be in the hands of the owners of the most insanitary property. Nor is this state of things altogether confined to old places. Some of recent growth have been allowed, for the same reason, to spring up and develop without any regard to sanitary principles or the requirements of public health. There is therefore abundant scope for further reform and in not a few cases urgent need of it. On the other hand, we have a number of towns, particularly manufacturing towns, both large and small in the midlands and the north of England, which have already reached a good general standard of housing in all essential requirements, and only need the regular and steady exercise of vigilance by the public health service to remove such defects as still remain or may reveal themselves with the lapse of time.

Rents.—Rent is a matter of great importance from every point of view, and that is now being realized. A quantity of official information on the subject has been collected and made available by an elaborate inquiry ordered by the Board of Trade in 1905 and published in 1908 (Cd. 3864). It relates to working class dwellings in the principal industrial towns in the United Kingdom, 94 in all: namely, 77 in England and Wales, 11 in Scotland and 6 in Ireland. The following tables give in a condensed form the chief statistical results obtained in October 1905:—

Predominant Range of Weekly Rents.

	England and Wales.		Scotland.	Ireland.
	London.	Provincial towns.		
One room	..	..	2/- to 2/6	1/6 to 2/6
Two rooms	4/6 to 7/6	3/- to 3/6	3/10 to 4/3	2/6 to 3/6
Three rooms	6/- to 9/-	3/9 to 4/6	5/2 to 6/5	4/- to 5/-
Four rooms	7/6 to 10/6	4/6 to 5/6	..	5/6 to 6/9
Five rooms	9/- to 13/-	5/6 to 6/6	..	..
Six rooms	10/6 to 15/6	6/6 to 7/9	..	..

Rents are lowest in Ireland and next lowest in English provincial towns, considerably higher in Scotland and highest of all in London, for which further special details are given. It is divided into three zones (1) central, (2) middle, (3) outer, which have the following mean weekly rents:—

London Mean Weekly Rents.

	Zone.		
	Central.	Middle.	Outer.
One room	4/6	3/9	..
Two rooms	7/-	6/-	..
Three rooms	8/9	7/6	6/6
Four rooms	..	9/-	7/9
Five rooms	..	11/-	9/6
Six rooms	..	13/-	11/-

In central London—which extends to Stepney in the East, Lambeth m the South, Islington in the North, and includes Westminster, Holborn, Finsbury, Marylebone, Shoreditch, most of Bethnal Green, Southwark and Bermondsey—the rent of a single room may be as high as 6s. or even 6s. 6d. (Holborn) a week. It is here that overcrowding is greatest, and block-tenements, philanthropic and municipal, most numerous. The rentals of the block dwellings have not been taken into account in the foregoing official statistics; they range as follows: 1 room, 2s. 6d. to 5s.; 2 rooms, 5s. to 8s.; three rooms, 6s. 6d. to 11s. The lowest rent for which a single room can be obtained in this area is 2s. 6d. a week. In no English town are rents nearly so high as in London. If 100 is taken as the index number for rent in London the nearest towns to it (Croydon and Plymouth) only reach 81, and one town on the list (Macclesfield) is as low as 32. The index number of twenty-one towns out of the

whole is 50 or under, and these include a number of important industrial centres—Hull, Leicester, Blackburn, Northampton, Warrington, Coventry, Crewe and others. The index numbers of the great towns are: Liverpool 65, Manchester and Salford 62, Birmingham 59, Leeds 56, Sheffield 55, Bristol 53, Bradford 59, Hull 48; that is to say the level of rents in these towns is little more than half that in London. This is one more proof of the untypical character of London, and of the fallacy of generalizing from it to the rest of the country. Even in the overcrowded towns on Tyneside rents do not run to three-fourths of the London level. When the towns are divided into geographical groups the index numbers run thus: London 100, Northern Counties 62, Yorkshire 56, Lancashire and Cheshire 54, Midlands 51, Eastern Counties 50, Southern Counties 61, Wales and Monmouth 60. Rents are always highest in capitals, and Edinburgh complies with the rule; but it is very slightly in advance of Glasgow, and in Scotland generally the range is much smaller than in England. Dublin, on the other hand, is differentiated from the other Irish towns as widely as London from English ones.

A general and progressive rise in rents has been taking place for many years. The following index numbers for the great towns are given in the second series of memoranda published by the Board of Trade in 1904 (Cd. 1761):—

Relative Working-Class Rents.

1880	86.6	1890	89.9
1885	90.1	1900	100.0
1895	96.3		

The tendency to rise is attributable to increased cost of labour, due to higher wages and less work, increased cost of materials and higher rates. Weekly working-class rents generally include rates which are paid by the landlord. Housing reform has contributed to the rise, both directly and through the rates, on which it has thrown a heavy burden in various ways. When slums are cleared away and replaced by superior dwellings the new rents are generally higher than the old and this fact has proved a great difficulty. Most of the improved housing is beyond the means of those who need it most, and they seek other quarters resembling the old ones as nearly as possible. The example of Liverpool, which has the largest proportion of casual and ill-paid labour of all the great towns, and has been the most successful in providing new dwellings of a fair quality, centrally situated and not in blocks, at really low rates, shows that the problem is not insoluble; but as a rule too little attention is paid to the question of rent in housing reform, especially in building undertaken by municipalities. It is not ignored, but the importance attached to it by the poor is not realized. To them it is the first consideration after four walls, a roof and a fire-place; and 6d. a week makes a vast difference in their calculations. Reform which aims at raising the lowest classes of tenants by improving their dwellings defeats itself when it drives them away.

Rural Housing.—Little has hitherto been said about rural housing. It is of less importance than urban housing because it concerns a much smaller proportion of the population, and because in rural life the influence of inferior housing on health is offset by other conditions; but it has recently attracted much attention and was made the subject of inquiry by a Select Committee of the House of Commons in 1906. The report laid stress chiefly on the inaction of local rural authorities under the Public Health and Housing Acts, and on various obstacles in the way of improving existing houses and of providing more and better ones at rents which agricultural labourers can afford to pay. The available facts with regard to rural housing are scrappy and unsatisfactory. The word “rural” has no precise meaning and it includes several very different sections of the population; for instance, the inhabitants of suburbs, mining villages and mill villages as well as the real agricultural population. Complaint is made of both the quantity and the quality of rural housing. With regard to quantity it is said that in spite of migration to the towns there is a dearth of cottages through dilapidation and demolition without rebuilding. That may happen in particular localities, but there is no evidence to support a general allegation. Inquiries issued by the Board of Trade to agricultural correspondents brought the following replies: insufficient 56, sufficient 111, more than sufficient 32. Similar inquiries of land agents and owners resulted thus: insufficient 9, sufficient 11, more than sufficient 4, variable 6. From which it appears that insufficiency exists but is not general. The official evidence with regard to overcrowding is that it is much less acute than in the towns. The proportion of the rural population in England living in overcrowded conditions in 1901 was 5.8%; if the rural mining districts, the exceptional overcrowding of which has been noted above, be eliminated, the rest cannot be very bad. Moreover, the percentage has appreciably diminished; in 1891 it was 8.46. The complaint of bad quality is better founded. Some landowners take great pride in the state of their property, and excellent cottages may be found in model villages and elsewhere in many parts of the country; but much rural housing is of an extremely insanitary character. A good deal of evidence on this head has of late years been published In the reports of medical inspectors to the Local Government Board. And local authorities are very reluctant to set the law in motion against insanitary dwellings. On the other hand, they have in some cases hindered and prevented building by too rigid insistence on by-laws, framed with a view to urban housing and quite unsuited to rural conditions. A few rural authorities have taken action with regard to building schemes under Part III. of the Housing Act. A list of 31 in 17 counties is

given in “Housing up to Date”; 13 applications were refused and 13 granted by the respective county councils and others were dropped. Details are given by the same authority of 54 houses built by 17 rural district councils. Public action may thus be said to amount to nothing at all. Landowners, however, have borrowed under the Improvements of Lands Acts upwards of £1,250,000 for building labourers’ cottages; and this is probably only a fraction of the amount spent privately.

In Ireland a special condition of affairs exists. A series of about a dozen acts, dating from 1881 and culminating in the Labourers (Ireland) Act of 1906, have been passed for promoting the provision of labourers’ cottages; and under them 20,634 cottages had been built and some thousands more authorized previous to the act of 1906, which extended the pre-existing facilities. The principle is that of the English Housing Acts applied to rural districts, but the procedure is simpler and quicker. The law provides that a representation may be made to the local authority by three ratepayers or resident labourers that “the existing house accommodation for agricultural labourers and their families is deficient having regard to the ordinary requirements of the district, or is unfit for human habitation owing to dilapidation, want of air, light, ventilation or other convenience or to any other sanitary defects,” whereupon the local authority shall make an improvement scheme. It may also initiate a scheme without representation, or the Local Government Board may do so in default of the local authority. The scheme is published, an inquiry held, notice given and an order made with very much less delay and expense than under the English law. Land is purchased by agreement, or compulsorily and the money for land and building raised by loan. Loans amounting to about 3½ millions sterling had been raised down to 1906. The great majority of the cottages built are in Münster and Leinster. They must have at least 2 bedrooms and a kitchen, and the habitable rooms must be 8 ft. high. One of the most remarkable features is the low cost—about £150—at which these cottages have been built, including land and the expenses of procedure.

Recent Developments.—It is clear from a general review of the subject that the problem of housing the working classes in a satisfactory manner has proved more complex than was at one time realized. Experience has falsified hopes and led to a change of attitude. It is seen that there are limits to drastic interference with the normal play of economic forces and to municipal action on a large and ambitious scale. A reaction has set in against it. At the same time the problem is being attacked on other sides and from new points of departure. The tendency now is towards the more effectual application of gradual methods of improvement, the utilization of other means and the exercise of prevention in preference to cure. Under each of these heads certain movements may be noted.

The most troublesome problem is the treatment of existing bad housing. In regard to this the policy of large improvement schemes under which extensive areas are bought up and demolished has had its day, and is not likely to be revived to any considerable extent. That is not only because it is extremely costly but also because it has in the main done its work. It has done what could not have been done otherwise, and has swept away the worst of the old housing *en masse*. To call it a failure because it is costly and of limited application would be as great a mistake as to regard it as a panacea. The procedure which seems to be coming into favour in place of it is that adopted in Birmingham and advocated by Mr J. S. Nettlefold (*Practical Housing*) coupled with a more general and effective use of the Public Health Acts. The principle is improvement in detail effected by pressure brought to bear on owners by public authority. The embodiment of this principle forms an important part of the Housing and Town Planning Bill introduced by the Local Government Board in 1908, which contained clauses empowering the central authority to compel apathetic local authorities to do their duty in regard to the closing of unfit houses, and authorizing local authorities both to issue closing orders and to serve notices on landlords requiring them “to execute such works as the local authority may specify as being necessary to make the house in all respects reasonably fit for human habitation.”

Among the other and less direct means to which attention is being turned is the policy of getting people away from the towns. The effect of improved travelling facilities in reducing urban overcrowding has been noted above. That object was not specifically contemplated in the building and electrification of tramways, and in the development of other means of cheap local travel, but the beneficial effect has caused them to be recognized as an important factor in relation to housing and to be more systematically applied in that connexion. A newer departure, however, is to encourage migration not to the outskirts of towns but altogether into the country by facilitating the acquisition of small holdings of land. This has been done by private landowners in an experimental way for some years, and in 1907 the policy was embodied in the Small Holdings Act, which gives county and borough councils power to purchase or hire land compulsorily and let it in holdings of not more than 50 acres or £50 annual value. Failing action on their part the Board of Agriculture may frame schemes. Power is also conferred on the Board and on County Councils to establish co-operative agricultural societies and credit banks. These measures have been adopted from foreign countries, and particularly from Denmark and Germany. A very large number of applications for holdings have been made under this act, but it is too early to state the effects. They will depend on the success of tenants in earning a livelihood by agricultural produce.

Another new and quite different departure is the attempt to establish a novel kind of town, called a “Garden City,” which shall combine the advantages of the town and the country. The principal points are the choice of a site, which must be sufficiently convenient to enable industries to be carried on, yet with rural surroundings, the laying out of the ground in such a way as to ensure plenty of open space and variety, the insistence on building of a certain standard and the limitation of size. One has been established at Letchworth in Hertfordshire, 34 m. from London, and so far seems to be prospering. It consists of an area of 3800 acres, bought from the previous owners by a company registered in 1903 and entitled First Garden City Ltd., with a capital of £300,000 in £5 shares. The interest is limited to a dividend of 5%, all further profits to be devoted to the benefit of the town. The estate is divided into a central urban area of 1200 and a surrounding agricultural belt of 2600 acres. The town is planned for an eventual population of 30,000 and at present (1909) has about 5000. Some London printing works and other small industrial establishments have been planted there, and a number of model cottages have been built. In this connexion another recent novelty has appeared in the shape of an exhibition of cottages. The idea, originated by Mr St Loe Strachey, was to encourage the art of designing and building cheap but good and convenient cottages, especially for the country. Two exhibitions have been held at Letchworth in 1905 and 1907, and others at Sheffield (1907) and Newcastle (1908). The two latter were held on municipal land, and it is proposed by the National Housing Reform Council to hold one every year.

The “Garden City” has led to the “Garden Suburb,” an adaptation of the same idea to suburban areas. One was opened near Hampstead Heath in 1907: it consists of 240 acres, of which 72 have been reserved for working-class cottages with gardens. These developments, with which may be associated the model industrial villages, mentioned above, at Bournville, Port Sunlight and Earswick, represent an aspiration towards a higher standard of housing for families belonging to the upper ranks of the working classes; and the same movement is demonstrated in a still more interesting fashion by a particular form of co-operative activity known as Co-partnership Housing. The first complete example of this method of organization was the Ealing Tenants Limited, a society registered under the Industrial and Provident Societies Act in 1901, though the Tenant Co-operators Limited, formed in 1888, was a precursor on very nearly the same lines. The essential principle is self-help applied by combination to the provision of superior homes, and the chief material feature is the building of houses which are not only of good design and workmanship, but disposed on a systematic plan so as to utilize the ground to the best advantage. Land is bought and houses are built with combined capital to which each tenant contributes a substantial share; the houses are let at rents which will return 5% on share capital and 4% on loan capital after defraying all expenses, and the surplus profits are divided among the tenant members in proportion to the rents paid by them. Each tenant’s share of profits is credited to him in shares until his share capital equals the value of the house he occupies, after which it is paid in cash. There is thus common ownership of the whole group, which forms a little community. This system has caught on in a remarkable way and has spread with great rapidity. In 1905 a central organizing body was formed called the Co-partnership Housing Council, for the purpose of promoting the formation of societies and assisting them with advice; it is supported by voluntary contributions. In 1909 twelve societies, including the original Tenant Co-operators, had been formed with a total investment of £536,300. They are situated at Ealing, Letchworth, Seven-oaks, Leicester, Manchester, Hampstead (two), Harborne near Birmingham, Fallings Park, Stoke-on-Trent, Wayford and Derwentwater. The rapidity with which the movement has developed and spread since the establishment of the Co-partnership Housing Council indicates great vitality, and since it is based on thoroughly sound lines it has probably a large future. It is the most interesting and in many respects the best of all recent developments. The Report of the Select Committee on Rural Housing mentioned above suggested that a Co-partnership Housing Society should be formed in every county in England.

All the enterprises just described have one feature in common, namely, the laying out of sites on a plan which takes cognizance of the future, secures a due proportion of open space, variety in the arrangement of streets and the most advantageous disposition of the houses and other buildings. They go beyond sanitary requirements and take account of higher needs. They have lent force to the advocacy of municipal “town-planning,” as practised by several towns in Germany; and provision was made for this procedure in the Housing and Town Planning Act of 1909. The act contains clauses giving local authorities power to prepare plans with reference to any land which appears likely to be used for building purposes within or near their own boundaries; and also to purchase land comprised in a town-planning scheme and either build on it themselves or let plots for building in accordance with the plan. The chief object is to safeguard the future, prevent the repetition of past defects and encourage a higher standard of housing.

These new developments represent an upward movement at the higher end of the scale. They cater for the superior ranks of working classes, those who attach some importance to the aesthetic and moral influence of pleasant and wholesome surroundings, and are willing to sacrifice immediate gratifications to a higher end. They embody an aspiration, set an example and exercise an educative influence. But they have nothing to do with the housing of the really poor, which is the great difficulty; and their very attractiveness seems in some danger of drawing attention from it. Garden cities and suburbs will never house the poor or even the bulk of our working class population, and it would be a pity if the somewhat sentimental popularity of romantic schemes led to a distaste for the plodding effort which alone can effect a real cure of deep-seated social evils of

long standing. All the new schemes and legislative proposals leave untouched the greatest difficulty of all, which lies not in the dwelling but in the tenant. It is comparatively easy to afford better opportunities to those who are willing to take advantage of them, but how to raise those who are not? The lesson taught by Miss Octavia Hill's classical experiment is, if not forgotten, certainly neglected in the presence of more showy efforts. Or perhaps it would be more true to say that half of it is neglected. Miss Hill was one of the pioneers in the comparatively modest method of improving and reconstructing bad houses, which, as we have noted, is now being more generally recognized and pursued; but that was only half her work. She improved bad dwellings and made them decent, but she also managed them on business lines, by a system of inspection and rent collection which combined a judicious discipline with the stimulus of reward. This was done by means of personal service, which is the secret of all really effective work among the poor. Her words written years ago remain true to-day: "The people's homes are bad partly because they are badly built and arranged; they are tenfold worse because the tenants' habits and lives are what they are. Transplant them to-morrow to healthy and commodious homes and they will pollute and destroy them."

The following is a list of the principal associations formed for the promotion of housing reform: Mansion House Council on the Dwellings of the Poor, Rural Housing and Sanitation Association, Workmen's National Housing Council, National Housing Reform Council, Co-partnership Tenants Housing Council. They are all of recent date, except the first. There are also local associations at Liverpool, Oldham, Rochdale, York, Plymouth, and elsewhere.

Other Countries

At the International Housing Congress organized by the National Housing Reform Council and held in London in 1907 representatives were present from a number of foreign countries and a good deal of information was collected and published in the report of the Congress. Further detailed data have been supplied by foreign correspondents to Mr W. Thompson and published in *Housing up to Date*. The more important facts relating to the principal industrial countries are here condensed from this and other sources of information.

Austria.—An act for encouraging the building of cheap working-class dwellings was passed in 1902; it provides for exemption from taxes for 24 years of working-class dwellings which fulfil certain conditions including sanitary requirements, a minimum area per room, minimum height, minimum door and window spaces, thickness of walls, a maximum number of inhabitants (one to 4 sq. metres in sleeping rooms), prohibition of lodgers, fixed rent and maximum profit. The municipalities are the authority for administering sanitary and housing laws; they have no power of compulsory purchase of land without a special law. There is excessive overcrowding in the large towns; in Vienna (1900) 43% of the population live in dwellings of 1 room or 1 room and a kitchen; in 60 provincial towns the proportion is 63%. Overcrowding is reckoned at more than 5 persons to a room and more than 9 to two rooms; the proportion of overcrowded on this basis is nearly one-fifth in Vienna and one-fourth in the provincial towns (Thompson).

Belgium.—An act was passed in 1889 instituting *Comités de Patronage*; since then other Acts relating to loan societies, and to inheritance and succession in the case of small properties. Comités de Patronage are semi-official bodies, but without legal power, whose function it is to study the subject of housing, to report to local authorities on existing conditions, to advise, to collect funds and promote the provision of good houses by any means in their power. They influence public opinion and stimulate the activity of local authorities which have the power to compel improvements and close dwellings unfit for habitation; they have led to the formation of numerous societies for erecting working-class dwellings. The latter are encouraged by the law in various ways; they are exempt from the payment of some government duties and partly exempt from others. Working men buying or building houses liable to registration fees up to from 72 to 171 francs are exempted from personal, provincial and communal taxes. The National Savings Bank of Belgium is empowered to lend money to working men for buying or building houses and to insure the lives of those doing so, to preserve the home for the family. In 1904 the number of workmen's homes exempted from taxation was 164,387, and the amount of taxation remitted considerably exceeded 3 million francs; workmen had acquired lands and houses valued at nearly £4,000,000; there were 161 societies for building working-class dwellings; 30,000 workmen representing a population of 150,000 had become owners of property; and 70,000 representing a population of 350,000 had availed themselves of the law in obtaining exemptions and loans (O. Velghe). The foregoing results effected in 15 years are remarkable and indicate a great capacity for self-help on the part of Belgian workmen with suitable and well-considered assistance. But this movement, in common with those of a similar character in other countries, does not touch the problem of housing the very poor. No statistics of overcrowding are available, but the average number of persons to a dwelling is over 5 for the whole country and nearly 9 in Brussels. The communal administrations are the authorities for health and housing; they have power to abate nuisances but not to compel landowners to sell land for building, though they have the right to dispossession for "public purposes." No town has constructed quarters devoted entirely to working-class dwellings and only one commune (St Giles) has built any. In towns the height of buildings is regulated by the width of streets; generally it is the width plus 6 metres. The height of rooms and thickness of walls are prescribed by local regulations but not the area of rooms. The housing difficulty has been lessened

in a notable degree by cheap transport facilities, including railroads, light railroads and tramways; a large proportion of the workpeople travel long distances to and from work. One-quarter travel on the State railways alone; fares are 1s. 6d. a week for a daily double journey of 20 m., 2s. for 44 m. and 2s. 6d. for 66 m. The area of the labour market of Liége extends nearly to Ostend and out of 5830 workmen travelling over 1000 live more than 50 kilometres from Liége. Some journeys last 3 hours.

France.—The question of housing was publicly raised in France quite as early as in England on grounds of public health in connexion with the first visitation of cholera, and building societies were formed as early as 1851, but little was done until after 1889, when the *Société Française des Habitations à Bon Marché* was founded under the inspiration of M. Siegfried. This led to the formation of several societies, which increased rapidly after the passage of *la loi Siegfried* in 1894, for promoting the provision of working-class dwellings. In 1902 a Public Health Act and in 1906 a Housing of the Working Classes Act were passed, and these three enactments with regulations made in 1907 govern the procedure. The act of 1906 embodies the Belgian system of Comités de Patronage, of which at least one was to be established in each department with grants in aid, and exemptions from certain taxes of working-class dwellings fulfilling specified conditions as to sanitation and rent. The law promotes the formation of Housing Societies by granting various facilities for the investment of money in building by public bodies and benevolent institutions by taking shares or by loans. Down to the end of 1906 there had been lent for this purpose £233,000 by savings banks, £258,000 by the Caisse des Dépôts, and £14,000 by charitable institutions. The law does not authorize municipalities to build houses and none of the communes have acquired land for this purpose. Under the Public Health Act of 1902 towns can purchase land compulsorily in connexion with unhealthy areas. The Public Health and Housing Acts are administered by the local authority, which makes regulations for building and for laying out building land. A minimum height of 2.6 metres and a minimum cubical content of 25 cubic metres are prescribed for rooms; there are no regulations for thickness of walls. Housing societies are under the Ministry of Works and a Superior Housing Council, which is a central advisory body. These societies are now numerous; there are 46 in Paris alone, but their operations are not on a large scale. One of them deserves special notice on account of its special object. It is called the *Société de logements pour familles nombreuses* and it builds special flats called *maisons des enfants* which are let at low rents only to persons with large families. In 1907 it had housed 168 families, averaging 6.8 persons, in two blocks at Belleville and Montmartre. The great defect in France is the large quantity of old, bad, insanitary housing. Real slums exist in all the old towns and in some of them, such as Marseilles and Lyons, on an extensive scale. Very little has hitherto been done to grapple with this difficulty. The standard of sanitation is altogether lower in France than in England, as is shown by the death-rates, and this holds good of the housing. But conditions vary widely in different parts of the country. They are better, generally speaking, in the industrial towns of the north, which are largely Flemish and distinguished by the prevalence of small houses after the English fashion, than in the central or southern districts where tall old tenement houses of six and seven storeys abound. There are no statistics and no standard of overcrowding; but the careful inquiry carried out by the Board of Trade and published in 1909 shows the extraordinary prevalence of tenements consisting of 1, 2 or 3 rooms. In 16 towns for which information was obtained the average proportion of dwellings containing less than 4 rooms was 75% of the whole; in some it was as high as 89% and in none lower than 61%. In 8 towns, including Paris, the number of one-roomed dwellings was more than a quarter of the whole, and in two towns (Brest and Fougères) it was more than half. Some corresponding statistics for English and German towns are given below in the section on Germany. According to the same report, the general accuracy of which has been confirmed by personal inquiries, made in 1909 by the writer in a number of towns, rents are decidedly lower in France. If the London level be taken as 100 that of Paris is only 78 and the other French towns are considerably lower, 21 out of 29 being less than half the London standard. A general comparison between a number of English and French towns shows the average level of French rents to be less than three-fourths of English ones. A noticeable feature of housing in France is the large number of dwellings built by employers in recent years. The mining companies, particularly in the Pas de Calais, have built whole groups of villages; the railway companies and various manufacturers have also done a great deal, chiefly in rural areas. Among the manufacturers MM. Schneider at Le Creusot and the textile mill-owners in the Vosges are noticeable. The houses provided are of a charming type, white with red roofs; the rooms are of good size, the rents low, and a large garden is usually attached to every house.

Germany.—In no country is the problem of housing more acute than in Germany, where the increase of population, the growth of manufacturing industry and the urbanization of the people have proceeded at an exceptionally rapid pace in recent years and have combined with increasing wealth and a rising standard of living to force the question into prominence. Up to 1909 no uniform legislation for the empire had been framed and no central authority existed for dealing with housing; but the several states have their own public health and housing laws, and great activity has been developed in various directions. The most general difficulty is deficiency of quantity consequent on the rapid change in the distribution of the population. The proportion of the whole population living in the great towns increased from 7.2% to 16.2%, or more than doubled between 1890 and 1900; in England it only increased by about one-tenth. Slums are a much less conspicuous feature than in England because of the comparatively recent development of German towns, but where old quarters exist on a large scale, as in Hamburg, the conditions are quite as bad as anything in English towns, and call for similar measures. Public sanitation in Germany is still as a

whole less advanced than in England; but in some cases it is superior and in general it is coming up rapidly; the administration of sanitary laws, as of others, is more effective and uniform, and less subject to evasion. This also contributes to the comparative absence of slums. And there is a third factor which has perhaps the greatest influence of all, and that is the superior manner in which German homes are kept. But the pressure of inadequate quantity is urgent; it has caused high rents, overcrowding, and the development of large barrack or block dwellings which are becoming the prevailing type. At the same time it has led to many and varied efforts to meet the difficulty. Isolated attempts go back to an early date. For instance a building society was formed in Berlin in 1849, Alfred Krupp began to build his “colonies” at Essen in 1863, Barmen started a society in 1871 and there were other cases; but general attention seems first to have been drawn to the subject by the reforming efforts of Pastor Bodelschwingh at Bielefeld about 1884 in connexion with his *Arbeiterheim*. In short housing reform in Germany is really a matter of the last 20 years. The first efficient by-laws for regulating building in Berlin were not adopted till 1887; the previous regulations dating from 1853 permitted many abuses and under them a great deal of bad housing was constructed, especially after the establishment of the empire and the beginning of the great development of the capital.

The worst feature is the general prevalence of dwellings containing a very small number of rooms —from 1 to 3—and consequent overcrowding. The following figures are extracted from the Report to the Board of Trade on Rents, Housing, &c., in Germany (1908, Cd. 4032). They indicate the proportion of dwellings containing 1, 2 or 3 rooms, or (in a few cases) the proportion of the population living in such dwellings. The towns are those for which the information is given. They are not selected as particularly bad specimens but as representative, and they include most of the capitals and chief industrial centres. The figures relate to the year 1900, except in a few cases, in which they are taken from a municipal house census in 1905.

Percentage of Dwellings or Population living in Dwellings containing

Town.	1 Room.	2 Rooms.	3 Rooms.	Total under 4 Rooms.
Berlin	8.0	37.2	30.6	75.8
Aachen	13.7	32.0	21.9	67.6
Barmen (pop.)	1.5	24.3	28.8	54.6
Bremen	3.8(?)	26.8	26.1	56.7(?)
Breslau (pop.)	3.9	46.0	24.4	74.3
Chemnitz (pop.)	1.7	34.8	29.9	66.4
Dantzig	3.3	45.0	29.9	78.2
Dortmund	4.7	45.5	30.0	80.2
Dresden	0.8	3.5	27.8	32.1
Düsseldorf	5.0	26.4	22.7	54.1
Elberfeld	8.4(?)	36.9	21.7	67.0(?)
Essen	2.9	35.4	30.0	68.3
Hamburg	1.0	3.9	24.7	29.6
Königshütte (pop.)	10.0	60.4	16.8	87.2
Leipzig (pop.)	0.4	1.7	14.5	16.6
Mannheim	3.1	22.1	40.4	65.6
Munich (pop.)	4.6	24.1	28.4	57.1
Plauen (pop.)	1.3	14.2	21.8	36.3

The figures must be read with a certain amount of caution, as they are not in every case compiled on a precisely uniform method with regard to inclusion of kitchens and attics. For this reason the position of Bremen and Elberfeld is probably more unfavourable than it ought to be. But broadly the table shows that in most of the large towns in Germany more than half, and in some cases more than three-quarters of the dwellings have less than 4 rooms. Leipzig is the most striking exception. If working-class quarters alone are taken it is found that dwellings of more than 3 rooms are so few as to be negligible. In Stuttgart, where housing is very dear, the percentages for working-class quarters are—1 room 21.0, 2 rooms 51.8, 3 rooms 26.9; total under 4 rooms 98.7. Königshütte, the chief coal and iron centre in Silesia and a purely working-class town, shows the same state of things; 60% of the whole population live in dwellings of 2 rooms and 87% in less than four. It is interesting to compare English towns. The proportion of dwellings containing less than 4 rooms in London was (1901) 52.2%, in Berlin 75.8%; the proportion of the population living in such dwellings was—London 38.7%, Berlin 71.5%. Not only is the proportion of small dwellings very much higher in Berlin but the proportion of the population living in them shows a far greater discrepancy. This indicates a much higher degree of overcrowding. The only point in which Berlin has the advantage is the smaller number of single-room dwellings. The proportions are London 14.7%, Berlin 8.0%. But it is to be observed that overcrowding is not so common in 1-room dwellings, which are often occupied by a single person, as in those with 2 or 3 rooms, which are occupied by families, though probably the most extreme cases of overcrowding occur in particular 1-room dwellings. In the English county boroughs the proportion of dwellings with less than 4 rooms was 24.0%, in other urban districts 17.4, and in all urban areas including London 26.4%. When all allowance is made for minor errors and discrepancies it may be broadly concluded that the proportion of small dwellings

containing less than 4 rooms is at least twice as great in German as in English towns, and that the conditions as to accommodation which in England prevail only in London are general in urban Germany. As a set-off German rooms are generally larger than English ones and in block dwellings there is often a little ante-room or landing which does not count but really increases the space.

The German census does not take cognisance of overcrowding and there is no general official standard; but some towns have adopted a standard of their own, namely, six or more persons to 1 room and ten or more to 2 rooms. In Breslau, which is one of the worst towns, 17.5% of the population (53,000) of the “city” or inner ring were overcrowded on this basis in 1900. In Barmen, which is not one of the worst, 20% of the 2-roomed and 17% of the 3-roomed dwellings (together housing more than half the population) were overcrowded according to the English standard. Overcrowding and other bad conditions are worst in the basement or cellar dwellings, of which some towns have a very large number. In Breslau 15,000 persons were living in 3853 such dwellings in 1900; in Berlin 91,426 persons were living in 24,088 basements. Some of these are free from objection, but 11,147, housing 38,663 persons, were situated in back buildings and unfit for habitation on account of darkness, damp, dilapidation and the like. “Back” houses are a feature of old towns; they are houses which do not give on the street but lie behind and are approached by a passage; they are what we call courts and quite as insanitary as anything of the kind in English towns.

With regard to rents the Board of Trade (London) Report gives the following figures for Berlin and a number of other towns:—

No. of Rooms per Dwelling.	Predominant Range of Weekly Rents.	
	Berlin.	Other Towns.
2 rooms	5/- to 6/-	2/8 to 3/6
3 rooms	7/- to 9/3	3/6 to 4/9
4 rooms	..	4/3 to 6/-

Rents are higher in Berlin than in any other town, though Stuttgart comes very near it. The following table of index numbers shows the relations of 32 towns to Berlin:—

Town.	Index Number.	Town.	Index Number.
Berlin	100	Nuremberg	53
Stuttgart	97	Aachen	53
Düsseldorf	79	Crefeld	52
Dortmund	68	Bremen	52
Anchaffenburg	67	Plauen	52
Hamburg	66	Leipzig	51
Mannheim	64	Dantzig	49
Königsberg	62	Mülhausen	48
Munich	63	Königshütte	47
Essen	62	Stettin	46
Solingen	61	Magdeburg	43
Bochum	57	Chemnitz	40
Elberfeld	57	Zwickau	38
Barmen	57	Brunswick	37
Remscheid	56	Stassfurt	33
Breslau	56	Oschersleben	28
Dresden	54		

Comparing rents in Germany and England, the Board of Trade Report gives the following table, to which the corresponding ratio of French towns has been added.

No. of rooms.	Predominant Weekly Rents.		Ratio of German to English (100)	Ratio of French to English (100)
	England.	Germany.		
2 rooms	3/- to 3/6	2/8 to 3/6	95	79
3 rooms	3/9 to 4/6	3/6 to 4/9	100	86
4 rooms	4/6 to 5/6	4/3 to 6/-	102	78

If the mean of the English and German figures be taken it shows a very slight difference in favour of Germany; the mean weekly rent per room being 1s. 5d. in England and 1s. 4¾d. in Germany. But in England rent usually includes local taxation (rates) whereas in Germany it does not; if this be added German rents are to English as 123 to 100, or nearly one-fourth more.

The statistics given above indicate a wide range of variation in the conditions prevailing in different towns in Germany; and that holds good with regard to improvements. The administration of the laws relating to public health and housing is in the hands of the local authorities. The public health service is generally efficient and sometimes very good. Increasing attention has been paid in

recent years to the sanitary inspection of houses and in some towns it is now thorough and systematic, but active efforts to deal with old and insanitary quarters *en masse* are isolated and exceptional. Hamburg is an instance; scared by the visitation of cholera in 1892 the authorities put in hand an extensive improvement scheme on the English plan at a cost of half a million sterling. But demolition is exceptional; slums are usually subjected to supervision and are not allowed to be in a state of dilapidation, and sometimes, as at Mannheim, notices are served to abate overcrowding. In Munich a policy of gradually buying up insanitary houses has been adopted. But improvement has principally been promoted by new building and the reduction of the population in old insanitary quarters, to which cheap locomotive facilities have greatly contributed. The great bulk of urban Germany is new, and the most valuable contribution made by it to the housing question is the more effective control of new building and particularly the principle of town-planning, coupled with the purchase of neighbouring ground with a view to future extension. This policy is comparatively recent and still very partially applied, but it is now rapidly extending. A general act providing for the planning of streets was passed in Prussia in 1875 and still forms the basis of building legislation; but as noted above no effective by-laws were adopted even in Berlin until after 1887, and consequently a very faulty style of building was adopted, especially in large blocks which conceal grave defects behind an imposing exterior. The Saxon towns have been conspicuously successful in regard to housing. Leipzig stands alone among German towns in having 83.4% of its population living in dwellings of 4 rooms and upwards. Yet it is a great commercial city, the fifth in the empire, with a population of upwards of half a million. It also comes low on the rent table, having an index number little more than half that of Berlin. All the Saxon towns are low, Chemnitz and Zwickau particularly so, and the position of Dresden, being a capital, is remarkable. More than two-thirds of the population live in dwellings of 4 rooms or more, and the rent index number is only 54. In Saxony a general Building Act, especially providing for town planning, was passed in 1900; and the Grand Duchy of Hesse, which alone among the German states has a government Housing Department, adopted a Housing of the Working Classes Act in 1902. Other states have followed or are following and the air is full of movement. The distinctive features of urban housing reform in Germany are (1) the systematic planning of extensions, (2) purchase of ground by municipalities, (3) letting or sale of municipal land for building under prescribed conditions. Many of the great towns, including Berlin, Munich, Dresden, Leipzig, Cologne, Frankfort and Düsseldorf, are owners of land to a variable but sometimes large extent. This policy seems to have been originally adopted on economic grounds and those municipalities which bought or otherwise came into possession of town land at an early date derive a substantial revenue from it now, besides being in a position to promote housing improvement. There is comparatively little municipal building, and that as a rule only or principally for municipal servants, as at Düsseldorf, Mannheim and Nuremberg; but there seems to be a tendency to venture further in this direction and some towns have built houses for letting. The municipalities generally sell or let their land, and the building agencies which enjoy most official favour are the societies “of public utility”; they are encouraged in every way and have greatly developed, particularly in the Rhine province. Some are co-operative, others semi-philanthropic in that they aim at building good houses and limit their profits. In 1901 the Prussian Government issued an order urging municipalities to support these societies by remitting the cost of constructing streets and sewers, placing the assistance of building officials at their disposal, taking their shares, lending them money and becoming security for them. A great deal of public money has been advanced to building societies, and one very important source of supply has been developed, since the Old Age and Infirmity Insurance Act of 1889, in the National Insurance Funds which invest their surplus capital in this way. Down to 1906 the Boards of insurance had lent £8,650,000 to societies for building; the Imperial Government had lent £1,250,000, the Prussian Government £1,825,000, and the other states further large sums in addition to the municipalities. Money lent by the state is usually limited to building houses for state employees and Insurance Boards lend on condition that the houses are let to persons who come under the insurance laws. The development of building societies has been promoted by the formation of general building associations of which the earliest was established in Düsseldorf in 1897 for the Rhine provinces; under its influence one-fifth of the new housing provided in 1901 was erected by the societies. The example was followed at Frankfort, Münster and Wiesbaden. Housing by employers has also been carried out on a large scale in Germany. States and municipalities have to some extent built houses as employers, the former chiefly for railwaymen, besides lending money to societies for the purpose; but most housing of this kind has been done by private employers. Krupps, who had built 4274 dwellings housing nearly 27,000 persons down to 1901, are the most famous example; but they are only one among many. In Rhineland and Westphalia employers had in 1902 provided 22,269 houses containing 62,539 dwellings at a cost of £10,500,000; more than half the families so housed belonged to the mining industry, the rest to various manufactures. These two provinces, in which industrial development has been extremely rapid, are exceptional; but housing by employers is not confined to them. At Mannheim for instance over 1000 working-class households have been so provided. At Nuremberg the Siemens Schuckert Company have encouraged an interesting system of collective building among their employees, by which 722 dwellings have been provided.

Holland.—In 1901 a Public Health and a Housing Act were passed, and these two embody most of the features of housing reform adopted in other countries. The first provides for a general sanitary service under the Ministry of the Interior. The second ordains that local authorities shall frame by-laws for building and for the maintenance and proper use of dwellings; that they shall inspect existing dwellings, order improvements or repairs or demolition; empowers them to take land compulsorily for the purposes of the act, to prohibit building or rebuilding on sites reserved for

public purposes and to make grants or loans to societies or companies operating exclusively for the improvement of working-class dwellings. If they fail to make by-laws the provincial authorities may take action. Land buying with a view to extensions has been adopted by a number of municipalities including Amsterdam, Rotterdam, Utrecht and other important towns, and the practice is increasing. Amsterdam has also begun the systematic planning of extensions. There has been a little municipal building in some small places, but it is on an insignificant scale; the tendency is rather to favour societies of public utility as in France, Germany and Belgium. The new laws are too recent to have had much effect and housing reform is as yet in an early stage. Rents are high in the large towns, namely, 1 room 1s. 8d. to 3s.; 2 rooms 2s. 6d. to 5s.; 3 rooms 3s. 6d. to 6s; 4 rooms 4s. 2d. to 7s.

Italy.—A Housing of the Working Classes Act was passed in 1903, to promote the improvement and provision of workmen's dwellings. Municipalities have the power to purchase land compulsorily for housing purposes and also to build workmen's dwellings. A few towns, of which Milan is one, have done so. There are building regulations relating to the area and height of rooms and the thickness of walls. The antiquity of the Italian towns and the great quantity of old and insanitary building make housing improvement a very difficult matter. *La Società Umanitaria*, a benevolent trust founded by Prosper Loria of Milan in 1902, has taken up this subject among others and has built two model tenements, housing 2000 persons.

United States.—Interest in the housing question in the United States is confined to a few of the largest cities and can only be said to be acute in New York, though there have been investigations by commissions elsewhere and Miss Octavia Hill's work in London has found admirers and imitators in Philadelphia and Boston as well as in New York. The evils of housing in New York have been the subject of much sensational writing which has elevated them to the position of a world-wide scandal. It is not necessary to accept all the allegations made in order to see that several circumstances have combined to produce an exceptional state of things in this great city. The limited space—the island or peninsula of Manhattan—in which central New York is built has compelled the erection of large tenement blocks, otherwise rare in American towns; the incessant inrush of immigrants from the poorest parts of Europe has filled these tenements with immense numbers of persons of many nationalities accustomed to a low standard of living; the generally backward state of public sanitation in America, and the absence or evasion of regulations and supervision, have permitted the erection of bad dwellings, their deterioration into worse, and their misuse by excessive overcrowding. Other large cities in which bad housing conditions are known to exist are Chicago, Philadelphia, Boston, Baltimore, Cincinnati, Pittsburg, Jersey City. There are doubtless many others, but bad housing conditions are not so general in the United States as in Europe. Outside the very large cities there is more space, more light and air, less crowding together, less darkness, dirt and dilapidation. Large houses, occupied by two or perhaps three families, are common, but they have more room space than is usual in Europe. The 18th annual report (1903) of the Commissioner of Labour gives the result of a special inquiry embracing 23,447 families distributed in 33 states. The average number of rooms was 4.95 per family and 1.04 per individual. It is a fair inference that overcrowding is confined to a comparatively small number of exceptional places. A large number of the schedules were furnished by the eminently urbanized and manufacturing states of New York, Pennsylvania, Massachusetts, Ohio and Illinois; and in all these the average number of rooms to a family exceeded 4, ranging from 4.2 in Ohio to 5.5 in Massachusetts. The condition of homes as to sanitation and cleanliness was statistically stated thus: Sanitary condition—good 61.46%, fair 32,59%, bad 5.95%; Cleanliness—good 79.63%, fair 14.66 bad 5.71%. Other special inquiries have been carried out in particular towns. In 1891-1892 the tenements in Boston were investigated for the Massachusetts Labour Bureau, which found 3657 sleeping rooms without outside windows and about 8% of the population living in conditions objectionable from one cause or another. In 1892 Congress authorized a special inquiry into the slum population of New York, Chicago, Philadelphia and Baltimore, the results of which were published in the seventh special report (1894) of the United States Commissioner of Labour. It was estimated that the total "slum population" (presumably those living in unhealthy conditions) was—New York 360,000, Chicago 162,000, Philadelphia 35,000, Baltimore 25,000. In Baltimore 530 families, consisting of 1648 persons, were living in single rooms with an average of 3.15 persons to a room; in Philadelphia 401 families were so living with an average of 3.11 persons to a room. The proportion of 1-room dwellings was less in New York and Chicago. In New York 44.55% or nearly half the families investigated were found living in 2-roomed dwellings, in Baltimore 27.88%, in Philadelphia 19.41% and in Chicago 19.14%. These figures conclusively prove that European conditions reproduce themselves in American cities. Poverty was not the cause, as the average earnings per family ranged from £3, 4s. a week in Baltimore to £4, 6s. a week in Chicago. Another official investigation in New York was carried out in 1895 by the Tenement House Commission appointed by the State of New York. It reported "many houses in the city in an insanitary condition which absolutely unfits them for habitation." Further details have been compiled from the census by the New York Federation of Churches, chiefly relating to density of population in the city. In 1900, out of a total of nearly 250,000 dwellings, 95,433 (38.2%) contained from 2 to 6 persons, 60,672 (24.2%) from 7 to 10 persons and 89,654 (35.9%) 11 persons or more. The density of population for the whole city as now constituted was 19 persons to the acre, in Manhattan 149; in the south-eastern district of Manhattan 382 and in one ward 735. Between 1900 and 1905 the density increased in every district, and in the latter year there were 12 blocks with from 1000 to 1400 persons to the acre. The number of persons to the acre in London (1901) is 60.6; in the most densely populated borough 182, and in the most densely populated district (a very small one) 396.

This will give a measure of comparison. The large tenement blocks in New York have been constructed with far less regard to health than those in Berlin, and reproduce in an aggravated form the same evil of insufficient light and air. In place of the inadequate courts round which many are built in Berlin, the New York tenements have merely narrow air shafts. In 1904 there were reported to be 362,000 dark interior rooms, that is with no outside windows.

If American cities have nothing to learn from other countries in regard to bad housing, they have nothing to teach in the way of reform. They are following Europe slowly and a long distance behind. There is no serious attempt to deal with insanitary areas as they have been dealt with in England, or to prevent the creation of new ones by regulation and planning of extensions as in Germany, or to promote the provision of superior houses by organized public effort as in several countries. A little has been done in New York to improve the worst housing. A Tenement House Act was passed after the report of the Commission of 1895 and a Department formed to give effect to it. Some cleansing and repairing and insertion of windows is carried out every year, but more attention seems to be paid to fire escapes. Societies for providing improved dwellings exist in New York, Boston, Chicago and Philadelphia. The oldest is one formed in Boston in 1871, called the Co-operative Building Company; it was followed in 1876 by an Improved Dwellings Company in Brooklyn, and in 1879 by a similar society in Manhattan, and in 1885 by another in Boston. The largest concern of the kind is the City and Suburban Houses Company in New York, formed in 1896 under the guidance of Dr E. R. L. Gould; it has built four groups of tenements housing 1238 families in the city and 112 houses on a suburban estate at Brooklyn; in all it has housed some 6000 persons. More recently Mr Henry Phipps has given £200,000 for the provision of model dwellings in New York, and a building has been erected on the plan of the Maison des Enfants in Paris. In Chicago the City Houses Association works at housing reforms in various ways. There are some other institutions of a like kind, but the aggregate results are inconsiderable. Two other building agencies have done far more in the United States than philanthropic societies; these are the building and loan associations and private employers. The former are co-operative provident societies; they are widely diffused throughout the United States and their operations are on a very large scale. They date from 1831, when the Oxford Provident Building Association was formed at Frankfort, near Philadelphia. Pennsylvania has still the largest number of associations, but from 1843 onwards the movement spread rapidly and continuously in other states. The high-water mark appears to have been reached in 1897, when the total assets of the associations amounted to about £133,000,000. In 1905 there were 5326 associations with an aggregate membership of 1,686,611 and assets of about £130,000,000. The states of Pennsylvania and Ohio head the list, but the movement is very strong in many others. It accounts for the comparatively large number of houses owned by working-class families in the United States. With regard to housing by employers, no comprehensive information is available, but the total amount is certainly considerable though probably not so large as in Germany or in France. Some of the better-known instances are the Pelzer Manufacturing Company at Pelzer in South Carolina, which has built about 1000 dwellings; the Maryland Steel Company at Sparrows Point, Maryland, 800 dwellings; Ludlow Manufacturing Associates at Ludlow, Mass., 500 dwellings; Whitin Machine Works at Whitinsville, Mass., 600 dwellings; Westinghouse Air Brake Co. at Wilmerding, Penn., 360 dwellings; Draper Co., Hopedale, Mass., 250 dwellings. These are all more or less “model” settlements, not in cities, but in outlying or country places, where works have been established, and that is generally true of housing by employers in the United States, whereas in Germany much has been provided by them in the large towns. Rents are very much higher in American cities than in European towns of comparable size and character.

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(A. SL.)

HOUSMAN, LAURENCE (1867-), English writer and artist, was born on the 18th of June 1867. Having studied at South Kensington, he first made a reputation as a book-illustrator. Some of his best pictorial work may be seen in the editions of Meredith’s *Jump to Glory Jane* (1892), the *Weird Tales of Jonas Lie* (1892), Jane Barlow’s *Land of Elfintoun* (1894), Christina Rossetti’s *Goblin Market* (1893), *Werewolf* (1896), by his sister, Miss Clemence Housman, Shelley’s *Sensitive Plant* (1898), and his own *Farm in Fairyland* (1894). His designs were engraved on wood by Miss Housman. His volumes of verse include *Green Arras* (1896), *Rue* (1899), *Spikenard* (1898) and *Mendicant Rhymes* (1906); and the mysticism which characterizes the devotional poems in *Spikenard* recurs in his half-allegorical tales, *All Fellows* (1896), *The Blue Moon* (1904) and *The Cloak of Friendship* (1906). His nativity play, *Bethlehem*, was presented in the Great Hall of London University at South Kensington for a week in December 1902. In 1900 he published anonymously *An Englishwoman’s Love Letters*, which created a temporary sensation; and he followed this essay

in popular fiction by the novels *A Modem Antaeus* (1901) and *Sabrina Warham* (1904). On the 23rd of December 1904 his fantastic play *Prunella*, written in collaboration with Mr Granville Barker, was produced at the Court Theatre.

His brother, Alfred Edward Housman (b. 1859), an accomplished scholar, professor of Latin at University College, London, is known as a poet by his striking lyrical series, *A Shropshire Lad* (1896).

HOUSSAYE, ARSÈNE (1815-1896), French novelist, poet and man of letters, was born at Bruyères (Aisne), near Laon, on the 28th of March 1815. His real surname was Housset. In 1832 he found his way to Paris, and in 1836 he published two novels, *La Couronne de bluets* and *La Pécheresse*. He had many friends in Paris, among them Jules Janin and Théophile Gautier, and he wrote in collaboration with Jules Sandeau. He produced art criticism in *L'Histoire de la peinture flamande et hollandaise* (1846); semi-historical sketches In *Mlle de la Vallière et Mme de Montespan* (1860) and *Galerie de portraits du XVII^e siècle* (1844); literary criticism in *Le Roi Voltaire* (1858) and his famous satirical *Histoire du quarante et unième fauteuil de l'académie française* (1855); drama in his *Comédiennes* (1857); poetry in his *Symphonie des vingt ans* (1867), *Cent et un sonnets* (1873), &c.; and novels, *Les Filles d'Ève* (1852) and many others. In 1849, through the influence of Rachel, he was entrusted with the administration of the Théâtre Français, a position he filled with unfailing tact and success until 1859, when he was made inspector-general of works of art. He died on the 26th of February 1896.

His *Confessions, souvenir; d'un démi-siècle* appeared in 1885-1891. See also J. Lemaître, *Arsène Houssaye* (1897), with a bibliography.

His son, Henry Houssaye (1848-), the historian, was born in Paris. His early writings were devoted to classical antiquity, studied not only in books but on the actual Greek sites which he visited in 1868. He published successively *Histoire d'Apelles* (1867), a study on Greek art; *L'Armée dans la Grèce antique* (1867); *Histoire d'Alcibiade et de la république athénienne depuis la mort de Périclès jusqu'à l'avènement des trente tyrans* (1873); Papers on *Le Nombre des citoyens d'Athènes au V^ème siècle avant l'ère chrétienne* (1882); *La Loi agraire à Sparte* (1884); *Le Premier Siège de Paris en 52 av. J.-C.* (1876); and two volumes of miscellanies, *Athènes, Rome, Paris, l'histoire et les mœurs* (1879), and *Aspasie, Cléopatre, Théodora* (6th ed. 1889). The military history of Napoleon I. then attracted him. His first volume on this subject, called *1814* (1888), went through no fewer than forty-six editions. It was followed by *1815*, the first part of which comprises the first Restoration, the return from Elba and the Hundred Days (1893); the second part, Waterloo (1899); and the third part, the second abdication and the White Terror (1905). He was elected a member of the French Academy in 1895.

HOUSTON, SAM, or Samuel (1793-1863), American general and statesman, of Scotch-Irish descent, was born near Lexington, Virginia, on the 2nd of March 1793. His father, who had fought in the War of Independence, died in 1806, and soon afterward Samuel removed with his mother to the frontier in Blount county, Tennessee. When he was about fifteen his elder brothers obtained for him a place as clerk in a trader's store, but he ran away and lived with the Cherokee Indians of East Tennessee for nearly three years. On his return he opened a country school, and later attended a session or two of the Academy at Maryville. During the War of 1812 he served under Andrew Jackson against the Creek Indians, and his bravery at the battle of Tohopeka, in which he was disabled by several wounds, won promotion to a lieutenancy. In 1817 he was appointed sub-agent in managing the business relating to the removal of the Cherokees from East Tennessee to a reservation in what is now Arkansas, but he was offended at a rebuke from John C. Calhoun, then secretary of war, for appearing before him in Indian garments, as well as at an inquiry into charges affecting his official integrity, and he resigned in 1818. He entered a law office in Nashville, and was admitted to the bar, and was soon elected a district attorney. From 1823 to 1827 Houston represented the ninth district of Tennessee in Congress, and in 1827 was elected governor of the state by the Jackson Democrats. He married Eliza Allen in January 1829; his wife left him three months later, and he resigned his office of governor, again took up his residence among the Cherokees, who were at this time about to remove to Indian Territory, and was formally adopted a member of their nation.

In 1830 and again in 1832 he visited Washington to expose the frauds practised upon the Cherokees by government agents, and attracted national attention by an encounter on the 13th of

April 1832 with William Stanberry, a Congressman from Ohio, who intimated that Houston himself was seeking to defraud them. Commissioned by President Jackson, Houston went to Texas in December 1832 to negotiate treaties with the Indian tribes there for the protection of American traders on the border. He decided to remain in Texas, and was elected a delegate to the constitutional convention which met at San Felipe on the 1st of April 1833 to draw up a memorial to the Mexican Congress asking for the separation of Texas from Coahuila, in which the anti-American party was in control, as well as to frame a constitution for the commonwealth as a new member of the Mexican Republic, and he served as chairman of the drafting committee, and took a prominent part in the preparations for war when next year the petition was refused. In October 1835, soon after the outbreak of the War for Texan Independence, the committees of the township of Nacogdoches chose Houston as commander-in-chief of the forces in eastern Texas, and after the San Felipe convention in November he was chosen commander-in-chief of the Texan army. On the 21st of April 1836, while in command of 743 raw troops, he met on the bank of the San Jacinto about 1600 Mexican veterans led by Santa Anna and completely routed them; on the next day Santa Anna was taken prisoner.

Texan independence was won by this victory (although the Mexican government repudiated the treaty negotiated by Santa Anna), and Houston was elected president of Texas (1st of September) and was inaugurated on the 22nd of October. His term expired in December 1838; he was elected again in 1841 and served until 1844. During his first term a newly founded city was named in his honour and this was the seat of government in 1837-39 and in 1842-45. Texas having been admitted as a state of the American Union in 1845, Houston was elected one of its first two United States senators. He served as a stalwart Union Democrat from March 1846 until 1859; he opposed the Kansas-Nebraska bill in an able speech (3rd March 1854), and spoke frequently in defence of the rights of the Indians. In 1859 he was elected governor of Texas and tried to prevent the secession of his state; upon his refusal, in March 1861, to swear allegiance to the Confederacy he was declared deposed. He died at Huntsville, Texas, on the 26th of July 1863. Houston was an able soldier, wary, intrepid and resolute; and was a legislator of rare foresight, cool discrimination and fearless candour.

See A. M. Williams, *Sam Houston and the War of Independence in Texas* (Boston, 1893); Henry Bruce, *Life of General Houston* (New York, 1891); and W. C. Crane, *Life and Select Literary Remains of Sam Houston* (Philadelphia, 1884).

HOUSTON, a city and the county-seat of Harris county, Texas, U.S.A., at the head of deep-sea navigation on Buffalo Bayou, a tributary of Galveston Bay, 50 m. N.W. of Galveston, and about 325 m. W. of New Orleans. Pop. (1880) 16,513; (1890) 27,557; (1900) 44,633, of whom 4415 were foreign-born and 14,608 were negroes; (1910 census) 78,800. The land area in 1906 was 16.02 sq. m.; in 1908, about 20 sq. m. It is served by the Galveston, Harrisburg & San Antonio (Southern Pacific), the Galveston, Houston & Henderson, the Gulf, Colorado & Santa Fe, the Houston & Texas Central (Southern Pacific), the Houston, East & West Texas, the International & Great Northern, the Missouri, Kansas & Texas, the San Antonio & Aransas Pass, the Trinity & Brazos Valley, the St Louis, Brownsville & Mexico, the Texas & New Orleans, and the Houston Belt & Terminal railways, several of which have their headquarters at Houston. The Federal government has greatly improved the natural channel from the city to the Gulf of Mexico, straightening, widening and deepening it to a depth of 25 ft. for the entire distance from the Galveston jetties to the Houston turning basin—where the municipality has constructed free municipal wharves. The city occupies an unusually fine site on both sides of the Buffalo Bayou. Among the principal buildings are a Carnegie library, the Houston Lyceum, the Federal building, the Masonic temple, the city high school, the city hall and market house, the Harris County Court House, the Cotton Exchange, and the First and Commercial National banks. Houston is the seat of the Texas Dental College, of St Thomas College (1903), and of the Houston, Annunciation and St Agnes academies; and the will (1901) of William Marsh Rice provided an endowment (valued in 1908 at about $7,000,000) for the William M. Rice Institute for the Advancement of Literature, Science and Art, of which Dr Edgar Odell Lovett, formerly professor of mathematics (1900-1905) and of astronomy (1905-1908) in Princeton University, was made president in 1908. The city is the most important railway and shipping centre of South Texas, and has a large trade in cotton (the receipts for the year ending Aug. 31, 1907 being 2,967,535 bales), cotton-seed oil, sugar, rice,[1] lumber and citrus fruits. Houston is important also as a manufacturing centre, its factory product being valued at $13,564,019 in 1905, an increase of 81% over the factory product in 1900. There are extensive railway car-shops, cotton-seed oil, petroleum and sugar refineries, cotton gins and compresses, steel rolling mills, car-wheel factories, boiler, pump and engine works, flour mills, rice mills and a rice elevator, breweries, planing and saw-mills, pencil factories, and brick and tile factories. Its proximity to the Texas oil fields gives the city a cheap factory fuel. The assessed valuation of taxable property in the city increased from $27,480,898 in 1900 to $51,513,615 in 1908. The No-

Tsu Oh Carnival week each November is a distinctive feature of the city. Houston, like Galveston, adopted in 1905 a very successful system of municipal government by commission, a commission of five (one of whom acts as mayor) being elected biennially and having both executive and legislative powers. The waterworks are owned and operated by the municipality, which greatly improved them from the city's surplus under the first two years of government by commission. In 1908 extensive improvements in paving, drainage and sewerage were undertaken by the city. The payment of an annual poll-tax of $2.50 is a prerequisite to voting. Houston was settled and laid out in 1836, and was named in honour of General Sam Houston, whose home in Caroline Street was standing in 1908. In 1837-1839 and in 1842-1845 Houston was the capital of the Republic of Texas. About 15 m. E.S.E. of the city is the battleground of San Jacinto, which was bought by the state in 1906 for a public memorial park.

1 Much rice is cultivated in the vicinity of Houston by Japanese farmers.

HOUWALD, CHRISTOPH ERNST, Freiherr von (1778-1845), German dramatist and author, was born at Straupitz in Lower Lusatia, a son of the president of the district court of justice, on the 28th of November 1778. He studied law at the university of Halle, and on completion of his academic studies returned home, married, and managed the family estates. In 1816 he afforded a home to his friend K. W. S. Contessa (1777-1825), himself a poet, who had met with serious reverses of fortune; Contessa lived with Houwald, assisting and stimulating him in his literary work, for eight years. In 1821 Houwald was unanimously elected syndic for Lower Lusatia, an office which placed him at the head of the administration of the province. He died at Neuhaus, near Lübben, on the 28th of January 1845.

Houwald is remembered as the author of several so-called "Fate tragedies" (see German Literature), of which the best known are *Das Bild*, *Der Leuchtturm*, *Die Heimkehr*, *Fluch und Segen* (all published in 1821). They have, however, small literary value, and Houwald is seen to better advantage in his narratives and books for juvenile readers, such as *Romantische Akkorde* (publ. by W. Contessa, Berlin, 1817); *Buch für Kinder gebildeter Stände* (1819-1824); and *Jakob Thau, der Hofnarr* (1821). Houwald's collected works, *Sämtliche Werke*, were published in five volumes (Leipzig, 1851; 2nd ed., 1858-1859). See J. Minor, *Die Schicksalstragödie in ihren Hauptvertretern* (Frankfurt, 1883), and *Das Schicksalsdrama* in Kürschner's *Deutsche Nationalliteratur*; vol. cli. (Stuttgart, 1884); O. Schmidtborn, *C. E. von Houwald als Dramatiker* (1909).

HÒVA, the name originally applied to the middle-class Malayo-Indonesian natives of Madagascar (*q.v.*), as distinct from the noble class *Andrìana* and the slave class *Andèvo*. Hòva has now come to mean the most numerous and powerful of the tribes which form the native population of Madagascar. The Hòva, who occupy the province of Imérina, the central plateau of the island, are of Malayo-Indonesian origin. The period at which the Hòva arrived in Madagascar is still a subject of dispute. Some think that the immigration took place in very early times, before Hinduism reached the Malay Archipelago, since no trace of Sanskrit is found in Malagasy. Others believe that the Hòva did not reach the island until the 12th or 13th century. At the French conquest of Madagascar (1895), the Hòva were the most powerful and, politically, the dominant people; but were far from having subjected the whole of the island to their rule. The Hòva are short and slim, with a complexion of a yellowish olive, many being fairer than the average of southern Europeans. Their hair is long, black and smooth but coarse. Their heads are round, with flat straight foreheads, flat faces, prominent cheekbones, small straight noses, fairly wide nostrils, and small black and slightly oblique eyes. The physical contrast to the negro is usually very obvious, but, especially among the lower classes, there is a tendency to thick lips, kinky hair and dark skin. In many of their customs, such as taboo, infanticide, marriage and funeral rites, they show their Indonesian origin. Most of them now profess Christianity.

HOVE, a municipal borough of Sussex, England, adjoining the watering-place of Brighton on the west, on the London, Brighton, & South Coast railway. Pop. (1901) 36,535. The great seawall of Brighton continues along the front at Hove, forming a pleasant promenade. Here is the Sussex

county cricket ground. The municipal borough, incorporated in 1898, includes the parishes of Hove and Aldrington, of which the first is within the parliamentary borough of Brighton, but the second is in the Lewes division of the county. The corporation consists of a mayor, 10 aldermen and 30 councillors. Area, 1521 acres.

HOVENDEN, THOMAS (1840-1895), American artist, was born in Dunmanway, Co. Cork, Ireland, on the 28th of December 1840. He was a pupil of the South Kensington Art Schools and those of the National Academy of Design, New York, whither he had removed in 1863. Subsequently he went to Paris and studied in the École des Beaux Arts under Cabanel, but passed most of his time with the American colony in Brittany, at Pont-Aven, where he painted many pictures of the peasantry. Returning to America in 1880, he became an academician in 1882, and attracted attention by an important canvas of "The Last Moments of John Brown" (now in the Metropolitan Museum of Art). His "Breaking Home Ties," a picture of American farm life, was engraved with considerable popular success. Hovenden was mortally injured in a heroic effort to save a child from a railroad train in the station at Germantown, near Philadelphia, and died at Norristown, Pennsylvania, on the 14th of August 1895. Among his principal works are:—"News from the Conscript" (1877), "Loyalist Peasant Soldier of La Vendée" (1879). "A Breton Interior," "Image Seller" and "Jerusalem the Golden" (in the Metropolitan Museum of Art).

HOW, WILLIAM WALSHAM (1823-1897), English divine, son of a Shrewsbury solicitor, was born on the 13th of December 1823, and was educated at Shrewsbury school and Wadham College, Oxford. He was ordained in 1846, and for upwards of thirty years was actively engaged in parish work at Whittington in Shropshire and Oswestry (rural dean, 1860). He refused preferment on several occasions, but his energy and success made him well known, and in 1879 he became a suffragan bishop in London, under the title of bishop of Bedford, his province being the East End. There he became the inspiring influence of a revival of church work. He founded the East London Church Fund, and enlisted a large band of enthusiastic helpers, his popularity among all classes being immense. He was particularly fond of children, and was commonly called "the children's bishop." In 1888 he was made bishop of Wakefield, and in the north of England he continued to do valuable work. His sermons were straightforward, earnest and attractive; and besides publishing several volumes of these, he wrote a good deal of verse, including such well-known hymns as "Who is this so weak and helpless," "Lord, Thy children guide and keep." In 1863-1868 he brought out a *Commentary on the Four Gospels*; and he also wrote a *Manual for the Holy Communion*. In the movement for infusing new spiritual life into the church services, especially among the poor, How was a great force. He died on the 10th of August 1897. He was much helped in his earlier work by his wife. Frances A. Douglas (d. 1887).

See his *Life* by his son, F. D. How (1898).

HOWARD (Family). Among English families, the house of Howard has long held the first place. Its head, the duke of Norfolk, is the first of the dukes and the hereditary earl marshal of England, while the earls of Suffolk, Carlisle and Effingham and the Lord Howard of Glossop represent in the peerage its younger lines.

Its founder was a Norfolk lawyer, William Howard or Haward, who was summoned to parliament as a justice in 1295, being appointed a justice of the common pleas in 1297. Over the parentage of this man genealogists have disputed for centuries. The pedigree-makers have hailed him in turn as the descendant of a Norman "Auber, earl of Passy" and as the heir of Hereward, "the last of the English." But out of the copies of Norfolk deeds and records collected for Thomas, earl of Arundel, in the early part of the 17th century, it seems clear enough that he sprang from a Norfolk family, several of whose members held lands at Wiggenhall near Lynn. These notes from deeds, evidently collected by an honest inquirer, make no extravagant claims of ancient ancestry or illustrious origin for the Howards, although the facts contained in them were recklessly manipulated by subservient genealogists. Doubtless the judge was the son of John Howard of Wiggenhall, living about 1260, whose widow Lucy, called by the genealogists the daughter of John Germund, was probably the

wife of John Germund by her second marriage. William Howard was employed as counsel by the corporation of Lynn, and it is worthy of note that the “crosslets fitchy” in his shield of arms suggest the cross with which the dragon was discomfited by St Margaret, the patroness of Lynn. Prospering by the law, William Howard of Wiggenhall rose to knight’s rank and acquired by purchase Grancourt’s manor in East Winch, near Lynn, where he had his seat in a moated house whose ruins remain. He was probably dead and buried in his chapel at East Winch before November 27, 1308, the date of the patent by which Henry Scrope succeeded him as a commissioner of trailbaston. His two wives, Alice Ufford and Alice Fitton—heir of Fitton’s manor in Wiggenhall—were both daughters of knightly houses. Before his death his eldest son, John Howard, was a knight and already advanced by his marriage with Joan of Cornwall, one of the bastard line founded by Richard of Cornwall, king of the Romans.

Sir John Howard served in Edward II.’s wars in Scotland and Gascony, was sheriff of Norfolk and Suffolk and governor of Norwich Castle. When he died in 1331 he was seised of many Norfolk manors. His son and heir, another Sir John, admiral of the king’s navy in the north, was a banneret who displayed his banner in the army that laid siege to Calais. By the admiral’s wife Alice, sister and heir of Sir Robert de Boys, the Howards had the Boys manor of Fersfield, near Diss, which is still among the possessions of the dukes of Norfolk. His son Sir Robert Howard, who had married a daughter of Sir Robert Scales (Lord Scales), died in 1388. From Sir John Howard, the only son of Sir Robert, two branches of the house of Howard spring. The elder line was soon extinct. By his first wife, Margaret, daughter and heir of Sir John Plays, Sir John Howard had a son who died before him, leaving a daughter through whom descended to her issue, the Veres, earls of Oxford, the ancient Norfolk estates of the Howards at East Winch and elsewhere, with the lands of the houses of Scales, Plays and Walton, brought in by the brides of her forefathers. After the death of Margaret Plays, her widower found, with the peculiar instinct of his race, a second well-endowed wife. By her, the heir of the Tendrings of Tendring, he had a second son, Sir Robert Howard, a knight who fought under Henry V. in France, and died, like his half-brother, before the old knight’s career ended in 1436.

It is to the marriage of this young knight that the house of Howard owes the tragedy of its greatness. He was a younger son, although he had some of his mother’s inheritance. Had he married the landless daughter of a neighbour he might have been the ancestor of a line of Essex squires, whose careers would have had the parish topographer for chronicler. But his bride was Margaret Mowbray, daughter of the banished duke of Norfolk. Although this was a noble alliance, it is probable that the lady had no great portion. The head of her elder brother, the boy earl marshal, had been stricken off in the cornfield under the walls of York, but her younger brother’s right to his father’s dukedom was allowed by parliament in 1425.

Sir John Howard, only son of the match between Howard and Mowbray, took service with his cousin the third duke of Norfolk, who had him returned as knight of the shire for Norfolk, where, according to the *Paston Letters*, this Howard of the Essex branch was regarded by the gentry as a strange man. He followed the White Rose and was knighted at the crowning of King Edward IV., who pricked him for sheriff of Norfolk and Suffolk. In the duke’s quarrel he brawled with the Pastons, his wife boasting that, should her husband’s men meet with John Paston “there should go no penny for his life.” “And Howard,” writes Clement Paston, “hath with the king a great fellowship.” Offices and lands came to John Howard by reason of that fellowship. Henry VI., when restored, summoned him to parliament in 1470 as Lord Howard, a summons which may have been meant to lure him to London into Warwick’s power, but he proclaimed the Yorkist sovereign on his return and fought at Barnet and Tewkesbury. When peace was made, Edward summoned him again as a baron and gave him the Garter and the treasurership of his household. After Edward’s burial, at which he bore the king’s banner, Howard, an enemy of the Wydviles, linked his fortunes with those of the duke of Gloucester. At this time came his sudden lifting to the highest rank in the peerage. The last of the dukes of Norfolk had left a child heir, Anne Mowbray, married to the infant duke of York, the younger of the princes doomed by Richard in the Tower. By the death of this little girl, John Howard became one of the coheirs of her illustrious house, which was now represented by the issue of Margaret Mowbray, his mother, and of her sister Isabel, who had married James, Lord Berkeley. A lion’s share of the Mowbray estates, swollen by the great alliances of the house, heir of Breouse and Segrave, and, through Segrave, of Thomas of Brotherton, son of Edward I., fell to Howard, who, by a patent of June 28, 1483, was created duke of Norfolk and earl marshal of England with a remainder to the heirs male of his body. On the same day the lord Berkeley, the other coheir, was made earl of Nottingham. High steward at Richard’s crowning, the duke bore the crown and rode as marshal into Westminster Hall. For the rest of his life he was Richard’s man, and though warned by the famous couplet that “Dykon his master” was bought and sold, “Jack of Norfolk” led the archer vanguard at Bosworth and died in the fight, from which his son the earl of Surrey was carried away a wounded prisoner. An attainder by the first parliament of Henry VII. extinguished the honours of the father with those of the son, who had been created an earl when the lord Howard was raised to the dukedom. Their estates were forfeit.

Thomas Howard, a politic mind, loyal to the powers that be, was released from the Tower of London in 1489, his earldom of Surrey and his Garter restored. Accepting the position in which the Tudor king would have his great nobles, he became the faithful soldier, diplomatist and official of

the new power. In his seventieth year, as lieutenant-general of the North, he led the English host on the great day of Flodden, earning a patent of the dukedom of Norfolk, dated 1 February 1513/4, and that strange patent which granted to him and his heirs that they should bear in the midst of the silver bend of their Howard shield a demi-lion stricken in the mouth with an arrow, in the right colours of the arms of the king of Scotland. This augmentation has been interpreted as a golden scocheon with the demi-lion within the Scottish tressure. Thus charged on the silver bend, it makes bad armory and it is worthy of note that, although the grant of it is clearly to the duke and his heirs in fee simple, Howards of all branches descending from the duke bear it in their shields, even though all right to it has long passed from the house to the duke's heirs general, the Stourtons and Petres.

The victor of Flodden is the common ancestor of all living Howards that can show a descent from the main stock. The second duke, twice married, was father of at least eleven sons and six daughters, the sons including Edward the lord high admiral, killed in boarding Prégent's galleys at Brest, Edmund the knight marshal of the army at Flodden, and William the first Lord Howard of Effingham. The eldest son, Thomas, succeeded as the third duke of his name, although the second under the patent of 1514. He had fought as captain of the vanguard at Flodden and after the victory was created earl of Surrey. When Richard III. was allying himself with the Howards, Thomas Howard, a boy of eleven, had been betrothed to Anne, daughter of the late King Edward IV., and Henry VII. allowed the marriage with his queen's sister to take place in 1495. This royal bride died of consumption, leaving no living child, and her husband took in 1513, as his second wife, Elizabeth Stafford, daughter of that duke of Buckingham upon whom the old duke of Norfolk, the tears upon his cheeks, was forced to pass sentence of death. Succeeding his father in 1524, Norfolk was created earl marshal in 1533. An unsuccessful diplomatist, his chief services in arms were the butchery in the north after the Pilgrimage of Grace and the raid into Scotland which ended with the rout of Solway Moss. He left his wife for a mistress, Elizabeth Holland, was in discord with his family, and lived to see his two nieces, Anne Boleyn and Catherine Howard, and his son Surrey, the fiery-tempered poet, go in turn to the block. He himself was attainted and was lying a prisoner in the Tower, doomed to die in the morning, on the night of the death of Henry VIII. He was not released until the accession of Mary, parliament restoring his dukedom on his petition for reversal of the attainder. His grandson Thomas succeeded him in 1554, and in 1556 made the second of those marriages which have given the Howards their high place among the English nobility. The bride was Mary, sole heir in her issue of her father Henry, the last of the Fitzalan earls of Arundel. Her father's line and the royal Stewards of Scotland sprang from one forefather, Alan, son of Flaald the Breton. The Mowbray match had already brought to the Howards the representation of an elder line of the Fitzalan earls, who sat in the seats of their ancestors, the Aubignys and Warennes, great earls near akin to their sovereigns. And now the younger line, earls of Arundel and Lords Mautravers, were also to have a Howard to represent them. From this time the spreading genealogy of the Howards drew its origins from most of the illustrious names of the houses founded after the Norman Conquest.

The young duchess died in her seventeenth year after giving birth to a son, and the duke took a second wife from a humble stock, newly enriched and honoured, the daughter of Henry VIII.'s subservient chancellor, the Lord Audley of Walden. Within ten years he married a third time, the lady being Elizabeth Leybourne, the widow of Lord Dacre of Gilsland. She survived her marriage but a few months and her husband then obtained the wardship of her Dacre offspring, a son who died young, and three daughters whom the duke, with the true Howard eye for a rich inheritance, gave as brides to three of his sons. After three such good fortunes by marriage Norfolk in his folly looked for a crown with a fourth match, listening to the laird of Lethington when he set forth the scheme by which the duke was to marry a restored queen of Scots and rule Scotland with her who should be recognized as Elizabeth's successor. Ten months in the Tower under strong suspicion would have warned another man, but Norfolk was unstable and false. After promising fidelity and the abandonment of the Scots marriage scheme, Cecil took him corresponding with Mary and tampering with the Ridolfi plot. He died on Tower Hill in 1572 for an example to the disloyal counties, protesting innocence and repentance, warning his children in a last letter to discredit all "false bruits" that he was a papist.

By his attainder the Norfolk titles were once more forfeited. But Philip Howard, the son and heir, succeeded to the ancient earldom of Arundel in 1580, on the death of his maternal grandfather, while the Lord Lumley, his uncle by marriage, surrendered to him his life interest in the castle and honour of Arundel. The next year an act of parliament restored the earl in blood. After a profligate youth at court, he followed his wife in professing the Roman faith, and in 1585 made an attempt to leave England to seek safety from the penal laws. But his ship was boarded in the Channel and the earl, condemned by the Star-Chamber to a heavy fine and to imprisonment during the queen's pleasure, suffered a harsh captivity in the Tower. After the defeat of the Armada he had been condemned to death on a charge of high treason, founded on the tale drawn by torture from a priest, that Arundel had urged him to say a mass for the success of the Spaniards. But he was allowed to linger in his prison until 1595 when he died, the sight of his wife and children being cruelly refused to the dying man. Thus it befell that, of the chiefs of the Howards born since the great Mowbray alliance, two had died by the axe and one in the prison from which a fourth had hardly escaped. A fifth had fallen in a lost battle, and only one had died in peace in his own house.

The ill fate of the Howards seemed to be appeased by the death of Philip, earl of Arundel. Tudor policy did its work well, and noblemen, however illustrious their pedigrees, could no longer be counted as menaces by the Crown, which was, indeed, finding another rival to its power. In the first year of James I., Thomas, the young son of Earl Philip, was restored in blood and given the titles of Arundel and Surrey. But the lands belonging to these titles remained with the Crown and he had to repair his fortunes by one of those marriages which never failed his house, his wife being Alathea Talbot, who was at last the heir of Gilbert, earl of Shrewsbury. To the grief of his mother he left the Roman church. A knight of the Garter, he was in 1621 created earl marshal for life, and revived the jurisdiction belonging to the office. An act of 1627, one of several such aimed at aggrandizing families by diverting the descent of dignities in fee from heirs general, entailed the earldom and castle of Arundel upon Thomas, earl of Arundel and Surrey and the heirs male of his body "and for default of such issue, to the heirs of his body." His pride and austerity made him unpopular at court and he left the country in 1642, settling at last in Padua, where he died in 1646, impoverished by the sequestrations of the parliament, whose forces had taken and retaken his castle of Arundel. In answer to his petition for the dukedom, the king had, on the 6th of June 1644, given him a patent of the earldom of Norfolk, in order, as it would seem, to flatter him by suggesting that the title of Norfolk would at least be refused to any other family. He is celebrated as a collector of paintings, books, gems and sculptures, his "Arundel marbles" being given by his grandson in 1667 to the University of Oxford. The dukedom for which Arundel had petitioned Charles I. in vain was restored by act of the first parliament of Charles II. to his grandson Thomas, a lunatic living at Padua, on whose death in 1677 it passed to this Thomas's brother, Henry Frederick, who had been created earl of Norwich and hereditary earl marshal of England in 1672. In 1777 Edward, the ninth of the Howard dukes, died childless in his ninety-second year. With him ended the earldom of Norwich, while the representation of the Mowbrays and Segraves passed to his nieces, the Ladies Stourton and Petre, the abeyance of the two baronies being determined in 1878 in favour of Lord Stourton. Under the act of 1627 the earldom of Arundel and the castle passed with the dukedom to a second cousin, Charles Howard of Greystock (d. 1786), an eccentric recluse. At his death in 1786 he was succeeded by his son Charles, the notorious "Jockey of Norfolk," the big, coarse, generous, slovenly, hard-drinking Whig of whom all the memoir-writers of his age have their anecdotes. He conformed to the Church of England and spent a vast sum in restoring Arundel Castle. A third cousin succeeded him in 1815, Bernard Edward Howard, who, although a Roman Catholic, was enabled, by the act of 1824, to act as earl marshal. This was the grandfather of the fifteenth duke, earl of Arundel, Surrey and Norfolk, and hereditary earl marshal of England.

The eldest of the cadet branches of the ducal house has its origin in William (*c.* 1510-1573), eldest son of the victor of Flodden by his second marriage. He survived the reign of Henry VIII., that perilous age for the Howards, with no worse misadventure than the conviction of himself and his wife of misprision of treason in concealing the offences of his niece, Queen Catherine. But both were pardoned. In 1553 he had the office of lord admiral of England, and in the next year the Garter. For his services against Sir Thomas Wyat he was created (March 11, 1553/4) Lord Howard of Effingham, the title being taken from a Surrey manor granted him by Edward VI. Queen Elizabeth continued his employment in diplomacy, and had he been richer he might have had an earldom. His eldest son Charles (1536-1624), lord admiral of England in 1585, sailed as commander in chief against the Spanish Armada, and, although giving due weight to the counsel of Drake and his other officers, showed himself a leader as prudent as courageous. He was created earl of Nottingham in 1596 and died in 1624. The legend that the admiral was a Roman Catholic has no authority. Two of his sons succeeded in turn to the earldom of Nottingham, extinct on the death of Charles, the third earl in 1681. Sir William Howard of Lingfield, younger brother of the great admiral, carried on the Effingham line, his great-grandson succeeding to the barony on the extinction of the earldom. Francis, seventh Lord Howard of Effingham, was created earl of Effingham in 1731, a title extinct in 1816 with the fourth earl, but revived again in 1837 for the eleventh baron, who had served as a general officer in the Peninsular campaign, the great-grandfather of the present peer.

A patent of 1604 created Henry Howard (1540-1614), younger son of Surrey the poet, earl of Northampton, a peerage which ended with the death of this, the most unprincipled of his house.

Thomas, son of the fourth duke of Norfolk's marriage with the daughter and heir of Thomas, Lord Audley of Walden, founded the line of the present earls of Suffolk and Berkshire and of the extinct Lords Howard of Escrick. His barony of Howard of Walden has descended to his heirs general. Lord William Howard (1563-1640), the "belted Will" of Scott's Lay and the "bauld Willie" of more authentic legend, was another of the sons of the fourth duke and Margaret Audley. Married in 1577 to one of the three co-heirs of the Lord Dacre of Gilsland he suffered under Elizabeth more than one imprisonment with his brother the unfortunate earl of Arundel. But in 1603 he was able, on the partition of the Dacre lands, to make his home at Naworth Castle, where he lived, a border patriarch, cultivating his estates and serving as a commissioner of the borders. His great-grandson Charles Howard, although fledged in a nest of cavaliers, changed sides and fought at Worcester for the parliament. The Protector summoned him in 1657 to his House of Lords, but he was imprisoned in 1659 on suspicion of a share in Booth's insurrection and, after the Restoration, was created, in 1661, earl of Carlisle, Viscount Morpeth and Lord Dacre of Gilsland, titles which are still held by his descendants. From Sir Francis Howard, a cavalier colonel and a younger son of "bauld Willie," come the Howards of Corby Castle in Cumberland, a branch without a hereditary title.

William Howard, Viscount Stafford, was the fifth son of Thomas, earl of Arundel, and grandson of Philip the prisoner. Marrying the sister and heir of the fifth Lord Stafford, who died in 1637, he and his wife were created Baron and Baroness Stafford by a patent of 1640, with remainder, in default of heirs male, to heirs female. A grant of the precedence enjoyed by the bride's father being held illegal, her husband was in the same year created Viscount Stafford. Roger Stafford, the impoverished heir male of the ancient Staffords, had been forced to surrender his barony to the king by a deed dated in the preceding year, a piece of injustice which is in the teeth of all modern conceptions of peerage law. The Viscount Stafford was one of the "five Popish lords" committed to the Tower in 1678 as a result of the slanders of Titus Oates and he died by the axe in 1680 upon testimony which, as the diarist Evelyn protested, "should not be taken against the life of a dog." But three earls of his own house—Carlisle, Suffolk and Berkshire—and the Lord Howard of Escrick, an ex-trooper of Cromwell's guard and an anabaptist sectary, gave their votes against him, his nephew Mowbray being the only peer of his name in the minority for acquittal. In 1688 his widow was created countess of Stafford for life, and his eldest son, Henry, had the earldom of Stafford, with special remainder to his brothers. This earldom ended in 1762, but the attainder was reversed by an act of 1824 and in the following year Sir George Jerningham, the heir general, established his claim to the Stafford barony of 1640.

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(O. BA.)

HOWARD, CATHERINE (d. 1542), the fifth queen of Henry VIII., was a daughter of Lord Edmund Howard and a granddaughter of Thomas Howard, 2nd duke of Norfolk (d. 1524). Her father was very poor, and Catherine lived mainly with Agnes, widow of the 2nd duke of Norfolk, meeting the king at the house of Stephen Gardiner, bishop of Winchester. Henry was evidently charmed by her; the Roman Catholic party, who disliked the marriage with Anne of Cleves, encouraged his attentions; and after Anne's divorce he was privately married to Catherine at Oatlands in July 1540. Soon afterwards she was publicly acknowledged as queen. Before her marriage Catherine had had several lovers, among them being a musician, Henry Mannock, or Manox; her cousin, Thomas Culpepper; and Francis Dereham, to whom she had certainly been betrothed. After becoming queen she occasionally met Dereham and Culpepper, and in November 1541 Archbishop Cranmer informed Henry that his queen's past life had not been stainless. Cranmer had obtained his knowledge indirectly from an old servant of the duchess of Norfolk. Dereham confessed to his relations with Catherine, and after some denials the queen herself admitted that this was true; but denied that she had ever been betrothed to Dereham, or that she had misconducted herself since her marriage. Dereham and Culpepper were executed in December 1541 and their accomplices were punished, but Catherine was released from prison. Some fresh information, however, very soon came to light showing that she had been unchaste since her marriage; a bill of attainder was passed through parliament, and on the 13th of February 1542 the queen was beheaded.

See A. Strickland, *Lives of the Queens of England* (vol. iii. 1877).

HOWARD, JOHN (1726-1790), English philanthropist and prison reformer, was born at Hackney, probably on the 2nd of September 1726. His childhood was passed at Cardington, near Bedford, where his father, a retired merchant of independent means, had a small estate. He was apprenticed to a firm of grocers in the city of London, but on the death of his father in 1742, by which he inherited considerable property, he bought up his indenture, and devoted more than a year to foreign travel. Never constitutionally strong, he became, on his return to England, a confirmed invalid. Having been nursed through an acute illness by an attentive landlady, a widow of some fifty-three years of age, Howard, in return for her kindness, offered her marriage and they were united in 1752. Becoming a widower in less than three years, he determined to go abroad again, Portugal being his destination. The ship, however, in which he sailed was taken by a French privateer, the crew and passengers being carried to Brest, where they were treated with great severity. Howard was permitted to return to England on parole to negotiate an exchange, which he accomplished, as well as successfully representing the case of his fellow-captives. He now settled down on his Cardington property, interesting himself in meteorological observations. He was admitted a member of the Royal Society in 1756. In 1758 he married Henrietta, daughter of

Edward Leeds, of Croxton, Cambridgeshire. He continued to lead a secluded life at Cardington and at Watcombe, Hampshire, busying himself in the construction of model cottages and the erection of schools. In 1765 his second wife died after giving birth to a son. In the following year Howard went for a prolonged foreign tour, from which he returned in 1770.

In 1773 the characteristic work of his life may be said to have begun by his acceptance of the office of high sheriff of Bedford. When the assizes were held he did not content himself with sitting out the trials in open court, his inquisitiveness and his benevolence alike impelled him to visit the gaol. Howard found it, like all the prisons of the time, wretchedly defective in its arrangements; but what chiefly shocked him was the circumstance that neither the gaoler nor his subordinates were salaried officers, but were dependent for their livelihood on fees from the prisoners. He found that some whom the juries had declared not guilty, others in whom the grand jury had not found even such appearance of guilt as would warrant a trial, others whose prosecutors had failed to appear, were frequently detained in prison for months after they had ceased to be in the position of accused parties, until they should have paid the fees of gaol delivery (see Introduction to *The State of the Prisons of England and Wales*). His prompt application to the justices of the county for a salary to the gaoler in lieu of his fees was met by a demand for a precedent in charging the county with an expense. This he undertook to find if such a thing existed. He went accordingly from county to county, and though he could find no precedent for charging the county with the wages of its servants he did find so many abuses in prison management that he determined to devote himself to their reform.

In 1774 he gave evidence before a committee of the House of Commons, and received the thanks of the house for “the humanity and zeal which have led him to visit the several gaols of this kingdom, and to communicate to the House the interesting observations which he has made on that subject.” Almost immediately an act was passed which provided for the liberation, free of all charges, of every prisoner against whom the grand jury failed to find a true bill, giving the gaoler a sum from the county rate in lieu of the abolished fees. This was followed in June by another requiring justices of the peace to see that the walls and ceilings of all prisons within their jurisdiction were scraped and whitewashed once a year at least; that the rooms were regularly cleaned and ventilated; that infirmaries were provided for the sick, and proper care taken to get them medical advice; that the naked should be clothed; that underground dungeons should be used as little as could be; and generally that such courses should be taken as would tend to restore and preserve the health of the prisoners. It was highly characteristic of the man that, having caused the provisions of the new legislation to be printed at his own private cost in large type, he sent a copy to every gaoler and warder in the kingdom, that no one should be able to plead ignorance of the law if detected in the violation of its provisions. He then set out upon a new tour of inspection, from which, however, he was brought home by the approach of a general election in September 1774. Standing as one of the anti-ministerial candidates for Bedford, he was returned by a narrow majority but was unseated after a scrutiny.

After a tour in Scotland and Ireland, he set out in April 1775 upon an extended tour through France, the Low Countries and Germany. At Paris he was at first denied access to the prisons; but, by recourse to an old and almost obsolete law of 1717, according to which any person wishing to distribute alms to the prisoners was to be admitted, he succeeded in inspecting the Bicêtre, the Force l’Évêque and most of the other places of confinement, the only important exception being the Bastille. Even in that case he succeeded in obtaining possession of a suppressed pamphlet, which he afterwards translated and published in English, to the unconcealed chagrin of the French authorities. At Ghent he examined with special interest the great Maison de Force, then recently erected, with its distinctive features—useful labour, in the profits of which the prisoners had a share, and complete separation of the inmates by night. At Amsterdam, as in Holland generally, he was much struck with the comparative absence of crime, a phenomenon which he attributed to the industrial and reformatory treatment there adopted. In Germany he found little that was useful and much that was repulsive; in Hanover and Osnabrück, under the rule of a British sovereign, he even found traces of torture. After a short tour in England (Nov. 1775 to May 1776), he again went abroad, extending his tour to several of the Swiss cantons. In 1777 appeared *The State of the Prisons in England and Wales, with Preliminary Observations, and an Account of some Foreign Prisons*. One of the immediate results was the drafting a bill for the establishment of penitentiary houses, where by means of solitary imprisonment, accompanied by well-regulated labour and religious instruction, the object of reforming the criminal and inuring him to habits of industry might be pursued. New buildings were manifestly necessary; and Howard volunteered to go abroad again and collect plans. He first went to Amsterdam (April 1778), and carefully examined the “spin-houses” and “rasp-houses”[1] for which that city was famous; next he traversed Prussia, Saxony, Bohemia, Austria and Italy, everywhere inspecting prisons, hospitals and workhouses, and carefully recording the merits and defects of each. The information he thus obtained having been placed at the service of parliament, a bill was passed for building two penitentiary houses, and Howard was appointed first supervisor, but he resigned the post before anything practical had been achieved. In 1780 he had published a quarto volume as an appendix (the first) to his *State of Prisons*; about the same time also he caused to be printed his translation of the suppressed French pamphlet on the Bastille; but on obtaining release from his employments at home his passion for accumulating

statistics urged him to new and more extended continental tours, as far as to Denmark, Sweden and Russia in 1781, and to Spain and Portugal in 1783. The results of these journeys were embodied in 1784 in a second appendix, with the publication of which his direct labours in connexion with the subject of prison reform may be said to have ceased.

The five remaining years of his life were chiefly devoted to researches on the means for prevention of the plague, and for guarding against the propagation of contagious distempers in general. After an extended tour on the continent his researches seemed to be complete; and with a great accumulation of papers and memoranda, he was preparing to return homewards from Constantinople by Vienna, when it occurred to his scrupulous mind that he still lacked any personal experience of quarantine discipline. He returned to Smyrna, and, deliberately choosing a foul ship, took a passage to Venice. A protracted voyage of sixty days, during which an attack by pirates gave Howard an opportunity of manifesting his personal bravery, was followed by a weary term of confinement which enabled him to gain the experience he had desired. While imprisoned in the Venetian lazaretto he received the information that his only son, a youth of twenty-two years of age, had lost his reason and had been put under restraint. Returning hastily by Trieste and Vienna (where he had a long and singular interview with the emperor Joseph II.), he reached England in February 1787. His first care related to his domestic concerns; he then set out upon another journey of inspection of the prisons of the United Kingdom, at the same time busying himself in preparing for the press the results of his recent tour. The somewhat rambling work containing them was published in 1798 at Warrington, under the title *An Account of the Principal Lazarettos in Europe: with various Papers relative to the Plague, together with further Observations on some Foreign Prisons and Hospitals, and additional Remarks on the present State of those in Great Britain and Ireland*.

In July 1789 he embarked on what proved to be his last journey. Travelling overland to St Petersburg and Moscow, and so southwards, and visiting the principal military hospitals that lay on his route, he reached Kherson in November. In the hospitals of this place and of the immediate neighbourhood he found more than enough to occupy his attention while he awaited the means of transit to Constantinople. Towards the end of the year his medical advice was asked in the case of a young lady who was suffering under the camp fever then prevalent, and in attending her he himself took the disease, which terminated fatally on the 20th of January 1790. He was buried near the village of Dauphigny on the road to St Nicholas. There is a statue by Bacon to his memory in St Paul’s, London, and one at Bedford by A. Gilbert. In personal appearance Howard is described as having been short, thin and sallow—unprepossessing apart from the attraction of a penetrating eye and a benevolent smile.

AUTHORITIES.—*Anecdotes of the Life and Character of John Howard, written by a Gentleman* (1790); Aikin, *View of the Character and Public Services of the late John Howard*. (1792); *Memoirs* by J. Baldwin Brown (1818); T. Taylor (1836), Hepworth Dixon (1849), J. Field (1850), and J. Stoughton, *Howard the Philanthropist* (1884).

1 The spinhouses were for women prisoners, who were set to spinning or other useful work; in the rasp-houses, the prisoners were employed in rasping wood.

HOWARD, OLIVER OTIS (1830-1909), American soldier, was born in Leeds, Maine, on the 8th of November 1830. He graduated at Bowdoin College in 1850, and at the U.S. Military Academy in 1854. In 1857 he served in Florida against the Seminole Indians, and from 1857 to 1861 he was assistant professor of mathematics at West Point. At the beginning of the Civil War he resigned to become colonel of the 3rd Maine volunteer regiment, and at the first battle of Bull Run was in command of a brigade. In September he was promoted brigadier-general of volunteers. He served in the Peninsular Campaign, and at the battle of Seven Pines (Fair Oaks) he was twice wounded, losing his right arm. On his return to active service in August 1862 he took part in the Virginian campaigns of 1862-63; at Antietam he succeeded Sedgwick in command of a division, and he became major-general of volunteers in March 1863. In the campaign of Chancellorsville (see WILDERNESS) he commanded the XI. corps, which was routed by “Stonewall” Jackson, and in the first day’s battle at Gettysburg he was for some hours (succeeding Doubleday after Reynolds’s death) in command of the Union troops. The XI. corps was transferred to Tennessee after Rosecrans’s defeat at Chickamauga, and formed part of Hooker’s command in the great victory of Chattanooga. When Sherman prepared to invade Georgia in the spring of 1864 the XI. corps was merged with the XII. into the new XX., commanded by Hooker, and Howard was then placed, in command of the new IV. corps, which he led in all the actions of the Atlanta campaign, receiving another wound at Pickett’s Mills. On the death in action of General M’Pherson, Howard, in July 1864, was selected to command the Army of the Tennessee. In this position he took part in the “March to the Sea” and the Carolinas campaign. In March 1865 he was breveted major-general U.S.A. “for gallant and meritorious service in the battle of Ezra Church and during the campaign against Atlanta,” and in

1893 received a Congressional medal of honour for bravery at Fair Oaks. After the peace he served as commissioner of the Bureau of Refugees, Freedmen and Abandoned Lands from 1865 until 1874; in 1872 he was special commissioner to the hostile Apaches of New Mexico and Arizona; in 1874-1881 was in command of the Department of the Columbia and conducted the campaign against Chief Joseph in 1877 and that against the Bannocks and Piutes in 1878. In 1881-1882 he was superintendent of West Point; and in 1882-1886 he commanded the Department of the Platte, in 1886-1888 the Department of the Pacific, and in 1888-1894 the Department of the East. In 1886 he was promoted major-general and in 1894 he retired. He died at Burlington, Vermont, on the 26th of October 1909.

Howard was deeply interested, in the welfare of the negroes; and the establishment by the U.S. Government in 1867 of Howard University, at Washington, especially for their education, was largely due to him; it was named in his honour, and from 1869 to 1873 he presided over it. In 1895 he founded for the education of the "mountain whites" the Lincoln Memorial University at Cumberland Gap, Tenn. (see CUMBERLAND MOUNTAINS), and became president of its board. He held honorary degrees of various universities, and was a chevalier of the Legion of Honour. He wrote, amongst other works, *Donald's Schooldays* (1877); *Chief Joseph* (1881); a life of General Zachary Taylor (1892) in the "Great Commanders" series; *Isabella of Castile* (1894); *Fighting for Humanity* (1898); *Henry in the War* (1898); papers in the "Battles and Leaders" collection on the Atlanta campaign; *My Life and Experience among our Hostile Indians* (1907); and *Autobiography of O. O. Howard* (2 vols., New York, 1907).

HOWARD, SIR ROBERT (1626-1698), English dramatist, sixth son of Thomas Howard, 1st earl of Berkshire, was born in 1626. He was knighted at the second battle of Newbury (1644) for his signal courage on the Royalist side. Imprisoned in Windsor Castle under the Commonwealth, his loyalty was rewarded at the Restoration, and he eventually became auditor of the exchequer. His best play is a comedy, *The Committee, or the Faithful Irishman* (1663; printed 1665), which kept the stage, long after its interest as a political satire was exhausted, for the character of Teague, said to have been drawn from one of his own servants. He was an early patron of Dryden, who married his sister, Lady Elizabeth Howard, and in the *Indian Queen*, a tragedy in heroic verse (1664; pr. 1665) Howard had assistance from Dryden, although the fact was not made public until the production of Dryden's *Indian Emperor*. The magnificence of the spectacle, and the novelty of the costume of feathers, presented by Mrs. Aphra Behn, that was worn by Zempoalla, the Indian queen, made a great sensation. The scenery and accessories were unusually brilliant, the richest ever seen in England, according to Evelyn. In 1665 Howard published *Foure New Plays*, in the preface to which he opposed the view maintained by Dryden in the dedicatory epistle to *The Rival Ladies*, that rhyme was better suited to the heroic tragedy than blank verse. Howard made an exception in favour of the rhyme of Lord Orrery, but by his silence concerning Dryden implicated him in the general censure. Dryden answered by placing Howard's sentiments in the mouth of Crites in his own *Essay on Dramatic Poesy* (1668). The controversy did not end here, but Dryden completely worsted his adversary in the 1668 edition of *The Indian Emperor*. Howard died on the 3rd of September 1698.

His brother, James Howard, wrote two comedies, *All Mistaken, or the Mad Couple*, a comedy (1667; pr. 1672), and *The English Mounsieur* (1666; pr. 1674), the success of which seems to have been partly due to the acting of Nell Gwynn.

HOWARD, LORD WILLIAM (1563-1640), known as "Belted, or Bauld (bold) Will," 3rd son of Thomas Howard, 4th duke of Norfolk (executed in 1572), and of his second wife Margaret, daughter of Lord Audley, was born at Audley End in Essex on the 19th of December 1563. He married on the 28th of October 1577 Elizabeth, daughter of Thomas, Lord Dacre, and proceeded subsequently to the University of Cambridge. Being suspected of treasonable intentions together with his elder brother, Philip, earl of Arundel, he was imprisoned in 1583, 1585 and 1589. He joined the church of Rome in 1584, both brothers being dispossessed by the queen of a portion of their Dacre estates, which were, however, restored in 1601 for a payment of £10,000. Howard then took up his residence with his children and grandchildren at Naworth Castle in Cumberland, restored the castle, improved the estate and established order in that part of the country. In 1603, on the accession of James, he had been restored in blood. In 1618 he was made one of the commissioners for the border, and performed great services in upholding the law and suppressing marauders. Lord William was a learned and accomplished scholar, praised by Camden, to whom he

sent inscriptions and drawings from relics collected by him from the Roman wall, as “a singular lover of valuable antiquity and learned withal.” He collected a valuable library, of which most of the printed works remain still at Naworth, though the MSS. have been dispersed, a portion being now in the Arundel MSS. in the Royal College of Arms; he corresponded with Ussher and was intimate with Camden, Spelman, and Cotton, whose eldest son married his daughter. He published, in 1592 an edition of Florence of Worcester’s *Chronicon ex Chronicis*, dedicated to Lord Burghley, and drew up a genealogy of his family, now among the duke of Norfolk’s MSS. at Norfolk House. He died in October 1640 at Greystock, to which place he had been removed when failing in health to escape the Scots who were threatening an advance on Naworth. He had a large family of children, of whom Philip, his heir, was the grandfather of Charles, 1st earl of Carlisle, and Francis was the ancestor of the Howards of Corby.

HOWARD OF EFFINGHAM, WILLIAM HOWARD, 1st Baron (*c.* 1510-1573), English lord high admiral, was the son of the 2nd duke of Norfolk. He was popular with Henry VIII., and at Anne Boleyn’s coronation was deputy earl marshal; and he was sent on missions to Scotland and France; but in 1541 he was charged with abetting his relative Queen Catherine Howard, and was convicted of misprision of treason, but pardoned. In 1552 he was made governor of Calais, and in 1553 lord high admiral, being created Baron Howard of Effingham in 1554 for his defence of London in Sir Thomas Wyat’s rebellion against Queen Mary. He befriended the princess Elizabeth, but his popularity with the navy saved him from Mary’s resentment; and when Elizabeth became queen he had great influence with her and filled several important posts. His son, the second baron, who is famous in English naval history, was created earl of Nottingham (*q.v.*); and from a younger son the later earls of Effingham were descended. William’s descendant, Francis (d. 1695), inherited the barony of Howard of Effingham on the death of his cousin, Charles, in 1681; and Francis’s son, Francis (1683-1743), was created earl of Effingham in 1731. This earldom became extinct on the death of Richard, the fourth holder, in 1816; but it was created again in 1837 in favour of Kenneth Alexander (1767-1845), another of William Howard’s descendants, who had succeeded to the barony of Howard of Effingham in 1816.

HOWE, ELIAS (1819-1867), American sewing-machine inventor, was born in Spencer, Massachusetts, on the 9th of July 1819. His early years were spent on his father’s farm. In 1835 he entered the factory of a manufacturer of cotton-machinery at Lowell, Massachusetts, where he learned the machinist’s trade. Subsequently, while employed in a machine shop at Cambridge, Mass., he conceived the idea of a sewing machine, and for five years spent all his spare time in its development. In September 1846 a patent for a practical sewing machine was granted to him; and Howe spent the following two years (1847-1849) in London, employed by William Thomas, a corset manufacturer, to whom he had sold the English rights for £250. Years of disappointment and discouragement followed before he was successful in introducing his invention, and several imitations which infringed his patent, particularly that of Isaac Merritt Singer (1811-1875), had already been successfully introduced and were widely used. His rights were established after much litigation in 1854, and by the date of expiration of his patent (1867) he had realized something over $2,000,000 out of his invention. He died in Brooklyn, New York, on the 3rd of October 1867.

See *History of the Sewing Machine and of Elias Howe, Jr., the Inventor* (Detroit, 1867); P. G. Hubert, Jr., *Inventors*, in “Men of Achievement” series (New York, 1893).

HOWE, JOHN (1630-1706), English Puritan divine, was born on the 17th of May 1630 at Loughborough, Leicestershire, where his father was vicar. On the 19th of May 1647 he entered Christ’s College, Cambridge, as a sizar, and in the following year took his degree of B.A. During his residence at the university he made the acquaintance of Ralph Cudworth, Henry More and John Smith, from intercourse with whom, as well as from direct acquaintance with the *Dialogues* themselves, his mind received that “Platonic tinge” so perceptible in his writings. Immediately after graduation at Cambridge, he migrated to Oxford, where he became fellow and chaplain of Magdalen College, proceeding M.A. in 1652. He was then ordained by Charles Herle (1598-1659),

the Puritan rector of Winwick, and in 1654 went as perpetual curate to Great Torrington in Devon, where he preached the discourses which later took shape in his treatises on *The Blessedness of the Righteous* and on *Delighting in God*. In the beginning of 1657 a journey to London accidentally brought Howe under the notice of Cromwell, who made him his domestic chaplain. In this position his conduct was such as to win the praise of even the bitterest enemies of his party. Without overlooking his fellow-Puritans, he was always ready to help pious and learned men of other schools. Seth Ward (afterwards bishop of Exeter) and Thomas Fuller were among those who profited by Howe's kindness, and were not ashamed subsequently to express their gratitude for it. On the resignation of Richard Cromwell, Howe returned to Great Torrington, to leave it again in 1662 on the passing of the Act of Uniformity. For several years he led a wandering and uncertain life, preaching in secret as occasion offered to handfuls of trusted hearers. Being in straits he published in 1668 *The Blessedness of the Righteous*; the reputation which he thus acquired procured him an invitation from Lord Massereene, of Antrim Castle, Ireland, with whom he lived for five or six years as domestic chaplain, frequently preaching in public, with the approval of the bishop of the diocese. Here too he produced the most eloquent of his shorter treatises, *The Vanity of Man as Mortal*, and *On Delighting in God*, and planned his best work, *The Living Temple*. In the beginning of 1676 he accepted an invitation to become joint-pastor of a nonconformist congregation at Haberdashers' Hall, London; and in the same year he published the first part of *The Living Temple* entitled *Concerning God's Existence and his Conversableness with Man: Against Atheism or the Epicurean Deism*. In 1677 appeared his tractate *On the Reconcileableness of God's Prescience of the Sins of Men with the Wisdom and Sincerity of His Counsels, Exhortations and whatsoever means He uses to prevent them*, which was attacked from various quarters, and had Andrew Marvell for one of its defenders. *On Thoughtfulness for the Morrow* followed in 1681; *Self-Dedication* and *Union among Protestants* in 1682, and *The Redeemer's Tears wept over Lost Souls* in 1684.

For five years after his settlement in London Howe enjoyed comparative freedom, and was on not unfriendly terms with many eminent Anglicans, such as Stillingfleet, Tillotson, John Sharp and Richard Kidder; but the greater severity which began to be exercised towards nonconformists in 1681 so interfered with his liberty that in 1685 he gladly accepted the invitation of Philip, Lord Wharton, to travel abroad with him. In 1686 he determined to settle for a time at Utrecht, where he officiated in the English chapel. Among his friends there was Gilbert Burnet, by whose influence he obtained several confidential interviews with William of Orange. In 1687 Howe availed himself of the declaration for liberty of conscience to return to England, and in the following year he headed the deputation of nonconformist ministers who went to congratulate William on his accession to the English throne. The remainder of his life was uneventful. His influence was always on the side of mutual forbearance, between conformists and dissenters in 1689, and between Congregationalists and Presbyterians in 1690. In 1693 he published three discourses *On the Carnality of Religious Contention*, suggested by the disputes that became rife among nonconformists as soon as liberty of doctrine and worship had been granted. In 1694 and 1695 he published various treatises on the subject of the Trinity, the principal being *A Calm and Solemn Inquiry concerning the Possibility of a Trinity in the Godhead*. The second part of *The Living Temple*, entitled *Animadversions on Spinosa and a French Writer pretending to confute him, with a recapitulation of the former part and an account of the destitution and restitution of God's Temple among Men*, appeared in 1702. In 1701 he had some controversy with Daniel Defoe on the question of occasional conformity. In 1705 he published a discourse *On Patience in the Expectation of Future Blessedness*, but his health had begun to fail, and he died in London on the 2nd of April 1706. Richard Cromwell visited him in his last illness.

Though excelled by Baxter as a pulpit orator, and by Owen in exegetical ingenuity and in almost every department of theological learning, Howe compares favourably with either as a sagacious and profound thinker, while he was much more successful in combining religious earnestness and fervour of conviction with large-hearted tolerance and cultured breadth of view. He was a man of high principle and fine presence, and it was said of him "that he never made an enemy and never lost a friend."

The works published in his lifetime, including a number of sermons, were collected into 2 vols. fol. in 1724, and again reprinted in 3 vols. 8vo. in 1848. A complete edition of the *Whole Works*, including much posthumous and additional matter, appeared with a memoir in 8 vols, in 1822; this was reprinted in 1 vol. in 1838 and in 6 vols. in 1862-1863. E. Calamy's *Life* (1724) forms the basis of *The Life and Character of Howe, with an Analysis of his Writings*, by Henry Rogers (1836, new ed. 1863). See also a sketch by R. F. Horton (1896).

HOWE, JOSEPH (1804-1873), Canadian statesman, was born at Halifax, Nova Scotia, on the 13th of December 1804, the son of John Howe (1752-1835), a United Empire Loyalist who was for many years king's printer and postmaster-general for the Maritime Provinces and the Bermudas.

He received little regular education, and at the age of 13 entered his father's office. In 1827 he started the *Acadian*, a weekly non-political journal, but soon sold it, and in 1828 purchased the *Nova Scotian*, which later became amalgamated with the *Morning Chronicle*. From this date he devoted increasing attention to political affairs, and in 1835 was prosecuted for libelling the magistrates of Halifax. Being unable to find a lawyer willing to undertake his case, he pleaded it himself, and won his acquittal by a speech of over six hours, which secured for Nova Scotia the freedom of the press and for himself the reputation of an orator. In 1836 he was elected member for Halifax in the provincial assembly, and during the next twelve years devoted himself to attaining responsible government for Nova Scotia. This brought him into fierce conflict with the reigning oligarchy and with the lieutenant-governor, Lord Falkland (1803-1884), whom he forced to resign. Largely owing to Howe's statesmanship responsible government was finally conceded in 1848 by the imperial authorities, and was thus gained without the bloodshed and confusion which marked its acquisition in Ontario and Quebec. In 1850 he was appointed a delegate to England on behalf of the Intercolonial railway, for which he obtained a large imperial guarantee. In 1854 he resigned from the cabinet, and was appointed chief commissioner of railways. In 1855 he was sent by the imperial government to the United States in connexion with the Foreign Enlistment Act, to raise soldiers for the war in the Crimea. Through the rashness of others he got into difficulties, and was attacked in the British House of Commons by Mr Gladstone, whom he compelled to apologize.

In 1855 he was defeated by Mr (afterwards Sir Charles) Tupper, but was elected by acclamation in the next year in Hants county, and was from 1860 to 1863 premier of Nova Scotia. In the latter years he was appointed by the imperial government fishery commissioner to the United States, and thus took no part in the negotiations for confederation. Though his eloquence had done more than anything else to make practicable a union of the British North American provinces, he opposed confederation, largely owing to wounded vanity; but on finding it impossible to obtain from the imperial authorities the repeal of the British North America Act, he refused to join his associates in the extreme measures which were advocated, and on the promise from the Canadian government of better financial terms to his native province, entered (on the 30th of January 1869) the cabinet of Sir John Macdonald as president of the council. This brought upon him a storm of obloquy, under which his health gradually gave way. In May 1873 he was appointed lieutenant-governor of Nova Scotia, but died suddenly on the 1st of June of the same year.

Howe's eloquence, and still more his unfailing wit and high spirits, made him for many years the idol of his province. He is the finest orator whom Canada has produced, and also wrote poetry, which shows in places high merit. Many of his sayings are still current in Nova Scotia. In 1904 a statue in his honour was erected in Halifax.

His *Letters and Speeches* were published in 1858 in Boston, Mass., in 2 vols., edited nominally by William Annand, really by himself. See also *Public Letters and Speeches of Joseph Howe* (Halifax, 1909). The *Life and Times* by G. E. Fenety (1896) is poor. The *Life* by the Hon. James W. Longley (Toronto, 1904) is dispassionate, but otherwise mediocre. *Joseph Howe*, by George Monro Grant (reprinted Halifax, 1904), is a brilliant sketch.

(W. L. G.)

HOWE, JULIA WARD (1819-1910), American author and reformer, was born in New York City on the 27th of May 1819. Her father, Samuel Ward, was a banker; her mother, Julia Rush [Cutler] (1796-1824), a poet of some ability. When only sixteen years old she had begun to contribute poems to New York periodicals. In 1843 she married Dr Samuel Gridley Howe (*q.v.*), with whom she spent the next year in England, France, Germany and Italy. She assisted Dr Howe in editing the *Commonwealth* in 1851-1853. The results of her study of German philosophy were seen in philosophical essays; in lectures on "Doubt and Belief," "The Duality of Character," &c., delivered in 1860-1861 in her home in Boston, and later in Washington; and in addresses before the Boston Radical Club and the Concord school of philosophy. Samuel Longfellow, his brother Henry, Wendell Phillips, W. L. Garrison, Charles Sumner, Theodore Parker and James Freeman Clarke were among her friends; she advocated abolition, and preached occasionally from Unitarian pulpits. She was one of the organizers of the American Woman-Suffrage Association and of the Association for the Advancement of Women (1869), and in 1870 became one of the editors of the *Woman's Journal*, and in 1872 president of the New England Women's Club. In the same year she was a delegate to the Prison Reform Congress in London, and founded there the Woman's Peace Association, one of the many ways in which she expressed her opposition to war. She wrote *The World's Own* (unsuccessfully played at Wallack's, New York, in 1855, published 1857), and in 1858, for Edwin Booth, *Hippolytus*, never acted or published. Her lyric poetry, thanks to her temperament, and possibly to her musical training, was her highest literary form: she published *Passion Flowers* (anonymously, 1854), *Words for the Hour* (1856), *Later Lyrics* (1866), and *From Sunset Ridge: Poems Old and New* (1898); her most popular poem is *The Battle Hymn of the Republic*, written to the old folk-tune associated with the song of "John Brown's Body," when Mrs Howe was at the front

in 1861, and published (Feb. 1862) in the *Atlantic Monthly*, to which she frequently contributed. She edited *Sex and Education* (1874), an answer to *Sex in Education* (1873) by Edward Hammond Clarke (1820-1877); and wrote several books of travel, *Modern Society* (1880) and *Is Polite Society Polite?* (1895), collections of addresses, each taking its title from a lecture criticizing the shallowness and falseness of society, the power of money, &c., *A Memoir of Dr Samuel G. Howe* (1876), *Life of Margaret Fuller* (1883), in the "Famous Women" series. *Sketches of Representative Women of New England* (1905) and her own *Reminiscences* (Boston, 1899). Her children were: Julia Romana Anagnos (1844-1886), who, like her mother, wrote verse and studied philosophy, and who taught in the Perkins Institution, in the charge of which her husband, Michael Anagnos (1837-1906), whose family name had been Anagnostopoulos, succeeded her father; Henry Marion Howe (b. 1848), the eminent metallurgist, and professor in Columbia University; Laura Elizabeth Richards (b. 1850), and Maud Howe Elliott (b. 1855), wife of John Elliott, the painter of a fine ceiling in the Boston library,—both these daughters being contributors to literature. Mrs Howe died on the 17th of October 1910.

HOWE, RICHARD HOWE, Earl (1726-1799), British admiral, was born in London on the 8th of March 1726. He was the second son of Emmanuel Scrope Howe, 2nd Viscount Howe, who died governor of Barbadoes in March 1735, and of Mary Sophia Charlotte, a daughter of the baroness Kilmansegge, afterwards countess of Darlington, the mistress of George I.—a relationship which does much to explain his early rise in the navy. Richard Howe entered the navy in the "Severn," one of the squadron sent into the south seas with Anson in 1740. The "Severn" failed to round the Horn and returned home. Howe next served in the West Indies in the "Burford," and was present in her when she was very severely damaged, in the unsuccessful attack on La Guayra on the 18th of February 1742. He was made acting-lieutenant in the West Indies in the same year, and the rank was confirmed in 1744. During the Jacobite rising of 1745 he commanded the "Baltimore" sloop in the North Sea, and was dangerously wounded in the head while co-operating with a frigate in an engagement with two strong French privateers. In 1746 he became post-captain, and commanded the "Triton" (24) in the West Indies. As captain of the "Cornwall" (80), the flagship of Sir Charles Knowles, he was in the battle with the Spaniards off Havana on the 2nd of October 1748. While the peace between the War of the Austrian Succession and the Seven Years' War lasted, Howe held commands at home and on the west coast of Africa. In 1755 he went with Boscawen to North America as captain of the "Dunkirk" (60), and his seizure of the French "Alcide" (64) was the first shot fired in the war. From this date till the peace of 1763 he served in the Channel in various more or less futile expeditions against the coast of France, with a steady increase of reputation as a firm and skilful officer. On the 20th of November 1759 he led Hawke's fleet as captain of the "Magnanime" (64) in the magnificent victory of Quiberon.

By the death of his elder brother, killed near Ticonderoga on the 6th of July 1758, he became Viscount Howe—an Irish peerage. In 1762 he was elected M.P. for Dartmouth, and held the seat till he received a title of Great Britain. During 1763 and 1765 he was a member of the Admiralty board, and from 1765 to 1770 was treasurer of the navy. In that year he was promoted rear-admiral, and in 1775 vice-admiral. In 1776 he was appointed to the command of the North American station. The rebellion of the colonies was making rapid progress, and Howe was known to be in sympathy with the colonists. He had sought the acquaintance of Benjamin Franklin, who was a friend of his sister Miss Howe, a clever eccentric woman well known in London society, and had already tried to act as a peacemaker. It was doubtless because of his known sentiments that he was selected to command in America, and was joined in commission with his brother Sir William Howe, the general at the head of the land forces, to make a conciliatory arrangement. A committee appointed by the Continental Congress conferred with the Howes in September 1776 but nothing was accomplished. The appointment of a new peace commission in 1778 offended the admiral deeply, and he sent in a resignation of his command. It was reluctantly accepted by Lord Sandwich, then First Lord, but before it could take effect France declared war, and a powerful French squadron was sent to America under the count d'Estaing. Being greatly outnumbered, Howe had to stand on the defensive, but he baffled the French admiral at Sandy Hook, and defeated his attempt to take Newport in Rhode Island by a fine combination of caution and calculated daring. On the arrival of Admiral John Byron from England with reinforcements, Howe left the station in September. Until the fall of Lord North's ministry in 1782 he refused to serve, assigning as his reason that he could not trust Lord Sandwich. He considered that he had not been properly supported in America, and was embittered both by the supersession of himself and his brother as peace commissioners, and by attacks made on him by the ministerial writers in the press.

On the change of ministry in March 1782 he was selected to command in the Channel, and in the autumn of that year, September, October and November, he carried out the final relief of Gibraltar. It was a difficult operation, for the French and Spaniards had in all 46 line-of-battle ships to his 33, and in the exhausted state of the country it was impossible to fit his ships properly or to supply

them with good crews. He was, moreover, hampered by a great convoy carrying stores. But Howe was eminent in the handling of a great multitude of ships, the enemy was awkward and unenterprising, and the operation was brilliantly carried out. From the 28th of January to the 16th of April 1783 he was First Lord of the Admiralty, and he held that post from December 1783 till August 1788, in Pitt's first ministry. The task was no pleasant one, for he had to agree to economies where he considered that more outlay was needed, and he had to disappoint the hopes of the many officers who were left unemployed by the peace. On the outbreak of the Revolutionary war in 1793 he was again named to the command of the Channel fleet. His services in 1794 form the most glorious period of his life, for in it he won the epoch-making victory of the 1st of June (see First of June, Battle of). Though Howe was now nearly seventy, and had been trained in the old school, he displayed an originality not usual with veterans, and not excelled by any of his successors in the war, not even by Nelson, since they had his example to follow and were served by more highly trained squadrons than his. He continued to hold the nominal command by the wish of the king, but his active service was now over. In 1797 he was called on to pacify the mutineers at Spithead, and his great influence with the seamen who trusted him was conspicuously shown. He died on the 5th of August 1799, and was buried in his family vault at Langar. His monument by Flaxman is in St Paul's Cathedral. In 1782 he was created Viscount Howe of Langar, and in 1788 Baron and Earl Howe. In June 1797 he was made a knight of the Garter. With the sailors he was always popular, though he was no popularity hunter, for they knew him to be just. His nickname of Black Dick was given on account of his swarthy complexion, and the well-known portrait by Gainsborough shows that it was apt.

Lord Howe married, on the 10th of March 1758, Mary Hartop, the daughter of Colonel Chiverton Hartop of Welby in Leicestershire, and had issue two daughters. His Irish title descended to his brother William, the general, who died childless in 1814. The earldom, and the viscounty of the United Kingdom, being limited to heirs male, became extinct, but the barony, being to heirs general, passed to his daughter, Sophia Charlotte (1762-1835), who married the Hon. Penn Assheton Curzon. Their son, Richard William Curzon (1796-1870), who succeeded his paternal grandfather as Viscount Curzon in 1820, was created Earl Howe in 1821; he was succeeded by his son, George Augustus (1821-1876), and then by another son, Richard William (1822-1900), whose son Richard George Penn Curzon-Howe (b. 1861) became 4th Earl Howe in 1900.

The standard *Life* is by Sir John Barrow (1838). Interesting reminiscences will be found in the *Life of Codrington*, by Lady Bourchier. Accounts of his professional services are in Charnock's *Biographia Navalis*, v. 457, and in Ralf's *Naval Biographies*, i. 83. See also Beatson's *Naval and Military Annals*, James's *Naval History*, and Chevalier's *Histoire de la Marine française*, vols. i. and ii.

(D. H.)

HOWE, SAMUEL GRIDLEY (1801-1876), American philanthropist, was born at Boston, Massachusetts, on the 10th of November 1801. His father, Joseph N. Howe, was a ship-owner and cordage manufacturer; and his mother, Patty Gridley, was one of the most beautiful women of her day. Young Howe was educated at Boston and at Brown University, Providence, and in 1821 began to study medicine in Boston. But fired by enthusiasm for the Greek revolution and by Byron's example, he was no sooner qualified and admitted to practice than he abandoned these prospects and took ship for Greece, where he joined the army and spent six years of hardship amid scenes of warfare. Then, to raise funds for the cause, he returned to America; his fervid appeals enabled him to collect about $60,000, which he spent on provisions and clothing, and he established a relief depot near Aegina, where he started works for the refugees, the existing quay, or American Mole, being built in this way. He formed another colony of exiles on the Isthmus of Corinth. He wrote a *History of the Greek Revolution*, which was published in 1828, and in 1831 he returned to America. Here a new object of interest engaged him. Through his friend Dr John D. Fisher (d. 1850), a Boston physician who had started a movement there as early as 1826 for establishing a school for the blind, he had learnt of the similar school founded in Paris by Valentin Haüy, and it was proposed to Howe by a committee organized by Fisher that he should direct the establishment of a "New England Asylum for the Blind" at Boston. He took up the project with characteristic ardour, and set out at once for Europe to investigate the problem. There he was temporarily diverted from his task by becoming mixed up with the Polish revolt, and, in pursuit of a mission to carry American contributions across the Prussian frontier, he was arrested and imprisoned at Berlin, but was at last released through the intervention of the American minister at Paris. Returning to Boston in July 1832, he began receiving a few blind children at his father's house in Pleasant Street, and thus sowed the seed which grew into the famous Perkins Institution. In January 1833 the funds available were all spent, but so much progress had been shown that the legislature voted $6000, later increased to $30,000 a year, to the institution on condition that it should educate gratuitously twenty poor blind from the state; money was also contributed from Salem, and from Boston, and Colonel Thomas H. Perkins, a prominent Bostonian, presented his mansion and grounds in Pearl

Street for the school to be held there in perpetuity. This building being later found unsuitable, Colonel Perkins consented to its sale, and in 1839 the institution was moved to South Boston, to a large building which had previously been an hotel. It was henceforth known as the "Perkins Institution and Massachusetts Asylum (or, since 1877, School) for the Blind." Howe was director, and the life and soul of the school; he opened a printing-office and organized a fund for printing for the blind—the first done in America; and he was unwearied in calling public attention to the work. The Institution, through him, became one of the intellectual centres of American philanthropy, and by degrees obtained more and more financial support. In 1837 Dr Howe went still further and brought the famous blind deaf-mute, Laura Bridgman (*q.v.*) to the school.

It must suffice here to chronicle the remaining more important facts in Dr Howe's life, outside his regular work. In 1843 he married Julia Ward (see above), daughter of a New York banker, and they made a prolonged European trip, on which Dr Howe spent much time in visiting those public institutions which carried out the objects specially interesting to him. In Rome, in 1844, his eldest daughter, Julia Romana (afterwards the wife of Michael Anagnos, Dr Howe's assistant and successor), was born, and in September the travellers returned to America, and Dr Howe resumed his activities. In 1846 he became interested in the condition and treatment of idiots, and particularly in the experiments of Dr Guggenbühl on the cretins of Switzerland. He became chairman of a state commission of inquiry into the number and condition of idiots in Massachusetts, and the report of this commission, presented in 1848, caused a profound sensation. An appropriation of $2500 per annum was made for training ten idiot children under Dr Howe's supervision, and by degrees the value of his School for Idiotic and Feeble-minded Youths, which, starting in South Boston, was in 1890 removed to Waltham, was generally appreciated. It was the first of its kind in the United States. An enthusiastic humanitarian on all subjects, Dr Howe was an ardent abolitionist and a member of the Free Soil party, and had played a leading part at Boston in the movements which culminated in the Civil War. When it broke out he was an active member of the sanitary commission. In 1871 he was sent to Santo Domingo as a member of the commission appointed by President Grant to examine the condition of the island, the government of which desired annexation; and when that scheme was defeated through Sumner's opposition he returned (1872) as the representative of the Samana Bay Company, which proposed to take a lease of the Samana peninsula; but though in 1874 he revisited the island, it was only to see the flag of the company hauled down. His health was then breaking and began soon after to fail rapidly, and on the 9th of January 1876 he died at Boston. The governor of the state sent a special message of grief to the legislature on his death, eulogies were delivered in the two houses, and a public memorial service was held, at which Dr O. W. Holmes read a poem. Whittier had in his lifetime commemorated him in his poem "The Hero," in which he called him "the Cadmus of the blind"; and in 1901 a centennial celebration of his birth was held at Boston, at which, among other notable tributes, Senator Hoar spoke of Howe as "one of the great figures of American history."

A *Memoir* of Dr Howe by his wife appeared in 1876. See also the *Letters and Journals of S. G. Howe*, edited by Laura E. Richards (1910).

(H. Ch.)

HOWE, WILLIAM HOWE, 5th Viscount (1729-1814), British general, was the younger brother of George Augustus, 3rd viscount, killed in the Ticonderoga expedition of 1758, and of Richard, 4th viscount and afterwards Earl Howe, the admiral. He entered the cavalry in 1746, becoming lieutenant a year later. On the disbanding of his regiment in 1749 he was made captain-lieutenant and shortly afterwards captain in Lord Bury's (20th) regiment, in which Wolfe was then a field officer. Howe became major in 1756 and lieutenant-colonel in 1757 of the 58th (now Northampton) regiment, which he commanded at the capture of Louisburg. In Wolfe's expedition to Quebec he distinguished himself greatly at the head of a composite light battalion. He led the advanced party in the landing at Wolfe's Cove and took part in the battle of the Plains of Abraham which followed. He commanded his own regiment in the defence of Quebec in 1759-1760, led a brigade in the advance on Montreal and took part on his return to Europe in the siege of Belleisle (1761). He was adjutant-general of the force which besieged and took Havana in 1762, and at the close of the war had acquired the reputation of being one of the most brilliant of the junior officers of the army. He was made colonel of the 46th foot in 1764 and lieutenant-governor of the Isle of Wight four years later. From 1758 to 1780 he was M.P. for Nottingham. In 1772 he became major-general, and in 1774 he was entrusted with the training of light infantry companies on a new system, the training-ground being Salisbury Plain.

Shortly after this he was sent out to North America. He did not agree with the policy of the government towards the colonists, and regretted in particular that he was sent to Boston, where the memory of his eldest brother was still cherished by the inhabitants, and General Gage, in whom he had no confidence, commanded in chief. He was the senior officer after Gage, and led the troops actively engaged in the storming of Bunker Hill, he himself being in the thickest of the fighting. In

the same year Howe was made a K.B. and a lieutenant-general, and appointed, with the local rank of general, to the chief command in the seat of war. For the events of his command see American War of Independence. He retained it until May 1778—on the whole with success. The cause of his resignation was his feeling that the home government had not afforded the proper support, and after his return to England, he and his brother engaged in a heated but fruitless controversy with the ministers. Howe's own defence is embodied in *Narrative of Sir William Howe before a Committee of the House of Commons* (London, 1780). In 1782 Howe was made lieutenant-general of the ordnance; in 1790 he was placed in command of the forces organized for action against Spain, and in 1793 he was made a full general. He held various home commands in the early part of the French revolutionary war, in particular that of the eastern district at the critical moment when the French established their forces on the Dutch coast. When Earl Howe died in 1799, Sir William succeeded to the Irish viscounty. He had been made governor of Berwick-on-Tweed in 1795, and in 1805 he became governor of Plymouth, where he died on the 12th of July 1814. With his death the Irish peerage became extinct.

HOWEL DDA ("the Good") (d. 950), prince of Deheubarth (South Central Wales) from before 915, and king of Wales from 943 to 950, was the grandson of Rhodri Mawr (the Great), who had united practically the whole of Wales under his supremacy. As Idwal Voel succeeded his father Anarawd, the elder son of Rhodri, as lord of Gwynedd in 915, so Howel at some time before that date succeeded Rhodri's younger son Cadell as prince of Deheubarth. Howel married Elen, daughter of the last king of Dyfed, and also added Kidweli and Gwyr to his dominions, while on the death of Idwal, who was slain by the English in 943, he took possession of Gwynedd. Both these princes had done homage to the English kings, Edward the Elder and Aethelstan, in 922 and 926, and we find that Howel attended the witans of the English kingdom and witnessed about ten charters between the years 931 and 949. He was secure, therefore, from attack on the eastern side of his kingdom, and it is not certain whether he was engaged in any of the battles recorded during these years in Wales, either in Môn 914, at Dinas Newydd 919 or at Brun 935. To the peaceful character of his reign is probably due the high place which he holds among the Welsh princes. From 943 to 950 Howel Dda was probably ruler of all Wales except Powys (apparently dependent on Mercia), Brecheiniog, Buallt, Gwent and Morgannwg. With Morgan Hen, king of Morgannwg, Howel had a dispute which was eventually settled in favour of the former at the court of the English king. Howel died in 950, and such unity as he had preserved at once disappeared in a war between his sons and those of Idwal Voel. The code of laws attributed to this prince is perhaps his chief claim to fame. He is said to have summoned four men from each cantref in his dominions to the Ty Gwyn (perhaps Whitland in Caermarthenshire) to codify existing custom. Three codes, accordingly called Venedotian, Demetian and Gwentian, are said to have been written down by Bleggwryd, archdeacon of Llandaff (see Welsh Laws).

See Sir John Rhys and Brynmor-Jones, *The Welsh People* (London, 1900); and Aneurin Owen, *Ancient Laws and Institutions of Wales* (London, 1841).

HOWELL, JAMES (*c.* 1594-1666), British author, who came of an old Welsh family, was born probably at Abernant, in Carmarthenshire, where his father was rector. From the free grammar school at Hereford he went to Jesus College, Oxford, and took his degree of B.A. in 1613. About 1616 he was steward in Sir Robert Mansell's glass-works in Broad Street, and was commissioned to go abroad to procure the services of expert workmen. It was not till 1622 that he returned, having visited Holland, France, Spain and Italy. With the intention of utilizing to better purpose his knowledge of continental languages and methods, he left the glass business and applied for a diplomatic post. Failing to obtain this, he was for a short time tutor in a nobleman's family. At the close of 1622 he was sent on a special mission to Madrid to obtain redress for the seizure of an English vessel, but, owing to the presence at the Spanish court of Prince Charles and the duke of Buckingham to arrange a marriage between the prince and the infanta of Spain, the negotiations had to be broken off. He made many friends among the prince's retinue, and, after his return in 1624, applied for employment to the duke of Buckingham, but without success. In 1626 he became secretary to Lord Scrope, Lord President of the North at York, and retained the office under Scrope's successor, Thomas Wentworth. In 1627 he was elected M.P. for Richmond; in 1632 he was sent as secretary to the embassy of the earl of Leicester to Denmark; and in 1642 the king appointed him one of the clerks of the privy council. In 1643 he was committed to the Fleet prison by the parliament, according to his own account, on suspicion of royalist leanings, or, as Anthony à Wood says, for debt. Whatever the reason, he remained in prison until 1651. He had acquired

considerable fame by his allegorical Δενδρολογία: *Dodona's Grove, or the Vocall Forest*, published in 1640, and his *Instructions for Forreine Travell* (1642), which has been described as the first continental handbook; and now he was driven to maintain himself by his pen. He edited and supplemented (1650) Cotgrave's French and English dictionary, compiled *Lexicon Tetraglotton, or an English, French, Italian and Spanish Dictionary* (London, 1660), translated various works from Italian and Spanish, wrote a life of Louis XIII. and issued a number of political pamphlets, varying the point of view somewhat to suit the changes of the time. Among these tracts may be mentioned a rather malicious *Perfect Description of the People and Country of Scotland*, which was revived by John Wilkes and printed in the *North Briton* during the agitation directed against Lord Bute. In 1660 he asked for the place of clerk of the privy council; and, though this was not granted him, the post of historiographer royal was created for him. In 1661 he applied for the office of tutor in foreign languages to the infanta Catherine of Braganza, and in 1662 published an *English Grammar translated into Spanish*. He was buried in the Temple Church on the 3rd of November 1666, having realized to the last his favourite motto, "Senesco non segnesco."

All Howell's writings are imbued with a certain simplicity and quaintness. His elaborate allegories are forgotten; his linguistic labours, of value in their time, are now superseded; but his *Letters*, the *Epistolae Ho-elianae* (four volumes issued in 1645, 1647, 1650 and 1655), are still models of their kind. Their dates are often fictitious, and they are, in nearly every case, evidently written for publication. Thackeray said that the *Letters* was one of his bedside books. He classes it with Montaigne and says he scarcely ever tired of "the artless prattle" of the "priggish little clerk of King Charles's council."

The *Epistolae* have been frequently edited, notably by J. Jacobs in 1890, with a commentary (1891), and Agnes Repplier (1907).

HOWELLS, WILLIAM DEAN (1837-), American novelist, was born at Martin's Ferry, Ohio, on the 1st of March 1837. His father, William Cooper Howells, a printer-journalist, moved in 1840 to Hamilton, Ohio, and here the boy's early life was spent successively as type-setter, reporter and editor in the offices of various newspapers. In the midst of routine work he contrived to familiarize himself with a wide range of authors in several modern tongues, and to drill himself thoroughly in the use of good English. In 1860, as assistant editor of the leading Republican newspaper in Ohio, he wrote—in connexion with the Presidential contest—the campaign life of Lincoln; and in the same year he was appointed consul at Venice, where he remained till 1865. On his return to America he joined the staff of the *Atlantic Monthly*, and from 1872 to 1881 he was its editor-in-chief. Since 1885 he has lived in New York. For a time he conducted for *Harper's Magazine* the department called "The Editor's Study," and in December 1900 he revived for the same periodical the department of "The Easy Chair," which had lapsed with the death of George William Curtis. Of Mr Howells's many novels, the following may be mentioned as specially noteworthy: *Their Wedding Journey* (1872); *The Lady of the Aroostook* (1879); *A Modern Instance* (1882); *The Rise of Silas Lapham* (1885); *The Minister's Charge* (1886); *A Hazard of New Fortunes* (1889); *The Quality of Mercy* (1892); *The Landlord at Lion's Head* (1897). He also published *Poems* (1873 and 1886); *Stops of Various Quills* (1895), a book of verse; books of travel; several amusing farces; and volumes of essays and literary criticism, among others, *Literary Friends and Acquaintance* (1901), which contains much autobiographical matter, *Literature and Life* (1902), and *English Films* (1905).

Howells is by general consent the foremost representative of the realistic school of indigenous American fiction. From the outset his aim was to portray life with entire fidelity in all its commonplaceness, and yet to charm the reader into a liking for this commonplaceness and into reverence for what it conceals. Though in his earliest novels his method was not consistently realistic—he is at times almost as personal and as whimsical as Thackeray—yet his vivid impressionism and his choice of subjects, as well as an occasional explicit protest that "dulness is dear to him," already revealed unmistakably his realistic bias. In *A Modern Instance* (1882) he gained complete command of his method, and began a series of studies of American life that are remarkable for their loyalty to fact, their truth of tone, and their power to reveal, despite their strictly objective method, both the inner springs of American character and the sociological forces that are shaping American civilization. He refuses to over-sophisticate or to over-intellectualize his characters, and he is very sparing in his use of psychological analysis. He insists on seeing and portraying American life as it exists in and for itself, under its own skies and with its own atmosphere; he does not scrutinize it with foreign comparisons in mind, and thus try to find and to throw into relief unsuspected configurations of surface. He keeps his dialogue toned down to almost the pitch of everyday conversation, although he has shown in his comedy sketches how easy a master he is of adroit and witty talk.

See also J. M. Robertson, *Essays towards a Critical Method* (London, 1889); H. C. Vedder,

American Writers (Boston, 1894).

HOWITT WILLIAM, (1792-1879), English author, was born on the 18th of December 1792 at Heanor, Derbyshire. His parents were Quakers, and he was educated at the Friends' public school at Ackworth, Yorkshire. In 1814 he published a poem on the "Influence of Nature and Poetry on National Spirit." He married, in 1821, Mary Botham (1799-1888), like himself a Quaker and a poet. William and Mary Howitt collaborated throughout a long literary career, the first of their joint productions being *The Forest Minstrels and other Poems* (1821). In 1831 William Howitt produced a work for which his habits of observation and his genuine love of nature peculiarly fitted him. It was a history of the changes in the face of the outside world in the different months of the year, and was entitled *The Book of the Seasons, or the Calendar of Nature* (1831). His *Popular History of Priestcraft* (1833) won for him the favour of active Liberals and the office of alderman in Nottingham, where the Howitts had made their home. They removed in 1837 to Esher, and in 1840 they went to Heidelberg, primarily for the education of their children, remaining in Germany for two years. In 1841 William Howitt produced, under the pseudonym of "Dr Cornelius," *The Student Life of Germany*, the first of a series of works on German social life and institutions. Mary Howitt devoted herself to Scandinavian literature, and between 1842 and 1863 she translated the novels of Frederika Bremer and many of the stories of Hans Andersen. With her husband she wrote in 1852 *The Literature and Romance of Northern Europe*. In June of that year William Howitt, with two of his sons, set sail for Australia, where he spent two years in the goldfields. The results of his travels appeared in *A Boy's Adventures in the Wilds of Australia* (1854), *Land, Labour and Gold; or, Two Years in Victoria* (1855) and *Tallangetta, the Squatter's Home* (1857). On his return to England Howitt had settled at Highgate and resumed his indefatigable book-making. From 1856 to 1862 he was engaged on Cassell's *Illustrated History of England*, and from 1861 to 1864 he and his wife worked at the *Ruined Abbeys and Castles of Great Britain*. The Howitts had left the Society of Friends in 1847, and became interested in spiritualism. In 1863 appeared *The History of the Supernatural in all Ages and Nations, and in all Churches, Christian and Pagan, demonstrating a Universal Faith*, by William Howitt. He added "his own conclusions from a practical examination of the higher phenomena through a course of seven years." From 1870 onwards Howitt spent the summers in Tirol and the winters in Rome, where he died on the 3rd of March 1879. Mary Howitt was much affected by his death, and in 1882 she joined the Roman Catholic Church, towards which she had been gradually moving during her connexion with spiritualism. She died at Rome on the 30th of January 1888. The Howitts are remembered for their untiring efforts to provide wholesome and instructive literature. Their son, Alfred William Howitt, made himself a name by his explorations in Australia. Anna Mary Howitt married Alaric Alfred Watts, and was the author of *Pioneers of the Spiritual Reformation* (1883).

Mary Howitt's autobiography was edited by her daughter, Margaret Howitt, in 1889. William Howitt wrote some fifty books, and his wife's publications, inclusive of translations, number over a hundred.

HOWITZER (derived, through an earlier form *howitz*, and the Ger. *Haubitz*, from the Bohemian *houfnice* = catapult, from which come also, through the Ital. *obiza* or *obice*, the French forms *obus* = shell and *obusier* = howitzer), a form of mobile ordnance in use from the 16th century up to the present day. It is a short and therefore comparatively light gun, which fires a heavy projectile at low velocity. A high angle of elevation is always given and the angle of descent of the projectile is consequently steep (up to 70°). On this fact is based the tactical use of the modern howitzer. The field howitzer is of the greatest value for "searching" trenches, folds of ground, localities, &c., which are invulnerable to direct fire, while the more powerful siege howitzer has, since the introduction of modern artillery and, above all, of modern projectiles, taken the foremost place amongst the weapons used in siege warfare.

See Artillery, Ordnance and Fortification and Siegecraft.

HOWLER, a name applied to the members of a group of tropical American monkeys, now known

scientifically as *Alouata*, although formerly designated *Mycetes*. These monkeys, which are of large size, with thick fur, sometimes red and sometimes black in colour, are characterized by the inflation of the hyoid-bone (which supports the roof of the tongue) into a large shell-like organ communicating with the wind-pipe, and giving the peculiar resonance to the voice from which they take their title. To allow space for the hyoid, the sides of the lower jaw are very deep and expanded. The muzzle is projecting, and the profile of the face slopes regularly backwards from the muzzle to the crown. The long tail is highly prehensile, thickly furred, with the under surface of the extremity naked. Howlers dwell in large companies, and in the early morning, and again in the evening, make the woods resound with their cries, which are often continued throughout the night. They feed on leaves, and are in the habit of sitting on the topmost branches of trees. When active, they progress in regular order, led by an old male.

(R. L.*)

HOWRAH, a city and district of British India, in the Burdwan division of Bengal. The city is situated opposite Calcutta, with which it is connected by a floating bridge. The municipal area is about 11 sq. m.; pop. (1901) 157,594, showing an increase of 35% in the decade. Since 1872 the population has almost doubled, owing to the great industrial development that has taken place. Howrah is the terminus of the East Indian railway, and also of the Bengal-Nagpur and East Coast lines. It is also the centre of two light railways which run to Amta and Sheakhala. Further, it is the headquarters of the jute-manufacturing industry, with many steam mills, steam presses, also cotton mills, oil mills, rope-works, iron-works and engineering works. Sibpur Engineering College lies on the outskirts of the town. There is a hospital, with a department for Europeans, and Howrah forms a suburban residence for many people who have their place of business in Calcutta.

The District of Howrah extends southwards down the right bank of the Hugli to the confluence of the river Damodar. For revenue purposes it is included within the district of Hugli Its area is 510 sq. m.; pop. (1901) 850,514, showing an increase of 11% in the decade. In addition to the two steam tramways and the East Indian railway, the district is crossed by the high-level canal to Midnapore, which communicates with the Hugli at Ulubaria. The manufacturing industries of Howrah extend beyond the city into the district. One or two systems of draining low-lying lands are maintained by the government.

HOWSON, JOHN SAUL (1816-1885), English divine, was born at Giggleswick-in-Craven, Yorkshire, on the 5th of May 1816. After receiving his early education at Giggleswick school, of which his father was head-master, he went to Trinity College, Cambridge, and there became tutor successively to the marquis of Sligo and the marquis of Lorne. In 1845 Howson, having taken orders, accepted the post of senior classical master at the Liverpool College under his friend W. J. Conybeare, whom he succeeded as principal in 1849. This post he held until 1865, and it was largely due to his influence that a similar college for girls was established at Liverpool. In 1866 he left Liverpool for the vicarage of Wisbech, and in 1867 he was appointed dean of Chester Cathedral, where he gave himself vigorously to the work of restoring the crumbling fabric, collecting nearly £100,000 in five years for this purpose. His sympathies were with the evangelical party, and he stoutly opposed the “Eastward position,” but he was by no means narrow. He did much to reintroduce the ministry of women as deaconesses. The building of the King’s School for boys, and the Queen’s School for girls (both in Chester), was due in a great measure to the active interest which he took in educational matters. He died at Bournemouth on the 15th of December 1885, and was buried in the cloister garth of Chester. Howson’s chief literary production was *The Life and Epistles of St Paul* (1852) in which he collaborated with Conybeare.

> The book is still of interest, especially for its descriptive passages, which were mostly done by Howson; but later researches (such as those of Sir W. M. Ramsay) have made the geographical and historical sections obsolete, and the same may be said of the treatment of the Pauline theology.

HOWTH [pronounced *Hōth*], a seaside town of Co. Dublin, Ireland, on the rocky hill of Howth, which forms the northern horn of Dublin Bay, 9 m. N.E. by N. of Dublin by the Great Northern

railway. Pop. (1901) 1166. It is frequented by the residents of the capital as a watering-place. The artificial harbour was formed (1807-1832) between the mainland and the picturesque island of Ireland's Eye, and preceded Kingstown as the station for the mail-packets from Great Britain, but was found after its construction to be liable to silt, and is now chiefly used by fishing-boats and yachts. The collegiate church, standing picturesquely on a cliff above the sea, was founded about 1235, and has a monastic building attached to it. The embattled castle contains the two-handed sword of Sir Almeric Tristram, the Anglo-Norman conqueror of the hill of Howth, and a portrait of Dean Swift holding one of the Drapier letters, with Wood, the coiner against whom he directed these attacks, prostrate before him. The view of Dublin Bay from the hill of Howth is of great beauty. Howth is connected with the capital by electric tramway, besides the railway, and another tramway encircles the hill.

HÖXTER, a town of Germany, in the Prussian province of Westphalia, prettily situated on the left bank of the Weser, and on the Prussian state railways Börssum-Soest and Scherfede-Holzminden, 32 m. N. of Cassel. Pop. (1905) 7699. It has a medieval town hall, and interesting houses with high gables and wood-carved façades of the 15th and 16th centuries. The most interesting of the churches is the Protestant church of St Kilian, with a pulpit dating from 1595 and a font dating from 1631. There are a gymnasium, a school of architecture and a monument to Hoffmann von Fallersleben in the town. The Weser is crossed here by a stone bridge about 500 ft. in length, erected in 1833. On the Brunsberg adjoining the town there is an old watch-tower, said to be the remains of a fortress built by Bruno, brother of Widukind. Near Höxter is the castle, formerly the Benedictine monastery, of Corvey. The principal manufactures of the town are linen, cotton, cement and gutta-percha, and there is also a considerable shipping trade. Höxter (Lat. *Huxaria*) in the time of Charlemagne was a *villa regia*, and was the scene of a battle between him and the Saxons. Under the protection of the monastery of Corvey it gradually increased in prosperity, and became the chief town of the principality of Corvey. Later it asserted its independence and joined the Hanseatic League. It suffered severely during the Thirty Years' War. After the peace of Westphalia in 1648 it was united to Brunswick; in 1802 it was transferred to Nassau; and in 1807 to the kingdom of Westphalia, after the dismemberment of which, in 1814, it came into the possession of Prussia.

See Kampschulte, *Chronik der Stadt Höxter* (Höxter, 1872).

HOY (Norse *Haey*, "high island"), the second largest island of the Orkneys, county of Orkney, Scotland. Pop. (1901) 1216. It has an extreme length from N.W. to S.E. of 13⅓ m., its greatest breadth from E. to W. is 8 m., and its area occupies 53 sq. m. It is situated 2 m. S.W. of Pomona, from which it is separated by Hoy Sound. As seen from the west it rises abruptly from the sea, presenting in this respect a marked contrast to the rest of the isles of the Orcadian group, which as a whole are low-lying. Its eastern and southern shores are indented by numerous bays, one of which, Long Hope, forms a natural harbour 4 m. long, with a breadth varying from ¼ m. to more than 1 m., affording to any number of vessels a haven of refuge from the roughest weather of the Pentland Firth. Off the eastern coast lie the islands of Graemsay, Cava, Risa, Fara, Flotta and Switha, while the peninsula of South Walls, forming the southern side of the harbour of Long Hope, is an island in all but name. Red and yellow sandstone cliffs, sometimes over 1000 ft. in height, stretch for 10 to 12 m. on the Atlantic front. The detached pillar or stack called the Old Man of Hoy (450 ft.) is a well-known landmark to sailors. The only break in this remarkable run of rocky coast is at Rackwick in the bight below the head of Rora. In the interior, Ward Hill (1564 ft.) is the loftiest summit in either the Orkneys or Shetlands. In the valley between Ward Hill and the ridge of the Hamars to the south-east is situated the famous Dwarfie Stone, an enormous block of sandstone measuring 28 ft. long, from 11 ft. to 14½ ft. broad, and 6½ ft. high at one end and 2 ft. high at the other, in which two rooms have been artificially hollowed out, traditionally believed to be the bed-chambers of Trolld, the dwarf of the sagas, and his wife. A boulder lying at the narrow end was supposed to be used to close the entrance. The generally accepted theory is that it was a pagan altar which some hermit afterwards converted into a cell. Other hills in the island are the Cuilags (1420 ft.) and the Knap of Trewieglen (1308 ft.), besides several peaks exceeding 1000 ft. in height. Hoy is commonly approached from Stromness, there being piers at Linksness, the nearest point to Graemsay, and at Hackness, South Ness and North Bay, the last three all on the harbour of Long Hope.

HOYLAKE, a watering-place in the Wirral parliamentary division of Cheshire, England, 8 m. W. of Birkenhead, on the Wirral railway. With West Kirby to the south, at the mouth of the estuary of the Dee, it forms the urban district of Hoylake and West Kirby. Pop. (1901) 10,911. The well-known links of the Royal Liverpool Golf Club are at Hoylake. The town has a considerable population of fishermen.

HOYLAND NETHER, an urban district in the Hallamshire parliamentary division of the West Riding of Yorkshire, England, 5½ m. S.S.E. of Barnsley, on the Midland railway. Collieries and brickworks employ the large industrial population. Pop. (1901) 12,464.

HOYLE, EDMUND, or Edmond (1672-1769), the first systematizer of the laws of whist, and author of a book on games, was born in 1672. His parentage and place of birth are unknown, and few details of his life are recorded. For some time he was resident in London, and partially supported himself by giving instruction in the game of whist. For the use of his pupils he drew up a *Short Treatise* on the game, which after circulating for some time in manuscript was printed by him and entered at Stationers' Hall in November 1742. The laws of Hoyle continued to be regarded as authoritative until 1864, since which time they have been gradually superseded by the new rules adopted by the Arlington and Portland clubs in that year (see Whist). He also published rules for various other games, and his book on games, which includes the *Short Treatise*, has passed into many editions. The weight of his authority is indicated by the phrase "according to Hoyle," which, doubtless first applied with reference to whist, has gained currency as a general proverb. Hoyle died in London on the 29th of August 1769.

HOZIER, PIERRE D', Seigneur de la Garde (1592-1660), French genealogist, was born at Marseilles on the 10th of July 1592. In 1616 he entered upon some very extensive researches into the genealogy of the noble families of the kingdom, in which work he was aided by his prodigious memory for dates, names and family relationships, as well as by his profound knowledge of heraldry. In 1634 he was appointed historiographer and genealogist of France, and in 1641 *juge d'armes* of France, an officer corresponding nearly to the Garter king-of-arms in England. In 1643 he was employed to verify the claims to nobility of the pages and equerries of the king's household. He accumulated a large number of documents, but published comparatively little, his principal works being *Recueil armorial des anciennes maisons de Bretagne* (1638); *Les noms, surnoms, qualitez, armes et blasons des chevaliers et officiers de l'ordre du Saint-Esprit* (1634); and the genealogies of the houses of La Rochefoucauld (1654), Bournonville (1657) and Amanzé (1659). He was renowned as much for his uprightness as for his knowledge, no slight praise in a profession exposed to so many temptations to fraud. He died in Paris on the 1st of December 1660. At his death his collections comprised more than 150 volumes or portfolios of documents and papers relating to the genealogy of the principal families in France. Of his six sons, only two survived him. His eldest son, Louis Roger d'Hozier (1634-1708), succeeded him as *juge d'armes*, but became blind in 1675, and was obliged to surrender his office to his brother.

Charles René d'Hozier (1640-1732), younger son of Pierre, was the true continuator of his father. In addition to his commentary appended to Antoine Varillas's history of King Charles IX. (1686 ed.), he published *Recherches sur la noblesse de Champagne* (1673). On the promulgation in 1696 of an edict directing all who had armorial bearings to register them on payment of 20 livres, he was employed to collect the declarations returned in the various *généralités*, and established the *Armorial général de France*. This work, which contained not only the armorial bearings of noble families, but also of those commoners who were entitled to bear arms, is not complete, inasmuch as many refused to register their arms, either from vanity or from a desire to evade the fee.

> The collection (now in the Bibliothèque Nationale) consists of 34 volumes of text and 35 of coloured armorial bearings, and in spite of its deficiencies is a useful store of information for the history of the old French families. It contains 60,000 names, grouped according to provinces and provincial subdivisions. The sections relating to Burgundy and Franche-Comté were published by Henri Bouchot (1875-1876): those relating to the *généralité* of Limoges, by Moreau de Pravieux

(1895); and those for the *élection* of Reims, by P. Gosset (1903).

In 1717, in consequence of a quarrel with his nephew Louis Pierre, son of Louis Roger, Charles sold his collection to the king. It then comprised 160 portfolios of genealogical papers arranged alphabetically, 175 volumes of documents, and numerous printed books profusely annotated. In 1720 it was inventoried by P. de Clairambault, who added a certain number of genealogies taken from the papers of F. R. de Gaignières, increasing the total to 217 boxes and portfolios. Thus originated the *Cabinet des titres* of the Bibliothèque Nationale. Charles subsequently became reconciled to his nephew, to whom he left all the papers he had accumulated from the date of the quarrel until his death, which occurred in Paris on the 13th of February 1732.

Louis Pierre d'Hozier (1685-1767), son of Louis Roger, succeeded his uncle Charles as *juge d'armes*. He published the *Armorial général, ou registre de la noblesse de France* (10 vols., 1738-1768), which must not be confounded with the publication mentioned above, inasmuch as it related solely to noble families and was not an official collection. Complete copies of this work, which should contain six *registres*, are comparatively rare. A seventh *registre*, forming vol. xi., prepared by Ambroise Louis Marie, nephew of Louis Pierre, was published in 1847 by comte Charles d'Hozier. Louis Pierre died on the 25th of September 1767. His eldest son, Antoine Marie d'Hozier de Sérigny (1721-*c.* 1810), was his father's collaborator and continuator; and his fourth son, Jean François Louis, wrote an account of the knights of St Michael in the province of Poitou, which was published in 1896 by the vicomte P. de Chabot.

His nephew, Ambroise Louis Marie d'Hozier (1764-1846), was the last of the *juges d'armes* of France. He held the position of president of the *cour des comptes, aides et finances* of Normandy, and was therefore generally known as President d'Hozier, to distinguish him from the other members of the family. After the Restoration he was employed to verify French armorial bearings for the *conseil du sceau des titres*. He died in obscurity. His collection, which was purchased in 1851 by the Bibliothèque Nationale, comprised 136 volumes, 165 portfolios of documents and 200 packets of extracts from title-deeds, known as the *Carrés d'Hozier*.

Abraham Charles Auguste d'Hozier (1775-1846), who also belonged to his family, was implicated in the conspiracy of Georges Cadoudal, and was condemned to death, but Bonaparte spared his life. He did not, however, recover his liberty until after the fall of the emperor, and died at Versailles on the 24th of August 1846.

(C. B.*)

HRABANUS MAURUS MAGNENTIUS (*c.* 776-856), archbishop of Mainz, and one of the most prominent teachers and writers of the Carolingian age, was born of noble parents at Mainz. Less correct forms of his name are Rabanus and Rhabanus. The date of his birth is uncertain, but in 801 he received deacon's orders at Fulda, where he had been sent to school; in the following year, at the instance of Ratgar, his abbot, he went together with Haimon (afterwards of Halberstadt) to complete his studies at Tours under Alcuin, who in recognition of his diligence and purity gave him the surname of Maurus, after St Maur the favourite disciple of Benedict. Returning after the lapse of two years to Fulda, he was entrusted with the principal charge of the school, which under his direction rose into a state of great efficiency for that age, and sent forth such pupils as Walafrid Strabo, Servatus Lupus of Ferières and Otfrid of Weissenburg. At this period it is most probable that his *Excerptio* from the grammar of Priscian, long so popular as a text-book during the middle ages, was compiled. In 814 he was ordained a priest; but shortly afterwards, apparently on account of disagreement with Ratgar, he was compelled to withdraw for a time from Fulda. This "banishment" is understood to have occasioned the pilgrimage to Palestine to which he alludes in his commentary on Joshua. He returned to Fulda on the election of a new abbot (Eigil) in 817, upon whose death in 822 he himself became abbot. The duties of this office he discharged with efficiency and success until 842, when, in order to secure greater leisure for literature and for devotion, he resigned and retired to the neighbouring cloister of St Peter's. In 847 he was again constrained to enter public life by his election to succeed Otgar in the archbishopric of Mainz, which see he occupied for upwards of eight years. The principal incidents of historical interest belonging to this period of his life were those which arose out of his relations to Gottschalk (*q.v.*): they may be regarded as thoroughly typical of that cruel intolerance which he shared with all his contemporaries, and also of that ardent zeal which was peculiar to himself; but they hardly do justice to the spirit of kindly benevolence which in less trying circumstances he was ever ready to display. He died at Winkel on the Rhine, on the 4th of February 856. He is frequently referred to as St Rabanus, but incorrectly.

His voluminous works, many of which remain unpublished, comprise commentaries on a considerable number of the books both of canonical and of apocryphal Scripture (Genesis to Judges, Ruth, Kings, Chronicles, Judith, Esther, Canticles, Proverbs, Wisdom, Ecclesiasticus, Jeremiah, Lamentations, Ezekiel, Maccabees, Matthew, the Epistles of St Paul, including Hebrews); and

various treatises relating to doctrinal and practical subjects, including more than one series of Homilies. Perhaps the most important is that *De institutione clericorum*, in three books, by which he did much to bring into prominence the views of Augustine and Gregory the Great as to the training which was requisite for a right discharge of the clerical function; the most popular has been a comparatively worthless tract *De laudibus sanctae crucis*. Among the others may be mentioned the *De universo libri xxii., sive etymologiarum opus*, a kind of dictionary or encyclopaedia, designed as a help towards the historical and mystical interpretation of Scripture, the *De sacris ordinibus*, the *De disciplina ecclesiastica* and the *Martyrologium*. All of them are characterized by erudition (he knew even some Greek and Hebrew) rather than by originality of thought. The poems are of singularly little interest or value, except as including one form of the "Veni Creator." In the annals of German philology a special interest attaches to the *Glossaria Latino-Theodisca*. A commentary, *Super Porphyrium*, printed by Cousin in 1836 among the *Ouvrages inédits d'Abélard*, and assigned both by that editor and by Hauréau to Hrabanus Maurus, is now generally believed to have been the work of a disciple.

The first nominally complete edition of the works of Hrabanus Maurus was that of Colvener (Cologne, 6 vols. fol., 1627). The *Opera omnia* form vols. cvii.-cxii. of Migne's *Patrologiae cursus completus*. The *De universo* is the subject of *Compendium der Naturwissenschaften an der Schule zu Fulda im IX. Jahrhundert* (Berlin, 1880). Maurus is the subject of monographs by Schwarz (*De Rhabano Mauro primo Germaniae praeceptore*, 1811), Kunstmann (*Historische Monographie über Hrabanus Magnentius Maurus*, 1841), Spengler (*Leben des heil. Rhabanus Maurus*, 1856) and Köhler (*Rhabanus Maurus u. die Schule zu Fulda*, 1870). *Lives* by his disciple Rudolphus and by Joannes Trithemius are printed in the Cologne edition of the *Opera*. See also Pertz, *Monum. Germ. Hist.* (i. and ii.); Bähr, *Gesch. d. römischen Literatur im Karoling. Zeitalter* (1840), and Hauck's article in the Herzog-Hauck *Realencyklopädie*, ed. 3.

HRÓLFR KRAKI, perhaps the most famous of the Danish kings of the heroic age. In *Beowulf*, where he is called Hrothwulf, he is represented as reigning over Denmark in conjunction with his uncle Hrothgar, one of the three sons of an earlier king called Healfdene. In the Old Norse sagas Hrólfe is the son of Helgi (Halga), the son of Halfdan (Healfdene). He is represented as a wealthy and peace-loving monarch similar to Hrothgar in *Beowulf*, but the latter (Hróarr, or Roe) is quite overshadowed by his nephew in the Northern authorities. The chief incidents in Hrólfr's career are the visit which he paid to the Swedish king Aðils (Beowulf's Eadgils), of which several different explanations are given, and the war, in which he eventually lost his life, against his brother-in-law Hiörvarðr. The name Kraki (pole-ladder) is said to have been given to him on account of his great height by a young knight named Vöggr, whom he handsomely rewarded and who eventually avenged his death on Hiörvarðr. There is no reason to doubt that Hrólfr was an historical person and that he reigned in Denmark during the early years of the 6th century, but the statement found in all the sagas that he was the stepson of Aðils seems hardly compatible with the evidence of *Beowulf*, which is a much earlier authority.

See Saxo Grammaticus, *Gesta Danorum*, pp. 52-68, ed. A. Holder (Strassburg, 1886); and A. Olrik, *Danmarks Hettedigtning* (Copenhagen, 1903).

HROSVITHA (frequently Roswitha, and properly Hrotsuit), early medieval dramatist and chronicler, occupies a very notable position in the history of modern European literature. Her endeavours formed part of the literary activity by which the age of the emperor Otto the Great sought to emulate that of Charles the Great. The famous nun of Gandersheim has occasionally been confounded with her namesake, a learned abbess of the same convent, who must have died at least half a century earlier. The younger Hrosvitha was born in all probability about the year 935; and, if the statement be correct that she sang the praises of the three Ottos, she must have lived to near the close of the century. Some time before the year 959 she entered the Benedictine nunnery of Gandersheim, a foundation which was confined to ladies of German birth, and was highly favoured by the Saxon dynasty. In 959 Gerberga, daughter of Duke Henry of Bavaria and niece of the emperor Otto I., was consecrated abbess of Gandersheim; and the earlier literary efforts of the youthful Hrosvitha (whose own connexion with the royal family appears to be an unauthenticated tradition) were encouraged by the still more youthful abbess, and by a nun of the name of Richarda.

The literary works of Hrosvitha, all of which were as a matter of course in Latin, divide themselves into three groups. Of these the first and least important comprises eight narrative religious poems, in leonine hexameters or distichs. Their subjects are the Nativity of the Virgin

(from the apocryphal gospel of St James, the brother of our Lord), the Ascension and a series of legends of saints (Gandolph, Pelagius, Theophilus, Basil, Denis, Agnes). Like these narrative poems, the dramas to which above all Hrosvitha owes her fame seem to have been designed for reading aloud or recitation by sisters of the convent. For though there are indications that the idea of their representation was at least present to the mind of the authoress, the fact of such a representation appears to be an unwarrantable assumption. The comedies of Hrosvitha are six in number, being doubtless in this respect also intended to recall their nominal model, the comedies of Terence. They were devised on the simple principle that the world, the flesh and the devil should not have all the good plays to themselves. The experiment upon which the young Christian dramatist ventured was accordingly, although not absolutely novel, audacious enough. In form the dramas of "the strong voice of Gandersheim," as Hrosvitha (possibly alluding to a supposed etymology of her name) calls herself, are by no means Terentian. They are written in prose, with an element of something like rhythm, and an occasional admixture of rhyme. In their themes, and in the treatment of these, they are what they were intended to be, the direct opposites of the lightsome adapter of Menander. They are founded upon legends of the saints, selected with a view to a glorification of religion in its supremest efforts and most transcendental aspects. The emperor Constantine's daughter, for example, Constantia, gives her hand in marriage to *Gallicanus*, just before he starts on a Scythian campaign, though she has already taken a vow of perpetual maidenhood. In the hour of battle he is himself converted, and, having on his return like his virgin bride chosen the more blessed unmarried state, dies as a Christian martyr in exile. The three holy maidens, Agape, Chionia and Irene, are preserved by a humorous miracle from the evil designs of *Dulcitius*, to offer up their pure lives as a sacrifice under Diocletian's persecutions. *Callimachus*, who has Romeo-like carried his earthly passion for the saintly Drusiana into her tomb, and among its horrors has met with his own death, is by the mediation of St John raised with her from the dead to a Christian life. All these themes are treated with both spirit and skill, often with instinctive knowledge of dramatic effect—often with genuine touches of pathos and undeniable felicities of expression. In *Dulcitius* there is also an element of comedy, or rather of farce. How far Hrosvitha's comedies were an isolated phenomenon of their age in Germany must remain undecided; in the general history of the drama they form the visible bridge between the few earlier attempts at utilizing the forms of the classical drama for Christian purposes and the miracle plays. They are in any case the productions of genius; nor has Hrosvitha missed the usual tribute of the supposition that Shakespeare has borrowed from her writings.

The third and last group of the writings of Hrosvitha is that of her versified historical chronicles. At the request of the abbess Gerberga, she composed her *Carmen de gestis Oddonis*, an epic attempting in some degree to follow the great Roman model. It was completed by the year 968, and presented by the authoress to both the old emperor and his son (then already crowned as) Otto II. This poem so closely adheres to the materials supplied to the authoress by members of the imperial family that, notwithstanding its courtly omissions, it is regarded as an historical authority. Unfortunately only half of it remains; the part treating of the period from 953 to 962 is lost with the exception of a few fragments, and the period from 962 to 967 is summarized only. Subsequently, in a poem (of 837 hexameters) *De primordiis et fundatoribus coenobii Gandersheimensis*, Hrosvitha narrated the beginnings of her own convent, and its history up to the year 919.

The Munich MS., which contains all the works enumerated above except the *Chronicle of Gandersheim*, was edited by the great Vienna humanist, Conrad Celtes, in 1501. The edition of Celtes was published at Nuremberg, with eight wood-cuts by Albrecht Dürer. It was re-edited by H. L. Schurzfleisch and published at Wittenberg in 1707. The comedies have been edited and translated into German by J. Bendixen (Lübeck, 1857), and into French by C. Magnin (Paris, 1845), whose introduction gives a full account of the authoress and her works. See also her *Poésies latines*, with a translation into French verse by V. Rétif de la Bretonne (Paris, 1854). A copious analysis of her plays will be found in Klein, *Geschichte des Dramas*, iii. 665-754. See also W. Creizenach, *Geschichte des neueren Dramas*, i. 17 sqq. (Halle, 1893), and A. W. Ward, *History of English Dramatic Literature*, i. 6 sqq. (Cambridge, 1899). Gustav Freytag wrote a dissertation, *De Rosuitha poëtria* (Breslau, 1839), to qualify himself as an academical teacher, which, as he records (*Erinnerungen aus meinem Leben*, Leipzig, 1887, p. 1839), showed "how impossible it was to the German, a thousand years since, to compose dramatically"; and at the beginning of Albert Cohn's *Shakespeare in Germany* (Berlin, 1865) Shakespearean parallels are suggested to certain passages in Hrosvitha's dramas. Her two chronicles in verse were edited by Z. H. Pertz in the *Monumenta Germaniae*, iv. 306-335 (Hanover, 1841). See also J. P. Migne, *Patrologiae curs. compl.* (Paris, 1853, vol. 137). The *Carmen* was included by Leibnitz in his *Scriptores rer. Brunsvic.* (Hanover, 1707-1711). For other early editions of these see A. Potthast, *Bibliotheca historica medii aevi* (supplement, Berlin, 1862-1868); and for an appreciation of them see Wattenbach, *Geschichtsquellen*, pp. 214-216, and Giesebrecht, *Deutsche Kaiserzeit*, i. 780, who mentions a German translation by Pfund (1860). There is a complete edition of the works of Hrosvitha by K. A. Barack (Nürnberg, 1858). J. Aschbach (1867) attempted to prove that Celtes had forged the productions which he published under the name of Hrosvitha, but he was refuted by R. Köpke (Berlin, 1869). Anatole France, *La Vie littéraire* (3ème série, Paris, 1891), cited by Creienach, mentions a curious recent experiment, the performance of Hrosvitha's comedies in the Théâtre des Marionettes at Paris.

(A. W. W.)

HSÜAN TSANG (Hiouen Thsang, Hiwen T'sang, Yüan Tsang, Yuan-Chwang), the most eminent representative of a remarkable and valuable branch of Chinese literature, consisting of the narratives of Chinese Buddhists who travelled to India, whilst their religion flourished there, with the view of visiting the sites consecrated by the history of Sakya Muni, of studying at the great convents which then existed in India, and of collecting books, relics and other sacred objects.

The importance of these writings as throwing light on the geography and history of India and adjoining countries, during a very dark period, is great, and they have been the subject of elaborate commentaries by modern students. Several Chinese memoirs of this kind appear to have perished; and especially to be regretted is a great collection of the works of travellers to India, religious and secular, in sixty books, with forty more of maps and illustrations, published at the expense of the emperor Kao-Tsung of the T'ang dynasty, A.D. 666, with a preface from the imperial hand. We will mention the clerical travellers of this description who are known to us by name.

1. *Shi-tao-'an* (d. 385) wrote a work on his travels to the "western lands" (an expression applying often to India), which is supposed to be lost. 2. *Fa-hien* travelled to India in 399, and returned by sea in 414. His work, called *Fo-Kwo-Ki, or Memoirs on the Buddha Realms*, has been translated by Abel-Rémusat and Landresse, and again into English by the Rev. S. Beale; Mr Laidlay of Calcutta also published a translation from the French, with interesting notes. 3. *Hwai Seng* and *Sung-Yun*, monks, travelled to India to collect books and reliques, 518-521. Their short narrative has been translated by Karl Fried. Neumann, and also by Mr Beale (along with Fa-hien). 4. *Hsüan Tsang*, the subject of this notice. In relation to his travels there are two Chinese works, both of which have been translated with an immense appliance of labour and learning by M. Stanislas Julien, viz. (*a*) the *Ta-T'ang-Si-Yu-Ki, or Memoirs on Western Countries issued by the T'ang Dynasty*, which was compiled under the traveller's own supervision, by order of the great emperor Tai-Tsung; and (*b*) a *Biography of Hsüan Tsang* by two of his contemporaries. 5. *The Itinerary of Fifty-six Religious Travellers*, compiled and published under imperial authority, 730. 6. *The Itinerary of Khi-Nie*, who travelled (964-976) at the head of a large body of monks to collect books, &c. Neither of the last two has been translated.

Hsüan Tsang was born in the district of Keu-Shi, near Honan-Fu, about 605, a period at which 844
Buddhism appears to have had a powerful influence upon a large body of educated Chinese. From childhood grave and studious, he was taken in charge by an elder brother who had adopted the monastic life, in a convent at the royal city of Loyang in Honan. Hsüan Tsang soon followed his brother's example. For some years he travelled over China, teaching and learning, and eventually settled for a time at the capital Chang-gan (now Si-gan-fu in Shensi), where his fame for learning became great. The desire which he entertained to visit India, in order to penetrate all the doctrines of the Buddhist philosophy, and to perfect the collections of Indian books which existed in China, grew irresistible, and in August 629 he started upon his solitary journey, eluding with difficulty the strict prohibition which was in force against crossing the frontier.

The "master of the law," as his biographers call him, plunged alone into the terrible desert of the Gobi, then known as the Sha-mo or "Sand River," between Kwa-chow and Igu (now Hami or Kamil). At long intervals he found help from the small garrisons of the towers that dotted the desert track. Very striking is the description, like that given six centuries later by Marco Polo, of the quasi-supernatural horrors that beset the lonely traveller in the wilderness—the visions of armies and banners; and the manner in which they are dissipated singularly recalls passages in Bunyan's *Pilgrim's Progress*. After great suffering Hsüan Tsang reached Igu, the seat of a Turkish principality, and pursued his way along the southern foot of the T'ian-shan, which he crossed by a glacier pass (vividly described) in the longitude of Lake Issyk-kul. In the valley of the Talas river he encounters the great khan of the Turks on a hunting party,—a rencontre which it is interesting to compare with the visit of Zemarchus to the great khan Dizabul, sixty years before, in the same region. Passing by the present Tashkend, and by Samarkand, then inhabited by fire worshippers, he reached the basin of the Upper Oxus, which had recently been the seat of the powerful dominion of the Haiathelah, Ephthalites or White Huns, known in earlier days to the Greeks as *Tochari*, and to Hsüan Tsang (by the same name) as *Tuholo* or Tukhāra. His account of the many small states into which the Tukhāra empire had broken up is of great interest, as many of them are identical in name and topography with the high valley states and districts on the Upper Oxus, which are at this day the object of so much geographical and political interest.

Passing by Bamian, where he speaks of the great idols still so famous, he crosses Hindu-Kush, and descends the valley of the Kabul river to Nagarahara, the site of which, still known as Nagara, adjoining Jalalabad, has been explored by Mr W. Simpson. Travelling thence to Peshawar (*Purushapura*), the capital of Gandhara, he made a digression, through the now inaccessible valley of Swat and the Dard states, to the Upper Indus, returning to Peshawar, and then crossing the Indus (*Sintu*) into the decayed kingdom of *Taxila* (Ta-cha-si-lo, Takshasila), then subject to Kashmir. In the latter valley he spent two whole years (631-633) studying in the convents, and visiting the many monuments of his faith. In his further travels he visited Mathura (*Mot'ulo*, Muttra), whence

he turned north to Thanesar and the upper Jumna and Ganges, returning south down the valley of the latter to Kanyakubja or Kanauj, then one of the great capitals of India. The pilgrim next entered on a circuit of the most famous sites of Buddhist and of ancient Indian history, such as Ajodhya, Prayaga (Allahabad), Kausambhi, Sravasti, Kapilavastu, the birth-place of Sakya, Kusinagara, his death-place, Pataliputra (Patna, the *Palibothra* of the Greeks), Gaya, Rajagriha and Nalanda, the most famous and learned monastery and college in India, adorned by the gifts of successive kings, of the splendour of which he gives a vivid description, and of which traces have recently been recovered. There he again spent nearly two years in mastering Sanskrit and the depths of Buddhist philosophy. Again, proceeding down the banks of the Ganges, he diverged eastward to Kamarupa (Assam), and then passed by the great ports of Tamralipti (Tamluk, the misplaced *Tamalitis* of Ptolemy), and through Orissa to Kanchipara (Conjeeveram), about 640. Thence he went northward across the Carnatic and Maharashtra to Barakacheva (Broach of our day, *Barygaza* of the Greeks). After this he visited Malwa, Cutch, Surashtra (peninsular Gujarat, *Syrastrene* of the Greeks), Sind, Multan and Ghazni, whence he rejoined his former course in the basin of the Kabul river.

This time, however, he crosses Pamir, of which he gives a remarkable account, and passes by Kashgar, Khotan (*Kustana*), and the vicinity of Lop-nor across the desert to Kwa-chow, whence he had made his venturous and lonely plunge into the waste fifteen years before. He carried with him great collections of books, precious images and reliques, and was received (April 645) with public and imperial enthusiasm. The emperor T’ai-Tsung desired him to commit his journey to writing, and also that he should abandon the eremitic rule and serve the state. This last he declined, and devoted himself to the compilation of his narrative and the translation of the books he had brought with him from India. The former was completed A.D. 648. In 664 Hsüan Tsang died in a convent at Chang-gan. Some things in the history of his last days, and in the indications of beatitude recorded, strongly recall the parallel history of the saints of the Roman calendar. But on the other hand we find the Chinese saint, on the approach of death, causing one of his disciples to frame a catalogue of his good works, of the books that he had translated or caused to be transcribed, of the sacred pictures executed at his cost, of the alms that he had given, of the living creatures that he had ransomed from death. “When Kia-shang had ended writing this list, the master ordered him to read it aloud. After hearing it the devotees clasped their hands, and showered their felicitations on him.” Thus the “well-done, good and faithful” comes from the servant himself in self-applause.

The book of the biography, by the disciples Hwai-li and Yen-t’sung, as rendered with judicious omissions by Stan. Julien, is exceedingly interesting; its Chinese style receives high praise from the translator, who says he has often had to regret his inability to reproduce its grace, elegance and vivacity.

AUTHORITIES.—*Fo-Koue-Ki*, trad. du Chinois, par Abel-Rémusat, revu et complété par Klaproth et Landresse (Paris, 1836); *H. de la vie de Hiouen-Thsang, &c.*, trad. du Chinois par Stanislas Julien (Paris, 1853); *Mémoires sur les contrées occidentales ...* trad. du Chinois en Français (par le même) (2 vols., Paris, 1857-1858); *Mémoire analytique*, &c., attached to the last work, by L. Vivien de St Martin; “Attempt to identify some of the Places mentioned in the Itinerary of Hiuan Thsang,” by Major Wm. Anderson, C.B., in *Journ. As. Soc. Bengal*, vol. xvi. pt. 2, p. 1183 (the enunciation of a singularly perverse theory); “Verification of the Itinerary of Hwan Thsang, &c.,” by Captain Alex. Cunningham, Bengal Engineers, ibid. vol. xvii. pt. 1, p. 476; *Travels of Fah-hian and Sung-Yan, Buddhist Pilgrims, &c.*, by Sam. Beal (1869); *The Ancient Geography of India*, by Major-General Alex. Cunningham, R.E. (1871); “Notes on Hwen Thsang’s Account of the Principalities of Tokharistan,” by Colonel H. Yule, C.B., in *Journ. Roy. As. Soc.*, new ser., vol. vi. p. 82; “On Hiouen Thsang’s Journey from Patna to Ballabhi,” by James Fergusson, D.C.L., ibid. p. 213.

(H. Y.; R. K. D.)

HUAMBISAS, a tribe of South American Indians on the upper Marañon and Santiago rivers, Peru. In 1841 they drove all the civilized Indians from the neighbouring missions. In 1843 they killed all the inhabitants of the village of Santa Teresa, between the mouths of the Santiago and Morona. They are fair-skinned and bearded, sharing with the Jeveros a descent from the Spanish women captured by their Indian ancestors at the sack of Sevilla del Oro in 1599.

HUANCAVELICA, a city of central Peru and capital of a department, 160 m. S.E. of Lima. The city stands in a deep ravine of the Andes at an elevation of about 12,400 ft. above the sea, the ravine having an average width of 1 m. Pop. (1906 estimate) 6000. The city is solidly and regularly built, the houses being of stone and the stream that flows through the town being spanned by

several stone bridges. Near Huancavelica is the famous quicksilver mine of Santa Barbara, with its subterranean church of San Rosario, hewn from the native cinnabar-bearing rock. Huancavelica was founded by Viceroy Francisco de Toledo in 1572 as a mining town, and mining continues to be the principal occupation of its inhabitants. The department is traversed by the Cordillera Occidental, and is bounded N., E. and S. by Junin and Ayacucho. Pop. (1906 official estimate) 167,840; area, 9254 sq. m. The principal industry is mining for silver and quicksilver. The best-known silver mines are the Castrovirreyna.

HUÁNUCO, a city of central Peru, capital of a department, 170 m. N.N.E. of Lima in a beautiful valley on the left bank of the Huallaga river, nearly 6000 ft. above sea-level. Pop. (1906 estimate) about 6000. The town was founded in 1539 by Gomez Alvarado. Huánuco is celebrated for its fruits and sweetmeats, the “chirimoya” (*Anona chirimolia*) of this region being the largest and most delicious of its kind. Mining is one of the city’s industries. Huánuco was the scene of one of the bloodthirsty massacres of which the Chileans were guilty during their occupation of Peruvian territory in 1881-1883. The department of Huánuco lies immediately N. of Junin, with Ancachs on the W. and San Martin and Loreto on the N. and E. Pop. (1906 estimate) 108,980; area, 14,028 sq. m. It lies wholly in the Cordillera region, and is traversed from S. to N. by the Marañon and Huallaga rivers.

HUARAZ, a city of northern Peru and capital of£ the department of Ancachs, on the left bank of the Huaraz, or Santa river, about 190 m. N.N.W. of Lima and 58 m. from the coast. Pop. (1876) 4851, (1906 estimate) 6000. Huaraz is situated in a narrow fertile valley of the Western Cordillera, at a considerable elevation above sea-level, and has a mild climate. A railway projected to connect Huaraz with the port of Chimbote, on the Bay of Chimbote, a few miles S. of the mouth of the Santa river, was completed from Chimbote to Suchimán (33 m.) in 1872, when work was suspended for want of money. In the valley of the Huaraz cattle are raised, and wheat, sugar and fruit, gold, silver, copper and coal are produced. Alfalfa is grown by stock-raisers, and the cattle raised here are among the best in the Peruvian market. In the vicinity of Huaraz are megalithic ruins similar to those of Tiahunaco and Cuzco, showing that the aboriginal empire preceding the Incas extended into northern Peru.

HUARTE DE SAN JUAN, or Huarte Y Navarro, Juan (*c.* 1530-1592), Spanish physician and psychologist, was born at Saint-Jean-Pied-de-Port (Lower Navarre) about 1530, was educated at the university of Huesca, where he graduated in medicine, and, though it appears doubtful whether he practised as a physician at Huesca, distinguished himself by his professional skill and heroic zeal during the plague which devastated Baeza in 1566. He died in 1592. His *Examen de ingenios para las ciencias* (1575) won him a European reputation, and was translated by Lessing. Though now superseded, Huarte’s treatise is historically interesting as the first attempt to show the connexion between psychology and physiology, and its acute ingenuity is as remarkable as the boldness of its views.

HUASTECS, a tribe of North American Indians of Mayan stock, living to the north of Vera Cruz. They are of interest to the ethnologist as being so entirely detached from the other Mayan tribes of Central America. The theory is that the Mayas came from the north and that the Huastecs were left behind in the migration southward.

HUBER, FRANÇOIS (1750-1831), Swiss naturalist, was born at Geneva on the 2nd of July 1750. He belonged to a family which had already made its mark in the literary and scientific world: his great-aunt, Marie Huber (1695-1753), was known as a voluminous writer on religious and theological subjects, and as the translator and epitomizer of the *Spectator* (Amsterdam, 3 vols., 1753); and his father Jean Huber (1721-1786), who had served for many years as a soldier, was a prominent member of the coterie at Ferney, distinguishing himself by his *Observations sur le vol des oiseaux* (Geneva, 1784). François Huber was only fifteen years old when he began to suffer from an affection of the eyes which gradually resulted in total blindness; but, with the aid of his wife, Marie Aimée Lullin, and of his servant, François Burnens, he was able to carry out investigations that laid the foundations of our scientific knowledge of the life history of the honey-bee. His *Nouvelles Observations sur les abeilles* was published at Geneva in 1792 (Eng. trans., 1806). He assisted Jean Senebier in his *Mém. sur l'influence de l'air, &c., dans la germination* (Geneva, 1800); and he also wrote "Mém. sur l'origine de la cire" (*Bibliothèque britannique*, tome xxv.), a "Lettre à M. Pictet sur certains dangers que courent les abeilles" (*Bib. brit*. xxvii), and "Nouvelles Observ. rel. au sphinx Atropos" (*Bib. brit*. xxvii). He died at Lausanne on the 22nd of December 1831. De Candolle gave his name to a genus of Brazilian trees—*Huberia laurina*.

Pierre Huber (1777-1840) followed in his father's footsteps. His best-known work is *Recherches sur les mœurs des fourmis indigènes* (Geneva and Paris, 1810; new ed., Geneva, 1861), and he also wrote various papers on entomological subjects.

See the account of François Huber, by De Candolle, in *Bibl. universelle* (1832); and the notice of Pierre in *Bibl. univ.* (1886); also Haag, *La France protestante*.

HUBER, JOHANN NEPOMUK (1830-1879), German philosophical and theological writer, a leader of the Old Catholics, was born at Munich on the 18th of August 1830. Originally destined for the priesthood, he early began the study of theology. By the writings of Spinoza and Oken, however, he was strongly drawn to philosophical pursuits, and it was in philosophy that he "habilitated" (1854) in the university of his native place, where he ultimately became professor (extraordinarius, 1859; ordinarius, 1864). With Döllinger and others he attracted a large amount of public attention in 1869 by the challenge to the Ultramontane promoters of the Vatican council in the treatise *Der Papst und das Koncil*, which appeared under the pseudonym of "Janus," and also in 1870 by a series of letters (*Römische Briefe*, a redaction of secret reports sent from Rome during the sitting of the council), which were published over the pseudonym Quirinus in the *Allgemeine Zeitung*. He died suddenly of heart disease at Munich on the 20th of March 1879.

Works.—The treatise *Über die Willensfreiheit* (1858), followed in 1859 by *Die Philosophie der Kirchenväter*, which was promptly placed upon the *Index*, and led to the prohibition of all Catholic students from attending his lectures; *Johannes Scotus Erigena* (1861); *Die Idee der Unsterblichkeit* (1864); *Studien* (1867); *Der Proletarier; zur Orientirung in der sozialen Frage* (1865); *Der Jesuitenorden nach seiner Verfassung und Doctrin, Wirksamkeit und Geschichte* (1873), also placed upon the *Index*; *Der Pessimismus* (1876); *Die Forschung nach der Materie* (1877); *Zur Philosophie der Astronomie* (1878); *Das Gedächtnis* (1878). He also published adverse criticisms of Darwin, Strauss, Hartmann and Häckel; pamphlets on *Das Papsttum und der Staat* (1870), and on *Die Freiheiten der französischen Kirche* (1871); and a volume of *Kleine Schriften* (1871).

See E. Zirngiebl, *Johannes Huber* (1881); and M. Carrière in *Allgemeine deutsche Biographie*, xiii. (1881), and in *Nord und Süd* (1879).

HUBER, LUDWIG FERDINAND (1764-1804), German author, was born in Paris on the 14th of September 1764, the son of Michael Huber (1727-1804), who did much to promote the study of German literature in France. In his infancy young Huber removed with his parents to Leipzig, where he was carefully instructed in modern languages and literature, and showed a particular inclination for those of France and England. In Leipzig he became intimate with Christian Gottfried Körner, father of the poet; in Dresden Huber became engaged to Dora Stock, sister of Körner's betrothed, and associated with Schiller, who was one of Körner's stanchest friends. In 1787 he was appointed secretary to the Saxon legation in Mainz, where he remained until the French occupation of 1792. While here he interested himself for the welfare of the family of his friend Georg Forster, who, favouring republican views, had gone to Paris, leaving his wife Therese Forster (1764-1829) and family in destitute circumstances. Huber, enamoured of the talented young wife, gave up his diplomatic post, broke off his engagement to Dora Stock, removed with the Forster family to

Switzerland, and on the death of her husband in 1794 married Therese Forster. In 1798 Huber took over the editorship of the *Allgemeine Zeitung* in Stuttgart. The newspaper having been prohibited in Württemberg, Huber continued its editorship in Ulm in 1803. He was created “counsellor of education” for the new Bavarian province of Swabia in the following year, but had hardly entered upon the functions of his new office when he died on the 24th of December 1804.

Huber was well versed in English literature, and in 1785 he published the drama *Ethelwolf*, with notes on Beaumont and Fletcher and the old English stage. He also wrote many dramas, comedies and tragedies, most of which are now forgotten, and among them only *Das heimliche Gericht* (1790, new ed. 1795) enjoyed any degree of popularity. As a critic he is seen to advantage in the *Vermischte Schriften von dem Verfasser des heimlichen Gerichts* (2 vols., 1793). As a publicist he made his name in the historical-political periodicals *Friedenspräliminarien* (1794-1796, 10 vols.) and *Klio* (1795-1798, 1819).

His collected works, *Sämtliche Werke seit dem Jahre 1802* (4 vols., 1807-1819), were published with a biography by his wife Therese Huber. See L. Speidel and H. Wittmann, *Bilder aus der Schiller-Zeit* (1884).

HUBERT (Hucbertus, Hugbertus), **ST** (d. 727), bishop of Liége, whose festival is celebrated on the 3rd of November. The Bollandists have published seven different lives of the saint. The first is the only one of any value, and is the work of a contemporary. Unfortunately, it is very sparing of details. In it we see that Hubert in 708 succeeded Lambert in the see of Maestricht (Tongres), and that he erected a basilica to his memory. In 825 Hubert’s remains were removed to a Benedictine cloister in the Ardennes, which thenceforth bore his name (St Hubert, province of Luxemburg, Belgium), and ultimately became a considerable resort of pilgrims. The later legends (*Bibliotheca hagiographica latina*, nos. 3994-4002) are devoid of authority. One of them relates, probably following the legend of St Eustace, the miracle of the conversion of St Hubert. This conversion, represented as having been brought about while he was hunting on Good Friday by a miraculous appearance of a stag bearing between his horns a cross or crucifix surrounded with rays of light, has frequently been made the subject of artistic treatment. He is the patron of hunters, and is also invoked in cases of hydrophobia. Several orders of knighthood have been under his protection; among these may be mentioned the Bavarian, the Bohemian and that of the electorate of Cologne.

See *Acta Sanctorum*, Novembris, i. 759-930; G. Kurth, *Chartes de l’abbaye de St Hubert en Ardenne* (Brussels, 1903); Anna Jameson, *Sacred and Legendary Art*, i. 732-737 (London, 1896); Cahier, *Caractéristiques des saints*, pp. 183, 775, &c. (Paris, 1867).

(H. De.)

HUBERTUSBURG, a château in the kingdom of Saxony, near the village of Wermsdorf and midway 6 m. between the towns Oschatz and Grimma. It was built in 1721-1724 by Frederick Augustus II., elector of Saxony, subsequently King Augustus III. of Poland, as a hunting box, and was often the scene of brilliant festivities. It is famous for the peace signed here on the 15th of February 1763, which ended the Seven Years’ War. After undergoing various vicissitudes, it now serves the purpose of a lunatic asylum and a training school for nursing sisters.

See Riemer, *Das Schloss Hubertusburg, sonst und jetzt* (Oschatz, 1881).

HUBLI, a town of British India, in the Dharwar district of Bombay, 15 m. S.E. of Dharwar town. Pop. (1901) 60,214. It is a railway junction on the Southern Mahratta system, where the lines to Bangalore and Bezwada branch off south and west. It is an important centre of trade and of cotton and silk weaving, and has two cotton mills and several factories for ginning and pressing cotton. Hubli was in early times the seat of an English factory, which, with the rest of the town, was plundered in 1673 by Sivaji, the Mahratta leader.

HÜBNER, EMIL (1834-1901), German classical scholar, son of the historical painter Julius Hübner (1806-1882), was born at Düsseldorf on the 7th of July 1834. After studying at Berlin and Bonn, he travelled extensively with a view to antiquarian and epigraphical researches. The results of these travels were embodied in several important works: *Inscriptiones Hispaniae Latinae* (1869, supplement 1892), *I. H. Christianae* (1871, supplement 1900); *Inscriptiones Britanniae Latinae* (1873), *I. B. Christianae* (1876); *La Arqueologia de España* (1888); *Monumenta linguae Hibericae* (1893). Hübner was also the author of two books of the greatest utility to the classical student: *Grundriss zu Vorlesungen über die römische Literaturgeschichte* (4th ed. 1878, edited, with large additions, by J. E. B. Mayor as *Bibliographical Clue to Latin Literature*, 1875), and *Bibliographie der classischen Altertumswissenschaft* (2nd ed., 1889); mention may also be made of *Römische Epigraphik* (2nd ed., 1892); *Exempla Scripturae Epigraphicae Latinae* (1885); and *Römische Herrschaft in Westeuropa* (1890). In 1870 Hübner was appointed professor of Classical Philology in the university of Berlin, where he died on the 21st of February 1901.

HÜBNER, JOSEPH ALEXANDER, Count (1811-1892), Austrian diplomatist, was born in Vienna on the 26th of November 1811. His real name was Hafenbredl, which he afterwards changed to Hübner. He began his public career in 1833 under Metternich, whose confidence he soon gained, and who sent him in 1837 as attaché to Paris. In 1841 he became secretary of embassy at Lisbon, and in 1844 Austrian consul-general at Leipzig. In 1848 he was sent to Milan to conduct the diplomatic correspondence of Archduke Rainer, viceroy of Lombardy. On the outbreak of the revolution he was seized as a hostage, and remained a prisoner for some months. Returning to Austria, he was entrusted with the compilation of the documents and proclamations relating to the abdication of the Emperor Ferdinand and the accession of Francis Joseph. His journal, an invaluable clue to the complicated intrigues of this period, was published in 1891 in French and German, under the title of *Une Année de ma vie, 1848-1849*. In March 1849 he was sent on a special mission to Paris, and later in the same year was appointed ambassador to France. To his influence was in large measure due the friendly attitude of Austria to the Allies in the Crimean War, at the close of which he represented Austria at the congress of Paris in 1856. He allowed himself, however, to be taken by surprise by Napoleon’s intervention on behalf of Italian unity, of which the first public intimation was given by the French emperor’s cold reception of Hübner on New Year’s Day, 1859, with the famous words: “I regret that our relations with your Government are not so good as they have hitherto been.” He did not return to Paris after the war, and after holding the ministry of police in the Goluchowski cabinet from August to October 1859, lived in retirement till 1865, when he became ambassador at Rome. Quitting this post in 1867, he undertook extensive travels, his descriptions of which appeared as *Promenade autour du monde, 1871* (1873; English translation by Lady Herbert, 1874) and *Through the British Empire* (1886). Written in a bright and entertaining style, and characterized by shrewd observation, they achieved considerable popularity in their time. A more serious effort was his *Sixte-Quint* (1870, translated into English by H. E. H. Jerningham under the title of *The Life and Times of Sixtus the Fifth*, 1872), an original contribution to the history of the period, based on unpublished documents at the Vatican, Simancas and Venice. In 1879 he was made a life-member of the Austrian Upper House, where he sat as a Clerical and Conservative. He had received the rank of Baron (Freiherr) in 1854, and in 1888 was raised to the higher rank of Count (Graf). He died at Vienna on the 30th of July 1892. Though himself of middle-class origin, he was a profound admirer of the old aristocratic régime, and found his political ideals in his former chiefs, Metternich and Schwarzenberg. As the last survivor of the Metternich school, he became towards the close of his life more and more out of touch with the trend of modern politics, but remained a conspicuous figure in the Upper House and at the annual delegations. That he possessed the breadth of mind to appreciate the working of a system at total variance with his own school of thought was shown by his grasp of British colonial questions. It is interesting, in view of subsequent events, to note his emphatic belief in the loyalty of the British colonies—a belief not shared at that time by many statesmen with far greater experience of democratic institutions.

See Sir Ernest Satow, *An Austrian Diplomatist in the Fifties* (1908).

HUC, ÉVARISTE RÉGIS (1813-1860), French missionary-traveller, was born at Toulouse, on the 1st of August 1813. In his twenty-fourth year he entered the congregation of the Lazarists at Paris, and shortly after receiving holy orders in 1839 went out to China. At Macao he spent some eighteen months in the Lazarist seminary, preparing himself for the regular work of a missionary. Having acquired some command of the Chinese tongue, and modified his personal appearance and

dress in accordance with Chinese taste, he started from Canton. He at first superintended a Christian mission in the southern provinces, and then passing to Peking, where he perfected his knowledge of the language, eventually settled in the Valley of Black Waters or He Shuy, a little to the north of the capital, and just within the borders of Mongolia. There, beyond the Great Wall, a large but scattered population of native Christians had found a refuge from the persecutions of Kia-King, to be united half a century later in a vast but vague apostolic vicariate. The assiduity with which Huc devoted himself to the study of the dialects and customs of the Tatars, for whom at the cost of much labour he translated various religious works, was an admirable preparation for undertaking in 1844, at the instigation of the vicar apostolic of Mongolia, an expedition whose object was to dissipate the obscurity which hung over the country and habits of the Tibetans. September of that year found the missionary at Dolon Nor occupied with the final arrangements for his journey, and shortly afterwards, accompanied by his fellow-Lazarist, Joseph Gabet, and a young Tibetan priest who had embraced Christianity, he set out. To escape attention the little party assumed the dress of lamas or priests. Crossing the Hwang-ho, they advanced into the terrible sandy tract known as the Ordos Desert. After suffering dreadfully from want of water and fuel they entered Kansu, having recrossed the flooded Hwang-ho, but it was not till January 1845 that they reached Tang-Kiul on the boundary. Rather than encounter alone the horrors of a four months' journey to Lhasa they resolved to wait for eight months till the arrival of a Tibetan embassy on its return from Peking. Under an intelligent teacher they meanwhile studied the Tibetan language and Buddhist literature, and during three months of their stay they resided in the famous Kunbum Lamasery, which was reported to accommodate 4000 persons. Towards the end of September they joined the returning embassy, which comprised 2000 men and 3700 animals. Crossing the deserts of Koko Nor, they passed the great lake of that name, with its island of contemplative lamas, and, following a difficult and tortuous track across snow-covered mountains, they at last entered Lhasa on the 29th of January 1846. Favourably received by the regent, they opened a little chapel, and were in a fair way to establish an important mission, when the Chinese ambassador interfered and had the two missionaries conveyed back to Canton, where they arrived in October of the same year. For nearly three years Huc remained at Canton, but Gabet, returning to Europe, proceeded thence to Rio de Janeiro, and died there shortly afterwards. Huc returned to Europe in shattered health in 1852, visiting India, Egypt and Palestine on his way, and, after a prolonged residence in Paris, died on the 31st of March 1860.

His writings comprise, besides numerous letters and memoirs in the *Annales de la propagation de la foi*, the famous *Souvenirs d'un voyage dans la Tartarie, le Thibet, et la Chine pendant les années 1844-1846* (2 vols., Paris, 1850; Eng. trans. by W. Hazlitt, 1851, abbreviated by M. Jones, London, 1867); its supplement, crowned by the Academy, entitled *L'Empire chinois* (2 vols., Paris, 1854; Eng. trans., London, 1859); and an elaborate historical work, *Le Christianisme en Chine, &c.* (4 vols., Paris, 1857-1858; Eng. trans., London, 1857-1858). These works are written in a lucid, racy, picturesque style, which secured for them an unusual degree of popularity. The *Souvenirs* is a narrative of a remarkable feat of travel, and contains passages of so singular a character as in the absence of corroborative testimony to stir up a feeling of incredulity. That Huc was suspected unjustly was amply proved by later research. But he was by no means a practical geographer, and the record of his travels loses greatly in value from the want of precise scientific data.

See, for information specially relating to the whole subject, the Abbé Desgodin's *Mission du Thibet de 1855 à 1870* (Verdun, 1872); and "Account of the Pundit's Journey in Great Tibet," in the *Royal Geographical Society's Journal* for 1877.

HUCBALD (HUGBALDUS, HUBALDUS), Benedictine monk, and writer on music, was born at the monastery of Saint Amand near Tournai, in or about 840, if we may believe the statement of his biographers to the effect that he died in 930, aged 90. He studied at the monastery, where his uncle Milo occupied an important position. Hucbald made rapid progress in the acquirement of various sciences and arts, including that of music, and at an early age composed a hymn in honour of St Andrew, which met with such success as to excite the jealousy of his uncle. It is said that Hucbald in consequence was compelled to leave St Amand, and started an independent school of music and other arts at Nevers. In 860, however, he was at St Germain d'Auxerre, bent upon completing his studies, and in 872 he was back again at St Amand as the successor in the headmastership of the convent school of his uncle, to whom he had been reconciled in the meantime. Between 883 and 900 Hucbald went on several missions of reforming and reconstructing various schools of music, including that of Rheims, but in the latter year he returned to St Amand, where he remained to the day of his death on the 25th of June 930, or, according to other chroniclers, on the 20th of June 932. The only work which can positively be ascribed to him is his *Harmonica Institutio*. The *Musica Enchiriadis*, published with other writings of minor importance in Gerbert's *Scriptores de Musica*, and containing a complete system of musical science as well as instructions regarding notation, has now been proved to have originated about half a century later than the death of the monk Hucbald, and to have been the work of an unknown writer

belonging to the close of the 10th century and possibly also bearing the name of Hucbald. This work is celebrated chiefly for an essay on a new form of notation described in the present day as *Dasia Notation*. The author of the *Harmonica Institutio* wrote numerous lives of the saints and a curious poem on bald men, dedicated to Charles the Bald.

AUTHORITIES.—Sir John Hawkins, *General History of the Science and Practice of Music* (i. 153); *Histoire littéraire de la France* (vi. 216 et seq.); Coussemaker, *Mémoire sur Hucbald* (Paris, 1841); Hans Müller, *Hucbald's echte und unechte Schriften über Musik* (Leipzig, 1884); Spitta, *Die Musica Enchiriadis und seine Zeitalter* (*Vierteljahresschrift für Musikwissenschaft*, 1889, 5th year).

HU-CHOW-FU, a city of China, in the province of Cheh-Kiang (30° 48′ N., 120° 3′ E.), a little S. of Tai-hu Lake, in the midst of the central silk district. According to Chinese authorities it is 6 m. in circumference, and contains about 100,000 families. A broad stream or canal crosses the city from south to north, and forms the principal highway for boat traffic. The main trade of the place is in raw silk, but some silk fabrics, such as flowered crape (*chousha*), are also manufactured. Silk is largely worn even by the lowest classes of the inhabitants.

HUCHOWN, "of the Awle Ryale" (fl. 14th century), Scottish poet, is referred to by Wyntoun in his *Chronicle* in these words:—

"Hucheon,
Þat cunnande was in littratur.
He made a gret Gest of Arthure,
And þe Awntyr of Gawane,
Þe Pistil als of Suet Susane.
He was curyousse in his stille,
Fayr of facunde and subtile,
And ay to pleyssance hade delyte,
Mad in metyr meit his dyte
Litil or noucht neuir þe lesse
Wauerande fra þe suythfastnes."
(Cott. MS. bk. v. II, 4308-4318).

Much critical ingenuity has been spent in endeavouring to identify (*a*) the poet and (*b*) the works named in the foregoing passage. It has been assumed that "Huchown," or "Hucheon," represents the "gude Sir Hew of Eglyntoun" named by Dunbar (*q.v.*) in his *Lament for the Makaris* (i. 53). The only known Sir Hugh of Eglintoun of the century is frequently mentioned in the public records from the middle of the century onwards, as an auditor of accounts and as witness to several charters. By 1360 he had married Dame Egidia, widow of Sir James Lindsay and half-sister of Robert the Steward. His public office and association with the Steward sorts well with the designation "of the Awle Ryale," if that be interpreted as "Aula Regalis" or "Royal Palace." He appears to have died late in 1376 or early in 1377.

The first of the poems named above, the *Gest of Arthure* or *Gest Historyalle* (*ib.* i. 4288), has been identified by Dr Trautmann, "Anglia," *Der Dichter Huchown* (1877), with the alliterative *Morte Arthure* in the Thornton MS. at Lincoln, printed by the E.E.T.S. (ed. Brock, 1865). The problem of the second (*The Awntyr of Gawane*) is still in dispute. There are difficulties in the way of accepting the conjecture that the poem is the "Awntyres of Arthure at the Tern Wathelyne" (see S.T.S., *Scottish Alliterative Poems*, 1897, and Introduction, pp. 11 et seq.), and little direct evidence in favour of the view that the reference is to the greatest of middle English romances, *Sir Gawain and the Grene Knight*. The third may be safely accepted as the well-known *Pistil* [Epistle] *of Swete Susan*, printed by Laing (*Select Remains*, 1822) and by the S.T.S. (*Scottish Alliterative Poems, u.s.*).

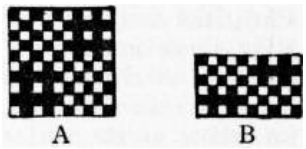
See, in addition to the works named, above, G. Neilson's *Sir Hew of Eglintoun and Huchown of the Awle Ryale* (Glasgow, 1901), which contains a full record of references to the historical Sir Hew of Eglintoun; *Huchown of the Awle Ryale, the Alliterative Poet* (Glasgow, 1902) by the same; J. T. T. Brown's *Huchown of the Awle Ryale and his Poems* (Glasgow, 1902), in answer to the foregoing. See also the correspondence in the *Athenaeum*, 1900-1901, and the review of Mr Neilson's pamphlets, *ib.* (Nov. 22, 1902); and J. H. Millar's *Literary History of Scotland* (1903), pp. 8-14.

HUCHTENBURG, the name of two brothers who were Dutch painters in the second half of the 17th century. Both were natives of Haarlem. Jacob, the elder, of whom very little is known, studied under Berghem, and went early to Italy, where he died young about 1667. His pictures are probably confounded with those of his brother. In Copenhagen, where alone they are catalogued, they illustrate the style of a Dutchman who transfers Berghem's cattle and flocks to Italian landscapes and marketplaces.

John van Huchtenburg (1646-1733), born at Haarlem it is said in 1646, was first taught by Thomas Wyk, and afterwards induced to visit the chief cities of Italy, where, penetrating as far as Rome, he met and dwelt with his brother Jacob. After the death of the latter he wandered homewards, taking Paris on his way, and served under Van der Meulen, then employed in illustrating for Louis XIV. the campaign of 1667-1668 in the Low Countries. In 1670 he settled at Haarlem, where he married, practised and kept a dealer's shop. His style had now merged into an imitation of Philip Wouvermans and Van der Meulen, which could not fail to produce pretty pictures of hunts and robber camps, the faculty of painting horses and men in action and varied dress being the chief point of attraction. Later Huchtenburg ventured on cavalry skirmishes and engagements of regular troops generally, and these were admired by Prince Eugene and William III., who gave the painter sittings, and commissioned him to throw upon canvas the chief incidents of the battles they fought upon the continent of Europe. When he died at Amsterdam in 1733, Huchtenburg had done much by his pictures and prints to make Prince Eugene, King William and Marlborough popular. Though clever in depicting a *mêlée* or a skirmish of dragoons, he remained second to Philip Wouvermans in accuracy of drawing, and inferior to Van der Meulen in the production of landscapes. But, nevertheless, he was a clever and spirited master, with great facility of hand and considerable natural powers of observation.

The earliest date on his pictures is 1674, when he executed the "Stag-Hunt" in the Museum of Berlin, and the "Fight with Robbers" in the Lichtenstein collection at Vienna. A "Skirmish at Fleurus" (1690) in the Brussels gallery seems but the precursor of larger and more powerful works, such as the "Siege of Namur" (1695) in the Belvedere at Vienna, where William III. is seen in the foreground accompanied by Max Emmanuel, the Bavarian elector. Three years before, Huchtenburg had had sittings from Prince Eugene (Hague museum) and William III. (Amsterdam Trippenhuis). After 1696 he regularly served as court painter to Prince Eugene, and we have at Turin (gallery) a series of eleven canvases all of the same size depicting the various battles of the great hero, commencing with the fight of Zentha against the Turks in 1697, and concluding with the capture of Belgrade in 1717. Had the duke of Marlborough been fond of art he would doubtless have possessed many works of our artist. All that remains at Blenheim, however, is a couple of sketches of battles, which were probably sent to Churchill by his great contemporary. The pictures of Huchtenburg are not very numerous now in public galleries. There is one in the National Gallery, London, another at the Louvre. But Copenhagen has four, Dresden six, Gotha two, and Munich has the well-known composition of "Tallart taken Prisoner at Blenheim in 1704."

HUCKABACK,[1] the name given to a type of cloth used for towels. For this purpose it has perhaps been more extensively used in the linen trade than any other weave. One of the chief merits of a towel is its capacity for absorbing moisture; plain and other flat-surfaced cloths do not perform this function satisfactorily, but cloths made with huckaback, as well as those made with the honeycomb and similar weaves, are particularly well adapted for this purpose. The body or foundation of the cloth is plain and therefore sound in structure (see designs A and B in figure), but at fixed intervals some of the warp threads float on the surface of the cloth, while at the same time a number of weft threads float on the back. Thus the cloth has a somewhat similar appearance on both sides. Weave A is the ordinary and most used huck or huckaback, while weave B, which is usually woven with double weft, is termed the Devon or medical huck. The cloths made by the use of these weaves were originally all linen, but are too often adulterated with inferior fibres.



1 Skeat, *Etym. Dict.* (1898), says, "The word bears so remarkable resemblance to Low Ger. *hukkebak*, Ger. *huckeback*, pick-a-back, that it seems reasonable to suppose that it at first meant 'peddler's ware.'" The *New English Dictionary* does not consider that the connexion can at present be assumed.

HUCKLEBERRY, in botany, the popular name in the north-eastern United States of the genus *Gaylussacia*, small branching shrubs resembling in habit the English bilberry (*Vaccinium*), to which it is closely allied, and bearing a similar fruit. The common huckleberry of the northern states is *G. resinosa*; while *G. brachycera* and *G. dumosa* are known respectively as box and dwarf huckleberry. The name *Gaylussacia* commemorates the famous French chemist Gay-Lussac.

HUCKNALL TORKARD, a town in the Rushcliffe parliamentary division of Nottinghamshire, England; 132 m. N.N.W. from London by the Great Central railway, served also by the Great Northern and Midland railways. Pop. (1901) 15,250. The church of St Mary Magdalene contains the tomb of Lord Byron. There are extensive collieries in the vicinity, and the town has tobacco and hosiery works. Small traces are found of Beauvale Abbey, a Carthusian foundation of the 14th century, in the hilly, wooded district W. of Hucknall; and 3 m. N. is Newstead Abbey, in a beautiful situation on the border of Sherwood Forest. This Augustinian foundation owed its origin to Henry II. It came into the hands of the Byron family in 1540, and the poet Byron resided in it at various times until 1818. There remain the Early English west front of the church, a Perpendicular cloister and the chapter-house; while in the mansion, wholly restored since Byron’s time, and in the demesne, many relics of the poet are preserved. To the S. of Hucknall are traces of Gresley Castle, of the 14th century.

HUCKSTER, a dealer or retailer of goods in a small way. The word, in various forms, is common to many Teutonic languages. In Early English it is found as *howkester*, *hokester*, *huxter*; in early modern Dutch as *heuker*, and Medieval Low German as *hoker*; but the ultimate origin is unknown. Huckster apparently belongs to that series of words formed from a verb,—as brew, brewer; but the noun “huckster” is found in use before the verb to huck. Hawker and pedlar are nearly synonymous in meaning, but “huckster” may include a person in a small way of trade in a settled habitation, while a hawker or pedlar invariably travels from place to place offering his wares. In a contemptuous sense, huckster is used of any one who barters, or makes gain or profit in underhand or mean ways, or who over-reaches another, to get advantage for himself.

HUDDERSFIELD, a municipal, county and parliamentary borough in the West Riding of Yorkshire, England, 190 m. N.N.W. from London. Pop. (1901) 95,047. It is served by the Lancashire & Yorkshire and London & North Western railways, and has connexion with all the important railway systems of the West Riding, and with the extensive canal system of Lancashire and Yorkshire. It is well situated on a slope above the river Colne, a tributary of the Calder. It is built principally of stone, and contains several handsome streets with numerous great warehouses and business premises, many of which are of high architectural merit. Of the numerous churches and chapels all are modern, and some of considerable beauty. The parish church of St Peter, however, though rebuilt in 1837, occupies a site which is believed to have carried a church since the 11th century. The town hall (1880) and the corporation offices (1877) are handsome classic buildings; the Ramsden Estate buildings are a very fine block of the mixed Italian order. The market hall (1880) surmounted by a clock-tower is in geometrical Decorated style. The cloth-hall dates from 1784, when it was erected as a clothiers’ emporium. It is no longer used for any such purpose, but serves as an exchange news-room. The Armoury, erected as a riding-school, was the headquarters of a volunteer corps, and is also used for concerts and public meetings. The chief educational establishments are the Huddersfield College (1838), a higher-grade school, the technical school and several grammar-schools, of which Longwood school was founded in 1731. The Literary and Scientific Society possesses a museum. Of the numerous charitable institutions, the Infirmary, erected in 1831, is housed in a building of the Doric order. The chief open spaces are Greenhead and Beaumont parks, the last named presented to the town by Mr H. F. Beaumont in 1880. There is a sulphurous spa in the district of Lockwood.

Huddersfield is the principal seat of the fancy woollen trade in England, and fancy goods in silk and cotton are also produced in great variety. Plain cloth and worsteds are also manufactured. There are silk and cotton spinning-mills, iron foundries and engineering works. Coal is abundant in

the vicinity. The parliamentary borough returns one member. The county borough was created in 1888. The municipal borough is under a mayor, 15 aldermen and 45 councillors. Area, 11,859 acres.

Huddersfield (*Oderesfelte*) only rose to importance after the introduction of the woollen trade in the 17th century. After the Conquest William I. granted the manor to Ilbert de Laci, of whom the Saxon tenant Godwin was holding as underlord at the time of the Domesday Survey. In Saxon times it had been worth l00s., but after being laid waste by the Normans was still of no value in 1086. From the Lacys the manor passed to Thomas Plantagenet, duke of Lancaster, through his marriage with Alice de Lacy, and so came to the crown on the accession of Henry IV. In 1599 Queen Elizabeth sold it to William Ramsden, whose descendants still own it. Charles II. in 1670 granted to John Ramsden a market in Huddersfield every Wednesday with the toll and other profits belonging. By the beginning of the 18th century Huddersfield had become a “considerable town,” chiefly owing to the manufacture of woollen kersies, and towards the end of the same century the trade was increased by two events—the opening of navigation on the Calder in 1780, and in 1784 that of the cloth-hall or piece-hall, built and given to the town by Sir John Ramsden, baronet. Since 1832 the burgesses have returned members to parliament. The town possesses no charter before 1868, when it was created a municipal borough.

HUDSON, GEORGE (1800-1871), English railway financier, known as the “railway king,” was born in York in March 1800. Apprenticed to a firm of linendrapers in that city, he soon became a successful merchant, and in 1837 was elected lord mayor of York. Having inherited, in 1827, a sum of £30,000, he invested it in North Midland Railway shares, and was shortly afterwards appointed a director. In 1833 he had founded and for some time acted as manager of the York Banking Company. He had for long been impressed with the necessity of getting the railway to York, and he took an active part in securing the passing of the York and North Midland Bill, and was elected chairman of the new company—the line being opened in 1839. From this time he turned his undivided attention to the projection of railways. In 1841 he initiated the Newcastle and Darlington line. With George Stephenson he planned and carried out the extension of the Midland to Newcastle, and by 1844 had over a thousand miles of railway under his control. In this year the mania for railway speculation was at its height, and no man was more courted than the “railway king.” All classes delighted to honour him, and, as if a colossal fortune were an insufficient reward for his public services, the richest men in England presented him with a tribute of £20,000. Deputy-lieutenant for Durham, and thrice lord mayor of York, he was returned in the Conservative interest for Sunderland in 1845, the event being judged of such public interest that the news was conveyed to London by a special train, which travelled part of the way at the rate of 75 m. an hour. Full of rewards and honours, he was suddenly ruined by the disclosure of the Eastern Railway frauds. Sunderland clung to her generous representative till 1859, but on the bursting of the bubble he had lost influence and fortune at a single stroke. His later life was chiefly spent on the continent, where he benefited little by a display of unabated energy and enterprise. Some friends gave him a small annuity a short time before his death, which took place in London, on the 14th of December 1871. His name has long been used to point the moral of vaulting ambition and unstable fortune. The “big swollen gambler,” as Carlyle calls him in one of the *Latter-Day Pamphlets*, was savagely and excessively reprobated by the world which had blindly believed in his golden prophecies. He certainly ruined scrip-holders, and disturbed the great centres of industry; but he had an honest faith in his own schemes, and, while he beggared himself in their promotion, he succeeded in overcoming the powerful landed interest which delayed the adoption of railways in England long after the date of their regular introduction into America.

HUDSON, HENRY, English navigator and explorer. Nothing is known of his personal history excepting such as falls within the period of the four voyages on which his fame rests. The first of these voyages in quest of new trade and a short route to China by way of the North Pole, in accordance with the suggestion of Robert Thorne (d. 1527), was made for the Muscovy Company with ten men and a boy in 1607. Hudson first coasted the east side of Greenland, and being prevented from proceeding northwards by the great ice barrier which stretches thence to Spitzbergen sailed along it until he reached “Newland,” as Spitzbergen was then called, and followed its northern coast to beyond 80° N. lat. On the homeward voyage he accidentally discovered an island in lat. 71° which he named Hudson’s Touches, and which has since been identified with Jan Mayen Island. Molineux’s chart, published by Hakluyt about 1600, was Hudson’s

blind guide in this voyage, and the polar map of 1611 by Pontanus illustrates well what he attempted, and the valuable results both negative and positive which he reached. He investigated the trade prospects at Bear Island, and recommended his patrons to seek higher game in Newland; hence he may be called the father of the English whale-fisheries at Spitzbergen.

Next year Hudson was again sent by the Muscovy Company to open a passage to China, this time by the north-east route between Spitzbergen and Novaya Zemlya, which had been attempted by his predecessors and especially by the Dutch navigator William Barents. This voyage lasted from the 22nd of April to the 26th of August 1608. He raked the Barents Sea in vain between 75° 30′ N.W. and 71° 15′ S.E. for an opening through the ice, and on the 6th of July, "voide of hope of a north-east passage (except by the Waygats, for which I was not fitted to trie or prove)," he resolved to sail to the north-west, and if time and means permitted to run a hundred leagues up Lumley's Inlet (Frobisher Strait) or Davis's "overfall" (Hudson Strait). But his voyage being delayed by contrary winds he was finally compelled to return without accomplishing his wish. The failure of this second attempt satisfied the Muscovy Company, which thenceforward directed all its energies to the profitable Spitzbergen trade.

Towards the end of 1608 Hudson "had a call" to Amsterdam, where he saw the celebrated 850
cosmographer the Rev. Peter Plancius and the cartographer Hondius, and after some delay, due to the rivalry which was exhibited in the attempt to secure his services, he undertook for the Dutch East India Company his important third voyage to find a passage to China either by the north-east or north-west route. With a mixed crew of eighteen or twenty men he left the Texel in the "Half-Moon" on the 6th of April, and by the 5th of May was in the Barents Sea, and soon afterwards among the ice near Novaya Zemlya, where he had been the year before. Some of his men becoming disheartened and mutinous (it is now supposed that he had arrived two or three months too early), he lost hope of effecting anything by that route, and submitted to his men, as alternative proposals, either to go to Lumley's Inlet and follow up Waymouth's light, or to make for North Virginia and seek the passage in about 40° lat., according to the letter and map sent him by his friend Captain John Smith. The latter plan was adopted, and on the 14th of May Hudson set his face towards the Chesapeake and China. He touched at Stromo in the Faroe Islands for water, and on the 15th of June off Newfoundland the "Half-Moon" "spent overboard her foremast." This accident compelled him to put into the Kennebec river, where a mast was procured, and some communication and an unnecessary encounter with the Indians took place. Sailing again on the 26th of July, he began on the 28th of August the survey where Smith left off, at 37° 36′ according to his map, and coasted northwards. On the 3rd of September, in 40° 30′, he entered the fine bay of New York, and after having gone 150 m. up the river which now bears his name to near the position of the present Albany, treating with the Indians, surveying the country, and trying the stream above tide-water, he became satisfied that this course did not lead to the South Sea or China, a conclusion in harmony with that of Champlain, who the same summer had been making his way south through Lake Champlain and Lake St Sacrement (now Lake George). The two explorers by opposite routes approached within 20 leagues of each other. On the 4th of October the "Half-Moon" weighed for the Texel, and on the 7th of November arrived at Dartmouth, where she was seized and detained by the English government, Hudson and the other Englishmen of the ship being commanded not to leave England, but rather to serve their own country. The voyage had fallen short of Hudson's expectations, but it served many purposes perhaps as important to the world. Among other results it exploded Hakluyt's myth, which from the publication of Lok's map in 1582 to the 2nd charter of Virginia in May 1609 he had lost no opportunity of promulgating, that near 40° lat. there was a narrow isthmus, formed by the sea of Verrazano, like that of Tehuantepec or Panama.

Hudson's confidence in the existence of a North-West Passage had not been diminished by his three failures, and a new company was formed to support him in a fourth attempt, the principal promoters being Sir Thomas Smith (or Smythe), Sir Dudley Digges and John (afterwards Sir John) Wolstenholme. He determined this time to carry out his old plan of searching for a passage up Davis's "overfall"—so-called in allusion to the overfall of the tide which Davis had observed rushing through the strait. Hudson sailed from London in the little ship "Discovery" of 55 tons, on the 17th of April 1610, and entered the strait which now bears his name about the middle of June. Sailing steadily westward he entered Hudson Bay on the 3rd of August, and passing southward spent the next three months examining the eastern shore of the bay. On the 1st of November the "Discovery" went into winter quarters in the S.W. corner of James Bay, being frozen in a few days later, and during the long winter months which were passed there only a scanty supply of game was secured to eke out the ship's provisions. Discontent became rife, and on the ship breaking out of the ice in the spring Hudson had a violent quarrel with a dissolute young fellow named Henry Greene, whom he had befriended by taking him on board, and who now retaliated by inciting the discontented part of the crew to put Hudson and eight others (including the sick men) out of the ship. This happened on the 22nd of June 1611. Robert Bylot was elected master and brought the ship back to England. During the voyage home Greene and several others were killed in a fight with the Eskimo, while others again died of starvation, and the feeble remnant which reached England in September were thrown into prison. No more tidings were ever received of the deserted men.

Although it is certain that the four great geographical landmarks which to-day serve to keep Hudson's memory alive, namely the Hudson Bay, Strait, Territory and River, had repeatedly been

visited and even drawn on maps and charts before he set out on his voyages, yet he deserves to take a very high rank among northern navigators for the mere extent of his discoveries and the success with which he pushed them beyond the limits of his predecessors. The rich fisheries of Spitzbergen and the fur industry of the Hudson Bay Territory were the immediate fruit of his labours.

See *Henry Hudson, the Navigator* (Hakluyt Society, 1860); and T. A. Janvier, *Henry Hudson* (1909). In 1909 a great celebration of the tercentenary was held in the United States.

HUDSON, JOHN (1662-1719), English classical scholar, was born at Wythop in Cumberland. He was educated at Oxford, where the remainder of his life was spent. In 1701 he was appointed Bodley's librarian, and in 1711 principal of St Mary's Hall. His political views stood in the way of his preferment in the church and university. He died on the 26th of November 1719. As an editor and commentator he enjoyed a high reputation both at home and abroad. His works, chiefly editions of classical authors, include the following: Velleius Paterculus (1693); Thucydides (1696); *Geographiae Veteris Scriptores Graeci minores* (1698-1712) containing the works and fragments of 21 authors and the learned, though diffuse, dissertations of H. Dodwell—a rare and valuable work, which in spite of its faulty text was not superseded until the appearance of C. W. Müller's edition in the Didot series: the editio princeps of Moeris, *De Vocibus Atticis et Hellenicis* (1712); Josephus (1720, published posthumously by his friend Anthony Hall, the antiquary), a correct and beautifully printed edition, with variorum notes and translation.

See Wood, *Athenae Oxonienses*, iv.; introduction to the edition of Josephus; W. Hutchinson, *History of Cumberland* (1794).

HUDSON, a city and the county-seat of Columbia county, New York, U.S.A., on the E. side of the Hudson river, about 114 m. N. of New York City and about 28 m. S. of Albany. Pop. (1890) 9970; (1900) 9528, of whom 1155 were foreign-born; (1910 census) 11,417. It is served by the Boston & Albany, the New York Central & Hudson River and the (electric) Albany & Hudson railways, by river steamboats, and by a steam ferry to Athens and Catskill across the river. The city is picturesquely situated on the slope of Prospect Hill; and Promenade Park, on a bluff above the steamboat landing, commands a fine view of the river and of the Catskill Mountains. Among the public buildings and institutions are a fine city hall, the Columbia County Court House, a public library, a Federal building, a State Training School for Girls, a State Firemen's Home, an Orphan Asylum, a Home for the Aged and a hospital. The city's manufactures include hosiery and knit goods, Portland cement (one of the largest manufactories of that product in the United States being here), foundry and machine shop products, car wheels, ice tools and machinery, ale, beer, bricks and tiles and furniture. The value of the factory products in 1905 was $4,115,525, an increase of 58.1% over that in 1900. The municipality owns and operates the water-works. Hudson, which was originally known as Claverack Landing, was for many years merely a landing with two rude wharfs and two small storehouses, to which farmers in the neighbourhood brought their produce for shipment on the river. Late in 1783 the place was settled by an association of merchants and fishermen from Rhode Island, Nantucket and Martha's Vineyard. The present name was adopted in 1784, and the city was chartered in 1785. For many years Hudson had a considerable foreign commerce and whaling interests, but these were practically destroyed by the war of 1812.

HUDSON BAY (less often, but more correctly, Hudson's Bay), an inland sea in the N.E. of Canada, extending from 78° to 95° W. and from 51° to 70° N. On the east it is connected with the Atlantic Ocean by Hudson Strait, and on the north with the Arctic Ocean by Fox Channel and Fury and Hecla Strait. Its southern extremity between 55° and 51° N. is known as James Bay. It is 590 m. in width, and 1300 from S. to N., including James Bay (350 m.) and Fox Channel (350 m.). The customary use of the term includes James Bay, but not Fox Channel. The average depth of water is about 70 fathoms, deepening at the entrance of Hudson Strait to 100 fathoms. James Bay is much shallower, and unfit for shipping save for a central channel leading to the mouth of the Moose river. The centre and west of the main bay are absolutely free from shoals, rocks or islands, but

down its east coast extend two lines of small islands, one close to shore, the other at 70 to 100 m. distance, and comprising a number of scattered groups (the Ottawa Islands, the Sleepers, the Belchers, &c.).

Into Hudson and James Bays flow numerous important rivers, so much so that the water of the latter is rather brackish than salt. Beginning at the north-west, the chief of these are Churchill, Nelson (draining Lake Winnipeg, and the numerous inland rivers of which it is the basin), Hayes (the old boat route of the *voyageurs* to Winnipeg), Severn, Albany, Moose, Rupert river (draining Lake Mistassini), Nottaway, East Main, Great Whale and Little Whale.

Save for some high bluffs on the east and north-east, the shores of the bay are low. Around much of James Bay extend marshes and swampy ground. Geologically the greater part of the Hudson Bay district belongs to the Laurentian system, though there are numerous outcrops of later formation; Cambro-Silurian on the south and west, and to the north of Cape Jones (the north-eastern extremity of James Bay) a narrow belt of Cambrian rocks, of which the islands are composed. Coal, plumbago, iron and other minerals have been found in various districts near the coast. The climate is harsh, though vegetables and certain root crops ripen in the open air as far north as Fort Churchill; cattle flourish, and are fed chiefly on the native grasses; spruce, balsam and poplar grow to a fair size as far as the northern limit of James Bay. Caribou, musk ox and other animals are still found in large numbers, and there is an abundance of feathered game—ducks, geese, loons and ptarmigan; hunting and fishing form the chief occupations of the Indians and Eskimo who live in scattered bands near the shore. The bay abounds with fish, of which the chief are cod, salmon, porpoise and whales. The last have long been pursued by American whalers, whose destructive methods have so greatly depleted the supply that the government of Canada is anxious to declare the bay a *mare clausum*.

Hudson Strait is about 450 m. long with an average breadth of 100 m., narrowing at one point to 45. Its shores are high and bold, rarely less in height than 1000 ft., save on the coast of Ungava Bay, a deep indentation on the south-east. No islands or rocks impede navigation. Its depth is from 100 to 200 fathoms. Owing to the violence of the tides, which rise to a height of 35 ft., it never absolutely freezes over.

After three centuries of exploration, the navigability of Hudson Bay and Strait remains a vexed question. To Canada it is one of great commercial interest, and numerous expeditions have been made and reports issued by the Geological Survey. From Winnipeg to Liverpool via Churchill is over 500 m. less than via Montreal, and from Edmonton to Liverpool almost 1000 m. less. Were navigation open for a sufficient time, such a route for the grain of the Canadian and American west would be of enormous advantage. But the inlet from the Arctic sends down masses of heavy ice, which drift about in the bay and the strait. Past the mouth of the strait flows a stream often over 100 m. wide, of berg and floe ice, carried by the Arctic current. Owing to the proximity of the Magnetic Pole (in Boothia) the compass often refuses to work. For sailing ships, such as the Hudson’s Bay Company has long employed, the season for safe navigation is from the 15th of July to the 1st of October. In over 200 years very few serious accidents have occurred to the company’s ships within these limits. It is claimed that specially built and protected steamers would be safe from the 15th of June till the 1st of November, and the problem may be solved by ice-breaking vessels of great power. The only good harbour available is Fort Churchill, at the mouth of the Churchill river, which is large and easy of access. Moose Factory (at the foot of James Bay) and York Factory (at the mouth of the Nelson) are mere roadsteads. Marble Island, south of Chesterfield Inlet, where the whalers winter, is too far north for regular shipping.

The Cabots entered the strait in 1498, and during the next century a series of Elizabethan mariners; but the bay was not explored until 1610, when Henry Hudson pushed through the ice and explored to the southern limit of James Bay.

See Lieutenant Gordon, R.N., *Reports on the Hudson’s Bay Expeditions* (1884, 5, 6); William Ogilvie, *Exploratory Survey to Hudson’s Bay in 1890* (Ottawa, 1891); R. F. Stupart, *The Navigation of Hudson’s Bay and Straits* (Toronto, 1904).

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