Transcriber's Note

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

NEW YORK, July 14, 1877.

Vol. XXXVII.—No. 2. [NEW SERIES.]

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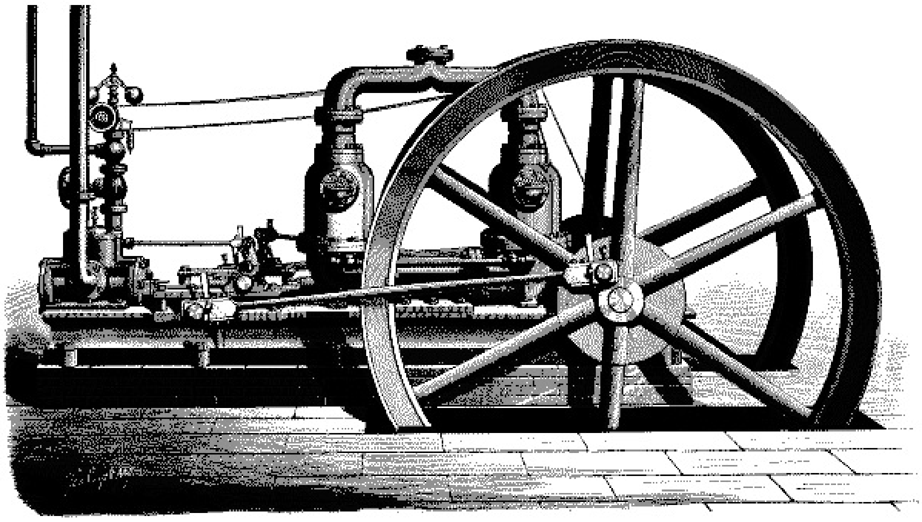
Contents:

(Illustrated articles are marked with an asterisk.)

BOWER'S PATENT AIR COMPRESSOR.

The new air compressor herewith illustrated may be operated by steam or water power, and is available for work in mines, tunnels, or quarries, for driving rock drills, coal cutters, and hauling and pumping engines, working mining pumps, for use in factories, and in fact for all service where a safe and efficient power is required. The construction of the machine, the capacity of which differs according to the amount of power required, will readily be understood from the illustration. Above the air cylinder are two distinct air chambers, each having two induction or receiving valves, which cushion on rubbers. With the movement of the piston these chambers alternately receive and force the compressed air through check valves placed in the upper part of the air compartment, both compartments being connected with one pipe conveying the air to the ordinary air receiver. These check valves lift alternately, and cushion on water; and as the compressed air is forced into the pipe connecting with the receiver, without a possibility of any of it escaping back into the receiving chambers, it is claimed that there is the smallest possible loss of power, and that the machine will give fully 90 per cent of steam power expended in the shape of compressed air. The compressor is compact in form, strongly made, simple in construction, and not liable to get out of order. One peculiarity in its construction is that no water jacket or hollow piston is used; yet under any of the extreme pressures to which the machine has been tested, no inconvenience, we are informed, from heat has been perceptible.



BOWER'S AIR COMPRESSOR.

In connection with the compressor, receivers of various sizes are used, into which the air is pumped and thence conveyed by pipe to the location where required, even if it be a mile or more, the loss by friction between receiver and point of utilization of the air being, it is claimed, under 2 lbs. of the pressure.

The manufacturers also build water-power compressors, one of which, driven by 75 to 100 horse power, they have recently shipped to Utah. The machine is intended to convey the air through iron tubes 5,000 feet to the mouth of a silver mine, where a 50 horse power hoisting and a 25 horse power pumping engine will be driven by air instead of steam, and a tube will be extended into the mine 1,000 feet deep, where the power drills and small pumps will be operated by air also.

The manufacturers submit a number of excellent testimonials from parties using the machine. From one, we learn, that at the Antelope and Prince of Wales mine, near Alta City, Utah, the compressor runs 10 hours per day, and supplies compressed air to two 3 inch drills used in running levels. The distribution terminates at distances of from 1,000 to 2,000 feet from the compressor. The machine also drives one hoisting engine and ventilates the lower part of the mine. The main supply pipe is three inches in diameter, 2,300 feet long, and is tapped by two inch pipe wherever power is required. The expenditure of fuel is one cord of green pine wood and 600 lbs. of bituminous coal per 10 hours. Air pressure in receiver 100 lbs. This pressure is reported to be obtained by 70 lbs. of steam as indicated by the gauges.

For further particulars, address the manufacturers, Messrs. Griffith and Wedge, Zanesville, Ohio.

Death of Professor Santini.

A cable dispatch announces the death of the Italian astronomer, Giovanni Santini. The Professor was born at Tuscany, June 30, 1786, and was in the ninety-first year of his age. He graduated at the University of Pisa. He soon devoted himself to a study of the exact sciences, and in 1814 he had achieved so much distinction that he was appointed to a professorship in the Padowa Observatory in place of Vincenzo Cheminello. In 1825 he was appointed Rector of the University, and up to the time of his death he held the position of Professor of Astronomy and Director of Mathematical Studies. He was generally esteemed by the learned societies of Europe, and held a number of honorary titles and degrees from various leading universities. He was also a correspondent of the French Academy. The principal books published by him are strictly scientific, such as "Decimal Arithmetic" (1808), "Elements of Astronomy" (1820), "Logarithms and Trigonometry," and "Optical Problems" (1821-23). Some of his elementary works on astronomy for beginners are the best ever published in Italy.

John Yule.

The death is announced of Mr. John Yule, of the Hutchestown Engine Works, Rutherglen, N. B., at the age of 66. During early life, Mr. Yule went the round of the best engineers' shops in Scotland and England, and became one of the recognized leaders in engineering progress. His inventiveness took various directions, amongst other fruits being an improved rotary engine, a compensating governor for the steam engine, and a screw tap, drill, and mandrel. For the latter he was awarded the silver medal of the Scottish Society of Arts. For some years Mr. Yule acted as the manager of the boiler department of Messrs. Robert Napier & Son's establishment, but eventually resumed business at the Hutchestown Works, and devoted attention amongst other matters to the improvement of swing bridges and steam cranes and hammers. In the former line two of his most important works are the plate girder bridge over the entrance to one of the docks at Port Glasgow, for the Caledonian Railway, erected from plans by Messrs. Bell and Miller, C.E., Glasgow; and a lattice girder bridge over the entrance to Kingston Dock, Glasgow Harbor. Owing to the angle at which this last bridge crosses the dock, great difficulties were experienced in working out the mechanical details so as to admit of easy motion. These were skillfully overcome, and the bridge was, as finally erected, a monument of his design as well as workmanship. The Blackhill incline on the Monkland Canal, constructed nearly a quarter of a century ago, is a sample of Mr. Yule's mechanical powers. Of late years he was largely engaged as a professional valuator.

Business Prospects.

We have recently taken the pains to make inquiries from the more eminent bankers and merchants in the chief cities of the interior, and the results of our inquiries have tended to confirm the belief we have more than once expressed in this journal, that although, from various causes, there is overhanging a portion of our American industries a cloud of gloom and depression, still throughout the nation at large there is going on a process of growth and recovery from which the best results are anticipated. How long we shall have to wait before the life which is at work silently and secretly beneath the surface will put forth its full power, in the full harvest of productive activity, is, of course, impossible to foretell. What is chiefly important for us to know, however, is that the progress we are making tends upwards and not downwards, and that it promises to lead our industry and commerce to a brighter and not to a darker future.—*Financial Chronicle.*

To Disinfect Rooms.

The disinfection of a room is not complete unless the walls have been thoroughly cleansed. If they are papered, the paper must be removed and the surface beneath carefully scraped and washed. If the walls are painted, they should be washed with caustic soda. The ceiling should also be subjected to a similar treatment.

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NEW YORK, SATURDAY, JULY 14, 1877.

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CARRYING PEACE INTO AFRICA.

To carry war into Africa has been a proverb ever since Rome vowed the destruction of Carthage. But the Carthagenian invasion was a modern episode in Africa's experiences of that nature. On one of the earlier monuments of Egypt there is figured a slave-hunter's raid upon an Ethiopian village, the horrid details of which are said by travelers to be an accurate picture of a slave raid of to-day. The same murderous work has been going on incessantly for at least 4,000 years: how much longer there is no telling. For all these ages the African borders have known war and war only, and of the most destructive and barbarizing nature.

Recently, under the influence of Sir Samuel Baker, Colonel Gordon, and the civilized world in general, the Khedive of Egypt has carried war into the interior in the interests of peace: a conquest in a measure justified by the suppression of inter-tribal war for the filling of slave pens, and the abolition of the slave trade down the Nile. A similar reform has been effected on the east coast by the pressure of English power on the Sultan of Zanzibar. And the immediate effect of these two movements has been to prevent the butchery or enslavement of not less than half a million negroes annually.

A still more promising invasion of Africa has just been decided upon in the International Geographical Conference in Brussels: an invasion wholly in the interests of peace and civilization. At the meeting, a year ago, it was declared advisable to establish, by international effort, a line of permanent commercial stations from Bagomoyo, on the coast of Zanzibar, to St. Paul de Loanda, on the opposite Atlantic coast; the first stations to be at Ujiji, where Stanley found Livingstone, on the eastern shore of lake Tanganyika; at Nyangwe, Livingstone's furthest point northward on the Lualaba; and at some point further west on the route of Cameron, to be fixed in the dominions of Muata Yamvo, one of the most powerful chiefs of Central Africa. At the second conference, which ended June 24, arrangements were made for sending out the first expedition toward Tanganyika.

The object of the proposed stations is the development of civilization by commerce, not by religious propaganda. Primarily they will serve as bases of operation for explorers of the interior, a sort of *entrepôts*, where the explorer may supply himself with provisions, instruments, and goods, and thus save the cost and embarrassment of an army of porters from the coast. They will also serve as places of refuge for explorers in times of sickness and other reverses, which have hitherto so terribly hampered explorers. The heads of these pioneer establishments are to be men of scientific training and proved executive ability; and each will be aided by a physician-naturalist and a few skilled artisans. The points thus far chosen are on a line regularly traveled by the caravans of Arab traders, carrying coffee, tea, sugar, arms, and woven goods to permanent Arab residences and trading stations in the interior. An agent of the London Missionary Society has already begun the survey of a route for ox teams as far as lake Tanganyika; and Cameron has expressed the opinion that a light narrow-gauge railway could be constructed from the coast to the lake at a cost not exceeding four thousand dollars a mile. The traffic along such a road, he thinks, would soon pay interest on the outlay.

The unexplored region thus to be opened up to civilization and commerce (other than in human beings) is larger than the United States east of the Mississippi. Around it is a still larger region of partially explored country of unequalled fertility, abounding in great lakes and navigable rivers, and for the most part so high above the sea that the products of the tropics mingle with those of the temperate zone. The cereals, durah, maize, rice, sugar cane, starch-yielding roots and tubers, cotton, coffee, tobacco, spices, gums and caoutchouc, dye-stuffs and medicinal plants, the banana, fig, date, orange, and the vine are among the known products of this region; and all are capable of becoming important staples of foreign commerce. The country is not less rich in coal, iron, copper, gold, and other valuable minerals. The climate, though moist from abundant rain, is less debilitating than India or Brazil; and everywhere, away from the miasmatic coast regions and the marshes of the lower river courses, European explorers have found small cause for complaining of excessive heat or unhealthiness. On the elevated plateaus which cover so large a part of Central Africa, the climate is like that of the sanitariums of India; while among the mountains the finest climates of the world are fairly rivalled. Stanley found in the mountainous region between the great lakes and within a degree of the equator every climatic condition and every element of landscape beauty that could attract and delight a white colony. It was a perfect alpine country, with mountains rising from twelve to fifteen thousand feet, yet free from alpine cold and snow. Countless torrents from the hills watered ever-verdant valleys as beautiful as those of Tyrol, lying under a brilliant equatorial sun, yet with a climate as cool and equable as any European might desire. Further south, among the mountains about Lake Nyassa, the same features are presented on a grander scale: a country aptly described as a second Switzerland of gigantic proportions.

There can be no question of the ability of Europeans to sustain themselves in the greater part of the interior—certainly on all the higher plateaus—nor of the possibility of building up in Central Africa a great civilized empire. Nature offers every facility, and the native population seem to be well fitted for productive industry. In every respect they are physically and morally superior to the negroes of the coast, and only need protection and the encouragement of legitimate commerce to weld them into a great nation. Already they stand on the borders of civilization. They are intelligent, industrious, and not unskillful in the manufacture of iron and copper ornaments, utensils, and weapons. The arts of tanning, spinning, weaving, dyeing, mat-making, etc., are widely diffused among them, and many of their products are remarkable for their fineness and strength. They carry on agriculture with considerable success; and, notwithstanding the chronic state of insecurity incident to slave-hunting, their wealth in cattle is very great. As soon as the disturbing and impoverishing influence of the slave traffic is abated, and a market provided for the products of peace, the advancement of the people in civilization is likely to go on with great rapidity. As the source of raw materials which we need, and as a market for the surplus manufactures of Europe and America, the country offers, to say the least, many attractions; and it will not be surprising if, within fifty years, thriving commercial stations will be founded on all its great lakes and rivers, and connected with the outer world by telegraphy, railways, and steamship lines.

ADDRESS OF CLARENCE KING ON CATASTROPHISM.

Mr. Clarence King lately delivered an interesting address before the Sheffield Scientific School of Yale College, New Haven, Conn., under the title of "Catastrophism, or the Evolution of Environment," which promises to evoke considerable discussion. We subjoin an abstract of the principal features of the address, which is quite lengthy. The full text will be found in our SUPPLEMENTS, Nos. 80, 81.

Mr. King refuted the doctrine of slow evolution as taught by Huxley and Darwin, and declared that the surface of the earth and climate had been subject to sudden and catastrophic mutation, which included in its environment all types of life.

He reasoned that marine fossils are found entombed in rocky beds far remote from present seas; and that these beds were once sea bottoms that have been upheaved by convulsions of Nature. The earliest history of mankind is pregnant with catastrophe, and we have historic story and biblical record of its sudden and destructive energy. He called to mind the vast and massive eruptions of the Pliocene basalt as seen upon our own continent.

The great obvious changes in the rocky crust were referred to a few processes; the sub-aerial decay of continents, delivery by streams of land-detritus into the sea, the spreading out of these comminuted materials upon a pelagic floor, and lastly upheaval, by which oceanic beds were lifted up into subsequent land masses. All these processes he declared to have been more rapid in the past than now. Suddenness, world-wide destructiveness, were the characteristics of geological changes. Periods of calm, like the present, are suddenly terminated by brief catastrophic epochs. Successive faunas and floras were created only to be extinguished by general cataclysms.

He believed in recurrent, abrupt accelerations of crust change, so violent as to destroy all life on the globe. He declared the idea to be the survival of a prehistoric terror, and was backed up by breaks in the great palæontological record. Of the geologic features of our continent, he said that beneath our America lies buried another distinct continent, which he called Archæan America, which was made up of what was originally ocean beds lifted into the air and locally crumpled into vast mountain chains, which were in turn eroded by torrents into mountain peaks. The original coast lines of this continent we may never be able fully to survey, but its great features, the lofty chains of the mountains which made its bones, were very nearly co-extensive with our existing systems, the Appalachians and Cordilleras. The cañon-cutting rivers of the present Western mountains have dug out the peaks and flanks of those underlying, primeval uplifts and developed an astonishing topography; peaks rising in a single sweep 30,000 feet from their bases, precipices lifting bold, solid fronts 10,000 feet into the air, and profound mountain valleys. The work of erosion, which has been carried on by torrents of the quaternary age, brings to light buried primeval chains loftier than any of the present heights of the globe.

At the close of the Palæzoic age, two enormous masses of what, probably, were then continents began to sink, and as they disappeared the present Atlantic and Pacific oceans appeared, while the sea-floor of a then ocean, emerged, and became the new continent of America. Dividing this new continent was a sea, but catastrophe removed this sea and resulted in the folding up of mountain ranges 20,000 and 40,000 feet in height, thereby essentially changing the whole climate of the continent. Of the land life of the mesozoic age we have abundant remains. The wonderful reptilian and avian fauna of the mesozoic age is now familiar to all. But after the catastrophe, and the change of climate which must necessarily have ensued, this fauna totally perished.

After criticising the opinions of Huxley, Lyell, Hutton, Darwin, and others, he recurred to the effects of sudden terrestrial or cosmical changes, and conceived that the effects of these changes would be, first, extermination; secondly, destruction of the biological equilibrium; and thirdly, rapid morphological change on the part of plastic species. When catastrophic change burst in upon the ages of uniformity, and sounded in the ear of every living thing the words "Change or die!" plasticity became the sole principle of salvation. And plasticity is the key to survival and prosperity. Mr. King remarked in conclusion of his address: "He who brought to bear that mysterious energy we call life upon primeval matter bestowed at the same time a power of development by change, arranging that the interaction of energy and matter, which make up environment should, from time to time, burst in upon the current of life and sweep it onward and upward to ever higher and better manifestations. Moments of great catastrophe, thus translated into the language of life, become moments of creation, when out of plastic organisms something newer and nobler is called into being."

DUPLEX EDUCATION.

The age in which we live is a fast one, and he who does not move with equal celerity, and keep pace with those around him, is ruthlessly thrust to the wall, and remains there unless he has strength and will to regain the lost position. We call to our aid every force of Nature and invoke the assistance of every appliance with which we are cognizant. We call our fathers slow, and to us they were so; but there was the same need of celerity in their every-day life as to-day there is in ours.

While calling to our aid the elements of Nature and adapting thousands of mechanical appliances to our wants, do we not often feel that there is beyond all these a "something" that may be invoked and trained to help us on in the race of life? Occasionally we find dim glimmerings of this "something" that we believe will eventually grow to be one of the prominent sciences. Physiologists tell us that the human brain is double, that the right and left lobes act in a degree independent of each other—the right lobe of the brain controlling the physiology of the left side of the individual from head to heel, while the left lobe exercises a like dominion on the opposite side. Grant this to be true, then can be explained the idiosyncrasy that is occasionally seen in individuals, of which we may instance that of writing at the same time with both hands; and again we have heard of telegraph operators sending and receiving two messages at the same time, operating with both hands, and independent of each other. It is said that Nasmyth, the inventor of the steam hammer, could actually produce two sketches or drawings in this way and at the same time. It is also affirmed that Sir Charles Fox, the architect of the Exhibition building of 1851, could write upon two ideas at the same time and transfer these ideas simultaneously to paper with right and left hand. The mechanic can often be found who can operate upon one piece of mechanism, while at the same time his brain is busy upon the study of some unborn idea, foreign to that work upon which he is laboring. Writers can be found who can write out one train of ideas, while ideas entirely different are being cogitated upon somewhere in their craniums. We have even heard it affirmed that an indistinct glimmering of a third idea would occasionally peep around the corner of the caputs of these favored ones.

Why not educate this? Why not form schools and institutions to bring it out and lead the brain to perform this double function? It can certainly be done. The world wants it, surely. The age demands it. Individuals need it. If these individuals can succeed and become experts in this method of double work, will not double compensation and a greater remuneration be their reward? This, certainly, will be an incentive to its acquirement. Go to the apprentice when first he takes position beside the vise, with chipping chisel in one hand and hammer in the other. The injunction he mentally receives as he raises the hammer is, that to miss the chisel is to hit his knuckles. After a few demonstrative blows he knows what it means, and therefore chisel and hammer soon come by some strange process to harmonize in action, so that in whatever position the head of the chisel may be, the blow is sure to be properly received, and that, too, without any sensible effort on his part. In this illustration both right and left hand are taught to act, by brain dictation, in a certain concerted manner.

Again, we find that mutes have been learned to articulate words and sentences by proper education, they being taught to imitate the motions of the mouth and labial organs as by their tutors directed. Education can do much, and these are some of its results. Can we not by proper teaching produce all the results as shown in the case of Nasmyth and Fox. The first lessons must necessarily be simple. For instance, two things done at the same time with both hands, giving expression at this time to ideas connected therewith, but distinct from each other. From this simple lesson we progress, and, as the ultimatum, we may arrive at greater achievements than Nasmyth or Fox ever dreamed of. We may find that we can so divide our entity that we can be conscious of a double-brain existence in a dual action.

THE CARRIGEEN CROP.

To the great majority of people, Carrigeen, under the more familiar name of Irish Moss, is known chiefly as the basis of a pleasant and wholesome drink for the sick room, or as an article of use in the preparation of delicacies for the table. Comparatively few are aware of its wide and varied use in the arts, or that the thousands of barrels of it employed annually by our manufacturers of paper, cloth, felt, and straw hats, etc., and by brewers, is not an Irish, but an American product, and, speaking strictly, is not a moss but a seaweed.

Carrigeen (*chondrus crispus*) is to be found more or less abundantly all along our northern coast, ranging between the low water line and the depth of forty feet, or so; but as a rule its fronds, which correspond to the leaves of air plants, are so numerously inhabited by small mollusca that they are spoiled for other use. The clean-growing article seems to be limited almost wholly to certain ledges in the neighborhood of Scituate, Mass.—a section of coast guarded by the celebrated Minot Ledge Lighthouse, and famous for its danger to shipping. Here, where the waves of the Atlantic dash with full force upon the rocky coast, the carrigeen grows to perfection; and wherever it escapes the spawn of mussels and other shellfish, is gathered during the summer season in vast quantities.

The harvest begins in May and ends about the first of September. The gathering is made in two ways—by hand-picking during exceptionally low tides, and by means of long-handled iron-toothed rakes at ordinary tides. Of course the work cannot be carried on except during fair weather. Hand-pulling is possible only during the bi-monthly periods of spring tides, that is, when the moon is full and again at new moon. At such times high tide occurs about midday and midnight, and the ledges are exposed for moss gathering morning and evening. The mossers' boats are rowed to the rocks where the finest grades abound, and the gatherers select with great care the growths that are freest from minute shells and other foreign matter. This portion of the crop, if properly handled afterwards, generally goes to the apothecary and fetches a price two or three times that of the common grade.

As the tide rises the pickers are driven to their boats, and proceed to the outer moss-bearing rocks where the rake is used, as it also is during ordinary low tides. Moss taken in this way is not so clean as the hand-picked, and is always mixed with tape grass, which must be removed during the process of curing and packing.

The curing of the moss is the most critical part of this peculiar farming. On being brought to the shore the moss is black and unsightly; it must be bleached as well as dried. The bleaching is effected by repeated wetting and drying in the sun; and as the moss is readily soluble in fresh water the bleaching beds are situated near the banks of the salt creeks that abound along the shore. After drying, the moss is packed in tubs and rolled to the water, where it is thoroughly washed, then rolled back to the bleaching bed, to be dried again in the sun. Five or six such exposures are usually sufficient. On the bleaching ground, the moss is carefully spread and turned, and watchfully guarded against wetting by rain. In this process it turns from black to red, then to the yellowish-white of the perfected article. When properly cured the moss is stored in bulk, in shanties; where, as time permits, it is picked over and packed in barrels. The crop averages about half a million pounds a year; and thanks to the brighter and more abundant sunshine of our coast, the moss has a brighter color and is of finer quality than the Irish product.

CATASTROPHISM IN GEOLOGY.

Mr. Clarence King was probably not a little surprised to learn from the Tribune that in his most suggestive address on "Catastrophism and the Evolution of Environment," he had turned the guns of Geology upon Biology; and that in calling attention to the influence of periods of accelerated change in environment upon exposed types of life he had swept away the "fundamental doctrines upon which has been built the scheme of development by natural selection and the survival of the fittest." Certainly nothing in the address betrays any consciousness of possible effects of that sort. And it is quite probable also that Mr. King will have to suffer some annoyance from seeing his name set up at gaze, like Joshua's moon in Ajalon, by the unscientific press generally, as that of the newest champion of orthodoxy against the leaders of modern scientific thought: a penalty which scientific men always have to pay for emphasizing neglected truths.

Mr. King certainly deals some telling blows against the position of the stricter school of Uniformitarians in geology, and brings into prominence a much neglected element in the struggle for existence; but there is no scientific revolution threatened, nor are any crumbs of comfort spread for those endeavoring to arrest the natural drift of scientific progress.

The issue between Mr. King and the sticklers for uniformity in rates of geological change is simply this: In the reaction against the sweeping cataclysms, the sudden wipings out of whole creations and the sudden introductions of new worlds of life believed in by earlier geologists, the modern English school has come to look upon time and the slower modifications of the earth's surface, now observable, with the struggle for existence under easy conditions, as the chief factors in geological change and its accompanying variations in the forms of life. Mr. King, on the other hand, insists that in so doing they have taken too little account of catastrophic changes, that is, widespread and sudden movements of sea and land. In other words, he raises rapid change of environment from the subordinate place it has hitherto occupied in the scheme of historical development, and gives special emphasis to the grand geologic movements which have to do with such changes.

In this Mr. King has unquestionably rendered good service to the science he has done so much to extend and honor in the field; while the illustrations from American geology which he brings to bear on the subject are as likely as his sturdy opinions to attract attention. Yet we are inclined to think that in some things he has allowed his enthusiasm to run away with him. The stolid self-confidence of extreme Uniformitarians has tempted him to exaggerate the periodic accelerations of geologic and biologic movement, and to overstate their effects quite as much as others have underestimated them; and when he charges the followers of Lyell with intellectual near-sightedness and a lack of "the very mechanism of imagination," they may possibly be able to retort not unjustifiably that he has mistaken the natural foreshortening of the geological vista due to distance for actual brevity; and that his belief in the abruptness and suddenness of the great changes which the earth's strata record, may be due to his own lack of sustained imaginative power for grasping and interpreting all the evidences of the enormous time really involved. But this is a question not of imaginative capacity but of logical deduction from observed facts; and however abrupt the beginning of some of the great geologic movements may have been, their subsequent progress cannot in all cases have been so rapid as to allow of their being called catastrophic in any ordinary acceptation of the term.

Take, for example, the alleged catastrophe which marked the close of the mesozoic age in the West. Of this movement Mr. King remarks: "In a quasi-uniformitarian way, 20,000 or 30,000 feet of sediment had accumulated in the Pacific and 14,000 in the [American] mediterranean sea; when these regions, which, during the reception of sediment, had been areas of subsidence, suddenly upheaved, the doming up of the middle of the continent quite obliterating the mediterranean sea and uniting the two land masses into one. The catastrophe which removed this sea resulted in the folding up of mountain ranges 20,000 and 40,000 feet in height, thereby essentially changing the whole climate of the continent."

That this great change occurred, and was attended with an obliteration of the wonderful reptilian and avian fauna of the mesozoic age, is most true: that it occurred suddenly does not appear. On the contrary, there is evidence to show that the prodigious folding up of mountain ranges involved could not have proceeded with sufficient rapidity to turn the course of a stream of water. It happened that one of those folds—one which, had no denudation been going on meanwhile, would have lifted its crest higher than the highest peak of the Himalayas—lay directly across the course of the Colorado river. The river held its course uninterruptedly, sawing its way through the uplift until six vertical miles of rocky strata had risen past it. At no time, therefore, could the rapidity of motion in the bulging strata have exceeded the capacity of the river to wear away the obstruction, and the bulge was fifty miles across! We do not know how rapidly a river may sink its channel through such a rising barrier; but we do know that a process of that nature cannot legitimately be described as swift or sudden. And surely it requires not less intellectual far-sightedness and imaginative faculty to carry the mind across the enormous stretch of time involved in such a change slowly wrought—a period during which at least three vertical miles of the rising mountain fold was worn down by rain and atmospheric abrasion—as to mass the continental doming, the mountain folding, and the attendant life changes together as a convulsive "catastrophe."

Mr. King, however, is not a Catastrophist of a very violent sort. He shelves among the errors of the past the belief in such cataclysms as Cuvier believed in, involving world-wide destruction of all life—"the mere survival of a prehistoric terror, backed up by breaks in the palæontological record and protected within those safe cities of refuge, the Cosmogonies;" though he rejects as equally unsatisfactory the mild affirmations of the Uniformitarians, that existing rates of change and indefinite time are enough to account for all the geological record. With our present light, he holds, geological history seems to be a dovetailing together of the two ideas. "The ages have had their periods of geological serenity, when change progressed in the still, unnoticeable way, and life through vast lapses of time followed the stately flow of years; drifting on by insensible gradations through higher and higher forms, and then all at once a part of the earth suffered short, sharp, destructive revolution unheralded as an earthquake or volcanic eruptions." Thus stated, his position does not seem to be radically different from that of the broader Uniformitarians, except that he marks the periods of accelerated physical change, and not those of comparative quiescence, as the dominant ones in their influence on life-change. He takes high and strong ground, too, in insisting that it is the business of geology not simply to decipher and map out the changes which have taken place in the configuration of the globe and in its climatic conditions, but also to investigate and fix the rates of change. And when the evolution of environment takes form as a distinct branch of geology, he expects to witness a marked modification in the dominant views of biologists. Its few broad laws will include "neither the absolute uniformitarianism of Lyell and Hutton, Darwin and Haeckel, nor the universal catastrophism of Cuvier and the majority of teleogists." "Huxley alone among prominent evolutionists opens the door for a union of the residue of truth in the two schools, fusing them in his proposed evolutional geology."

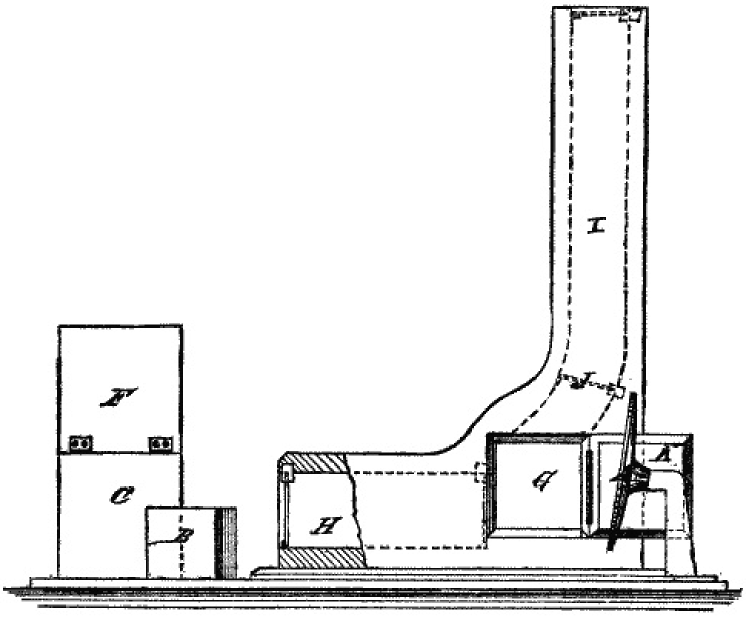
So, on looking back over a trail of thirty thousand miles of geological travel, Mr. King is impelled to say that Mr. Huxley's far-sighted view perfectly satisfies his interpretation of the broad facts of the American continent.

Of Mr. King's observations in regard to plasticity of physical structure in connection with rapidly changing environment and the struggle for existence, we propose to speak at another time.

The great stone monuments of England, like Stonehenge, are supposed, by Mr. James Fergusson, to be military trophies, erected in the time of King Arthur on the battle fields by the victorious armies.

A NEW APPARATUS FOR STORING AND UTILIZING SOLAR HEAT.

The apparatus herewith illustrated is devised to collect solar heat or other heat, store it up in a heat reservoir—a mass of iron or other suitable material—confine it in the reservoir until needed, keep it in such form that it can be transported from place to place, and utilize it for industrial or other purposes.



APPARATUS FOR STORING AND UTILIZING SOLAR HEAT.

A is a concave mirror for concentrating the solar rays upon the heat reservoir, B, which is a mass of iron. C is the heat box for confining the heat until needed, and also for serving as package for transporting the heat reservoir when hot. G is the heat reservoir chamber, in which the heat is communicated from the hot reservoir to the air. Under certain circumstances the heat reservoir may be heated in the heat reservoir chamber. H is a devaporizing chamber, for extracting the moisture from the air by means of a deliquescent substance or other material or treatment. A vertical stack or flue, I, communicates with the heat reservoir chamber, for conveying the heated air away for use.

The device for concentrating the solar rays may be either stationary or movable, and, if movable, may be moved by hand, or automatically, to follow the sun. The various chambers mentioned will have valves, J, at the ends to regulate the passage of the air, and there will be a door, K, at the side or bottom.

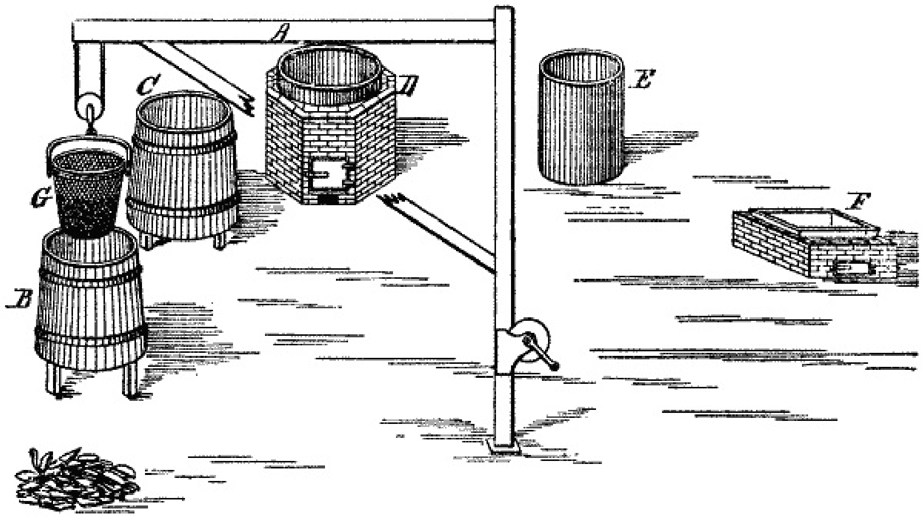
Patented through the Scientific American Patent Agency, March 20, 1877, by Messrs. John S. Hittell and Geo. W. Deitzler, of San Francisco, Cal.

Phosphorescent Sweating.

While the subject of phosphorescence in marine animals was under discussion at a society meeting in Florence, Professor Panceri cited the case of a medical man, who, after eating fish, felt indisposed, had nausea, and sweats that were luminous. This idiosyncrasy was laid to the *pesce baudiera*, a Neapolitan fish. Dr. Borgiotti, another member of the Academy, also narrated a case of phosphorescent sweating in a patient with miliaria, a fact which has previously been noticed.

UTILIZATION OF TIN SCRAP.

Messrs. Charles A. Catlin and George F. Wilson, of Providence, R. I., have patented, May 8, 1877, a new process of utilizing tin scrap, whereby they claim the tin is recovered, either as a valuable salt of that metal or in the metallic form, and the iron or other metal is left as a scrap at once available for reworking.



CALLIN AND WILSON'S PROCESS OF UTILIZING TIN SCRAP.

In any suitable building, a crane, A, is erected and placed in the sweep of that crane; in any convenient order are a boiler, D, two tanks, B and C, an evaporating pan, F, and an additional tank, E. From the crane is suspended a wire basket to contain the scrap to be treated, so perforated as to admit of the ready entrance of the liquid when submerged in, and its ready escape when withdrawn from, the boiler, D, in which boiler is put a sufficient quantity of the solution of caustic soda or potash to allow of a complete submersion therein of the basket and its contents. The basket, G, is then filled with the material to be treated, sprinkling in during the filling the requisite quantity of common salt or other chloride and nitrate of soda or other nitrate, using these dry, not in solution, either previously mixed or shaken in together in the proportion of from three to five pounds each to every hundred pounds of scrap, the requisite quantity depending upon the thickness of the tin plate to be removed. The loaded basket, being elevated by the crane, A, is then swung round, and, by lowering, submerged in the hot or boiling solution of caustic soda or potash in the iron boiler, D, which may hold in solution a further proportion of the chloride and nitrate used, the heat of which solution is maintained by a fire beneath the boiler, or in any other and ordinary way. In the ensuing reaction the oxygen of the nitrate combines with the tin to form stannic acid, and this, in turn, combining with the alkali present, forms a stannate of that base, which, entering into solution, leaves the before-plated metal tin-free, the chloride present assisting in the reaction. A further and more complex reaction takes place, by which copious fumes of ammonia are evolved, which may be utilized by proper appliances. When the reaction is complete, the basket containing the now tin-freed scrap is withdrawn from the boiler, and suspended above it long enough to drain. It is then swung over the tank, C, containing water, in which it is washed by submerging and withdrawing several times, and in like manner the washing completed in the water of the tank, B. The contents of the basket being now discharged, it is again filled with fresh scrap in the manner already described, and the process repeated. The loss by evaporation from the boiler, D, is supplied by the wash water in the tank, C; this, in turn, being supplied by the wash water in the tank, B, to which fresh water is supplied as required. When the caustic solution is sufficiently charged with the tin salt, it is allowed to deposit the impure crystals, which, being removed and drained, are redissolved in water in the iron tank, E. This solution in the iron tank, E, after filtration or decantation, is again concentrated in the evaporating pan, F, the crystals of stannate being removed from time to time, drained and dried; or the impure crystals obtained in the boiler, D, may be mixed with fine charcoal or other reducing agent, and subjected to the requisite heat for the reduction of the tin to the metallic form.

New Alloy.

A very beautiful new alloy, intended to replace brass in various ornamental uses, especially in window and door furniture, has been invented by W. A. Hopkins, of Paris. The alloy is composed of copper, tin, spelter, or zinc and lead, which metals are manipulated. A crucible is placed in the furnace and fired to red heat, and into the crucible thus heated the metals are placed in the proportions of—tin 1⅛ (say) 1 oz., spelter or zinc ½ oz., lead 5/16 of an ounce. These are the proportions he prefers to use, as he has found them to give excellent and satisfactory results, but he does not intend to confine himself rigidly to the precise proportions named, as they may, perhaps, be slightly varied in some particulars without materially detracting from the beautiful color of the alloy which it is intended to produce. The molten metals are kept well stirred, and any impurities therein should be removed. When thoroughly mixed, this alloy, which is termed the first alloy, is poured off into ingot moulds and left to cool. Copper, in the proportion of eight parts to one of this first alloy, is then placed in the crucible and brought to melting heat, when the tin or first alloy is added and intimately mixed with the copper, for which purpose the molten mass must be well stirred for several minutes; it is then poured into ingot moulds for sale in the form of ingots, or it may be poured into pattern moulds so as to produce the articles required. This is the mode of manipulation which it is preferred to employ, as an opportunity is thus afforded of removing any impurities from the first alloy before mixing it with the copper; but all the metals may, if preferred, be mixed together in the proportions given and melted at one operation. By this means an alloy is obtained of great strength, and of a very beautiful appearance, and which is particularly suitable for small work, such, for instance, as window and door furniture and other house furniture which is usually made in brass or other alloy of copper, though it is not intended to confine its use to such articles.

Sebastin—An Improved Explosive.

In the manufacture of the explosive known as dynamite, an infusorial earth is used, which is filled with or made to absorb nitroglycerin. As compared with certain kinds of charcoal, however, the absorptive and retentive power of infusorial earth in small changes of temperature unfavorably affect the common dynamite, and cause a separation of the nitrogylcerin from the infusorial earth. The improvement we now refer to is the invention of G. Fahnehjelm, of Stockholm, Sweden, and consists in the substitution of a highly porous and absorptive species of wood charcoal, in place of the earth heretofore employed. The author designates his production as "sebastin," and gives a number of interesting particulars as follow:

In order to produce a charcoal having the required quantities, the carbonization or coking must be done in such a manner as to completely destroy the organic substances, and to produce as porous a charcoal as possible. For this he selects by preference young trees or striplings or branches of poplar, hazelwood, or alder tree, and he burns them in an open fire. When the wood has been consumed he does not put out the fire by means of water, but leaves it to go out of itself. In this way he obtains a very inflammable and very porous charcoal, which can absorb more than five, and approaching six times its weight of nitroglycerin without any risk of the separation of the oil. The charcoal is pulverized in a wooden mortar, but it should not be reduced to too fine a powder, else it will not so completely absorb the nitroglycerin. The charcoal produced in the ordinary way, or by closed fire, is quite different as regards absorbing power. Charcoal of fir trees may, however, be used, and may acquire nearly the same qualities, that is, if charred a second time in a special oven.

By mixing the different kinds of charcoal, a material may be obtained possessing the required absorbing qualities, and an explosive compound may then be obtained of the required power without loss of the necessary consistency—that is, without being too dry, which is not desirable. The charcoal not only serves as the best absorbent for the nitroglycerin, but it plays also an important part in the combustion. The nitroglycerin in exploding decomposes into steam, carbonic acid, nitrogen, and oxygen. In the explosion of dynamite with inert base the oxygen goes away without being utilized, but in the explosion of this new compound (the new sebastin as he calls it) a part of the absorbent charcoal is burnt by means of the liberated oxygen. The quantity of gas is thus augmented, and also the development of heat, whereby again the tension of this gas is augmented. As, however, the quantity of charcoal necessary for the complete absorption of the nitroglycerin is in all cases much larger than that which can reduce the excess of oxygen produced at the explosion into carbonic acid, he adds to the compound a salt, which also by the combustion gives an excess amount of oxygen which may contribute to burn the rest of the charcoal. For this purpose he uses by preference nitrate of potassa, which may be added without any risk, and which gives the explosive compound a very much greater rapidity or vehemence, and consequent force of explosion.

The composition of the new sebastin depends upon the objects for which it is to be used, and the effects intended to be produced. The strongest compound, and even in this there is stated to be no risk of the separation of the nitroglycerin, is composed of 78 parts by weight of nitroglycerin, 14 of the wood charcoal, and 8 of nitrate of potassa; and when less power is required the proportions are varied, the second quality consisting of 68 per cent. by weight of nitroglycerin, 20 of the charcoal, and

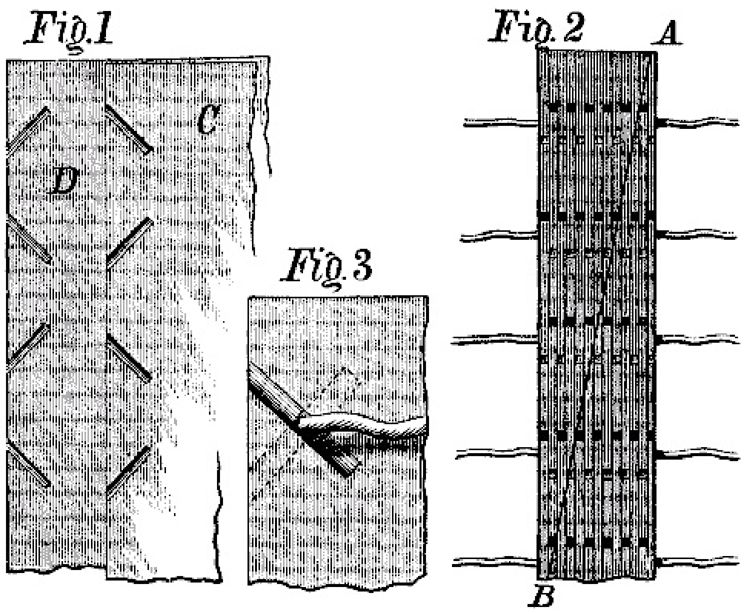
12 of nitrate of potassa.

To show the relative strength of the compounds, the inventor says: Let the dynamic force of pure nitroglycerin be represented by the number 2,884,043.6, then the dynamic force of the sebastin No. 1, as above, will be indicated by 2,416,575, and of the sebastin No. 2 by 1,933,079.4, while that of dynamite No. 1 (consisting of 75 per cent. of nitroglycerin and 25 per cent. of infusorial earth) will be represented by 674,694.

For the above qualities of sebastin the increased effect produced by the greater rapidity of the explosion must be taken into account also. The increase has not yet been measured, but is estimated at 10 per cent. The sebastin may also be compounded in other proportions of the constituent parts, but the object being to produce explosive compounds of the greatest force which it is possible to employ without danger, he merely mentions that the proportion by weight may vary from 50 to 80 per cent. of nitroglycerin, 15 to 35 per cent. of the prepared charcoal, and 5 to 20 per cent. of the nitrate of potassa; the parts being taken by weight, as above stated.

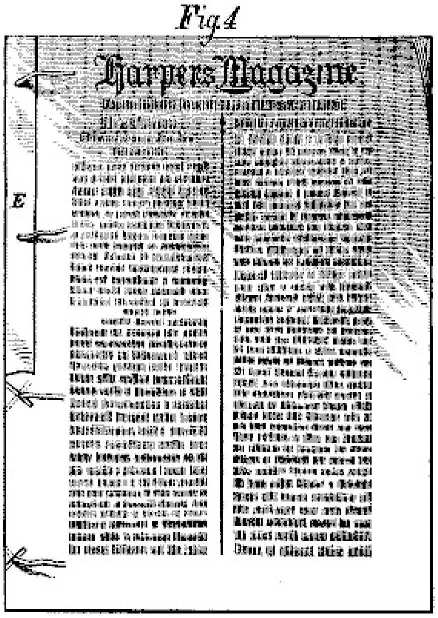
A NEW METHOD OF BOOKBINDING.

The annexed engravings represent a new system of binding books, for which a number of important advantages are claimed. It obviates stitching, allows of each leaf being firmly secured, and hence is especially well suited for single-leaved books. It admits of plates and maps being bound in their proper places instead of being pasted in, and renders the book much stronger and more durable. The inventor claims a saving of 40 to 75 per cent of the time required for stitching, and of 50 per cent of the time needed in ordinary rebinding work.



Bookbinding Figs. 1, 2, 3

The mode of operation is as follows: On receiving the sheets, the binder folds them and places them in consecutive order, according to the printer's signature. The front and bottom edges of the book are then trimmed so as to obtain two straight sides; and the backs of the sheets are cut off, transforming them into single leaves. Horizontal lines are now marked with pencil across the back of the book for the saw cuts; and a diagonal line, A, B, Fig. 2, is drawn to serve as a guide in replacing the leaves in their proper places. A thin coat of glue is next applied to the back; and when this is dry, the book is divided into sections of from four to eight leaves (without counting them) entirely disregarding the printer's signatures, but placing the sheets in their original order. The binder places the first section removed at his right hand, the next at his left, and so on, forming two piles. Each pile is then straightened, and in the back of each, a little below the transverse lines, are made bevel cuts with the saw. Said cuts are ⅛ inch in length, inclined at an angle of 45°, and so placed that one half their length is above and the other half below the marked line. When one pile of sheets is thus sawn, the other pile is similarly treated; but the corresponding cuts are made at relatively opposite angles. This will be understood



Bookbinding Fig. 4

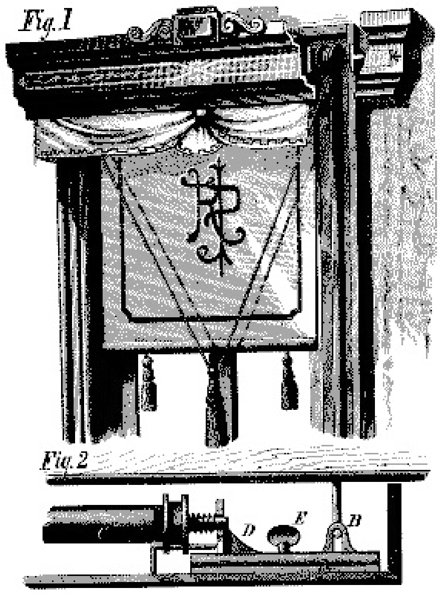
from Fig. 1, in which C represents the edge of the right hand pile, for example, and D that of the left hand pile.

The sections of each pile are now returned in their regular order, according to the printer's signatures. Should a section have been misplaced, the diagonal line, being thus broken, will show the fact. It will be seen, however, that this arrangement involves the alternate use of sheets from each pile, so that, when all are put together, the beveled cuts will cross or form dovetails, as shown in Fig. 3. Half inch strips of white paper muslin, E, Fig. 4, are next pasted around the back edges of the first and last sections. This is done to strengthen the hold of the twines in the back of the book, said sections necessarily bearing the whole strain of the covers. The twine used corresponds in size to the holes made by the coincidence of the beveled saw cuts. This twine is passed through the holes by means of a blunt darning needle. The back of the book is shown in Fig. 2; and in Fig. 4 the twines are represented as passed. Nothing further remains to be done but to paste in the fly-leaves and lining, and finish the book in the usual manner.

It is evident that this a very much stronger method of securing the leaves than that in which the twine is simply laid and glued in a straight cut. Each leaf is independently fastened; and the thread is prevented from cutting through, as is commonly the case when the book has been used to any great extent. Books can be bound to open more or less as desired; and in rebinding, instead of taking the book apart and cutting threads, a thin shaving is sliced off the back, and the leaves are treated in the manner already described.

Patented March 20, 1877, by Mr. Florenz E. Schmitz. For further information, address Messrs. Schmitz and Slosson, box 1180, Middletown, Orange county, N. Y.

IMPROVED CURTAIN FIXTURE.



Improved Curtain Fixture Figs. 1 and 2

We illustrate herewith an improved curtain fixture, which may be adjusted to windows or curtains of different widths, and is adapted for use in connection with different means for raising and lowering the curtain. Fig. 1 represents the device in place, a portion of the cornice being broken away to exhibit it; and Fig. 2 shows the same in detail.

Attached to the cornice are guides, A, in which are sliding loops, B. The latter may be adjusted to suit the position of the hooks placed in the window case to sustain the cornice, so that said hooks need not be set with any particularity. The curtain roller, C, has both its ends screw-threaded, to receive hollow pulleys, as shown. The spindles projecting from these pulleys are inclosed in coiled springs which press against the bearings, D, and so hold the shade in any position in which it may be placed. The bearings, D, are clasped in the ways, A, and are laterally adjustable. Sliding blocks are also arranged in said ways, and through each block passes a set screw, E. It will be perceived that the bearings may be readily adjusted to curtains of different widths, and the parts may afterward be locked in position by the set screws, E. The curtain may be raised or lowered by cords wound on the hollow pulleys.

Patented December 5, 1876, by Mr. K. J. Pospisil. For further particulars relative to sale of patent, address the Penn Patent Agency, 133 South Second street, Philadelphia, Pa.

BOOT AND SHOE MACHINERY.

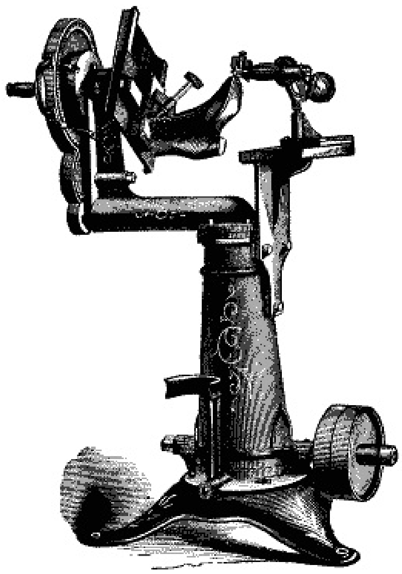


Fig. 1.

Boot and Shoe Machinery Fig. 1

No manufacturers have taken greater advantage of the ingenuity of the mechanical engineer than the American boot and shoe makers. Nearly every operation in the complex process of evolving finished boots from the plain skins of leather is the object of a special class of machinery; and for several years past, we have weekly chronicled the patenting of several improvements in the devices for effecting some of the numerous operations. We present herewith a series of eight labor-saving machines of the most approved construction, which we select from Knight's "American Mechanical Dictionary."[1]

[1] Published in numbers by Messrs. Hurd & Houghton, New York city.

Fig. 1 is a shoe-edge trimmer, in which the shoe is mounted on a jack, the carriage of which has a motion of translation and rotation communicated to it: so that, while the side of the sole is being trimmed, the shoe is fed longitudinally against the knife, but at the toe and heel is rotated beneath it. The knife is universally jointed, to permit the hands of the operator to determine the different bevels cut.

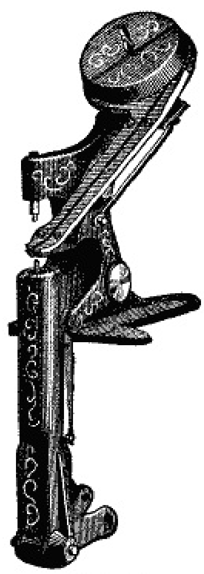


Fig. 2.

Boot and Shoe Machinery Fig. 2

Fig. 2 is an ingenious little machine for placing the eyelets of the lace holes in position, and fastening them. The eyelets are fed, one by one, from the reservoir at the top, down the inclined ways, and are seized at the foot between the plunger and anvil, and they are riveted in their proper places in the shoe or strip of leather, which is held and fed by the operator.

Fig. 3 is a machine in which a shoe or boot is chucked and revolved against a burnishing tool, to impart a smooth and elegant finish to the heel. Our engraving shows a machine with what is called in the trade a "hot kit," a heated burnishing tool, with a flexible gas pipe of sufficient length, which follows the oscillations of the burnishing stock, *a*, and which conveys gas to the interior of the tool, where it is burnt in a jet. The tool is made to reciprocate over the surface of the heel, passing from breast to breast at each oscillation with an elastic pressure.

Fig. 4 is a machine for pressing together the "lifts" which compose a boot or shoe heel, thus dispensing with the handiwork of the hammer and lapstone. The bed is adjusted vertically by a screw to any thickness to which the blank heel may be built; and the plunger is brought down by the depression of the treadle with such force as to compact the lifts together.

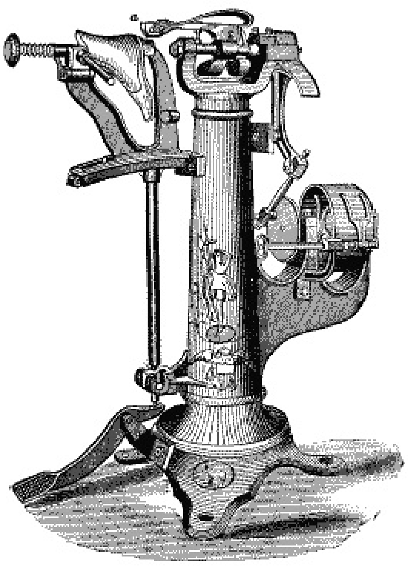


Fig. 3.

Boot and Shoe Machinery Fig. 3

Fig. 5 shows a heel-pricking machine. When the lifts of the heel are fairly pressed together by the appliance shown in Fig. 4, the pricking machine pierces the necessary holes through all the lifts at once by a gang of awls. The compressed heels are first secured together by tacking, and then placed on the platen; and the plunger, with its gang of awls, descends with great force.

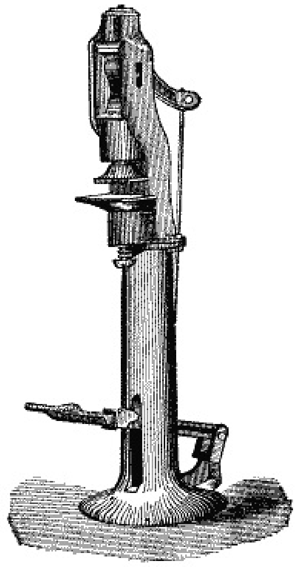


Fig. 4.

Boot and Shoe Machinery Fig. 4

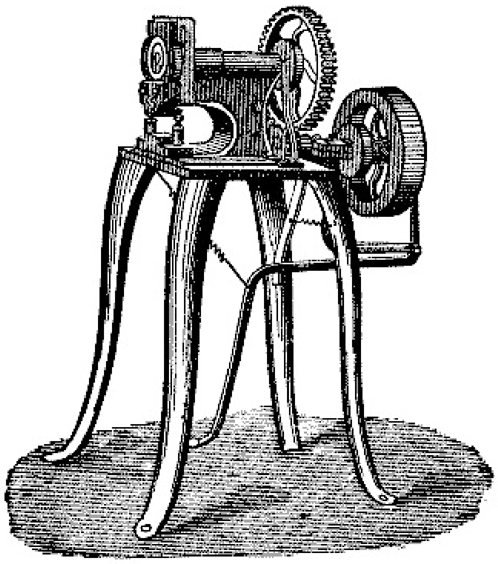


Fig. 5.

Boot and Shoe Machinery Fig. 5

Fig. 6 is a heel trimmer, known in the trade as the Coté trimmer. The shoe is held stationary by the treadle clamp; and the knife stock, which is centrally pivoted to the outer plate or jaw bearing upon the tread lift, is then grasped in the hands of the operator, and moved to give a sweeping cut to trim the heel.

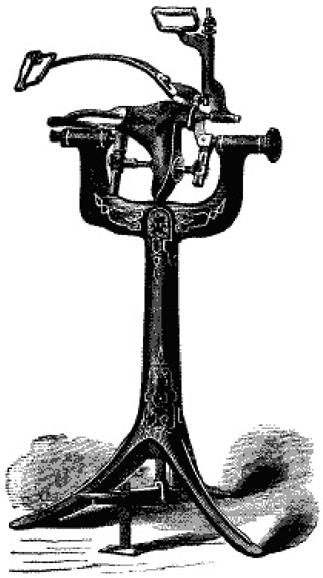


Fig. 6.

Boot and Shoe Machinery Fig. 6

Fig. 7 is a machine for pressing boot soles. Beneath the crosshead of the press is a swinging bed, on each end of which is a form, in order that a shoe may remain under pressure upon one while the operator is placing another shoe on the other. The pressure is given by the treadle, which brings down the upper platen on the channeled sole.

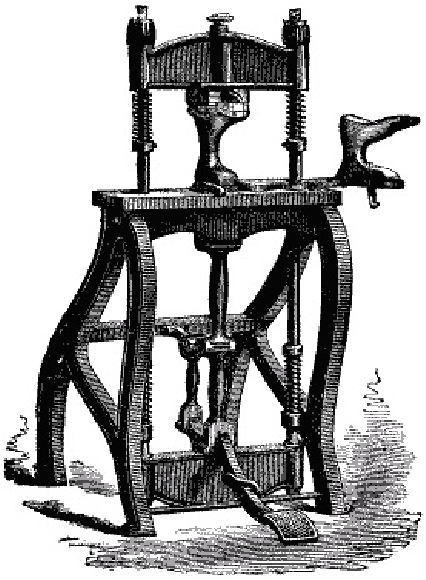


Fig. 7.

Boot and Shoe Machinery Fig. 7

On Dyspepsia.

At a late meeting of the Harveian Society, of London, Dr. Farquharson read a paper on this subject. Attention was directed to the state of the tongue in dyspepsia. A deeply fissured tongue often meant little; whereas a thin white fur, composed of minute dots, was generally found along with pain immediately after food. Pain after a longer interval was accompanied by a pale, flabby tongue, with reddish tip and center. The treatment of dyspepsia consisted of two parts, that of food and that of drugs. The latter was the principal part with patients applying for gratuitous relief. The pain occurring immediately after food was usually relieved by alkalies; whereas acids were indicated where suffering was not experienced until an hour or two after the commencement of the digestive act. For the relief of the nausea and sickness remaining after the bowels were thoroughly cleansed, nothing was so effectual as hourly drop doses of ipecacuanha wine. Nux vomica was also a valuable remedy. Pain might be but the protest of the stomach against an overload, or be the result of deficient tone from general nervous exhaustion. In some cases each meal was followed by diarrhœa; and for these cases attention was directed to Ringer's plan of minute doses of the liquor hydrargyri perchloridi In speaking of diet, Dr. Farquharson pointed out that there are three forms of dyspepsia: 1. The dyspepsia of fluids, as it is called, where the stomach seems intolerant of all forms of fluid; 2. The digestive derangement following intemperance in the matter of animal food; and, 3. The dyspepsia connected with indulgence in tea, or other warm and weak infusions of tannin.

The Destructive Effects of Lightning.

The amount of destruction of life and property by lightning, or rather electrical discharges, has been very great throughout the world.

It is estimated that at least 45 persons are killed annually by lightning in this country. The average number of deaths by lightning has been 22 in England, 9 in Switzerland, 3 in Belgium, and 75 in France. In France alone, during a period of thirty years, over 10,000 persons were smitten, of which 2,252 were instantly killed. Eighty were wounded and 9 killed during one thunderstorm at Châteauneuf les Montiers in 1861, and within one week, when the air was highly charged with electricity, thirty-three fearful flashes of lightning were observed, each bringing death to some victims.

During the sixteen years between 1799 and 1816, 156 vessels of the British navy were struck by lightning; 73 men were killed and 138 injured, and the loss of materials amounted to over a million dollars; but since the system of metallic conductors, adapted for vessels, devised by Sir W. Snow Harris, has been applied to the vessels in that navy, the losses and damages by lightning have almost entirely ceased, although the number of vessels has been greatly increased.

In Fuller's Church History it is stated that "scarcely a great abbey in England exists which once, at least, was not burned down by lightning from heaven."

On the night of April, 1718, twenty-four steeples were struck along the coast of Brittany; and on the 11th of January, 1815, twelve steeples suffered a similar fate in the Rhenish provinces.

On the 27th of July, 1759, lightning burnt all the woodwork of the great cathedral at Strasbourg; and on the 14th of August, 1833, it was struck three times within a quarter of an hour, and so much damaged that the repairs cost about $6,000,000. In 1835 lightning conductors were placed upon the building and steeple, and since then it has not been damaged whatever by lightning, although discharges have on several occasions occurred in line with the top of the steeple, which is 437 feet above the ground.

On the 18th of August, 1769, the Tower of St. Nazaire, at Brescia, was struck, and the subterranean powder magazine, containing 2,076,000 lbs. of powder, belonging to the Republic of Venice, was exploded. One sixth of the whole town was laid in ruins and the rest very much injured, and about 3,000 persons killed.

On the 26th of June, 1807, the powder magazine of Luxembourg, containing 28,000 lbs., was struck, and besides about 30 persons killed and 200 injured, the town was ruined.

Explosions and large fires, involving a great loss, have become rather frequent in this country, owing to the iron tanks used for the storage of petroleum being struck by lightning. From March to August, in 1876, over 10,000,000 gallons, and on April 19, 1877, over 2,000,000 gallons of oil, and the village of Troutman, were destroyed in the oil regions of Pennsylvania.

Some of the thunderstorms which have prevailed in this country have been very terrific and destructive. During August 14th, 15th, and 16th, 1872, portions of New York State and the New England States were visited by some of the most terrific thunderstorms ever experienced, during which over 200 dwellings were struck and damaged, about 10 persons were instantly killed, and 160 stunned. Quite a number of barns, with their contents, hay and cattle, were also struck, fired, and consumed. Cars, while running on some of the railroads, were surrounded by a vivid electric light, but no passengers were injured, although they were greatly alarmed. Telegraph wires were melted by the half mile, telegraph instruments broken, and poles shattered in all directions. One of these storms occurred at midnight, at Arlington, Mass., August 14th, in which brilliant streams of electricity darted across the sky in every direction, and the thunder which followed was constant for a period of thirteen minutes, without the intermission of an instant of silence. Three hundred and thirty-one discharges were counted in seven minutes by an observer, and each discharge was followed by loud and sometimes rattling reports, whose reverberations rolled through the heavens in an endless procession of majestic and terrific sounds. During this scene, the moon, which was about half an hour above the western horizon, was visible, but so magnified, through the haze and vapor, as to appear like a brilliant flame suspended in the sky. For a period of twenty minutes the scene was one of grandeur and sublimity rarely witnessed.

In the States of Illinois and Iowa, and the prairie country west of the Mississippi river, thunderstorms are generally more terrific, and more lives have been lost there from the effects of lightning than in any other section of this country. Owing to the said country being level and devoid of trees, the equilibrium between the electricity of the atmosphere and that of the earth is principally restored by disruptive discharges.—*Spang's "Treatise on Lightning Protection."*

A tooth of a mastodon has been dug up near the Ashley river in South Carolina. It is 11½ inches long, 6 inches in diameter, and weighs more than 5 lbs.

The Sea Serpent Sighted from a Royal Yacht.

The Osborne, paddle royal yacht, Commander Hugh L. Pearson, which arrived at Portsmouth from the Mediterranean on Monday, June 11, has forwarded an official report to the Admiralty, through the Commander-in-Chief (Admiral Sir George Elliot, K.C.B.), respecting a sea monster which she encountered during her homeward voyage.

At about 5 o'clock in the afternoon of June 2, the sea being exceptionally calm, while the yacht was proceeding round the north coast of Sicily toward Cape Vito, the officer on the watch observed a long ridge of fins, each about 6 feet long, moving slowly along. He called for a telescope, and was at once joined by other officers. The Osborne was steaming westward at ten and a half knots an hour, and having a long passage before her, could not stay to make minute observations. The fins were progressing in a eastwardly direction, and as the vessel more nearly approached them, they were replaced by the foremost part of a gigantic monster. Its skin was, so far as it could be seen, altogether devoid of scales, appearing rather to resemble in sleekness that of a seal.

The head was bullet-shaped, with an elongated termination, being somewhat similar in form to that of a seal, and was about six feet in diameter. Its features were only seen by one officer, who described them as like those of an alligator. The neck was comparatively narrow, but so much of the body as could be seen, developed in form like that of a gigantic turtle, and from each side extended two fins, about fifteen feet in length, by which the monster paddled itself along after the fashion of a turtle.

The appearance of the monster is accounted for by a submarine volcano, which occurred north of Galita, in the Gulf of Tunis, about the middle of May, and was reported at the time by a steamer which was struck by a detached fragment of submarine rock. The disturbance below water, it is thought probable, may have driven up the monster from its "native element," as the site of the eruption is only one hundred miles from where it was reported to have been seen.—*Portsmouth (Eng.) Times.*

Sunstroke.

The sudden accession of heat has already produced one fatal, and more than one severe, case of sunstroke in the metropolis. Probably the affection so designated is not the malady to which the term *coup de soleil* can be properly applied. The condition brought about is an exaggerated form of the disturbance occasioned by entering too suddenly the "hot" room of a Turkish bath. The skin does not immediately perform its function as an evaporating and therefore cooling surface, and an acute febrile state of the organism is established, with a disturbed balance of circulation, and more or less cerebral irritation as a prominent feature of the complaint. Death may suddenly occur at the outset of the complaint, as it has happened in a Turkish bath, where the subject labors under some predisposition to apoplexy, or has a weak or diseased heart. It should suffice to point out the danger and to explain, by way of warning, that although the degrees of heat registered by the thermometer, or the power of the sun's rays, do not seem to suggest especial caution, all sudden changes from a low to a high temperature are attended with danger to weak organisms. The avoidance of undue exercise—for example, persistent trotting or cantering up and down the Row—is an obvious precaution on days marked by a relatively, if not absolutely, high temperature. We direct attention to this matter because it is obvious the peculiar peril of overheating the body by exertion on the first burst of fine weather is not generally realized. It is forgotten that the increased temperature must be measured by the elevation which has recently taken place, not the number of degrees of heat at present recorded. The registered temperature may be more or less than that which occurred a year ago; but its immediate effects on the organism will be determined by the conditions which have preceded it and the violence of the change.—*Lancet*.

Dead Horses Standing Erect.

The Danville *Advertiser* of the 7th inst. says: Mr. Smith was in town on Saturday with his hired man, and the two tell a singular story about a lightning stroke. Mr. Smith was on a grain drill in a field, and his hired man was about 12 rods from him, dragging. Suddenly Smith heard the noise of thunder, and became unconscious. The man also heard the noise, but neither of them saw any flash of lightning. The man went to Smith, and in about twenty minutes he was restored to consciousness. Then attention was given to the horses. One of them was standing erect, with one foot lifted a little way from the earth, and the other was kneeling with his nose in the earth, and both were stone dead, and retained their positions until they were pushed over. The supposition is that in this case the electricity went from the earth to the sky.

The Berlin correspondent of the London *Times* states that General Berdan, of the United States, has invented an instrument which will greatly improve the art of killing. He calls his invention a "range-finder." It consists of a telescope and other instruments, all of which can be carried on a dogcart, and which enable the engineers to measure with perfect accuracy up to 2,000 metres, or 1,500 yards. The time needed to ascertain distances, is only two minutes, and the General believes that his invention will double the accuracy of artillery fire, and quadruple that of infantry.

SETTING LOCOMOTIVE SLIDE VALVES.

BY JOSHUA ROSE.

E. G. asks: "How can I set the slide valves of a locomotive when she is on the road?" J. H. S. asks: "What is the method of setting locomotive slide valves from marks on the slide spindle?" And F. O. asks: "How are the valves of inside cylinder locomotives set, since the back ports are out of sight and you cannot measure the lead?"

Our correspondent will find these questions answered in full below.

It is presumed that the lengths of the eccentric rod, reverse rod, and other parts are correct, and they are properly connected and oiled so as to be in working order. The first thing to do is to place the reverse lever in the forward full-gear notch of the quadrants, or sectors, as they are sometimes called. The next procedure is to place the crank on its forward dead center as near as can be ascertained by the eye, and loosening the set screw of the forward eccentric, that is to say, the eccentric which connects with the upper end of the link, move that eccentric round on the shaft until the valve leaves the port at the front end of the cylinder open to the amount of whatever lead it is desired to give the valve. In moving the eccentric round on the shaft, it is necessary to move it in the direction in which it will turn when in operation. This is done in order to take up any lost motion there may be in the eccentric straps, in the eccentric rod eyebolts, or other working parts or joints between the eccentric and the slide valve rod or spindle. If the eccentric was turned backward instead of forward, all the lost motion would operate to vitiate the set of the valve, because, when the eccentric begins to move, its motion will have no effect in moving the slide valve spindle, until all the lost motion in the various parts is taken up by the eccentric movement. In considering this part of the operation, we must bear in mind that, to set the valve, we must move the wheels of the engine, it being impracticable to move the piston itself. Now, in moving the wheels, we are confronted with the fact that the crank pin is pulling the connecting rod; hence, if there is any lost motion in the brasses at either end of the connecting rod, the piston will not be at the end of its stroke when the crank is on its dead center.

Suppose, for instance, that we have moved the driving wheel forward until the crank stands upright at a right angle to the bore of the cylinder, the resistance to motion of the piston and crosshead has caused the crank pin to bed against the half-brass nearest to the cylinder, all the play or lost motion is then between the other half-brass and the crank pin. When, however, the engine is at work and the piston is driving the crank pin, instead of being driven by it, the lost motion will exist between the crank pin and the half-brass nearest to the cylinder, and the contact will exist between the crank pin and the other brass. The difference in the position of the piston, caused by this lost motion, may be ascertained by moving the piston back and forth until the crank pin contacts with first one and then the other half-brass. It is sometimes attempted to remedy the defect due to this lost motion by moving the crank pin past the dead center and then moving it back to the dead center, so that while on that center the play or lost motion in the connecting rod is taken up. This is all very well so far as the connecting rod and piston is concerned, and will cause them both to stand on their respective dead centers with the lost motion taken up; but, in moving the wheel back to the dead center, we have given full liberty to all the lost motion in the various parts of the valve motion or gear, as already explained, in reference to moving the eccentric upon the shaft. As there are so many more parts in the valve gear, in which lost motion may occur, it is manifestly preferable to take up that play by moving the driving wheel in a continuous direction, rather than to move the latter back to accommodate any play there may be in the connecting rod.

The crank being placed by the eye upon its forward dead center, and the eccentric connected to the top of the link being moved round on the axle (in the direction in which the wheels will run when the engine is going forward) until the steam port at the front end of the cylinder is open to the amount of the lead, we fasten the eccentric to hold in that position. We then throw the reverse lever over into the last notch at the other end of the sector, lifting the link up so that the eccentric connected to the lower end of the link may be approximately adjusted, which is done by moving the eccentric round upon the axle (in the direction in which the axle will revolve when the engine is running backward) until the crank stands upon the same dead center, and the front port is open to the amount of the lead. This being done, we have the eccentrics approximately adjusted and may proceed to the final adjustment, in which the first thing to do is to find the exact dead centers of the crank. It is obvious that a line drawn through the center of the crank pin and the center of the wheel axle, will stand horizontally true and level when the crank is on either of the dead centers, but the presence of the crank pin makes it impracticable to draw such a line. We can therefore draw one which will be parallel to those centers; and to do this we draw a circle upon the end of the wheel axle (and from its center) of the same diameter as that of the crank pin, and then resting a straight-edge upon the bearing of the crank pin (taking care to avoid the round corner upon the pin, if there is one), we place the other end of the straight-edge even with the top of the circle drawn upon the axle; and then, using the straight-edge as a guide, we draw a line across the end of the axle and the wheel face. When this line is level the crank will be upon its dead center. This plan is sometimes employed, but is not a very accurate one, because the length of the line is very short as compared to the circumference of the driving wheel; hence, an error of the thickness of the line becomes one equal to several thicknesses of the line when carried out to the wheel circumference. Furthermore, if the line of the cylinder does not stand horizontally level, as is sometimes the case, the result of the whole proceeding will be inaccurate. Again, the connecting rod end and the coupling rod is in the way, rendering it awkward to both draw and level the line.

A better and more accurate method to find the dead centers is as follows: Place the reverse lever into the end notch of the sector at the forward end, and then move the driving wheel forward until the guide block is within about a quarter of an inch of the end of its travel, then place a straight-edge against the end of the guide block, and draw, on the outside face of the guide bar, a line even with the end of the guide block. Bend a piece of wire (pointed at both ends) to a right angle, make a center punch mark either in the rail, under the driving wheel, or in some stationary, solid part contiguous to the wheel, or at such distance from it that when one end of the bent wire is placed in the center punch mark, the operator with the other end will be able to draw a line across the rim of the driving wheel. Here, however, arises another consideration, that it is better to set the valves with the wheel axle in its proper position in the pedestal shoes, and in order to do this the wheel should rest upon the rail with its proper proportion of the weight of the engine resting upon it. The springs will then be deflected to their proper amount, and the axle box will have passed its proper distance up the pedestals. It is obvious that if the engine is blocked up so that the driving wheels clear the rails (which is done in order to avoid having the weight of the engine to move while setting the valve), the axle boxes will drop in the pedestal and the valve will be set incorrectly, as the wheels are in a wrong position. To avoid this, and at the same time to avoid having to move the whole engine while setting the valve, the engine is blocked up from the rails, and the axle boxes of the driving wheels are wedged up so as to be lifted up into their proper position. In this case there is no very accurate means of ascertaining what is the exact proper height, save it be by first marking upon the outside faces of the shoes or pedestal a line even with the top of the axle box when the load is upon the wheels, and then, after blocking up the engine from the rails, wedging up the axle boxes till the face again comes even with the line.

Whatever plan is pursued, one end of the piece of wire is rested in the fixed center punch mark, and with the other a line is drawn across the outside face of the wheel rim. The driving wheel is then revolved forward until the guide block returns, having passed to the end of its travel. When its end again stands exactly even with the mark made upon the guide bar, the piece of wire is again brought into requisition, one end being rested in the fixed center punch mark as before, and with the other end another line is drawn across the outside rim of the wheel. It is obvious that by taking a pair of compasses and finding a point exactly equidistant between the two lines thus marked upon the wheel rim, and then marking that point with a center punch mark, the crank will be upon its exact dead center, when one end of the piece of bent wire rests in the fixed center punch mark, the other end rests in the center punch mark upon the wheel rim. To find the other dead center, the wheel must be moved about halfway round and the process repeated with the motion block at the other end of the guide bars.

Thus, whenever the piece of wire will stand with one end resting in the fixed center punch mark and the other end in either of the center punch marks upon the wheel run, the crank is upon a dead center. Having thus placed the crank upon either dead center, we measure the valve lead, and if in temporarily fixing our eccentrics we gave it too much lead, we mark where it stands upon the shaft by means of a line drawn on the axle and carried up on the side face of the eccentric; then move the eccentric back some little distance more than is necessary to make the adjustment, and then move it forward again a little at a time, noting when the valve has the proper amount of lead, and thus fasten the eccentric upon the axle by means of the set screw.

The object of moving the eccentric too far back and then moving it forward is to make the adjustment so that the latter may be made with the lost motion of the valve gear all taken up. The next proceeding is to move the driving wheel halfway round and try the lead at that end of the stroke. If the lead at the two ends is not equal, it shows that either the slide valve spindle or the eccentric rods are not of the proper length and must be rectified; this being done, the crank must be again placed upon first one and then the other dead center, the valve lead being measured at each end. When the lead is equal at each end, the rods are of correct length, and the amount of the lead must be regulated by moving the eccentrics as already directed.

If the link block does not come opposite the end of the eccentric rod when the reverse lever is in the end notch of the sector, the length of the reverse rod is wrong and should be corrected. If the link block comes right, under the above conditions, for the forward but not for the backward eccentric rod, the notches in the sector are not cut in their proper positions, or the link hanger is not of the proper length. In either case the error may be remedied by altering the length of the latter. But, as doing this would alter the amount of the valve lead, it is well, if there is any prospect of such errors, to correct them before setting the valves.

Instead of measuring the lead of the valve with a rule, or by a wedge, the following plan is very often adopted: After the valve and spindle are in position, the valve is placed with the proper amount of lead upon the front port. A center punch mark is then made upon the face of the steam chest. A piece of quarter inch iron wire is then bent at right angles and each end filed to a point. One end of this wire is placed in the fixed center punch mark in the steam chest, and with the other a mark is made upon the slide spindle. Upon this latter mark a center punch mark is also made sufficiently deep to be very plainly visible when the burr raised by center punching is filed off, which is necessary to prevent this burr from cutting the packing. It follows that whenever the bent piece of wire will rest with one end in the center punch mark in the steam chest, and the other end in the center punch mark in the slide spindle, the valve is in its proper position when the crank is on the corresponding dead center. This plan is a very old one and possesses the advantage that the valve may be set without seeing it, that is to say, with the steam chest cover on. If the length of the piece of wire measured direct from point to point is known, the valve may be set when the engine is upon the road without taking off the steam chest cover. The center punch mark upon the steam chest should, however, always be placed in about the same spot, so as to avoid mistakes in case of there being other similar marks upon the chest. It should always be made deep, so as not to get filled up with paint and be difficult to find. In course of time the mark upon the slide valve spindle is apt to disappear from the wear of the spindle, hence the center punch with which it is made should have a long conical point. To mark the position of the eccentric upon the axle, it is an excellent plan, after the eccentrics are finally adjusted, to take a chisel with the cutting end ground to the form of a fiddle drill, one cutting edge being at a right angle to the other. The chisel must be held so that while one edge rests upon the axle, the other edge will bear against the radial face of the eccentric. A sharp blow with a hammer upon the chisel-head will make a clean indented cut upon the axle and the eccentric, the two cuts exactly meeting at their junction and denoting the position of the eccentrics. In setting the valves of inside cylinder locomotives, the back ports being out of sight, the amount of lead is ascertained by making a wooden wedge about three inches long, a thirty-second of an inch thick at one end and three eighths of an inch thick at the other end. The faces of this wedge are chalked, and the lead is measured by inserting it between the edge of the valve and the edge of the port until its thickness just fills the space, and then moving it edgeways so that the valve and port edges will just mark it. By measuring the thickness of the wedge at the mark, the amount of lead is ascertained. After the valves are set, it is still desirable to mark the position by center punch marks upon the outside of the steam chests and upon the valve spindles, as already described.

If an eccentric should slip when the engine is upon the road, and there are no marks whereby to readjust them, it may be done approximately as follows: Put the reverse lever in the end notch of the forward gear, then place the crank as nearly on a dead center as the eye will direct, and open both the cylinder cocks, then disconnect the slide valve spindle from the rocker arm, and move the valve spindle until the opening of the port corresponding to the dead center on which the crank stands will be shown by steam blowing through the cylinder cock, the throttle valve being opened a trifle. The position of the valve being thus determined, the eccentric must be moved upon the shaft until the valve spindle will connect with the rocker arm without being moved at all. The throttle valve should be very slightly opened, otherwise so much steam will be admitted into the cylinder that it will pass through any leak in the piston and blow through both cylinder cocks before there is time to ascertain which cock gives first exit to the steam.

New Steamer.

A new steamer for the Mallory line, between New York and Texas, was lately launched from the yard of Roach & Co., Chester, Pa., 2,200 tons burden. Principal dimensions as follows: Length over all, 239 feet 7 inches; beam (moulded), 34 feet; depth from the base to the spar deck beams, 18 feet 2½ inches; depth of hold, 16 feet 5½ inches; diameter of propeller (Hirsch's patent—four blades), 11 feet 6 inches. She is to be provided with compound engines, having cylinders 24 and 44 inches in diameter, with a stroke of 44 inches, and two return tubular boilers 10 feet long, 10 feet 3 inches wide, and 8 feet 6 inches high. Aft are compartments capable of holding 80 tons of water, for the purpose of depressing the stern before and after crossing the bar at Corpus Christi. Her low draught is 7½ feet; speed, 14 knots.

A Tin-Can Telephone.

In Professor Bell's telephone a plate of sheet iron is made to vibrate by means of the electrical current, something after the manner of the skin of a drumhead. In a recent improvement by Mr. G. B. Havens, Louisville, Ky., the electrical wires are wrapped around a common tin fruit can. By means of tin cans at each end, sounds, it is said, were sent over 92 miles of wire, and included several pieces of music.

MR. HOTCHKISS, an American inventor, whose improved revolving cannon we illustrated some time since, has received intimation that his system has been approved by the French Government, and that they have decided to adopt his cannon.

COLLENDER'S IMPROVED BILLIARD TABLE.

In the accompanying engravings, we illustrate two important improvements in the construction of billiard tables, which have recently been devised by Mr. H. W. Collender, the well known billiard table manufacturer of this city. The first, which is represented in Fig. 1, relates to the construction of the bed-supporting frame, and aims to render the same stronger while cheapening its manufacture. In putting together the body and framework of the table, the usual practice is to cut away the stock of the cross beam and longitudinal beam, and halve them together. Longitudinal grooves are also formed on the inner surface of the side and "broad rails," to accommodate tenons on the ends of the cross beams; and the latter are secured in place by bolts fastening their ends to the broad rails. Mr. Collender claims that, by this mode of construction, not only are the cross beams weakened by being halved together, but the broad rails are also weakened by the cutting away of this stock near the middle to effect the framing into them of the ends of the cross beams.

From Fig. 1, it will be seen that the cross beam, A, is combined with the side broad rails in the following manner: Upon the inner face of each broad rail is secured a cast iron socket piece, B, into which fits one end of the cross beam, A. From said beam the bolt, C, passes through the shoe, B, and is secured by a nut, D, let into the stock of the broad rail. The shoe, B, has lugs which enter the broad rail; and the aperture in it, through which the bolt passes, is made oblong to admit of the drawing of the parts together after the insertion of the bolt. Upon the sides of the cross beam near the middle, and directly opposite each other, are two shoes, E; these have no bolt holes. In them are placed the adjacent ends of the longitudinal beams, F, the other extremities of which are seated in shoes on the broad rails. The shoes, E, have their lugs of such a length, compared with the thickness of cross beam, A, that when put in place on said beam said lugs will come together. The advantage of this is that, should the beam, A, shrink in width, the shoes on each side of it will still maintain their proper relation to form immovable abutments for the ends of pieces, F. This construction allows of shorter stuff being used in the manufacture, and renders the framework stronger.

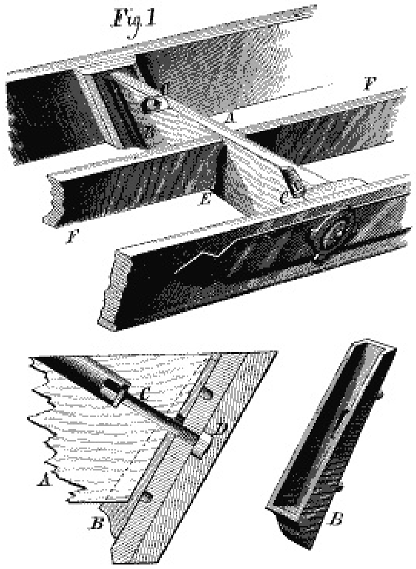


Fig 1, BILLIARD TABLE SUPPORT FRAME.

In Fig. 2 is illustrated a new method of forming the corners of the table. Hitherto it has been customary to use corner blocks, of various sizes according to the dimensions of the table, located one at each corner. Into these the broad rails were framed and secured. To this arrangement Mr. Collender adduces a long category of objections, based on the possibility of the weight of the bed being thrown on these blocks in case of shrinkage of the frame, on the fact that the corner of the table bed must necessarily be left without any support where it extends over the upper end of the corner block, and also that in a bevel table, in which the area of the top of the corner block is unavoidably much greater than that of the top of the corner block of a vertical-sided table, a large portion of the table bed will be left without any support.

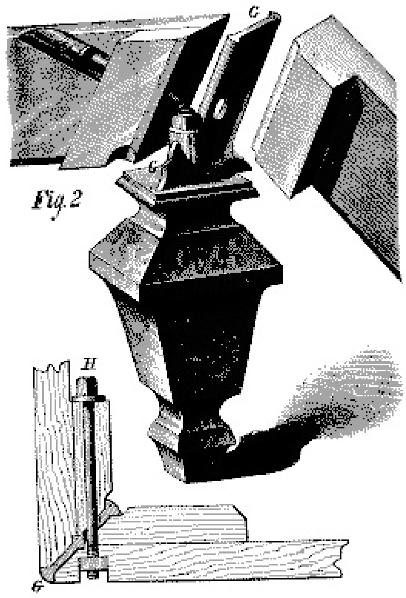


Figure 2, BILLIARD TABLE FRAME CORNER.

The new device consists of a cast iron union plate, G, which is bolted to the leg as shown. The broad rails and casting are securely fastened by the bolt, H. It will be seen that this bolt, passing through the end of one broad rail, and into a nut let into the other rail, will securely draw and hold together the ends of said rails and the interposed metal plate clamped between them, and that as the plain ends of the wooden rails just fit (widthwise) between the projecting heads on the edges of said interposed plate, the latter will form a sort of housing for the ends of the rails. And it will be understood that in this construction not only does the bead on the outer edge of the plate overlap the edges of the rails and form a neat and durable corner finish to the body, but the broad rails being bolted together in the direction of the grain of the wood with only an interposed metal plate, there will be no tendency to a loosening of the union of the parts of the frame. The main importance of this invention rests in the idea of dispensing with the usual corner blocks, and thus permitting the top edges of the broad rails, on which the bed rests, to practically come together and afford a perfect support to the bed clear out to the corners of the latter; at the same time the whole structure is rendered stronger and more durable with less weight of material.

These inventions are the subject of separate patents, that of the first being dated April 4, 1876, and of the second, November 16, 1875. For further information, address the manufacturer and patentee, Mr. H. W. Collender, 738 Broadway, New York city.

Coating Engraved Copper Plates with Steel.

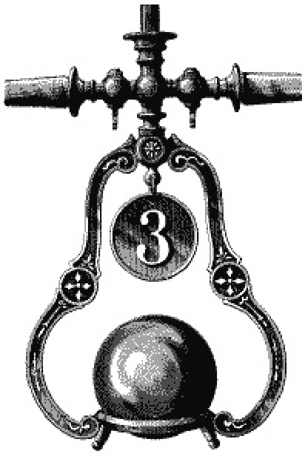
In order to render copper plates which are used in printing more durable, they can be covered with an electrolytic deposit of iron which possesses an unusual degree of hardness almost superior to steel. The salt usually employed has been the double sulphate of iron and ammonia. Professor Böttger, who first invented this process, has recently devised an improvement in the bath employed. He dissolves 10 parts of ferrocyanide of potassium (yellow prussiate of potash) and 20 parts of the double tartrate of soda and potash (Rochelle salts) in 200 parts of water, and to this he adds 3 parts of persulphate of iron dissolved in 50 parts of water. A large precipitate of Prussian blue is formed. To the whole is added, drop by drop, with constant stirring, a solution of caustic soda until the blue precipitate entirely disappears, leaving a perfectly clear, light yellow liquid, which is now ready for use.

Professor Böttger also claims that this solution can be employed with advantage for dyeing cotton yarn and fabrics a beautiful blue, without the use of a mordant. For this purpose the goods are put into the bath, that has previously been slightly warmed, until they are saturated through and through, and then dried in the air, after which they are immersed in extremely dilute sulphuric acid (1 to 50), which neutralizes the alkali, and after washing and drying again they are permanently dyed a fine blue color.

Test for Sulphur in Organic Compounds.

H. Vohl recommends the following as the best method of detecting sulphur in organic compounds: The substance to be tested is heated in a solution of caustic lime and oxide of lead in glycerin. The latter is prepared as follows: One volume of distilled water is mixed with 2 volumes of pure glycerin and heated to boiling; freshly prepared slaked lime is added, little by little, until it is saturated. Freshly precipitated hydrated oxide of lead, or moist litharge, is added in excess, and the liquid allowed to boil gently for a few minutes, then tightly corked and left to cool, after which the clear liquid is decanted from the sediment into a glass vessel that can be tightly corked. If into this solution be introduced and heated any organic which contains sulphur, like hair, feathers, horn, albumen, and the like, it will at once turn black from the formation of sulphide of lead. The great delicacy of this test is evident from the fact that, when pure wheat bread is boiled with this reagent, it turns yellow at first and then dark gray in consequence of the presence of sulphur in the gluten of the bread.

IMPROVED BILLIARD BALL HOLDER.



BILLIARD BALL HOLDER.

The usual receptacle for the fourth ball, when only three balls are used in the game of billiards, is placed at the side of the table. As this is both inconvenient and unsightly, a neat device, clearly shown in the annexed illustration, has been invented, which is intended to be attached to a gas fixture over the table. A plate or sign is also added on which the number of a table—in case several tables are employed, as in a billiard saloon—may be inscribed. The form and design of the arrangement may of course be varied in many ways.

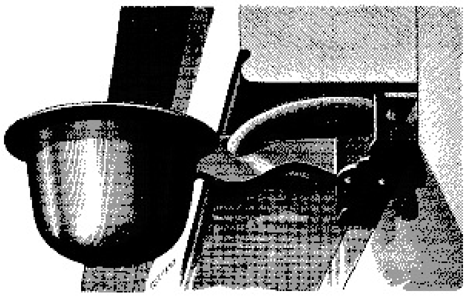
Patented May 2, 1876. For further particulars, address the manufacturer, Mr. H. W. Collender, 738 Broadway, New York city.

THE MONITOR CHALK CUP.

The annexed engraving represents an improved chalk cup or holder for billiard tables, which is so constructed that it will not become loose, sag down, mar the table, or jar when the ball strikes the cushion. It may be adjusted to remain in any desired position.

The shank is pivoted in a metallic frame which is secured to the table. The rear end of the shank works against a spring. On the upper portion of the shank is a projection which embraces a horizontal flange to sustain the box against being forced downward. The arrangement is very similar to the ordinary window catch. The player has only to start the box from its position under the table, when the spring carries it out at right angles to the rail. A touch is sufficient to cause the spring to carry the box back to its former position. The device is very simple, and its advantages will be evident to all billiard players cognizant of the defects of the ordinary cup.

Patented May 1, 1877. For further particulars, address the manufacturer and patentee, Mr. H. W. Collender, 738 Broadway, New York city.



THE MONITOR CHALK CUP.

CURIOUS CARNIVOROUS PLANTS.

Fig. 1.—ARUM DRACUNCULUS.

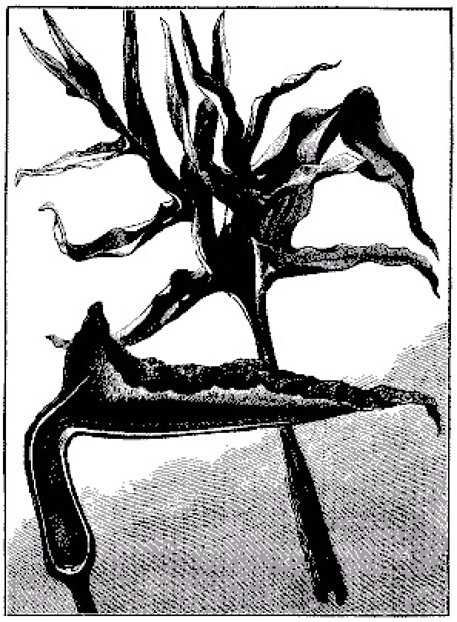


Fig. 2.—ARUM DRACUNCULUS.

The *arum Dracunculus* is one of the most curious of that wonderful series of carnivorous plants which at the present time are engaging the closest scrutiny of naturalists. It is a true trap in one sense—inasmuch as it captures the victim which ventures near it; but it relies on little or no mechanical means for securing its prey, but stupefies the living insect by its odor. The flower is horn-shaped, about 11 inches in length, with an opening some 5 inches in diameter. The color within is a dull dark violet, while the interior of the spathe is lined with black, hooked bristles, the whole appearance of the flower being thoroughly repulsive. The illustrations herewith presented, Figs. 1 and 2, represent it at one third its natural size, Fig. 2 showing a section of the flower. It is not certain what attracts the insects, which are usually of the species known as the meat fly and the common house fly. They do not seem to seek for the small quantity of nectar concealed, and yet they cluster about the fatal opening, as if drawn by some overpowering fascination. Overcome by lethargy, they fall inert upon the flower, are lightly held by the bristles, and finally die asphyxiated by the carbonic acid which the plant disengages in large quantities during its inflorescence. Strange as is the action of the *arum*, the method whereby the *mentzelia* takes its prey is even more wonderful. To illustrate on a magnified scale, let the reader imagine a surface thickly covered with strong iron posts, on the sides of which are numerous keen barbs pointing downward. Then between these posts, suppose that jars overflowing with honey are placed. An elephant, let it be imagined, attracted by the profusion of sweetness, inserts his trunk between the posts and finds easy access to the honey. But while he can force his proboscis downward past the barbs turned in that direction, when he attempts to withdraw it he finds the keen points catch in the flesh, and render it impossible to do so. A terrible struggle follows, the unfortunate animal twisting and writhing in every direction, until finally by an Herculean effort the head is torn from the body, and the latter becomes digested by some potent gastric juice, exuding from the colossal organism of which the trap forms but a portion. Of course this is vastly exaggerated, and it would puzzle an elephant to pull his own head off; but if for the post studded trap, we substitute the surface of a flower, and if we replace the elephant by a fly, we shall have conceived an accurate picture of what takes place in the peculiar receptacle with which Nature has provided the *mentzelia ornata*. This is very beautifully shown in Fig. 3; and at A, in same figure, is represented the barbed bristles grasping the highly magnified proboscis of the fly. Between the barbed bristles are mushroom-shaped projections, from the summits of which a viscous nectar exudes. This is the honey bait which induces the insect to insert his trunk between the fatal barbs. There is still another plant, *physianthus albens*, which captures butterflies by grasping the proboscis. The construction of the flower is quite complicated, so that the insects are compelled to insert their trunks through a narrow and winding passage in order to reach the nectar. The organ then necessarily comes in contact with an adhesive substance, which prevents its removal.

Fig. 3.—MENTZELIA.

Fig. 4.—GRONOVIA SCANDENS.

The *Gronovia scandens*, Fig. 4, is another plant trap, which catches no flies nor possesses any such wonderfully adapted devices as the plants already described. It simply has its branches covered with double barbed bristles of great strength which attach themselves to anything brought in contact with them. The bristles are strong enough to hold lizards, as represented by our engraving, the points inserting themselves in the interstices of the scaly covering of the reptile. Of course the lizard thus held starves to death, and small birds often follow a like fate. We are indebted to *La Nature* for the illustrations.

Popular Fallacies.

Night air and damp weather are held in great horror by multitudes of persons who are sickly or of weak constitutions; consequently, by avoiding the night air, and damp weather, and changeable weather, and weather that is considered too hot or too cold, they are kept within doors the much largest portion of their time, and as a matter of course continue invalids, more and more ripening for the grave every hour; the reason is, they are breathing an impure atmosphere nineteen-twentieths of their whole existence.

As nothing can wash us clean but pure water, so nothing can cleanse the blood, nothing can make health-giving blood, but the agency of pure air. So great is the tendency of the blood to become impure in consequence of waste and useless matters mixing with it as it passes through the body, that it requires a hogshead of air every hour of our lives to unload it of these impurities; but in proportion as this air is vitiated, in such proportion does it infallably fail to relieve the blood of these impurities, and impure blood is the foundation of all disease. The great fact that those who are out of doors most, summer and winter, day and night, rain or shine, have the best health the world over, does of itself falsify the general impression that night air or any other out-door air is unhealthy as compared with in-door air at the same time.

Air is the great necessity of life; so much so, that if deprived of it for a moment, we perish; and so constant is the necessity of the blood for contact with the atmosphere, that every drop in the body is exposed to the air through the medium of the lungs every two minutes and a half of our existence.

Whatever may be the impurity of the out-door air of any locality, the in-door air of that locality is still more impure, because of the dust, and decaying and odoriferous matters which are found in all dwellings. Besides, how can in-door air be more healthy than the out-door air, other things being equal, when the dwelling is supplied with air from without?

To this very general law there is one exception, which it is of the highest importance to note. When the days are hot, and the nights cool, there are periods of time within each twenty-four hours, when it is safest to be in-doors, with doors and windows closed; that is to say, for the hour or two including sunrise and sunset, because about sunset the air cools, and the vapors which the heats of the day have caused to ascend far above us, condense and settle near the surface of the earth, so as to be breathed by the inhabitants; as the night grows colder, these vapors sink lower, and are within a foot or two of the earth, so they are not breathed. As the sun rises, these same vapors are warmed, and begin to ascend, to be breathed again, but as the air becomes warmer, they are carried so far above our heads as to be innocuous. Thus it is that the old citizens of Charleston, S. C., remember, that while it was considered important to live in the country during the summer, the common observation of the people originated the custom of riding into town, not in the cool of the evening or of the morning, but in the middle of the day. They did not understand the philosophy, but they observed the fact that those who came to the city at mid-day remained well, while those who did so early or late suffered from it.

All strangers at Rome are cautioned not to cross the Pontine marshes after the heat of the day is over. Sixteen of a ship's crew, touching at one of the West India islands, slept on shore several nights, and thirteen of them died of yellow fever in a few days, while of two hundred and eighty, who were freely ashore during the day, not a single case of illness occurred. The marshes above named are crossed in six or eight hours, and many travelers who do it in the night are attacked with mortal fevers. This does, at first sight, seem to indicate that night air *is* unwholesome, at least in the locality of virulent malarias, but there is no direct proof that the air about sunrise and sunset is not that which is productive of the mischief.

For the sake of eliciting the observations of intelligent men, we present our theory on this subject.

A person might cross these marshes with impunity, who would set out on his journey an hour or two after sundown, and finish it an hour or two before sun-up, especially if he began that journey on a hearty meal, because, in this way, he would be traveling in the cool of the night, which coolness keeps the malaria so near the surface of the earth as to prevent its being breathed to a hurtful extent.

But if it is deadly to sleep out of doors all night in a malarial locality, would it be necessarily fatal to sleep in a house in such a locality? It would not. It would be safer to sleep in the house, especially if the windows and doors were closed. The reason is, that the house has been warmed during the day, and if kept closed, it remains much warmer during the night indoors than it is outdoors; consequently, the malaria is kept by this warmth so high above the head, and so rarefied, as to be comparatively harmless. This may seem to some too nice a distinction altogether, but it will be found throughout the world of Nature that the works of the Almighty are most strikingly beautiful in their *minutæ*, and these *minutæ* are the foundation of His mightiest manifestations.

Thus it is, too, that what we call fever and ague might be banished from the country as a general disease, if two things were done. 1. Have a fire kindled every morning at daylight, from spring to fall, in the family room, to which all the family should repair from their chambers, and there remain until breakfast is taken. 2. Let a fire be kindled in the family room a short time before sundown; let every member of the family repair to it, and there remain until supper is taken.

In both cases, the philosophy of the course marked out consists in two things. First. The fire rarefies the malaria and causes it to ascend above the breathing point. Second. The food taken into the stomach creates an activity of circulation which repels disease.—*Hall's Journal of Health*.

The Extension of the Plague.

Our recent English medical exchanges mention, with undisguised apprehension, the fact that already early this spring authentic observers state that the plague has broken out in Bagdad, and is rapidly increasing there; and information from other sources renders it probable that the disease has shown itself in other places in the vicinity of that city, some of which have not suffered before since the new development of the disease in Mesopotamia, three or four years ago. The progress of the epidemic in and about Bagdad last year shows that each year since its reappearance in that district it has covered a wider area, and it will be remembered that last year it crossed the Turco-Persian frontier, and broke out at Shuster, in Khuzistan. From the phenomena of the epidemic to this period it was feared, especially by the physicians on the spot, that, if it should recur in the present year, it must be expected to extend over a still wider area, and show itself in even a more aggravated form than had yet been observed. This opinion is concurred in by Surgeon-Major Colville, the medical officer attached to the British Embassy at Bagdad, and is expressed in his official report, on the subject of the last and previous year's outbreak.

The Turco-Russian struggle in Asia Minor, and the massing of Persian troops on the western frontier of that country, add an additional and most grave factor to this ominous intelligence.

It has been so long since Christian Europe has suffered from this terrible disease that most medical men have never seen a case, and, indeed, for awhile, epidemiologists flattered themselves it had "died out." They yet say that a thorough system of sanitation will certainly check its advance.

Let us hope so; for of all pestilences which have ever scourged humanity, and desolated empires, none approach in magnitude those of the plague. Under the name of "the black death," it fills, as Hirsch remarks, one of the darkest pages in the history of the human race. It devastated every known country of the earth, and penetrated to the remotest mountain hamlets and granges, sometimes sweeping away in a few days every inhabitant, leaving not one to remember the name or to inherit the goods of the family or the village. Long years afterward, travelers would come upon these unknown villages, the houses rotting, the bones of the plague-stricken owners bleaching in the rooms and streets, and no one to say who they had been.

As an epidemic disease, it no doubt spreads from India, that mother of pestilence, where, in the province of Kutch and Guzerat, it is found as an endemic of great malignancy. Far more fatal in its historical appearance than the cholera, it is well that the medical mind of Europe is on the alert to meet its approach with the most energetic measures; and should they fail, it will devolve upon us to lose no time in taking up the defensive in the most energetic manner.—*Medical and Surgical Reporter.*

Education in Germany.

The compulsory school laws of Prussia are frequently pointed to as models for similar laws, perhaps with the hope that by imitating her lower schools we can bring up our high schools to an equal rank with hers, and place our universities on a level with those which are producing the most finished scholars, the deepest thinkers, and the greatest investigators. We are likely to forget that the conditions are different, and especially that *nascitur, non fit,* is as true of a chemist as of a poet. The state of popular education in Germany is, however, a matter of interest, and is best illustrated by the following table, showing the percentage of unschooled men among the recruits from different German provinces:

	Per cent.
Prussia	3.19
Bavaria	1.79
Saxony	0.23
Würtemberg	0.02
Baden	0.22
Hesse	0.35
Mecklenburg	1.09
Thuringia	1.42

Alsace	3.45

These figures seem to indicate a higher grade of intelligence and wider diffusion of knowledge among all classes, for recruits are from every class, than in Austria, although in the latter the figures are arranged so differently as to make any accurate comparison of Austria and Germany rather difficult and unsatisfactory.

Name of District.	Number of Common Schools.	Number of inhabitants to each school.	Percentage of school children who attend.	Number of Normal Schools.
Bohemia	4,190	1,254	77	12
Bukowina	167	3,121	9	1
Dalmatia	241	1,864	12	2
Galicia	2,374	2,341	15	1
Carinthia	318	1,060	?	2
Carniola	234	1,187	48	2
Custrin	396	1,496	38	5
Moravia	1,866	1,082	78	5
Lower Austria	1,267	1,578	76	5
Upper Austria	506	1,455	82	2
Salzburg	155	982	85	1
Steiermark	690	1,657	59	3
Schlesia	433	1,208	77	4
Tyrol	1,926	457	?	6
Total	14,763			51

Over 3,000 teachers' positions are said to be vacant at the present time.

Bleaching Silk and Wool.

The methods now in use for bleaching silk, wool, and all animal fibers, such as sulphurous acid, alkalies, soap, etc., are so imperfect that Tessié du Motay has patented the following process, involving the use of binoxide of barium, with or without the addition of permanganates. The binoxide of barium is pulverized and subjected to the action of carbonic acid to remove any unconverted caustic baryta present. It is then thrown into boiling water, and after the bath has partially cooled the materials to be bleached are introduced and the bath kept at a temperature of 86° Fah. to 194° Fah. for two hours; silk from wild silkworms requiring a higher temperature than wool, goat's hair, and the like. It is then taken out and washed, put into an acid bath, then washed again. If necessary, the barium bath is repeated, as also the subsequent washings. If this second bath of binoxide of barium does not produce the requisite whiteness, it is introduced into a solution of permanganic acid or permanganate of magnesia before the last washing.

Binoxide of Barium, BaO_2, is made by subjecting the oxide or caustic baryta, BaO, to a stream of oxygen or common air at a high temperature. Its bleaching action is probably due to the formation of peroxide of hydrogen in solution in the bath.

An Alloy of Tin and Phosphorus.

At the Graupen Tin Works, in Bohemia, an alloy of tin and phosphorus is made containing the greatest possible quantity of phosphorus which the tin is able to retain without losing any of it upon repeated meltings. This compound, which is neither entitled to the name of alloy nor is it a phosphide of tin, is employed in the manufacture of phosphorus-bronze. In the manufacture of phosphorus-bronze, by alloying copper with phosphorus-tin, no other precautions require to be observed than in the preparation of common bronze. As the different properties of phosphorus-bronze depend upon the proportions of phosphorus and of tin, two kinds of phosphorus-tin are prepared. No. 0 contains 5 per cent., and No. 1, 2½ per cent. of phosphorus. These two kinds suffice to make the greater part of all the desired mixtures. For special purposes, the Graupen Works make to order phosphorus-tin with any desired quantity of phosphorus not exceeding 5 per cent., which is the highest possible limit. It is claimed that phosphorus-bronze may be manufactured by the use of this phosphorus-tin as much as 40 per cent. cheaper than that now in the market, while it will only cost 8 per cent. more than the ordinary tin and copper bronze.

No details are given of the method employed to make the phosphorus combine with tin, but the low melting point of tin as compared with that of copper would indicate that this would lead to the great saving promised above.

American Institute Exhibition.

The forty-sixth Exhibition of this Institute will open September 12, in this city. Parties having novelties which they intend to bring to public notice should at once address the General Superintendent for blanks and information. The medals, it is said, have been increased and special awards will be made upon a number of articles.

American Inventions for New South Wales.

Writing from Sydney, under date of April 14, the *Times* correspondent thus refers to the supply of locomotives and carriages from America: Our appearance at Philadelphia has drawn the attention of American manufacturers to us in a most marked and unexpected degree. A country that, like New South Wales, is rolling in wealth must be a country that is able to buy, and a country that is able to buy is exactly the country that American manufacturers have been anxiously looking out for. Our representatives at Philadelphia have come back strongly impressed with the fact that there are many things that the Americans can supply us with advantage. Our Government has an offer from Messrs. Baldwin & Co. to furnish a locomotive engine for about £1,000 less than the cost of an English engine, and to leave the payment open until the engine has been thoroughly proved and approved. A Pullman's sleeping car and an ordinary passenger car have already been ordered, and American wheels, axles, rails, and brakes are strongly pressed on our acceptance. As our Government engineers are all of the English school, American novelties will have a hard battle to fight to win official acceptance, but the demand for economy in railway construction and working is so great that people and Parliament will press on the Minister for Public Works a fair trial for any American novelties that may seem to be suited to our wants. The English manufacturers, therefore, who have hitherto supplied us must look to their laurels.—*Capital and Labor*.

Man's Place in Nature.

Concerning man's true place in Nature, Haeckel says:

"Whatever part of the body we consider, we find upon the most exact examination that man is more nearly related to the highest apes than are the latter to the lowest apes. It would therefore be wholly forced and unnatural to regard man in the zoological system as constituting a distinct order, and thus to separate him from the true ape. Rather is the scientific zoologist compelled, whether it is agreeable to him or not, to rank man within the order of the true ape (Simiæ)."

To whatever minutiæ of detail the comparison is carried, we reach in every case the same result. Between man and the anthropoid apes there are the closest anatomical and physiological resemblances. In form and function, there is the most exact agreement between all the corresponding bones of the skeleton of each; the same arrangement and structure of the muscles, nerves and entire viscera, and of the spleen, liver and lungs—the latter being a matter of especial significance, for between the manner of breathing and the process of nutrition there is the closest relation.

The brain, also, is subject to the same laws of development, and differs only with regard to size. The minute structure of the skin, nails, and even the hair, is identical in character. Although man has lost the greater part of his hairy covering, as Darwin thinks, in consequence of sexual selection, yet the rudimentary hairs upon the body correspond, in many respects, to those of the anthropoids. The formation of the beard is the same in both cases; while the face and ears remain bare. Anthropoids and men become grayhaired in old age. But the most remarkable circumstance is that, upon the upper arm, the hairs are, in both cases, directed downward, and upon the lower arm upward; while in the case of the half-apes it is different, and not as soft as that of man and the anthropoids.

The eye, on account of its delicate structure, is peculiarly suitable for comparisons of this kind; and we find here the greatest similarity: even inflammation and green cataract occur under the same circumstances, in both. See, also, Darwin upon this point.

There is no more striking proof that man and the anthropoid apes have the same anatomical and physiological nature, and require the same food, than the similarity of their blood. Under the microscope the blood corpuscles are identical in form and appearance; while those of the carnivora are clearly different from them.

It may now be interesting, in confirmation of what has been said, to refer to the family life, and, if one may so speak, to the mental and moral life of the anthropoids. Like man, the ape provides with exceeding care for its young, so that its parental affection has become proverbial. Connubial fidelity is a general and well known virtue. The mother ape leads its young to the water, and washes its face and hands in spite of its crying. Wounds are also washed out with water. The ape, when in distress, will weep like a human being, and in a manner that is said to be very affecting. Young apes manifest the same tendencies as human children. When domesticated, they are in youth docile and teachable, and also, at times, like all children, disobedient. In old age they often become morose and capricious. Most apes construct huts, or, at least, roofs, as a protection from the weather, and sleep in a kind of bed.

One peculiarity is alone common to them and man, and this is the habit of lying upon the back in sleep. In battle they defend themselves with their fists and long sticks; and, under otherwise like circumstances, they manifest like passions and emotions with man: as joy and sorrow, pain and envy, revenge and sympathy. In death, especially, the ape face assumes a peculiarly human-like and spiritual expression, and the sufferer is the object of as genuine compassion as exists in the case of man. It is also well known that apes bury their dead, laying the body in a secluded spot, and covering it with leaves. Regarding the domestic life of the ape, Darwin says, in his "Descent of Man" (vol. 1, p. 39):

"We see maternal affection manifested in the most trifling details. Thus Rengger observed an American monkey (a Cebus) carefully driving away the flies which plagued her infant; and Duvancel saw a Hylobates washing the faces of her young ones in a stream. So intense is the grief of female monkeys for the loss of their young, that it invariably caused the death of certain kinds kept under confinement by Brehm in North Africa. Orphan monkeys are always adopted, and carefully guarded by other monkeys, both males and females. One female baboon had so capacious a heart, that she not only adopted young monkeys of other species but stole young dogs and cats, which she continually carried about with her. Her kindness did not go so far, however, as to share her food with her adopted offspring; at which Brehm was surprised, as his monkeys divided everything quite fairly with their own young ones. An adopted kitten scratched the above-mentioned affectionate baboon, who certainly had a fine intellect, for she was much astonished at being scratched, and immediately examined the kitten's feet, and without more ado bit off the claws."

The number of characteristics possessed in common by man and the higher apes is, indeed, very great, and includes not only physical and emotional but even intellectual qualities.—*From Schlickeysen's "Fruit and Bread," translated by Dr. Holbrook.*

Special Notice.

Persons who have sent numbers of the Scientific American to this office, for the purpose of having them bound, will please call or send for them immediately.

Some of the volumes extend back to 1860, and as we need the room they occupy, we shall dispose of those not claimed within ten days from date of this paper.

MUNN & Co., 37 Park Row, New York.

DECISIONS OF THE COURTS.

United States Circuit Court.—District of New Jersey.

SHAWL STRAP PATENT.—GEORGE CROUCH *VS.* WILLIAM ROEMER.

[In equity.]

By Nixon, District Judge.

This is an action for an alleged infringement of complainant's letters patent No. 82,606, dated September 29, 1868, and reissued March 7, 1871, No. 4,289.

The subject-matter of the patent is in the reissue described to be a strap "to confine a shawl or similar article in a bundle," and termed a shawl-strap. The schedule attached to and forming a part of the said reissued patent states, that before the complainant's invention "straps had been used to confine a shawl or similar article in a bundle, and a leather cross-piece with loops at the ends, had extended from one strap to the other; and above and attached to this leather cross-piece was a handle. This leather cross-piece or connecting strap is liable to bend and allow the straps to be drawn toward each other by the handle in sustaining the weight. Hence the bundle is not kept in a proper shape and the handle is inconvenient to grasp."

The invention is then stated to consist "of a rigid cross-bar beneath the handle, combined with suspending straps, that are to be passed around the shawl or bundle, such straps passing through loops at the ends of the handle."

No question can be made but that the shawl straps manufactured and sold by the defendant are an infringement of the complainant's reissue. They consist of a metallic cross-bar, with slots at the ends for the reception of the straps, and which also connect the ends of the handle.

Several defences are set up in the answer, but the only one necessary to consider is the first, to wit: The want of novelty and prior public use.

I had occasion, heretofore, to inquire into the validity of the complainant's patent, in a controversy between the same complainant, and Speer *et al.*, reported in VI. Off. Gaz. 1874, in which, as in this case, the principal defence turned upon the novelty of the invention. A prior public use was alleged and attempted to be proved. I there said and now repeat "that the patent is *prima facie* evidence that the patentee was the original and first inventor, and that any one who controverts this assumes the burden of proof and undertakes to show affirmatively that there was a prior knowledge and use of the alleged invention under such circumstances, as to give to the public the right of its continued use against the patentee."

The defence in this case has brought out many facts in regard to the public use of the rigid cross-bar in shawl straps anterior to the date of the complainant's patent, which were not developed in the former suit. There is no evidence which in my judgment affects the honesty of the complainant's claim, or which creates any doubt that he really believed himself to be the original and first inventor, but nevertheless I am constrained to the conclusion, after a most careful examination of the whole testimony, that the proofs show with reasonable certainty that he has been anticipated in the invention and that his patent is void, in consequence of the prior knowledge and public use, and the bill must be therefore dismissed with costs.

[*E. B. Barnum*, for complainant.
Arthur v. Briesen, for defendant.]

NEW BOOKS AND PUBLICATIONS.

THE ECONOMIC THEORY OF THE LOCATION OF RAILWAYS. By Arthur M. Wellington, C.E. Price $2.00. New York city: Office of the Railroad Gazette, 73 Broadway.

The author of this book is thoroughly conversant with his subject, and his statement that the book has gradually grown from a few notes into a volume may be accepted as an explanation of the somewhat fragmentary character of the work. He asserts that "all our railways are uneconomically located," and "in many cases these errors are shockingly evident." If these statements are true, he is right in stating that "there is something almost pitiful in the waste of human labor enforced by such costly blundering." He considers that other countries have made lamentable blunders in locating their railroads, so that the suffering stockholders of American lines may take comfort from the thought that others are or may be as badly off.

FRUIT AND BREAD. A Scientific Diet. By Gustav Schlickeysen. Translated from the German by M. L. Holbrook, M.D. With an Appendix. Illustrated. New York city: M. L. Holbrook & Co.

The author and translator of this little treatise are firm believers in vegetarianism, and present in a highly attractive form the main arguments which sustain them in their position. The subject is most carefully and systematically treated, and although the conclusions at which the author arrives are greatly at variance with modern belief and practice, the book is nevertheless entitled to proper and respectful consideration. Illustrations are given of the teeth and stomachs of various animals, and these are compared with the similar organs existing in man, so exhibiting in a clear and satisfactory manner the perfect adaptedness of the latter to a purely vegetable regimen, which is certainly something more than merely accidental. Altogether the book is well worthy of perusal by others than those more immediately interested in the question of diet.

THEORETICAL NAVAL ARCHITECTURE: a Treatise on the Calculations involved in Naval Design. By Samuel J. P. Thearle, F.R.S.N.A., etc. Two Volumes; Text and

Plates. New York city: G. P. Putnam's Sons.

This book is designed to meet the requirements of both those who possess but a moderate amount of mathematical knowledge as well as of those who are much further advanced. Numerous formulæ and rules clearly stated will enable the former to perform without much difficulty the ordinary routine of the draughting office, while ample opportunity is afforded the latter to trace back the processes from which these rules have gone forth. The book is divided into six parts. Part I. embraces the calculations relating to the forms and dimensions of ships. II. those relating to the weights and centers of gravity of ships. Part III. refers to the strength of ships. IV. and V. to their propulsion by sails and by steam engines; while Part VI. treats of the calculations relating to steering. An excellent book of plates and tables accompanies the text.

Kemlo's Watch Repairer's Handbook: being a complete guide to the young beginner in taking apart, putting together, and thoroughly cleaning the English lever and other foreign watches, and all American watches. By F. Kemlo, Practical Watchmaker. With Illustrations. Price $1.25. Philadelphia, Pa.: Henry Carey Baird & Co.

This work will prove of great value to all in whom the curious mechanism of clocks and watches has excited more than a passing interest. None but skilled followers of the art have been allowed to contribute to its pages, so that the practical worth of the information given can be fully relied upon. A concise history of timekeepers is followed by a clear and exhaustive description of the English lever watch, which in turn is followed by articles on cleaning, putting together, and the conditions necessary to produce a good English watch. American watches deservedly engage considerable attention. Papers on repairing watches, cleaning and repairing clocks, and a short description of the necessary tools complete the book.

Recent Progress in Sanitary Science. By A. R. Leeds. Salem, Mass.: Printed at the Salem Press.

This is a reprint of a paper read at the Lyceum of Natural History, October 9, 1876, by the well known Professor of Chemistry at the Stevens Institute.

Williams' Tourist's Map and Guide To Colorado and the San Juan Mines. Price 50 cents each. New York city: H. T. Williams, 46 Beekman street.

Two well edited publications, deserving the attention of travelers and emigrants.

Inventions Patented in England by Americans.

June 7 to June 15, 1877, inclusive.

Boots and Shoes.—Mellen Bray, Newton, Mass.
Electro-Magnetic Motor.—W. W. Gary, Washington, D. C.
Furnaces.—J. J. Storer, New York city.
Gas.—M. H. Strong, Brooklyn, N. Y.
Gas Apparatus.—D. C. Smith, East Northwood, N. H.
Gas Machines.—T. F. Rowland, Greenpoint, N. Y.
Mineral Wool Apparatus.—A. D. Elbers, Hoboken, N. J.
Motive Power.—W. G. Smith *et al.*, New York city.
Power Looms.—James Long, Philadelphia, Pa.
Pulverizing Machines.—J. J. Storer, New York city.
Pump.—A. F. Eells *et al.*, Boston, Mass.
Refrigerating Apparatus.—B. J. B. Mills, Lexington, Ky.
Sewing Machines.—C. H. Warner, Sturbridge, Mass.
Sheet Metal Utensils.—F. G. Niedringhaus, St. Louis, Mo.
Valve Gear.—E. Cope *et al.*, Hamilton, Ohio.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the Scientific American. We are prepared to get up first-class wood engravings of inventions of merit, and publish them in the Scientific American on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HAY ELEVATOR.

Eugene L. Church, Walworth, Wis.—This is a hay elevator and carrier of simple and effective construction; and it consists essentially of a traveling carriage locking, by a tilting catch, on a fixed stop block of the track, from which it is released by the action of the bail of the sheave frame of the hay fork on a pivoted grappling hook, the sheave being held in suspended position by the joint action of a fixed hook, of the pivoted hook, and of the tilting catch. A track beam, which is suspended from the rafters of a barn or other building by means of eyebolts passing through the center of the track beam. A carriage runs along the track beam by a pair of flanged wheels, at each end of which the wheels of one pair are set at such distance from each other that they clear readily the suspension bolts as they pass along the same. A hoisting rope is attached, in the customary manner, to a fixed point at one end of carriage, and passed then through the sheave frame of the hay fork, and over a pulley of the carriage, and through a sheave at the end of track beam, and down to the ground, where a horse is hitched to its free end.

IMPROVED CORN HARVESTER.

Bennett Osgood, Lenox, Iowa.—This invention is an improved machine for cutting up the corn, removing the ears from the stalks, and cutting the stalks into pieces, and which may be adjusted to cut up the corn and shock it. As the stalks are carried back by chains, pins or hooks on bars tear open the husks of the ears; and the bars, in connection with rollers, break the ears from the stalks. The ears, when broken off, drop through an opening in the platform into an elevator, up which they are carried, and are discharged into a wagon drawn at the side of the machine. The box of the elevator is supported from the frame of the machine, and its carrier is driven from a shaft by an endless band. The stalks are carried back by endless chains, and allowed to drop from the rear end of the platform upon the brackets attached to the rear bar of the frame. As they fall upon the brackets they are cut into three pieces by two knives, which work in slots in the brackets, and to the upper part of which are pivoted the upper ends of two bars. The lower ends of these bars are pivoted to a crank formed upon the shaft, which revolves in bearings attached to the rear bar of the frame.

IMPROVED SULKY HARROW.

George M. Furman, Laclede, Mo.—This is an improved riding harrow, so constructed that it may be readily raised from the ground, by the driver from his seat, to clear it of rubbish, to pass obstructions, and to pass from place to place, to cut up the ground and cover the seed thoroughly, and be used for cultivating small grain and plants.

IMPROVED HARROW.

Hans Iver Lund, Charlotte, Iowa.—The object of this invention is to furnish an iron harrow which shall be light, strong, and durable, of less draft than an ordinary harrow, of less size, inexpensive in manufacture, and effective in operation, breaking up the lumps thoroughly, and stirring up the soil evenly. The harrow is designed to be made in three sections, all exactly alike, one, two, or three of which may be used at a time.

IMPROVED COMBINED COTTON SCRAPER AND CULTIVATOR.

Malachiah Roby, Kosciusko, Miss.—This machine is so constructed as to bar off and dirt or cultivate cotton plants at one operation; and the invention relates to the construction and arrangement of a center or main beam, to the forward end of which the draft is attached. To the beam, a little in the rear of its forward end, is attached the middle part of a crossbar, in which are formed a number of holes to receive the hooks or clevises by which the forward ends of side beams are secured to said crossbar. To the rear end of the main beam is attached the middle part of a crossbar, to which the rear ends of the side beams are secured by a bow and yoke passed around them diagonally, and which are tightened, when adjusted in place, by nuts screwed upon the ends of the bows. Bands are passed around said beams and diagonally around said standards, and tightened in place by wedges or other suitable means, so that the scrapers can be readily adjusted to work deeper or shallower in the ground, and easily detached when not required for use. Cultivating plows or dirters have standards which are attached to the side beams, the plows and standards of the inner side beams being placed in advance of those attached to the outer side beams. When the machine is to be used as a cultivator, the scrapers are detached, and may be replaced by cultivating plows.

IMPROVED CULTIVATOR.

Austin S. McDermott, Prairie Creek (Melleray P. O.), Iowa.—The object of this invention is to furnish a cultivator which shall be readily adjusted as the character of the work to be done may require, and easily guided and controlled. The tongue of the machine is made in V shape, and its rear end is attached to the axle. The arms of the tongue are connected by a crossbar, to which the doubletree is pivoted by a hammer bolt. To the ends of the axle are attached, or upon them are formed, crank axle arms, upon the journals of which the wheels revolve. To the arms of the tongue, near the forward end of said tongue, are bolted the ends of the forward arms of the three-armed bar, the third arm of which projects to the rearward, and its rear end is bent into U form to receive a curved bar, which is pivoted to the three-armed bar by a bolt that passes through the bend of the three-armed bar and through the center of the curved bar. The ends of the curved bar are secured to the forward ends of the beams by bolts, two to each end. To the rear ends of the beams are attached handles which may be strengthened by braces, and are designed for use in guiding the plows when the machine is used as a walking cultivator.

IMPROVED CHICKEN COOP.

Daniel M. Sullivan and Thomas A. Retallic, Montgomery City, Mo.— This invention consists of a coop adjustable vertically on a standard, and provided with removable partitions and doors for convenience in cleansing. The frame of the coop is placed on a standard, at the top of which is placed a pulley. A cord is attached to the top of the coop frame, and runs over the pulley, and is attached to a counterweight. The coop is divided by a central transverse partition into two compartments, which are subdivided by transverse partitions composed of slats, and held in place by a dowel pin at the bottom and by a pin at the top. The vertical strips that hold the slats of the partitions together are grooved on each side to receive sliding partitions which are arranged on a central longitudinal line of the coop, and at right angles to the partitions. Grooves are also made in the ends and central partition of the coop to receive these sliding partitions.

NEW TEXTILE INVENTIONS.

IMPROVED FULLING MILL.

James Hunter, North Adams, Mass., assignor to himself and James E. Hunter, of same place.—The object of this invention is to improve the construction of fulling mills in such a way that there can be no possibility of injuring the cloth while passing through the rollers, and in such a way as to give the operator full control over the friction caused by the tongue or lever upon the goods, whether said goods be heavy or light.

IMPROVED SHUTTLE-DRIVING MECHANISM FOR NARROW-WARE LOOMS.

William B. Willard, New York city.—This invention, relating to looms for weaving narrow ware, consists in the arrangement of a spur wheel traveling on a fixed rack, and actuating a movable rack attached to the shuttle carrier. Motion is given to the spur wheel by a cam on the main shaft of the machine, which acts through a slotted lever and a connecting rod. The object is to provide mechanism for throwing the shuttle in such looms. In the loom the shuttlerace is divided at its center, leaving a space of sufficient width to admit of the passage and shedding of the warp. The shuttle slides in the race, and is of such length as to overlap the opening, so that it may pass smoothly from one section of the shuttlerace to the other. The shuttle is pierced to receive the fingers of the shuttle carrier, which slides on the bar. The latter is a piece of sheet metal, which is turned over at its upper edge to receive the bar, and is provided with guides for the fingers. The said fingers are capable of engaging with the holes in the shuttle and project below the piece of sheet metal, and are bent at right angles, and provided with grooved friction rollers, which engage with a cam slot of such form that it will draw the fingers, one at a time, downward out of the shuttle, and retain them below the warp during the passage of the portion of the shuttle with which they engage, through the threads of the warp, and replace them after that part of the shuttle passes the warp.

IMPROVED LOOM TEMPLE.

Christian H. Schlaf, Rockville, Conn.—This is an improved device for stretching the cloth while being woven. It is so constructed as to adjust itself as the cloth is being woven and carried forward to the cloth beam.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED THILL COUPLING.

Josiah Kitzmiller, Keedysville, Md.—This is an improvement upon that form of thill coupling in which a pivoted cap is employed to slide over the end of the bolt or pin which secures the eye of the thill iron to the lugs or ears of the axle clip, the said cap serving to prevent the said pin from becoming accidentally displaced without the use of a screw nut or other securing device. It consists in the construction and arrangements of a spring catch for holding said pivoted cap down to its place against any tendency to rise accidentally, the said spring catch being located in a transverse groove or recess in the cap and between the cap and the adjacent lug and being provided with a beveled head and square shoulder, which engages with the under side of the lug to hold the cap down. The merit of this arrangement is that the catch is concealed from sight by the complete inclosure of the spring and the position of the beveled head beneath the coupling, and hence the exterior of the coupling presents a plain, smooth, and neat appearance, free from catches or projections, which would be liable to hook into the clothing in getting into or out of the carriage.

IMPROVED VEHICLE SPRING.

Fredrick W. Faber, Columbus, Texas.—This invention consists in combining an auxiliary spring with a spring suspended from goosenecks attached to the axle, the said auxiliary spring being attached to the axle, and provided with yokes for embracing the suspended spring, the object being to provide a device for steadying the main spring and preventing lateral motion.

IMPROVED TIRE HEATER.

Philip W. Cassil, New Athens, O.—To the top of the furnace or firebox is secured the ring heating chamber, which consists of the ring plate having a ring flange or rim formed around its outer edge. To the ring plate are attached the outer ends of a number of arms, the inner ends of which meet in the center of the ring plate, and have a journal attached to them. The journal may be hollow or solid, and upon it is placed a hub to which are attached a number of radial arms, to the outer ends of which is attached a rim. The rim fits against the inner part of the ring plate, and forms the inner wall of the heating chamber.

IMPROVED CHIMNEY COWL.

Andrew F. Barry and Ira G. Lane, New York city.—This invention is a chimney cowl or ventilator which will deflect the natural current of air, so that a draft is continually maintained. To the upper end of a sheet metal chimney top is attached a strip of metal, bent into a spiral form, and having spaces between the successive convolutions of the spiral. The spirals overlap each other, and increase in diameter towards the top. The coils are connected at intervals by stays, and the end of the upper and outer coil is tapped on to the one that precedes it, and is trimmed off horizontally, and upon it is placed an ornamental border. The wind, striking this top from any direction, is deflected so as to cause a draft. The device is claimed to be ornamental in appearance, is cheaply and easily made, and does not obstruct the chimney.

IMPROVED WAGON AXLE.

Wilbur F. Buckelew, Shreveport, La.—The object of this invention is to strengthen the wooden axles of wagons, and to fasten the skeins so that they will not become loose. A wooden axle is grooved longitudinally upon its under side throughout its entire length, to receive a rod, which is reduced in size at its ends, and threaded to receive the nuts. This rod is bent so as to conform to the tapering portion of the axle upon which the skein is placed. The skeins, having countersunk outer ends, are placed on the ends of the axle, and nuts having a beveled face corresponding to the countersunk ends of the skeins, are placed on the ends of the rod, and clamp the skeins securely on the axle. By giving the nut this peculiar form, it contains more threads than it otherwise would, and is in consequence stronger. The rod not only serves to retain the skeins securely in their places, but it also acts as a stay or truss rod for the axle, greatly strengthening it.

IMPROVED WAGON BRAKE LEVER.

Jacob P. Outson, Racine, Wis.—This invention consists of a curved ratchet bar and two levers working on the same pivot, one carrying a spring pawl, that engages with the curved ratchet bar, and the other carrying a stud for throwing the pawl out of the notches of the ratchet bar. When the brake is to be applied to the wheels of the wagon, one lever is thrown forward, carrying with it the other lever; and the pawl, by engaging the notches of the bar, holds the lever at any desired point. When it is desired to release the brake first named, the lever is drawn back, moving first the length of the slot, the stud striking the pawl and throwing it out of engagement with the ratchet bar, when the lever may be carried back to any required position.

NEW HOUSEHOLD INVENTIONS.

IMPROVED BAKER.

Luna Drew, Irving, Wis.—This is an improved baking attachment to heating stoves of all kinds, so that the heat of the same may be utilized for baking, warming, raising bread, and other purposes. It consists of a baker supported on adjustable legs, and secured to a round, oval, or square heating stove by suitable top and bottom slides. A warmer is arranged below the baker. The front of the baker is detachable, to admit its use for baking or warming purposes.

IMPROVED FIRE KINDLER.

John G. Distler, Brooklyn (Greenpoint P. O.), N. Y.—This invention is an improved fire kindler, simple in construction, convenient in use, and effective in operation, burning freely, and lasting long enough to fully kindle the fire. It is formed of corncobs, steamed, having a number of transverse holes formed through them, dried, dipped in melted white resin, and wrapped in paper. The corncobs are steamed to prevent them from breaking while being bored. The cobs, while still moist with the steam, have a number of transverse holes bored in them with a rapidly revolving bit, and are then thoroughly dried. When dry the cobs are dipped in melted white resin, and before they are fully cold they are wrapped in ordinary paper, which adheres to them, prevents any odor from passing off into the room and prevents them from soiling the hands while being handled.

IMPROVED MATCH SAFE.

John A. Field, Racine, Wis.—This is a match safe, the back, top, and front of which are made from a single piece of tin, and to which a lighter of wire cloth is attached, which is placed over a picture, to give the match safe an ornamental appearance. It is so arranged that the matches are delivered singly to a pair of hooks, from which they may be readily taken by the fingers.

IMPROVED NURSERY CHAIR.

Luther I. Adams, East Templeton, Mass.—This chair may be readily converted into a high or low chair, and in which an attached toy box retains the toys when the chair is in either position. The armed low chair has curved legs. Between the rear legs a shaft is journaled, upon which two wheels are placed. The support for the low parts when it is used as a high chair consists of two similar sides, each composed of two curved strips, which are held together partly by crossbars and partly by triangular metallic pieces that are attached to their upper ends and pivoted to the center of the crossbars that connect the legs. A shaft, having upon it wheels, is journaled in the curved strips at the back of the chair near the lower ends. The toy box consists of a tray that is concaved at its upper edge and is made convex at its lower end, and is provided with a cover that extends over a portion of it, and forms a receptacle for toys when the box is in a vertical position.

IMPROVED FRUIT JAR.

Catherine Hastings, Oswego, N. Y.—This is an improved attachment for fruit jars, to enable them to be conveniently handled when filled with hot fruit, and at other times. It does not interfere with standing the full fruit jars upon their tops, if desired, and enables the jars to be used for holding and carrying various articles. There is a metallic screw band, by which the cover is secured upon the mouth of jar. To the opposite sides of the band are soldered lugs to which are pivoted the ends of a wire bail.

IMPROVED VENTILATOR.

Charles E. Darling, Lewiston, Me., assignor of two thirds his right to Henry Free and John E. Lydston, of same place.—This ventilator for windows, doors, etc., works in noiseless manner, and is watertight. It consists of radially recessed face disks, clamped to the glass frame, and having an intermediate pivoted disk with corresponding recesses that are set by a crank lever and cords into open or closed piston.

IMPROVED BAKING PAN.

Charles I. Kagey and Fred W. Stoneburner, Arcola, Ill.—The body of this roaster is made of sheet iron, and is rectangular in form. To one end of the body a cap is secured, and to the other end a rectangular cast iron frame is fitted, to which a cast iron door is hinged. At the top of the roaster, at or near its center, an aperture is made, which is closed by a tapering projection that extends downward from a plate that is hinged to the top of the roaster. Rings are attached to the top of the roaster near each end for convenience in handling. The apparatus, when in use, is placed upon a stove or in an oven.

IMPROVED STOVEPIPE SHELF.

John W. Jackson, Sharpsville, Pa.—A wire of the requisite strength is bent into the shape required to form the horizontal support. To this the shelf is attached, and also the bracket, which rests against the pipe for supporting the same.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED WATER WHEEL.

Isaac Mallery, Dryden, N. Y.—This invention relates to downward discharge turbine water wheels; and it consists in the employment, in combination with a stationary chute case and an independent adjustable frame, of a series of gates, which are pivoted to this frame and adjustable to the periphery of said case. The bucket wheel is formed of curved and inclined buckets arranged around a hub, and applied to a cap ring and a skirting. This wheel is keyed on a driving shaft, stepped on a bridge, and passed up through a tubular sleeve, which is cast on the top of a cylindrical chute or guide case. This case is rigidly secured to the base or bed frame, and constructed with oblique issues, which direct the currents of inflowing water against the buckets of the wheel.

IMPROVED VALVE MOTION FOR STEAM ENGINES.

Henry Haering, New York city.—This is an improved device for operating the slide valve of a steam engine from the piston rod of said engine, in such a way that the valve will be moved slightly to partially uncover the inlet and exhaust ports as the piston completes its stroke, and its motion will be continued in the same direction as the piston begins to move upon the return stroke, until the ports are fully opened, and will then stand still, with the ports fully open, until the piston has nearly completed its return stroke. It consists in the combination of a three-armed bar, two levers, connecting bar, and connecting lever, with the piston rod and the valve stem of a steam engine; and in the combination of a lockbar, spring, two cylinders, and pin, with the two levers and the three-armed bar. As the piston approaches the end of its stroke, the upper end of an upright arm of a bar strikes the concaved side of the upper part of one of the levers operating it, and moving the slide valve to close the ports and admit steam in front of the piston. As the piston begins its return stroke the inclined upper surface of one of the side arms of the three-armed bar comes in contact with the lower end of the said lever, and continues its motion in the same direction, fully opening the said inlet port, which remains fully open until the piston has again nearly completed its stroke.

IMPROVED REVERSIBLE ECCENTRIC.

George G. Lafayette and Pitt W. Strong, Brockville, Ontario, Canada.—This is an improved device to act as a substitute for the link motion on a reversible engine, or for adjusting the stroke of a boiler-feed pump, while in motion, so as to regulate the amount of feed water supplied to the boiler, without the use of an overflow pipe and cock, and keeping thereby the pump constantly in motion, which will save the annoyance frequently experienced in pumps by their refusing to prime after having been stopped for a short time. It may be further used to control the speed of all kinds of engines, whether with plain slide valve or with a cut-off valve working on top of the other by connecting directly to the device a suitable governor, so as to automatically shorten and lengthen the stroke of the valve, and give a uniform motion to the engine under different loads.

IMPROVED EXPANDING REAMER.

Robert Blair, San Francisco, Cal.—In this improved tool there is a clamping bolt by which the cutters are clamped fast after being adjusted. The cutters are arranged to slide directly across the stock in dovetail grooves, and are slotted to slide along the clamping bolt and washers, by which they are clamped fast after they are adjusted to the position required by a toothed pinion and racks. The pinion is arranged in the stock between the cutters, and the shaft extends out of the end of the stock, with a nick in the end for a screwdriver to turn it.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED TORTOISE-SHELL HANDLE.

Christian W. Schaefer, New York city.—The object of this invention is to mount the handles of canes, umbrellas, parasols, whips, opera glasses, and similar articles with a tortoise-shell covering, in such a manner that the present inefficient mode of attaching the same by glue may be dispensed with, the covering attached in tightly fitting and durable manner, and the joint or weld of the edges be not noticeable in the least.

IMPROVED HAND STAMP.

Leonard Tilton, Brooklyn, E.D., N. Y.—This invention consists in novel devices for giving positive rotation to the stamp heads after the impressions are made, in combination with a reciprocating inking pad, and in means for adjusting the throw of the inking pad with respect to the printing faces of the stamp heads.

IMPROVED BUCKLE.

John Fenton, Indianapolis, Ind.—This invention is an improved buckle, neat in appearance, strong and durable, which may be easily fastened and unfastened, which will not require the strap to be perforated, and will hold it securely in any position into which it may be adjusted. The buckle is formed of a plate having holes in its middle part to receive the rivets by which it is secured to the strap, and having cross slots formed in its ends to receive the free end of the said strap, and the eccentric, having its outer side corrugated radially, and provided with a handle.

IMPROVED LIQUID DIFFUSER.

George M. Smyth, Brooklyn, N. Y.—This invention consists in the combination of an air compressor, an air reservoir, and a receptacle for the liquid, and an arrangement of pipes and nozzles for atomizing the liquid. An air compressor of any ordinary construction is connected with the reservoir by a pipe, in which two stopcocks are placed. There is a receptacle for containing the liquid to be diffused or atomized. A pipe passes through a stopper placed in the neck of the said receptacle, and extends nearly to the bottom of the same, and its upper end is provided with a stopcock and nozzle. A nozzle is arranged at right angles to the first-mentioned nozzle, and is attached to a brace that is secured to the pipe.

IMPROVED OIL CAN.

John Graves, New York city, assignor to himself and James L. Miller, Westfield, N. J.—This is an improved case for packing oil cans for transportation, the case furnishing the additional facility that the can may be readily inserted into the same and tilted for use. The invention consists of a wooden projecting case with side slots, in which trunnions of the can are guided and supported for swinging the can on pivot hooks, which serve also for the purpose of locking the lid to the case.

IMPROVED HARNESS TUGS.

Charles Hauff, Ashland, O.—The body of the carrier is made in the form of a ring with outwardly projecting flanges around its edges. The strap is passed around the ring in the groove formed by its flanges, and its inner end is sewed to its body at the side. Small wedge-shaped blocks of leather are inserted in the angle between the parts of the strap where they meet and the ring, which angular blocks are covered by angular projection of the flanges of the ring.

IMPROVED COMPOSITION FOR CASTING ORNAMENTAL FIGURES.

August Kiesele, New York city.—This consists in a composition formed by the admixture of dry pulverized sugar, melted paraffin, and stearine. It is poured into moulds and allowed to cool. The article is then removed from the mould, and powdered starch or sugar is dusted over it to destroy the gloss and give it the appearance of alabaster.

IMPROVED PEN RACK.

Harvey W. Forman, Golden City, Col.—This consists of an upper frame with intercrossing wires, forming wide spaces or meshes, and of a second frame with closer wires below the same, for holding the pen in upright position, in connection with a bottom pad or absorbent below the rack frames.

IMPROVED STOPPER FOR MUCILAGE BOTTLE.

James Tilghman, New York city.—This is a combined brush and stopper, consisting essentially of a handle having a stem and a flat end corresponding to the top of the cork. The brush has a flat head, corresponding to the bottom of the cork. The cork is interposed between the said head and end of the handle, and held in place by the central stem.

Business and Personal.

Fulton street, N. Y.

For Sale.—One 3 ft. Planer, $195; one 8 ft. do., $350; one 26" Lathe, $295; one 22" do., $175; one 15" do., $120. At Shearman's, 132 North 3d street, Philadelphia, Pa.

Inventors.—Send 10 cents for the "Journal of Invention," 4 months. 37 Park Row, N. Y. Room 2.

Reliable Oak Leather and Rubber Belting. A specialty of Belting for high speed and hard work. Charles W. Arny, Manufacturer, Phila., Pa. Send for price lists.

Shaw's Noise-Quieting Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quiets all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

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Removal.—Fitch & Meserole, Manufacturers of Electrical Apparatus, and Bradley's Patent Naked Wire Helices, have removed to 40 Cortlandt St., N. Y. Experimental work.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N. Y.

Lead Pipe, Sheet Lead. Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

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Blank Book Back-Shaping Machine. Illustrated circular free. Frank Thomas & Co., Home St., Cincinnati, O.

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Help for the weak, nervous, and debilitated. Chronic and painful diseases cured without medicine. Pulvermacher's Electric Belts are the desideratum. Book, with full particulars, mailed free. Address Pulvermacher Galvanic Co., 292 Vine St., Cincinnati, Ohio.

Silver Solder and small Tubing. John Holland, Cincinnati, Manufacturer of Gold Pens and Pencil Cases.

Patent Scroll and Band Saws. Best and cheapest in use. Cordesman, Egan & Co., Cincinnati, O.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

Best Glass Oilers. Cody & Ruthven, Cincinnati, O.

For Boult's Paneling, Moulding, and Dovetailing Machine, and other wood-working machinery, address B.C. Machinery Co., Battle Creek, Mich.

Chester Steel Castings Co. make castings for heavy gearing, and Hydraulic Cylinders where great strength is required. See their advertisement, page 30.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence. R. I.

Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters, to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Inquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical inquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact, hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to inclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to inclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

J. P. D. will find directions for colored whitewash on pp. 235, 236, vol. 36.—A. M. will find directions for electroplating on p. 59, vol. 36.—H. P. can recover silver from photographers' waste by the process detailed on p. 250, vol. 27.—A. W. A.'s difficulty as to 64 and 65 squares in the puzzle can be solved by an inspection of the diagrams on p. 323, No. 21, SCIENTIFIC AMERICAN SUPPLEMENT.—I. A. will find a description of a magneto-electric machine on p. 195, vol. 34. A clock thus would go for 12 hours, and wind itself at the same time for 12 hours more, if such a machine could exist, would be a perpetual motion. As to tempering small drills, see p. 186, vol. 26.—R. B. can prevent rust on iron or steel by the means described on p. 26, vol. 25. For a recipe for a depilatory, see p. 186, vol. 34.—A. T. R. is informed that the hydrocarbon engine is reversible.—T. W. will find directions for making sand belts on p. 235, vol. 36.—M. G. should address a manufacturer of oxygen cylinders.—J. S. C., who inquires as to a water fountain, sizes of pipes, etc., should send us a sketch with dimensions.—O. L. is informed that the proper way to ascertain the relative strengths of corrugated and plain sheet metal is by experiment.—G. H. B. will find directions for making colored printing inks on p. 90, vol. 36.—P. M. will find on p. 250, vol. 36, directions for making a polishing starch.—C. H. B. can braze the ends of his brass plate to make a cylinder of it. See p. 219, vol. 36.—W. H. C. is informed that his method of fluting reamers is not new.—C. C. G. will find his method of raising coal or other weights impracticable.—E. S. G. had better test so simple an experiment and satisfy himself. —W. H. C. is informed that the most satisfactory plan would be to get his tools nickel-plated.

(1) J. H. N., of Christ Church, New Zealand, asks: Is the stearin from which the olein has been extracted by Dr. Mott's process fit to be made at once into good stearin candles, without any further treatment? A. Yes.

(2) B. B. says: I wish to express the strongest coloring matter from certain herbs, sage leaves, for instance. How can it best be done cheaply and quickly? Evaporation during several days, after boiling and simmering, has the effect; but it is inconveniently slow. The color produced is a medium brown. A. Dry the leaves, etc., thoroughly, and grind to a fine powder. Digest this for several days in enough warm water to thoroughly moisten it throughout. Then add enough wood naphtha to make a stiff paste, and after standing an hour transfer to a fine linen bag and express the thick liquid in a screw press. 2. Is there anything that will set the color? A. Try a strong hot solution of alum.

(3) H. K. F. M. says: I have a box made of Bohemian crystal. The cover, which was held to the box by a brass frame, has come apart from its frame. It seemed to have been cemented by a hard substance resembling plaster of Paris. How can I make it? A. Boil 3 parts powdered rosin for sometime with 1 part of caustic soda and 5 parts of water; then stir into the soap formed one half its weight of plaster of Paris, and use immediately.

(4) F. N. Y. asks: Would a canvas bag, coated with a varnish made of india rubber dissolved in naphtha, be suitable to hold oxygen gas? A. Yes; but bags made of double pieces of cloth, cemented together with the varnish, are better.

(5) J. A. B. asks: Is there any difference between electricity and magnetism? A. Electricity and magnetism are supposed to be manifestations of the same force whose actions are produced at right angles to each other; the action which occurs in the line of polarization being called electricity, and the one at right angles to this line, magnetism. There is an important difference between them, however, as electricity is essentially a dynamic force, while magnetism is purely static.

1. Is not the idea of the world moving around the sun in an elliptic form absurd? A. No. 2. My idea is that the north star is the center of the universe, or in fact is the magnet that all the suns or fixed stars move around, and that the attraction of the pole of the earth, although it moves around the sun, is the cause of the change of seasons, or, in other words, the angle of light. A. There is nothing whatever to support the idea. But a supposed center of the universe has really been designated by some astronomers.

(6) P. S. asks: How much copper wire does it require to construct an electro-magnet that will uphold 100 lbs., and what size of wire should be used? A. Probably 500 or 600 feet of No. 14 copper wire would be sufficient with 3 or 4 very large size Grove cells and cores about 6 inches long and 1 inch in diameter.

(7) H. S. B. says: Water falls about 16 feet per second. My overshot water wheel moves about 4 feet per second. Do I in that way lose that percentage of the actual power of the water? A. Not necessarily.

(8) C. N. B. asks: Can a steam engine be worked with compressed air the same as with steam? A. Generally speaking, it can; but not in every respect.

(9) J. Y. says: If all the measures of length, surface, and capacity in the world, and all the weights were lost, by what means could new ones be made corresponding exactly with those we now have? A. It would be impossible, as all the measures in use refer to certain arbitrary standards.

(10) R. B. G. asks: If a horse be pulling at the end of a lever and traveling 3 miles an hour, how many lbs. pressure against his collar must he exert, to raise 33,000 lbs. 1 foot per minute? A. The force exerted by the animal will depend upon the length of the lever, which should be given.

(11) C. H. McK. asks: Would a pump so constructed as to create an incessant suction draw water an indefinite distance, or how far would it draw it? A. Such a pump would raise water no higher than any other that was equally tight.

(12) J. W. says: I wish to get some boilers made about 12 inches in diameter and 13 inches deep. I want them to stand a pressure corresponding to 400° Fah°. Do you think it would be safe to have them made of cast iron? A. We think it will be better to use wrought iron. Make the shell about 7/16 of an inch thick.

(13) J. R. S. says, in reply to E. W. P., who says that he has an artesian well which does not flow; but from which he pumps by inserting a pipe inside the well tubing, and asks: "If we attach the pump to the well tubing directly, allowing no air to enter the tube, would it not be like trying to pump water from an airtight barrel?" If such were the case, the drive well would be a miserable failure; for in all drive wells the pump is attached directly to the tube. I would advise E. W. P. to attach his pump to the well tube direct, and he will gain three times the amount of water that he now gets. By having his pump attached to the well tube directly, the working of the pump creates a vacuum, and the atmospheric pressure on the earth's surface violently forces the liquid to fill the vacuum thus formed, thereby giving a much greater amount of water than can be otherwise obtained. It is a well established fact that more water can be obtained by the drive well than by any other. A. In our answer to E. W. P., it will be evident, we think, to most of our readers, that we only referred to the case in which the well had no connection with the atmosphere, when the pipe was tightly fitted. It appears, however, that it might have been better to have stated this more definitely, and we gladly embrace the opportunity afforded by the interesting letters of our correspondents. We would be glad to receive from J. R. S. some experimental data in proof of his assertion as to the great gain from a tight connection. This also answers J. T. G. and W. H. F.

(14) H. H. S. says: 1. Given, a boat with a 35 feet keel, of 6 feet beam, with fine lines; also a two-cylinder engine, each cylinder 4 x 5 inches; and a wheel 28 inches in diameter and of 3½ feet pitch. Will an upright boiler, with 135 square feet heating surface, and 4 square feet grate surface, be sufficient to run the engine at 250 or 300 revolutions per minute with 100 lbs. steam? A. With good coal and a forced draft, the boiler may be large enough. 2. What will be the probable speed of boat? A. In smooth water, 7 to 8 miles an hour.

(15) F. A. asks: What would be a safe outside pressure for a cylinder of wrought iron, ½ inch thick and 4 feet in diameter, and 8 feet long? A. According to tables given in Wilson's "Treatise on Steam Boilers," the working pressure for such a tube would be about 65 lbs. per square inch.

(16) F. M. M. asks: 1. How large must an engine be to run a boat 12½ feet wide, 75 feet long, drawing 4 feet of water, at the rate of 30 miles per hour, on a river or bay where the surface is smooth? A. We have some doubts as to whether these conditions could be fulfilled. 2. Do steamboats on the ocean use salt water in their boilers for steam, or do they carry fresh water? A. They ordinarily have surface condensers, so that the water of condensation is returned to the boilers.

(17) E. S. N. says: Please give your ideas as to how much water an engine 18 inches in diameter by 22 inches stroke, running at 145 revolutions per minute, at 80 lbs. steam, cutting off at about 18 inches, will require. We furnished an injector for one of the above dimensions, capable of throwing 900 gallons per hour. It was found to be insufficient, and I went to the mill to discover the cause, if possible. The manufacturers of the injector thought it ought to be large enough, and so did we. I found everything set up properly, and the piston and valve were evidently in good order. I finally measured the capacity of the tank which supplied the injector, and found that it drew 960 gallons per hour. A. We do not think the data are sufficient for an accurate calculation. It is possible, however, that some of our readers have made experiments on similar engines, and can give some useful information.

(18) T. W. asks: What size of breast water wheel, with a fall of 2 feet water, would it require to produce the same power as an overshot wheel of 4 feet diameter, 18 inches face, with a fall of 5 feet water? A. If the breast wheel gave the same efficiency as the other, it would require a face about 2½ times as wide.

(19) A. K. says: A. asserts that if a small and a large boiler be set side by side and connected with the top gauge cock of the two boilers, level, when they are first filled with water, and then steam is raised, that the water will not remain the same, that the pressure will be greater in the larger boiler, and consequently will force the water into the smaller one. B. says that the water will always remain the same as long as the boilers are connected; that the pressure on the water will be the same in both boilers, and therefore the water will always assume the same level in each. Which is right? A. The pressures sometimes vary in two boilers connected in this way; and they should be set in such a way that the water cannot be forced from one into the other under any circumstances.

(20) J. T. G. says: I notice your reply to W. G. in regard to pounding of a steam pump, in which you recommend the use of a larger air vessel. I think that W. G. can remedy the difficulty by allowing a small quantity of air to enter the pump cylinder at each stroke, which can be done without sensibly diminishing the amount of water delivered, provided the lift is not so high as to nearly equal the capacity of the pump. That would keep the maximum quantity of air in the air vessel, and I think that the air in the discharge pipe would have the effect of converting a comparatively rigid column into an elastic one. W. G. can easily try the experiment by running with the drain cocks at the end of his pump partially open; and if that remedies the difficulty, he might insert a small check valve opening inward to prevent the discharge of water during the out-stroke. If W. G. tries this, I wish that he would let us know the result through the SCIENTIFIC AMERICAN.

(21) G. H. says: Please decide the following: A. claims that a team of horses can draw a greater load when hitched close to it than when hitched at a distance of 10 or 20 feet. B. claims that, everything else being equal, distance makes no difference, and that the team could pull as many lbs. at a distance of 20 feet as it could at ten or less. Which is right? A. We incline to B.'s opinion.

Please tell me the relative power of conducting electricity of the principal metals. A. According to Matthiessen, the electrical conductivity of the principal metals, under similar conditions, is as follows:

Silver	100.0
Copper	99.9
Gold	80.0
Aluminium	56.0

Sodium	37.4
Zinc	29.0
Cadmium	23.7
Potassium	20.8
Platinum	18.0
Iron	16.8
Tin	13.1
Lead	8.3
German silver	7.7
Antimony	4.6
Mercury	1.6
Bismuth	1.2

(22) S. R. S. asks: How can lime, or rather phosphate of lime, be precipitated from cod liver oil, which is perfectly clear and said to contain 2 per cent. of the phosphate? A. This can only be done by first destroying the organic matter of the oil, and then examining the residue for the phosphates with the usual reagents—magnesia solution, barium chloride, nitrate of silver, ammonium molybdate, etc. With so small a percentage of the phosphates, it will be necessary for you to work with concentrated solutions, and slowly. The oil may be oxidized by treating it on the waterbath with hot hydrochloric acid, with some chlorate of potash, added in small quantities at a time. Then evaporate down nearly to dryness, and treat with a little strong nitric and a few drops of sulphuric acid. This will take some time if properly done.

(23) J. H. S. says, in answer to J. H. B.'s query as to a parrot pulling out his feathers: Take a knife and scrape the inside edge of the bill, and the feathers will slip from the bill without coming out. This is done for feather-eating hens; no doubt it will answer for a parrot as well.

(24) S. R. S. says: I have some dentists' pellet gold. I alloyed it with brass and silver. I melted it several times, but it was so very brittle that I could not work it. I then added a $2½ gold coin, and fused, all together, but it was as brittle as before. I then fused it and dropped in lumps of pure saltpeter, but it is still as brittle as before. I fused the gold on a lump of charcoal with an alcohol blowpipe. Please tell me how to work it. A. You fail to state the proportions of your alloy. There may be an excess of zinc and copper, or the fusion may not have been complete. Place it, together with several small pieces of rosin and a little borax or carbonate of soda, in a small blacklead crucible, and heat to very bright redness over a good fire. If this does not obviate the difficulty, fuse the alloy with about three times its weight of nitrate of potassa (saltpeter), and treat the mass when cold with dilute sulphuric acid. Pour off the acid solution and fuse the alloy, together with any silver sulphate adhering to it and a little carbonate of soda. Any silver contained in the acid solution may be recovered by adding a little salt or muriatic acid, and fusing the precipitated chloride of silver with carbonate of soda.

(25) N. S. asks: 1. Can water be decomposed into its constituents (oxygen and hydrogen) with any considerable rapidity, and in large quantities, by electricity? A. Yes; providing a large magneto-electric machine be used. 2. What is the best and cheapest method of generating hydrogen in large quantities? A. The action of iron or zinc scraps on diluted oil of vitriol is among the best. A considerable volume of pure hydrogen may also be obtained with facility by passing superheated steam through a large iron tube filled with scrap iron heated to bright redness.

(26) G. S. D. W. asks: Is there any process by which an engraving can be transferred either to stone or wood, where the printing ink can be made to show up as black as in the original after the transfer has been made? A. We know of no satisfactory method whereby this may be accomplished directly. By means of the chromate of gelatin photographic process, such transfers may be made without great difficulty.

(27) F. M. M. asks: 1. If a steamboat 100 feet long, of 5 feet beam and 4 feet draught, be provided with one set of common side paddle wheels, and power enough to run it at the rate of 10 knots per hour, would two sets of side wheels, with the power doubled and the revolutions of the wheels doubled, double the speed of the boat? A. No. 2. If we take the same boat, side wheels, and power, for running 10 knots per hour, and arrange for the side wheels to feather their paddles, what effect would it have on the speed of the boat? A. You might obtain from 10 to 15 per cent. more of the power of the engine in useful effect.

(28) W. J. T. asks: 1. What is the best dark color to paint a laboratory, and what kind of paint must I use? A. One of the best for this purpose is shellac in alcohol, colored to suit with Vandyke or Spanish brown, etc. 2. I wish to varnish my benches. What varnish would you recommend? A. Shellac is commonly used, but copal gives good

results, also Brunswick black in oil.

Of what should a waste water pipe be made, so as to resist acids? A. Make it of lead or block tin.

Can you recommend an elementary work on electric batteries? A. Sprague's "Electricity: its Theory, Sources, and Applications," is one of the best.

(29) T. P. H. asks: Can I take a wax impression off type and then electrotype it with a battery? A. Yes. This is the common method of making electrotypes for printing from.

(30) C. M. asks: What are the locations of the various branch mints of the United States? A. A recent authority gives them as Philadelphia, Pa., San Francisco, Cal., Carson City, Nev., and Denver, Col. Assay offices are situated at New York city, Charlotte, N. C., and Boise City, Idaho.

(31) B. L. D. asks: Can you give me a recipe for making paste for sharpening razors, knives, etc.? A. Mix the finest emery obtainable with a little suet.

(32) C. B. McM. says: I hear that four gallon measures of different capacities are in use, and that The United States standard gallon contains 230 cubic inches. In the confusion of text-book statements such as—"wine gallon = 231 cubic inches," "beer gallon = 282 cubic inches," "American standard gallon = 58973 grains (Youmans' Chemistry) = nearly 234 cubic inches," and the very extensive ignorance of what is really correct, please repeat the information in a way that may be quoted as authority for the capacity of a United States gallon in cubic inches, and the weight in grains. A. "The gallon of the United States is the standard or Winchester wine gallon of 231 cubic inches, and contains 8.3388822 lbs. avoirdupois, or 58372.1754 troy grains of distilled water at 39.83° Fah., the barometer being at 30 inches. It is equal to 3.785207 liters. The gallon of the State of New York is of the capacity of 8 lbs. pure water at its maximum density, or 221.184 cubic inches. It is equal to 3.62346 liters."—*Appleton's Cyclopœdia.*

(33) S. C. D. says: Please give directions for electrotyping cylindrical rollers for impressing upon sheets of wax, accurately, of the proper figure for honeycomb foundations. The figure for the surface of the cylinders to be derived from sheets of wax foundation, having the figure correctly impressed upon them. A. This can be done by coating with plumbago, and then electrotyping with copper, in a way familiar to most printers and to all electrotyping establishments. The plates can afterwards be bent round a roller, and used to impress the sheets of wax.

(34) J. H. T. asks: There is a piece of ground, 100 rods long and 10 rods wide at one end, running to a point at the other, which we wish to divide into 4 equal lots. Please give a rule. A. Let the 100 rods be the base of a triangle, divide it into 4 parts of 25 rods each, and join the apex with each of the three dividing points. You will then have 4 triangles on equal bases and between the same parallels, which, according to Euclid, are equal to each other.

(35) R. S. asks: What are the chemical qualities of bisulphide of lime, and how can I prepare it? A. The bisulphide of calcium (C_2S_5) is produced by boiling milk of lime with sulphur and water, but not long enough to allow the lime to become completely saturated. The filtered liquid, on cooling, deposits crystals whose composition agrees with the formula $C_2S_2 + 3H_2O$. Exposed to the air, it soon absorbs oxygen, becoming converted into insoluble sulphate of calcium. Its aqueous solutions are likewise decomposed. Its reactions with the metallic salts are similar to those of the alkaline sulphides.

(36) H. M. S. asks: 1. Of what is the bronze preparation made and how is it applied to clock fronts? A. Bronze powders are made of various metallic alloys. The gold bronze is usually made of Dutch gold (an alloy of copper and zinc) and of the bisulphide of tin (*aurum musivum*). They are usually applied to metal work by means of an oil size or japan varnish. 2. In what way can I remove the old bronze? A. Wash first with a solution of washing soda (hot), clean and dry, and then rub with a little benzole, alcohol, or ether.

(37) W. E. W. asks: 1. Of what mixture is the bright red paint usually put upon axes made? A. It consists of fine vermilion ground with 1 part boiled oil and 2 parts turpentine. 2. Is more than one coat applied? A. One coat will suffice. It is best applied with a fine brush, when the metal is warm.

(38) C. M. B. asks: Is the odor emitted by the ailanthus tree unwholesome? A. It is considered so by many, but we have no proof as to the facts.

(39) L. S. & Co. ask: Is there anything known which would clean the hands from paints and lacquers without the use of turpentine? A. A little ammonia and benzine or naphtha, aided by a little sand, is often used in stubborn cases; but plenty of good

soap and warm water, with a stiff brush or a small piece of pumicestone, will ordinarily suffice.

(40) W. P. S., Jr., says: Can you give me a recipe for making *papier maché*? A. *Papier maché* is obtained from old paper and the like made into a pulp by grinding with milk of lime or lime water, and a little gum dextrin or starch. This pulp is then pressed into form, coated with linseed oil, baked at a high temperature, and finally varnished. The pulp is sometimes mixed with clay (kaolin), chalk, etc.; and other kinds are made of a paste of pulp and recently slaked lime. This is used for ornamenting wood, etc.

(41) M. P. B. says, in reply to a correspondent who asked how to prevent his water filter from getting choked up: Fit in the filter, on the top of the charcoal, a piece of board having in the center a circular hole from two to four inches in diameter, according to the size of the filter; force in this a sponge so tightly that all the water has to pass through it first, but not so as to prevent its free passage. This sponge will absorb readily the gross impurities of the water, and can easily be taken out and cleaned once or twice a week.

(42) A. C. S. asks: 1. Is there any reason why lightning rod points should always be bright, if the points are kept sufficiently sharp? A. It makes no difference if the points are not bright. 2. If lightning rods put up in the ordinary way above the roof terminate in the eaves' spouting of the house, and said spouting had good ground connections, would this not be equal to the best lightning rod, and thereby save many feet of rod and many dollars of expense? A. The arrangement you suggest would be good. Make a thoroughly good ground connection with leaders, have all joints well soldered, and you may dispense with the rod as you propose.

(43) J. A. W. says: Having occasion to do some copper plating some time ago, I dissolved sulphate of copper in water in a glass jar. I then poured it off into my battery, and there was some left in the jar. I threw a small piece of iron into it and left it for some days. I then took it out; and to my surprise, I found that it had been perfectly plated with copper. Please let me know the cause? A. The reaction you note is taken advantage of to cheaply copper plate small articles of cast iron. See answer to J. O. M., p. 347, vol. 36. In the presence of water, the reaction is as follows:

$CuSO_4$	+	Fe	=	$FeSO_4$	+	Cu.
Sulphate of copper.		Iron.		Sulphate of iron.		Copper.

As the iron is a more positive metal than copper, it displaced the latter in combination with acids, the remaining portions of the iron becoming coated with the precipitated copper.

(44) A. G. asks: Is the silver, for a reflecting telescope, put on the back of the glass the same as on looking glasses? A. No. Only one side of the glass is ground and polished to the shape required. The silvering is done on this side; and then, with the softest buckskin and the finest rouge, the surface of the silver is polished for the reflecting surface. In cities where gas is used, it will not retain its brilliancy very long; then it requires to be cleaned with nitric acid and resilvered, which is only the work of a few hours when a person has become accustomed to it.

(45) A. L. B. says: 1. I understand that, in modern chemistry, the acids and alkalies are the two extremes of a class of substances called hydrates, the only difference being the radical. In the reaction of nitric acid, HO NO_2 or HNO_3 on potassic hydrate, KOH is KO NO_2 or KNO_3, and H_2O. Which molecule loses the oxygen atom, and why should one part with it more than the other?

A.	HNO_3	+	KOH	=	KNO_3	+	H_2O
	Nitric acid		potassic hydrate		potassic nitrate		water

In this reaction the potassium is considered, by virtue of its greater affinity, as replacing the hydrogen atom in the hydric nitrate; the hydrogen in turn satisfying the OH group to form water. These hydrates are similar only in point of constitution. Their chemical deportments are widely different. 2. What are oxides in modern chemistry? A. The bodies formed by the direct combination of oxygen with the elementary bodies are called oxides. With water some of these oxides form hydrates, as

K_2O	+	H_2O	=	2(KHO)
potassium oxide		water		potassic hydrate

(46) J. R. M. asks: To have a circular saw run well, should the mandrel have a little end play if it is desired to relieve the saw and guides of strain? A. If the saw is not true or the carriage runs crooked, end play of the mandrel to the extent of the deviations will relieve the strain upon the saw. But if the carriage runs true and the

saw true, the mandrel should have no end play.

MINERALS, etc.—Specimens have been received from the following correspondents, and examined, with the result stated:

M. S. M.—It is a quartz crystal, the opposite sides of which have been ground flat, probably by artificial means.—F. B.—It is graphite.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Battery and Electric Clock. By J. E. W.

On Anti-Water Drinking. By C. P. W.

On Snakes Catching Fish. By C. R. G.

On Utilization of Sewage. By Dr. H. D. T.

On Aerial Navigation. By C. W.

On the Ash-Colored Salamander. By C. F. S.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes machinery suitable for making flour barrels? Whose is the best theodolite? Who sells steam whistles? Whose is the cheapest silk, suitable for balloons? Who makes the best engraving machine for transferring designs to copper?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

June 5, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city.

Air, cooling, C. Pfanne		191,710
Apple parers, etc., W. M. Griscom	191,669,	191,670
Ash sifter, G. W. & L. Demond		191,520
Bag holder, E. Woods		191,741

Baking pan, L. B. Foss	191,578
Baking pan, J. H. Pitts	191,548
Barrel cover, McClellan & McBride	191,699
Barrel head, G. M. Breinig	191,644
Bedstead, wardrobe, S. S. Burr	191,651
Bee hive, T. A. Atkinson	191,635
Bee hive, H. F. Poggenpohl	191,612
Bee hive, Sperry & Chandler	191,620
Bench dog, W. Lyle	191,693
Bit stock, J. T. Matthews	191,540
Blacksmith's tongs, J. Van Matre	191,734
Boiler furnace, etc., J. E. Crowell	191,518
Bottle stopper, C. De Quillfeldt (r)	7,722
Bottles, etc., sealing, C. L. Darby	191,519
Bottling machine, W. H. Kelly	191,596
Bracket, J. B. Sargent	191,718
Breech loading fire arm, V. Bovy	191,563
Breech loading fire arm, J. Schudt	191,721
Bridge, E. S. Sherman	191,552
Bung cutter, R. & G. N. Crichton	191,658
Button, clasp, L. B. Colin	191,657
Button fastening, A. Brookmann	191,649
Calender and washing list, J. C. Coombs	191,517
Car brake, E. S. Jones	191,594
Car coupling, W. Duesler	191,522
Car lavatory, C. E. Lucas	191,691
Carriage perch stay, J. R. McGuire	191,700
Chair convertible, J. P. True	191,733
Chair, folding, B. F. Little	191,689
Chicken coop, Sullivan & Retallic	191,621
Chicken coop, R. L, & N. J. Todd	191,556
Chimney draft regulator, W. H. Sears	191,722
Chisel, mortising, J. T. Bowen	191,643
Churn, T. J. Parrish	191,708
Churn, reciprocating, H. C. Sperry	191,726
Churn, rotary, A. J. Borland	191,562
Churn, rotary, Hatton & Record	191,676
Churn, rotary, J. G. Wallace	191,736
Clasp hook, spring, J. W. Knause	191,686
Clocks, adjusting position of, W. F. Wuterich	191,630
Coal and ore washer, J. M. Bailey	191,511
Corn dropper, J. P. Simmons	191,723
Corset skirt supporter, T. F. Hamilton	191,672
Cotton scraper, etc., M. Roby	191,613
Cultivator, W. E. Dewey	191,660
Cultivator, A. S. McDermott	191,606
Cupboard, W. H. Sallada	191,549
Curry comb, Bennett & Moody	191,559
Curry comb, P. Miller	191,608
Desk, school, C. H. Presbrey	191,713
Drawing instrument, J. R. Peel	191,611
Drill hoe, E. F. Pryor	191,714
Easel, T. L. Fisher	191,577
Easel, F. S. Frost	191,579
Eccentric, reversible, Lafayette & Strong	191,602
Elevator, etc., telescopic, W. R. Comings	191,516
Elliptic spring, N. J. Tilghman	191,731
Engine frame, S. W. Putnam	191,716
Engine exhaust, C. T. Parry	191,545
Engine valve motion, H. Haering	191,583
Feed rack, W. H. Howard	191,590

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Lathes, truing work in, A. Hatch	191,586
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Lithographic press, C. C. Maurice	191,696
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Loom take-up, J. Lyall	191,692
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Lubricator, C. H. Parshall	191,707
Mandrel, expanding, Amann & Harker	191,634
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Marine ram, N. H. Borgfeldt	191,514
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Medicine case, J. C. Millard	191,607
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Oil well rope socket, H. Baddock (r)	7,719
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Pianoforte bridge, J. Herald	191,587
Picture exhibitor, J. Hannerty	191,673
Plow, E. Haiman (r)	7,724
Plow, L. F. W. Liles	191,688
Plow clevis, C. O. Wilder	191,629
Plow colter, C. R. Thompson	191,622
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Plow, sulky, W. Henry	191,588
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Seed drill, H. L. Brown	191,565
Seed planter, check row, G. D. Haworth	191,528
Sewing machine, straw, S. C. Brown	191,647
Sewing machine trimmer, H. H. Hallett	191,584
Shingles, etc., bunching, P. Dexter (r)	7,723
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Spoon blank, die, H. W. Bassett	191,639
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Stamp mill, G. Downing	191,521
Steamboat smoke stack, Rouze *et al*	191,614
Stop motion fork slide, J. McCaffrey, Jr.	191,697
Stove, J. Gladding, 3d	191,580
Stove, coal oil, M. H. Barnes	191,558
Stove, cooking, D. E. Paris	191,706
Stovepipe damper, A. Brightman	191,646
Stovepipe thimble, J. Carhartt	191,567
Stove, oil, cooking, Sherburne *et al*	191,553
Straw cutter, A. Vahldieck	191,625
Sugar, liquefying hard, O. H. Krause	191,535
Sugar liquor, collecting, A. A. Goubert	191,527
Sugar liquor, collecting, Matthiessen *et al*	191,537, 191,538
Sugar, washing raw, F. O. Matthiessen	191,539
Swing, J. J. Janezeck	191,683
Thill coupling, J. Kitzmiller	191,599
Tobacco, hoisting, C. H. Slaton	191,619
Tobacco pipe, N. T. Oberg	191,544
Tobacco plant planter, R. A. Knox	191,601
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Tortoise-shell handle, C. W. Schaeffer	191,615
Towel rack, C. A. Brickley	191,564
Trap for balls, T. Wilkie	191,628
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Type writer, D. H. Sherman	191,617
Upholstering tuft, R. H. Bryant	191,650
Valve tank, J. P. Duncan	191,523
Vegetable cutter, W. Chapin	191,653
Vehicle spring and axle, S. W. Ludlow	191,536
Ventilation, etc., W. H. Bennett	191,512
Wagon axle skein, H. L. Hinds	191,679
Wagon gearing, W. P. Brown	191,648
Wagons, skid attachment for, C. Crandall	191,570
Wardrobe hook, labeled, T. F. Breese	191,645
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Water gauge, C. D. Smith	191,724
Water wheel, L. Good	191,668
Water wheel, I. Mallery	191,605
Weaving shuttle, duck, W. L. Gilbert	191,526
Wheelbarrow, E. W. Walker	191,735
Wood pressing machine, S. L. Nagle	191,704
Wrench, pipe, G. Fletcher	191,666

DESIGNS PATENTED.

10,030 to 10,032.—Embroidery.—E. Crisand, New Haven, Conn.
10,033.—Lock-Case.—R. Flocke, Newark, N. J.
10,034.—Bottles.—J. H. Harrison, Davenport, Iowa.
10,035 to 10,037.—Carpet.—H. S. Kerr, Philadelphia, Pa.
10,038, 10,039.—Carpets.—T. J. Stearns, Boston, Mass.
10,040.—Moulding.—R. M. Merrill *et al.*, Laconia, N. H.
10,041 to 10,044.—Oil Cloth.—C. T. Meyer *et al.*, Bergen, N. J.
10,045.—Studs, etc.—J. W. Miller *et al.*, Newark, N. J.
10,046.—Book Cases.—J. W. Schuckers, New York city.

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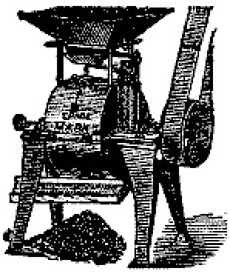

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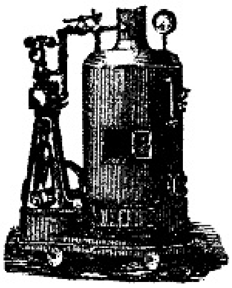

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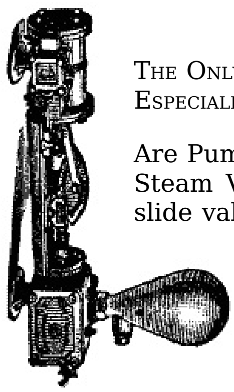

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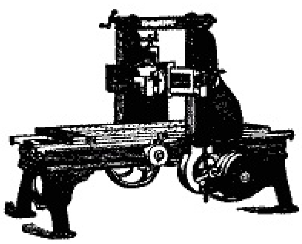

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Almost all kinds of Prints or Engravings from Wood, Stone, Copper and Steel may be reproduced directly. *The requisites are, clean, distinct black lines or stipple work, on white or only slightly tinted paper. All Photographs and Pencil Sketches must first be drawn in ink.* We keep a corps of artists constantly employed, trained to do this work in the best manner. We can make drawings from photographs or tin-types taken in the usual way. They may be of any size, but should, of course, show the object distinctly.

Drawings for our use, unless intended to be redrawn, should be on a *smooth, white* surface, in *perfectly black* lines, and usually twice the dimensions each way of the desired plate.

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In reproducing wood-cut prints, the size can often be considerably reduced; but if the reduction is great, the lines become so fine and close together that they will not print well. Coarse wood-cuts, such as are generally used in Newspapers, may often be reduced to half their linear dimensions, but *fine* wood-cuts will admit of but little reduction.

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In sending for estimates, be careful to send us the copy we are to work from, with full specifications as to size and quality, and remember that it is the same with engraving that it is with everything else; the price will vary greatly with the quality of work ordered.

Never, directly or indirectly, ask us to give *you* better prices than we give our other customers, as we try to treat all alike.

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We pledge ourselves to meet the reasonable demands of those who employ us. If, in any case, we cannot do so, we will refund the money advanced.

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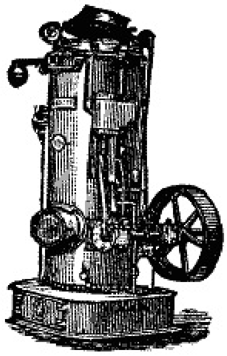

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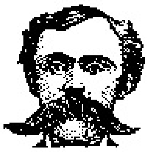

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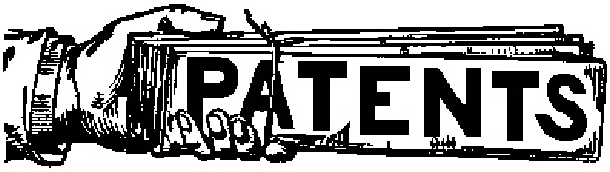

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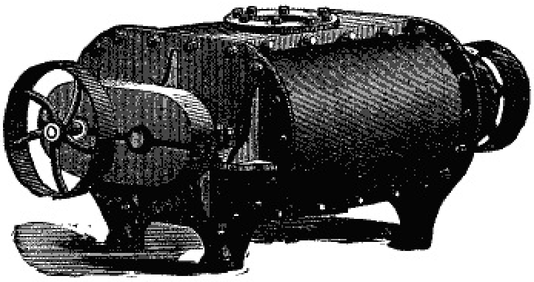

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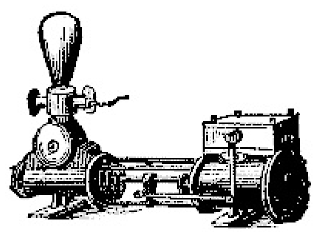

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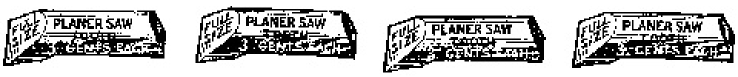

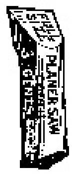

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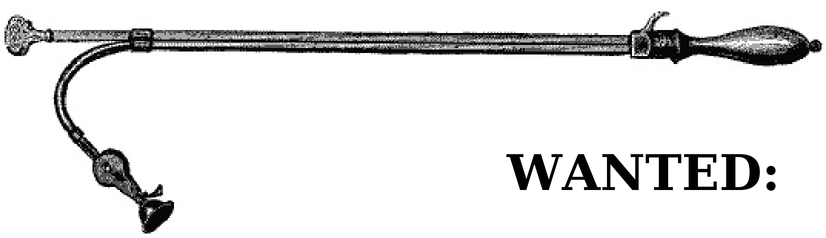

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Some archaic (Early American) spellings have been retained.

Obvious punctuation errors have been repaired.

Errata

The remaining corrections made are indicated by dotted lines under the corrections.
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'thin' corrected to 'tin'
"... the requisite quantity depending upon the thickness of the tin plate to be removed."
Article 13

'put' corrected to 'but'
"... but plenty of good soap and warm water,..."
Article NQ (39)

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figure obscured by address label ('Journal of Pharmacy X 145 S 10th st.').
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