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A New Era of Alloys.

Chemistry and mechanical skill are making rapid advances in the field of metallic alloys, thus creating new resources for ornamental as well as utilitarian purposes. An instance is afforded in nickel and its alloys, which have been carried to a point that causes that metal to be preferred in numerous articles to silver, as in watches, dress buttons, ornaments, furnishing hardware, harness and carriage trimmings, superseding in the latter silver plating and brass. The difficulty occasioned by the porousness of nickel, causing oxide or rust to form by the access of the oxygen of air or sulphurous and other fumes to the inferior metals with which it is combined, has been successfully overcome, solid alloys being produced which maintain the native brightness of the metal. One most important advance is in the purification of nickel carried to a point which secures its malleability, and this by the elimination of the gases absorbed by it in the molten state. The former stationary condition of nickel in the arts was not due to the inability of chemists in the laboratory to produce with it as a base exquisite alloys, but that their processes could not be carried out on a large scale, the chemists themselves being unequal to the task of securing their treatment of the crude material by the ton, or large open furnaces, taking it as it comes from divers sources and irregular qualities. Alloys are now produced free from cloudiness, and free from any liability to that tarnishing, corrosion, and easy abrasion to which silverware, solid and plated, is subject. These new alloys are much less affected than silver by organic acids, or the presence of sulphur or coal gas, "nickeline" or "platinine" silver not being eat into by them. Pedometers and watches and other fine pocket instruments made of alloys having nickel for their base wear clean and bright. The discovered malleability of nickel allows of its being chased similarly to gold and silver, and with the result of greater luster, while the qualities of brilliancy, hardness, and durability, whether used solidly or in electro-plating, commend it for table wear service.—*Trade Review.*

THE *Paris Bourse* estimates the total stock of gold in the world in use as coin or as banking reserves in one shape or other at about £580,000,000, of which total England has £126,000,000, France £136,000,000, Germany £80,000,000, and the United States £92,000,000. Other nations come in for shares varying from £800,000 in the case of Holland, to £30,400,000 in Spain's.

CRANE FOR TRANSFERRING CARS.

The North Shore Railway Company (of Canada) has established a line of iron steamers to ferry cars across the St. Lawrence River at Quebec, and thus make a connection between its road and the Intercolonial Railway for through traffic. The object of the crane illustrated by the engravings is to surmount the difficulty caused by the ebb and flow of the tide when loading and unloading cars from the steamer in winter. At this season the ice accumulates so rapidly as to make the use of a swing-slip totally impracticable. With the rise of the tide the floating ice is rushed up stream, and with the ebb it is carried down. It is consequently necessary that the steamer, on which the cars are to be ferried, must approach the wharf with its bow always directed against the running tide, otherwise it would be broken away from its moorings and be in danger of being wrecked. Besides this difficulty, the ice accumulates so rapidly at the end of the wharf in very cold weather in winter that it often prevents the steamer from being fastened closer than six or seven feet from the wharf. Therefore the crane is made so as to roll out and reach the cars at low tide as well as at the extreme high tides, and at a distance

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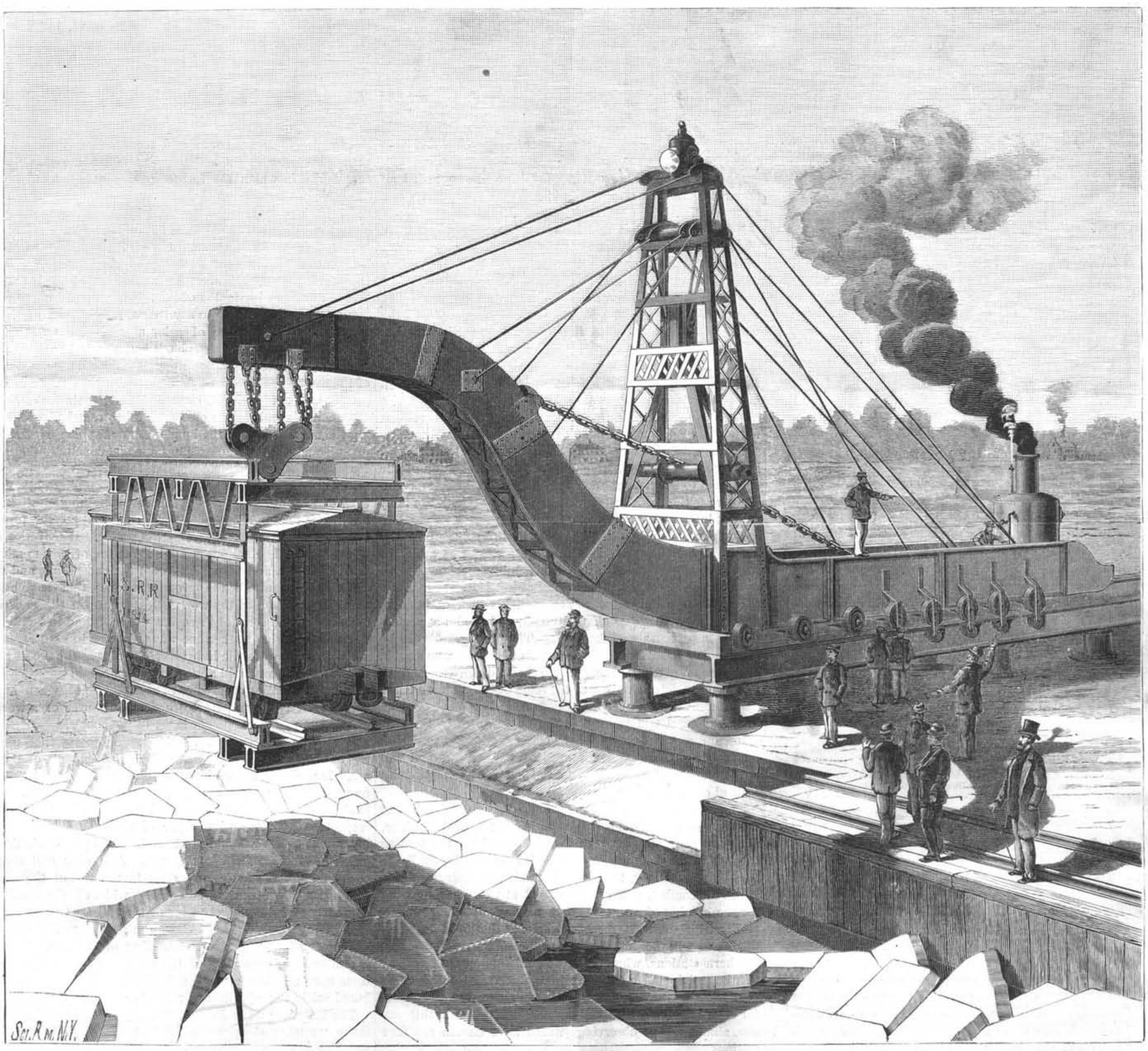

CRANE FOR TRANSFERRING CARS TO AND FROM FERRY BOATS OF THE NORTH SHORE RAILWAY (OF CANADA) AT QUEBEC.

Scientific American.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 359,

For the Week ending November 18, 1882.

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THE TRANSIT OF VENUS.

One of the greatest astronomical epochs of the century will occur on Wednesday, the 6th of December. The planet Venus will then make her way across the sun's disk, and American observers are this time on the right side of the earth to behold the rare phenomenon. The actual sight of the transit, except for its bearing on science, possesses no special interest. It is not a glorious spectacle, like a total solar eclipse, nor a weird combination of celestial beauty, like a total lunar eclipse, nor an awe-inspiring exhibition of omnipotent power, like a grand aurora, nor a startling display of celestial pyrotechnics, like a downfall of meteors, nor a sudden apparition of a great comet sweeping the skies with its gossamer tail.

A tiny black spot will cut sharply into the sun's border, move slowly over his disk, and, after a passage of nearly six hours, will suddenly disappear. This is all that will be perceptible to the naked-eye observer. But to the astronomer and the telescopist the event is full of the deepest significance. Through its instrumentality a solution is sought of one of the noblest problems ever elaborated by the highest exercise of human reason. To measure the unapproachable, is the point at issue, and never, in any previous combat with immensity, have astronomers had at their command such resources for becoming victors in the contest. The labor demanded is of the most severe and delicate nature, even when assisted by the most perfect instruments that have been invented. The utmost accuracy is required, or the result will be a failure. Measurements must be accumulated like grains of sand upon the seashore. Thousands of observations are often required in correcting an infinitesimal error. The grand object for which nearly one hundred transit expeditions have been organized, is to acquire the right of adding or subtracting less than one-tenth of a second to the solar parallax, from which the sun's distance from the earth is deduced.

It is a work of exceeding difficulty to determine the parallax of the sun, on account of its minuteness. The problem has not yet been accurately solved, after the incalculable labor bestowed upon it; the sun's distance is far from being a certainty. The best authorities give the parallax as less than 9″, almost certainly between 8·75″ and 8·85″. But this tenth of a second that is considered doubtful, is more than a hundredth part of the whole, although, says Professor Young, it is no more than the angle subtended by a single hair at a distance of 800 feet. If we accept 8·80″ as the parallax, an estimate probably nearer the truth than any other, the sun's distance, expressed in miles, will be 92,885,000, while the variation of one-twentieth of a second will change the result either way a half million miles. The most sanguine observers will feel that they have accomplished all they expect if the uncertainty is reduced to a quarter of a million miles.

If eyes were perfect and instruments were perfect, there would still be great difficulty in obtaining the exact parallax of the sun, but the problem is complicated by the imperfection of human vision and the imperfection of astronomical instruments. Three methods of observation are employed by transit observers: the direct observation of contacts, the photographic method, and the micrometric method, which all have their special advocates. The direct observation of ingress and egress is the most simple, and is chiefly relied on by English and some French astronomers. It needs only a good telescope, two eyes that know how to observe, and a chronometer. Of the three elements, the one that is seldom found, and is the most difficult to be acquired, is the clear-sighted, practiced eye. Hence many discrepancies are found in the contact method, which, from the organization of the eye, seem to be without remedy. A practiced observer can do more with a poor instrument than a novice with the most perfect instrument science can furnish.

The photographic method was devised to make up for the inaccuracy of the eye. This forms the means of attack of American observers, although it is coming into favor with astronomers of other nations. The object is to take as many photographs of the sun with Venus on his disk as possible during the continuation of the transit, and to aim at perfection in the execution of the work. The photographs can be taken home, compared, and measured at leisure. The trouble here lies in getting pictures free from distortion, and in the accurate determination of the scale of the pictures taken by different observers.

The micrometric method is the one adopted by the Germans, and requires the use of the heliometer. But the heliometer is a difficult and complicated instrument, and will only give satisfactory results in the hands of exceptionally skillful observers.

Thus it will be seen that each method of attacking Venus during her passage across the sun is beset with difficulties, and thus sympathy cannot fail to be roused for the zealous laborers in the field, who have traveled thousands of miles to reach their stations, transported cumbrous instruments to aid in the combat, and are now hard at work in preparing for the coming of an event that may crown their undertaking with some degree of success, or that in at least half the cases will be hid from view by an overcast sky. In southern stations, where it is now midsummer, a clear sky may be anticipated at about half the observing localities. In northern stations, where it is midwinter, the average chances for clear weather are only about one in fifty. For this reason, almost all the observing parties have chosen southern stations.

The problem of the sun's distance is of paramount importance, and fully justifies the outlay of brain, labor, and money lavished on this uncertain means of reaching its solution. It is the unit or yardstick of celestial measurement, the standard by which everything outside of the earth in the material universe is measured, excepting the distance of the moon. A mistake here makes all celestial computation inaccurate, the diameter of every planet, the radius of every orbit, the distance of every star. Thus the nearest fixed star in the northern hemisphere is 61 Cygni. Its distance is estimated at about 366,000 times the sun's distance or earth's radius. This means 366,000 times 92,885,000 miles. If there be an error of half a million miles in this estimate of the sun's distance, it will readily be seen that the error in the star's distance takes on gigantic proportions.

The 6th of December will therefore be a great day on the annals of the nineteenth century. Transit observers will do their utmost to obtain a more accurate determination of the sun's distance. If they do not reach perfect success, and there is little hope of such a result, they will have the satisfaction of feeling that they are laboring in a noble cause. For the observations made during the transit of 1882 will be a rich legacy to aid the astronomers who, 122 years hence, will observe the next transit in 2004.

We can only wish for good weather and good luck to the brave adventurers, and join in the prayer of the great astronomer, Halley, who, from an observation of the transit of Mercury in 1677, at St. Helena, was the first to discover the scientific import of transits. In recommending to future astronomers a careful observation of the transit of 1761, he says, in closing:

"May Heaven favor their observations with the most perfect weather. And when they shall have attained their object, and determined as well as they can our distance from the sun, let them remember that it was an Englishman who first conceived this fortunate idea."

RURAL VIEWS OF PATENTS AND PATENT RIGHTS.

To persons unfamiliar with the natural history of the industrial arts, who know little or nothing of the incessantly varying needs of our multiplying industries; nothing of the numberless lines of progress, each impinging somewhere upon the unknown, baffled for the moment, but certain sooner or later to shoot forward the instant the needed invention or discovery is made; and whose vision of the future is clouded by ignorance made denser by prejudice and professional bias—to such persons it naturally seems impossible for the human mind to find out much more that is new. The unoccupied field of invention, which to the intelligent is boundless and barely entered upon, is to them inconceivable; at best they can figure it only as a narrow circuit in which the future must endlessly tread upon the heels of the past. A charming example of this perverted and fallacious thinking—perverted by prejudice and fallacious through almost incredible unfamiliarity with the facts involved—appears in a recent issue of the *Western Rural.* The editor, discussing "Patents and Agriculture," makes the astonishing yet characteristic assertion that "it is pretty safe to say that nine-tenths of the things patented are worth less, and equally as safe to say that three-quarters of them are unpatentable because of prior use. Judging from the number of patents in existence, it is the easiest thing in the world to discover something new. On the contrary it is one of the most difficult things. The world makes mighty slow progress. It lives itself over and over again. It adopts new methods and forgets old ones. Then somebody, following the natural bent of the human mind, happens to stumble upon some of these obsolete methods, concludes he has found something new, and applies for a patent. The lost arts will be gradually revived, as the human mind becomes tired of what it knows and seeks for something else. The mind runs too much in one groove to make it possible for all our patents to represent something new. Discoveries of new forces and principles and the invention of new applications of forces and principles are rare exceptions, and we can almost count all the prominent ones that have been made in the whole of the world's history upon the ends of our fingers, and some of these have been found to be literal imitations of what at the time was unknown in nature. We are not nearly so fertile in inventive genius as the records of the Patent Office would appear to indicate.

"But original or otherwise, patentable or not, when anything is covered by a patent it becomes a source of a world of trouble, under our patent laws, to the people."

It may be safe enough for the *Rural* to say that nine tenths of patented things are worthless, or that all of them are. It probably knows its own constituency, and there is no penalty for talking nonsense save loss of favor among one's friends. To say it, however, betrays a recklessness with respect to truth or an ignorance of the actual outcome of inventions that we should not have believed possible in these days of general popular intelligence. And each and every one of the dozen or more assertions in the rest of the paragraph we have quoted is equally wide of the truth—flagrantly and ridiculously wide of the truth. One and all, they betray a perversion of view, a misreading of the plain evidences of fact, a misunderstanding of the conditions of invention, a misstatement of the effects of patented inventions upon public peace and wellbeing, that cannot be attributed solely to prejudice and misinformation.

The little world the *Rural* writer lives in must certainly make "mighty slow progress;" but how it is kept from touching at some points upon the real world that does move, and move rapidly, is a mystery which we will not attempt to solve. To those that are intellectually alive and actively engaged in the affairs of men, the world does not live itself over and over again. Every new day brings a new life with new needs, new inventions to meet them, and new problems for coming days to solve. A large part of all the inventions made are intended merely to improve, to simplify, to cheapen the means and processes of established arts. Others are absolute advances opening up new regions of research, discovery, and invention. The former, in helping to perfect a single art or process, so far help to improve the general conditions of living; and the smallest are often the basis of a competence for the inventor. The latter are germinal, creative; like the steam engine, the telegraph, and numberless other new departures, they open up ever widening spheres of human knowledge and activity; and at every advance an increasing number of newer departures and still newer improvements are called into existence. That portion of the human mind not represented by the *Rural* does not "run in one groove," to anything like the degree the *Rural* imagines. And to one standing where there is a clear view of any portion of human activity—however limited—the marvel is not that inventions are so many and novel, but that they are comparatively so few; that so many inviting fields are wholly or to a *great* extent unworked; that so few men and women are educated to perceive the urgent necessities of the arts in every direction, or trained in the constructive arts whereby the world's needs in such directions are to be met.

The greatest bars to useful invention are the mistaken notions which papers like the *Rural* take pains to foster—that there is no great need of new inventions, and that few patents are of value to their owners. Both are radically false, as false as the assertion that patented inventions are burdens upon the public and sources of trouble; or that any considerable portions of the patents issued by the Patent Office are, or should be, "unpatentable" for lack of novelty. To argue against such assertions is like bringing evidence to prove that strawberries do not grow on cucumber vines, or wheat on apple trees.

Yet it is well for inventors to know that such absurdities have currency in certain quarters, and that people who listen to such teachings have representatives in Congress who may cater to *Rural* ignorance and prejudice for purposes of their own.

RECENT PROGRESS IN OYSTER FARMING.

BY H. C. HOVEY.

The modern oyster-farm is essentially a Connecticut idea. The laws of other States do not yet make it a possibility elsewhere. In Rhode Island the oyster-grounds are rented at $10 an acre for a period of ten years, but those who wish to cultivate farms have no guarantee that they can reap the final results of their best endeavors. The law in Maryland and Virginia is that a man having riparian rights, can stake out and have a life-interest in one acre contiguous to his own shore property, not for cultivating, but simply for planting. All else is public property. In Connecticut, however, while the "natural oyster-beds" remain free to all comers, the remainder may be sold to private individuals.

An oyster commission is appointed to hold office for four years, or longer on reappointment, whose duties are of a very general nature, but sufficiently clear on the main points. At the present time these commissioners are Messrs. Wm. B. Hudson, Robert G. Pyke, and G. M. Woodruff. They have drawn a shore-line from point to point, within which all is the property of the several towns along the shore of Long Island Sound. Each town has its own oyster-ground committee, with whose management we need not now concern ourselves. Outside the shore line, and as far as the lately defined State-line between Connecticut and New York, are about 300,000 acres of water territory, a large amount of which is supposed to be suitable for the cultivation of oysters with modern appliances. All this is under the jurisdiction of the oyster commission, who are to map it out and who may designate the portions surveyed to applicants for the purpose of actual cultivation. The price is $1.10 per acre, for which a deed of permanent possession is given. Among the conditions, however, is one enabling the purchaser to return the ground if it should prove to be worthless for the purpose in view; in which case he gets his money back. But, on the other hand, if he allows it to lie unimproved for five years, it returns to the State as forfeited.

Of course numerous questions arise, some of them sufficiently vexatious, concerning the practical operation of this system. One of these has reference to the reservation of "natural beds," from which any one may remove oysters provided he does not dredge for them by steam. Cases are now pending that will settle many of these disputed matters. Meanwhile the fact remains that in Connecticut waters there is room for enterprise, as shown in the cultivation of what may very properly be styled "oyster farms." There are at this time more than 300 applications before the commissioners for the designation of grounds, varying in size from a few acres up to 1,000 or more; and some of the grounds hitherto sold and now under cultivation include several thousand acres.

The largest oyster-farm in Long Island Sound, if not the largest anywhere in the world, belongs to Mr. H. C. Rowe, of Fair Haven, a gentleman whose sagacity has done much to shape the legislation of Connecticut, and whose shrewdness has enabled him to profit by opportunities as they presented themselves. Mr. Rowe now controls between 10,000 and 11,000 acres of oyster-ground, and has it all staked off by buoys, so that he can go from one field to another, as a farmer would traverse his wheat-fields and grass-lots. For the successful cultivation of such extensive grounds resort has been necessary to steam dredging, but not without strenuous opposition from those who feared that such a method would injure the natural beds. Several other persons have now entered farms rivaling his in size, including from 2,000 to 6,000 acres, and more will be staked out as soon as the surveys can be completed. There is quite a contrast between the old method of "tonging," and even the more effective but uncertain mode of dredging by sail-boats (often at the mercy of wind and tide), and the trim, wide-awake little steamers that run four large dredges and rake up a thousand bushels of oysters a day. With the facilities thus furnished, grounds are managed under water from 25 to 50 feet deep.

Not long ago the Connecticut Academy of Arts and Sciences accepted an invitation to visit the oyster-farms, on the new steamer the Gordon Rowe, in company with the commissioners, and Lieut. Francis Winslow, U.S.N., of the U. S. Fish Commission. The day was favorable, and a large party went, including Profs. Dana, Brewer, Waldo, Platt, and others learned in geology, agricultural chemistry, astronomy, law, and theology, but confessedly having much yet to learn as to the growth of shell-fish. Omitting the incidents of the excursion, it is my intention to explain to the reader the facts exhibited to us by Lieut. Winslow.

Preliminary to doing so, it should be stated that fishing without restriction tends to destroy the source of supply. This fact seems so obvious as to be self-apparent. Yet a wrong impression has prevailed that the millions of eggs annually laid would repair any waste resulting from human invasion. Under this wrong impression they did away with the "closed season" in England some time ago, and in consequence their oyster-beds were nearly destroyed in six years, and it was found necessary to restore the old usage.

Count Pourtales made observations for a single season, ten or twelve years ago, in the Great South Bay and in the Hudson River. In 1877 the Maryland oystermen began to make inquiries as to how far up stream oysters could be raised in brackish water. About the same time Lieut. Fred. Collins made investigations as to the density of the water of the Chesapeake Bay. These steps were designed to be preparatory to similar investigations to extend over the entire area of national oyster-grounds. In 1878, Lieut. Winslow relieved Lieut. Collins in the Chesapeake Bay, and began his inquiries as to the conditions having special reference to domestic economy. They were continued in 1879, and the results, in part, have been published by the Maryland Fish Commission, but are to appear in full in the report of the U. S. Coast Survey, next fall. Dr. Brooks, of the Johns Hopkins University, began and successfully concluded, in 1879, his experiments in artificially fertilizing the egg of the female oyster, and raising the embryo from the period of segmentation through various stages up to the formation of the shell. An account of these interesting experiments was published in the proceedings of the Johns Hopkins University Laboratory. In 1880, Mr. J. H. Ryder, of the Philadelphia Academy of Science, investigated further, but with no results of especial importance. In the same year, Lieut. Winslow, following Dr. Brooks' methods, succeeded in raising from the egg, artificially, the Portuguese variety of the European oyster, the first attempt of the kind abroad.

During the present year, Lieut. Winslow has been able to reduce the period required for the hatching operation from six or eight days to two or three; and has been trying to devise methods of raising oysters artificially that would be of practical value. His investigations show that the Chesapeake beds are rapidly disappearing, and it remains to be decided whether experiments for restocking them are to be carried on by individuals or by the States. The latter seems to be impracticable, because the young brood will unavoidably attach themselves to localities, instead of benefiting the public oyster grounds at large. Hence Lieut. Winslow has been carrying on his experiments in Connecticut waters, where he can put large quantities of newly hatched oysters directly on the beds where they are to stay.

The parent oysters are first cut up by knives, or more usually ground fine in a small mill, and mixed in glass jars holding sea water. As soon as the particles have settled somewhat, the excess of spermatozoa is drawn off by a siphon, and the remaining mixture is set away to await further developments. The principal difficulty thus far is to supply the young with a sufficient quantity of food and lime in suitable proportion to aid in the formation of the growing shell. It is now known that the male and female oysters differ little in their appearance to the eye, but the "milk," as it is termed, differs greatly under the microscope, that of the male consisting of an infinitude of minute particles gyrating among themselves, while that of the female contains true eggs. In the mixture each egg is forthwith attacked by the spermatozoa, afterward taking the form of globules. All this takes place in a few minutes after the chopped particles are stirred together. The process of segmentation lasts for perhaps twenty-four hours, after which numerous cilia are put forth, and the young oyster uses them to enable it to swim about during its brief life of freedom. The sight is a strange one of a hundred of these diminutive creatures darting about in a drop or two of water, executing a sort of dance under the magnifying glass. The shell on its first appearance is single, then it parts into two valves, at first separate from each other, and afterward joined by a hinge. The cilia grow into a sort of hairy tuft, by means of which it is conjectured that the final attachment is made to the old shells, or other objects at the bottom where the shell fish is to stay. When this has been accomplished, the upper valve grows far more rapidly than the under one.

Each female oyster is estimated to contain from one to ten million eggs, not a tenth of which are vitalized in the course of nature. But by the artificial process, when perfected, it is hoped that fully one-half may be safely brought through the embryo state and then left to take care of themselves. As the matter now stands, each five-gallon planting can used by Lieut. Winslow, when finally lowered with its load of young oysters, is thought to contain about fifty million alive! These cans are provided with double caps, one at each end, which are removed by cords attached to them, after the can has been let down to the spot to be occupied by the young colony. Care is taken to mark the location exactly, so that it can be found again; and thus in a few months we can tell if the experiment has been followed by practical results.

It may as well be added, for the information of those not familiar with the mysteries of the oyster trade, that "seed oysters" are those that have attained the age of one or two years, when they are about as large as a dollar; the size varying according to the waters. At this stage they are gathered by ship-loads from the Connecticut beds and sold to oyster-raisers in New York and Rhode Island and elsewhere, at fifty cents a bushel. This is a profitable operation to both seller and buyer. For, while it thins out the beds of the former, it allows what are left to grow to better advantage, on the same principle that thinning a bed of beets will benefit the plants that remain; and for the latter it is profitable, because the third year of an oyster's life witnesses an extremely rapid growth, ending in a fine and marketable bivalve. Those that are four years old, and have been properly cared for, are the so-called "saddle rocks," for which the consumer must pay a fancy price.

The Comet.

An observation, unprecedented in the history of comets, was made, says *Knowledge*, at the Cape Town Observatory, on Sept. 17, at 4 h. 50 min. 58 sec. Cape mean time, corresponding to 3 h. 37 min. 3 sec. Greenwich time. "The comet was followed," writes Mr. Gill, "by two observers with separate instruments, right up to the sun's limb, where it suddenly disappeared," at the hour named. To be seen under these conditions the comet must at the time have been intensely brilliant—partly, no doubt, the effect of solar heat and light, but partly also, we conceive, on account of the resistance it experienced in its onward rush at the rate of certainly not less than 340 miles per *second!* The time when Mr. Gill's assistants saw the comet reach the sun's limb, preceded by 1 h. 35 min. the time of perihelion passage as given below.

The Emperor of Brazil telegraphs to the Academy of Sciences that the comet was visible in full daylight on the 18th, 19th, and 20th September. The spectroscope showed the presence of sodium and carbon. On the 26th, from 4 h. 10 min. to 5 h. 40 min. in the morning, it was a splendid object.

Mr. R. A. Proctor has made calculations which satisfy him that the period of the comet and the length of the greater axis of its orbit are rapidly diminishing, that it will return to us within a few months, and that it will soon be destroyed by being absorbed into the sun.

Electrical Glass Cutting.

At present large glass cylindrical vessels for scientific and commercial purposes are cut during manufacture by surrounding them with a thin filament drawn out from the molten glass, and then cooling them suddenly by contact with a cold substance. A more sure and perfect method has been devised by Herr Fahdt, of Dresden, who surrounds the glass vessel with a copper wire, connected by binding screws with the two poles of a galvanic battery, and made red-hot by forming contact. The rough edges are then rounded off by turning the object in a blowpipe flame; and, to prevent any unequal contraction of the parts subjected to this action, a slight annealing is effected in the furnace.—*Iron.*

Orange Wine.

A writer in the *Semi-tropic California* describes his experience in making orange wines from the wild orange of Florida years ago. He says that it cannot be surpassed for medical purposes, and sold when only eight months old for $3 per gallon. The oranges must be perfectly ripe. Peel them and cut them in halves, crosswise of the cells; squeeze into a tub. The press used must be so close that the seeds cannot pass into the must. Add two pounds of white sugar to each gallon of sour orange juice, or one pound to each gallon of the mixed sugar and juice. Close fermentation is necessary. The resultant wine is amber-colored, and tastes like dry hock with the orange aroma. Vinegar can be made from the refuse, and extract from the peels.

Vaccinating a Train Load of Passengers.

The New York Express train on the Erie Railroad, passing east at noon, was held at Elmira, Nov. 9, till physicians could vaccinate all the passengers not already safe from contact with small-pox, as a passenger afflicted with symptoms of that disease was taken from the train at Hornellsville.

CRANE FOR TRANSFERRING CARS.

(*Continued from first page.*)

of 32 feet from the side of the wharf. If it had been possible to run a steamer into a slip or between ice breakers at all seasons, that method would have been adopted, but the tide runs at a rate of from 5 to 15 miles per hour, and carries with it a body of ice from 2 to 4 feet thick, so that it would be useless to attempt to run a steamer crosswise to such a running stream, or between wharves, as the ice would under such circumstances cut the vessel to pieces. Consequently it was necessary to use a crane which would reach out from the wharf the distance named, and be able to lift a height of 27 feet from the water level. The crane is calculated to lift an ordinary 33-foot loaded box car from the steamer and land it on the end of the wharf in from 1¼ to 1½ minutes. It will be noticed that the bed of the crane forms part of the counterbalance weight, friction rollers being arranged below as well as above the flanges of the girders in which the crane runs. The cars, as will be seen, are run on or into a cage (shown in detail in Figs. 4 and 5), and it is thus lifted with the car to or from the boat. The crane has a lifting capacity of 85 tons.

The plans of the crane and of the works to be used in conjunction therewith, on both sides of the river, have been made by Mr. A. Davis, the mechanical superintendent of the North Shore road.—*The Railroad Gazette.*

Professor Haeckel on Education.

In face of the surprising velocity with which in these last years the development theory has paved an entrance into the most diverse departments of inquiry, we may here express the hope that its high pedagogic value also will be even more recognized, and that it will quite perfect the education of the coming generations. When, five years ago, at the fiftieth meeting of naturalists in Munich, I laid stress on the high significance of the development theory in relation to education, my remarks were so misunderstood that a few words of explanation may here be allowed me. It stands to reason that with these words I could not mean to claim that Darwinism should be taught in elementary schools. That is simply impossible. For just like the higher mathematics and physics, or the history of philosophy, Darwinism demands a mass of previous knowledge which can be acquired only in the higher stages of learning. Assuredly, however, we may demand that all subjects of education be treated according to the *genetic method*, and that the fundamental idea of the development theory, the *causality of phenomena*, find everywhere its acknowledgment. We are firmly persuaded that by this means thinking and judging conformably with nature will be promoted in far greater measure than by any other method.

At the same time, through this extended application of the development doctrine, one of the greatest evils of our day in the culture of youth will be removed—the cramming of the memory, we mean, with dead lumber, which smothers the best powers and prevents both soul and body from coming to a normal development. This excessive cramming is based on the old, fundamental, ineradicable error that the quantity of factual knowledge is the best method of culture, while, in truth, culture depends on the quality of causative science. We would therefore deem it especially useful that the selection of the material of instruction be much more carefully made, and that in making the selection those departments which cram the memory with masses of dead facts do not receive the preference, but those which cultivate the judgment through the living stream of the development idea. Let our worried school youth only learn half as much, but let them understand this half more thoroughly, and the next generation will in soul and body be doubly as sound as the present.—*Eisenach Lecture.*

Simple Facts about Bricks.

The *Carpenter's and Builder's Journal* gives the following facts:

An average day's work for a bricklayer is 1,500 bricks on outside and inside walls; on facings and angles and finishing around wood or stone work, not more than half of this number can be laid. To find the number of bricks in a wall, first find the number of square feet of surface, and then multiply by 7 for a 4 inch wall, by 14 for an 8 inch wall, by 21 for a 12 inch wall, and by 28 for a 16 inch wall.

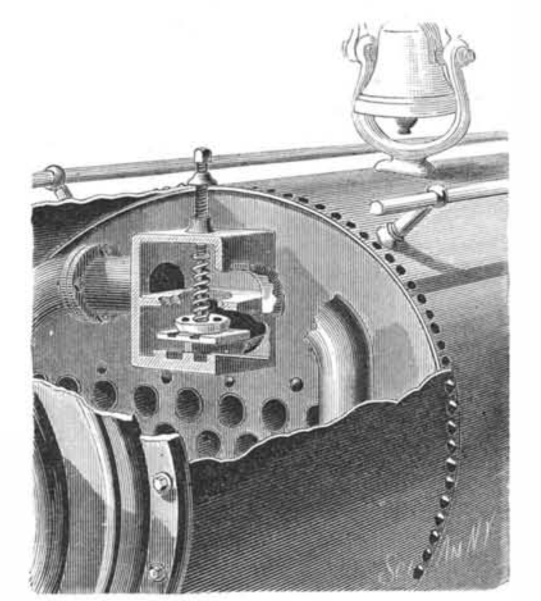
For staining bricks red, melt one ounce of glue in one gallon of water; add a piece of alum the size of an egg, then one-half pound of Venetian red, and one pound of Spanish brown. Try the color on the bricks before using, and change light or dark with the red or brown, using a yellow mineral for buff. For coloring black, heat asphaltum to a fluid state, and moderately heat true surface bricks and dip them. Or make a hot mixture of linseed oil and asphalt; heat the bricks and dip them. Tar and asphalt are also used for the same purpose It is important that the bricks be sufficiently hot, and be held in the mixture to absorb the color to the depth of one-sixteenth of an inch.

The enormous sum of $202,000,000 is invested in the submarine cables of the world, supposed to aggregate 64,000 miles in length.

NEW STOP-VALVE FOR LOCOMOTIVE STEAM PIPES.

This valve is designed to be placed in the steam pipe of a locomotive to be automatically closed by the excessive flow of steam when the driving wheels slip, the object being to cut off the steam from the engines and to stop the wheels. The valve opens automatically after the slipping ceases, so that it requires no attention from the engineer.

The valve is located in the steam pipe anywhere between the throttle valve and the branch pipes leading to the cylinders, but preferably at the junction of these pipes. When the valve is open it rests on a table that is adjustable to and from its seat by a wedge under control of the engineer, a rod extending from it to a suitable lever in the cab. The valve is pressed down on the table by a spiral spring, the pressure of which is adjusted by a screw extending out through the steam pipe and boiler shell. The valve will be

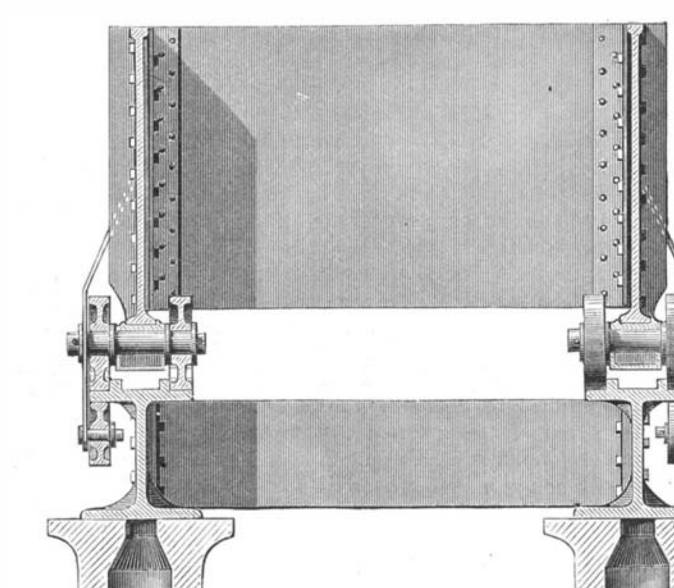


HIGDON'S STOP VALVE FOR LOCOMOTIVE STEAM PIPES.

pressed by the spring with about the same force that the steam exerts on the other side, so that the valve will be in equilibrium, or nearly so, and when any undue rush of steam takes place, the valve will close automatically and stop the flow of steam to the engines.

The object of the wedge above referred to is to regulate the action of the valve by setting it nearer to or further from its seat. The table between the valve and the wedge is designed to receive the lateral thrust of the wedge, the table being placed in guides which permit it to move only vertically.

This invention prevents the slipping of the engine wheels while reversing or backing suddenly, or while running over a slippery track, and not only saves the wrenching of the engine due to extremely rapid motion, but renders it more effective in emergencies. This invention has been patented by Mr. J. C. Higdon, 1008 E. 9th St., Kansas City, Mo.



CRANE FOR TRANSFERRING CARS.

Credit to Whom Credit is Due.

IN the SCIENTIFIC AMERICAN of November 4 appeared an engraving and description of some of the plumbing arrangements in Mr. Cornelius Vanderbilt's new house in this city. Credit should have been accorded to the *Sanitary Engineer* for the article.

ENGLAND has thirty electric light companies, with a capital of over $30,000,000. Nearly as much money is similarly invested in France.

Iceland Moss in Woolen Mills.

The cost of oil for lubricating the wool is a considerable item in a woolen mill. Many ways have been tried to reduce this item, and several substitutes have been used with only indifferent success. In France steam has been tried on the principle that wool is a hollow tube which can be filled with steam, and that, being a horny substance, it is softened and made supple by heat, but as the moisture leaves the wool almost as quickly as it takes it up, these attempts have proved futile, though an addition of water to the oil has yielded a certain advantage. Thus, a good mixture is made of 100 lb. water, 40 lb. oil, 3 lb. soda ash, and 4 lb. to 5 lb soap, as used for milling. Some spinners (country ones, evidently) have added to the oil double its quantity of milk, or milk and water; or one-third oil, two-thirds water, with a few pounds of soda, are taken. It is always of importance that the oil and the water should be well mixed, and for that purpose a little soda is of use. A better amalgamation can, however, be obtained by the addition of Iceland moss (Carrageen). It is nothing new, but we believe not known to many spinners, and is of advantage with dark colored goods and yarns which are made of dyed wool. Where goods are dyed light colors in the piece it is not to be recommended, as the cloth then may easily get mottled. On the whole, however, Iceland moss can be used with great advantage and a considerable saving in oil.

It is used in the following manner: In a wooden vat about 18 buckets of water are put, and steam introduced into it to boil. About 3 lb. soda ash is then introduced, after which 4 lb. to 5 lb. Iceland moss is put into a bag, and the latter, well tied, placed into the soda bath. The steam tap is then opened, and the water boiled for about four hours, while it is stirred about once every hour. The bath takes up this way a certain quantity of the gelatine which is made from the moss, and varies in strength according to its quality. When the mixture has cooled a little, three parts of this are mixed with one part of oil. Where olein is used instead of oil the mixture must be boiled a little after it has been made. A little practice will show how much moss should be taken, for too much is not good, and when enough gelatine has been extracted from the bag, the remainder may be used for the next mixing.

For 20 lb. white wool, 4 quarts of the mixture and 1 pint water are to be taken; for dyed wool, 4½ quarts should be taken and 1 to 2 pints water. Where a wool is to be used for proportionately fine counts, a little more oil may be used in mixing; for instance, 4½ quarts instead of 4 quarts for white wool, or a little more water may also be added. As in this mixture a good deal of water is contained, which soon evaporates, it is not advisable to make large mixings, or, where more has been mixed than is immediately wanted, to store this in a cool, damp, fireproof place. The safe storage is so much more important, as oiled wool, when compressed, is liable to spontaneous combustion, which may happen so much sooner where oily mungo is contained in the mixing, especially when oiled with olein.

The importance of having the wool well oiled is especially perceptible in mixings with mungo and short wool, which easily dry in the lap when lying by a few days; for instance, on holidays. The same mixing which before the stoppage spun easily would be difficult to manipulate after them, and the threads from the condenser bobbins would be constantly breaking. In such cases it is absolutely necessary, when recommencing work, to damp the laps with water to replace that lost by evaporation. The same result may be observed where the full bobbins have been lying in the sun, or been dried by other means. That dampness and warmth are necessary for spinning need hardly be mentioned here, and can best be observed on a winter's morning, when the spinners sometimes have much trouble on starting on Monday with the first score or two of ends near the windows.—*Textile Manufacturer.*

A New and Fast Steamer.

The first trip of the new steamer Werra, of the North German Lloyds, lately arrived here, was made in remarkably good time, notwithstanding head-winds and unusually high seas throughout most of the voyage. Her corrected time from Southampton to Sandy Hook was 7 days and 19 hours, closely crowding the best time on record from that port made by the Elbe with favoring winds and fair weather. The Werra was built at the yards of John Elder & Co., on the Clyde, and on her trial trip to Bremen made an average speed of seventeen and three-tenths miles an hour. She is a screw steamer of 5,109 tons gross burden, 2,856 tons net. She is 450 feet long over all, 46 feet beam, and 36 feet 6 inches depth of hold. Her hull is divided into a number of water-tight compartments. Her engines are of the compound, inverted cylinder type, and have developed 6,700 horse power. She has accommodations for 170 first, 90 second, and 1,100 third class or steerage passengers.

COPAL varnish applied to the soles of shoes, and repeated as it dries until the pores are filled and the surface shines like polished mahogany, will make the soles waterproof, and last as long as the uppers

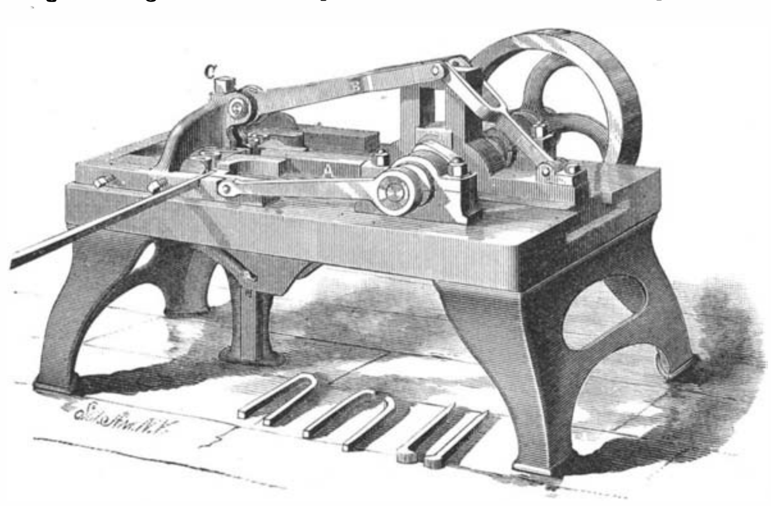
MACHINE FOR MAKING SPIKES.

The annexed engraving represents a machine for rapidly making from bars of iron spikes with perfectly shaped heads and points.

The successive steps in the formation of spikes in this machine will be understood on reference to the detail views, these steps being as follows: A piece of iron of the proper length, having been cut from the bar, is bent in the center, as shown, and the bent bar is then severed at the bend, so as to form two spike blanks, each with a hooked end, the spikes being completed by pressing the hooked ends of the blanks to form the heads, and rolling or pressing the opposite ends of the blanks to form the points.

The end of a bar of iron of the proper form and dimensions in cross-section is passed through an opening in one of the side frames of the machine, and through an opening in a knife occupying a central position between the frames, the front end of the bar resting against a gauge plate on the farther side of the machine.

A cutter bar then advances, and the bar of iron being held by the knife, the cutter severs from the bar the portion which is now supported vertically by the forked end of a sliding frame, A, and by the upper end of a sliding bar in the forked end of the frame, A, and having a central slot for the reception and guidance of a central knife. The frame, A, now advances, and those portions of the iron bar which project on the opposite sides of the knife are acted upon by two pairs of rollers, carried by the frame, A; the effect of this action is to bend the bar around a central block immediately in advance of the knife. As soon as the bar is so bent the knife descends and severs the bar at the bend, when the supporting bar descends with the knife, so as to be out of the way during the subsequent operations. As the frame, A, continues to advance the blanks produced by severing the bent bar are clamped between fixed and movable gripping dies, and the outer roller of each pair of rollers on the frame is acted upon by a cam, which causes them to press upon the inner rollers which press upon the blanks held between the gripping dies.



BAKER'S SPIKE MACHINE.

The final effect of the forward movement of the frame, A, is the pointing and heading of the spikes. The pointing is effected by the combined action of dies and cams, the latter acting through the medium of the rollers, and imparting the taper to one side of each spike blank, while the dies impart taper to the opposite sides.

The heading is done between the front end of the anvil or former block and a heading die, carried by the forked frame. A. The clamping dies are carried by a rod, C, which slides vertically in a bearing on the frame, and is operated by a lever, B, the short arm of which engages the rod, while the long arm of the lever is connected by links to a pin on the sliding frame, A, so that as the latter reciprocates a vibrating movement will be imparted to the lever.

This invention has been patented by Mr. J. M. Baker, of Allentown, Pa., who may be addressed for further information.

The Connellsville Coke Industry.

The Pittsburg *Manufacturer* has obtained from parties interested in the Connellsville (Pa.) coke industry the following facts respecting the magnitude of the business of that district. The 8,000 coke ovens of the district have a daily producing capacity of 15,000 net tons.

The most of the coke goes to the West and Northwest. Some of the most distant markets to which it is shipped are Colorado, Utah, New Mexico, and Arizona. Freight charges to these points range from $20.00 to $45.00 per net ton. It is mostly used in iron-making blast furnaces, and in the far West for smelting the precious metals, etc., but it is also largely used in foundries and other works. Its chief distinguishing merits are its high percentage of carbon, its freedom from impurities, and its hardness and consequent ability to bear a heavy burden in the furnace. Following is an analysis of Connellsville coke: Water at 225°, 0·030; volatile matter, 0·460; fixed carbon, 89·576; sulphur, 0 821; ash, 9·113.

The most amazing feature of this industry is the enormous waste of gas it involves, and of the by-products that would be got were the gas saved and purified.

SOME kinds of stains may be removed from silk by the application of essence of lemon, one part; spirits of turpentine, five parts. Mix, and apply to the spot by means of a linen rag.

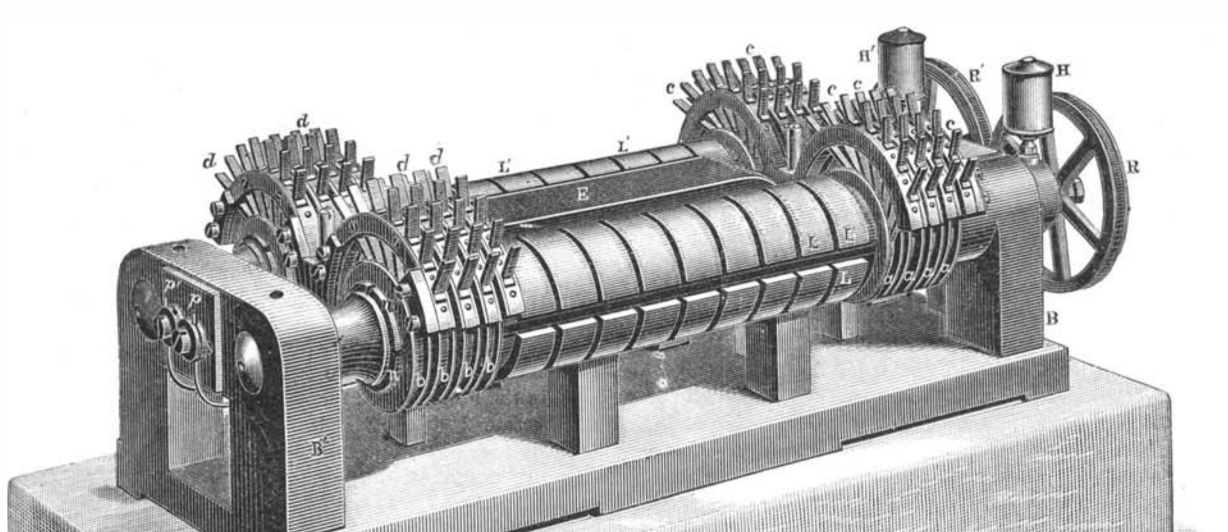
SIEMENS' UNIPOLAR MACHINE.

In an article published in a former number we called attention to an invention of Mr. Siemens' called a "unipolar machine," founded upon the induction produced in a copper cylinder revolving around the pole of a magnet.

The apparatus was formed essentially of a large, vertical, two-armed magnet, whose cores were twice the length of the arms. The two cores were surrounded by two hollow cylinders of copper which revolved with them. The lower part of each of the cylinders was connected by a rubber with one of the ends of the wire of the electros. Two other insulated rubbers communicated with the upper parts of the cylinder and served to take up the current. The electromotive power of this apparatus was about one volt, and, as its resistance was very weak, it permitted of quite a notable intensity being obtained. The performance, however, was not in proportion to the large dimensions of the machine. Mr. Kirchhoff suggested to Mr. Siemens the idea of increasing the electromotive power by cutting the cylinder into a certain number of longitudinal bands supported by an insulating material, and disposing the rubbers in such a way as to add to the electromotive power. To effect this, each band was to be in communication through each of its extremities with an insulated ferrule, and the current was to be collected by means of rubbers arranged circularly, while the concordant electromotive power would be added thereto.

At the time Mr. Siemens made known this idea of Mr. Kirchhoff, difficulties in the way of construction had prevented him from carrying it out; but these difficulties were due to the fact that it had only occurred to him to have the copper bands revolve around the pole of the magnet, and it was thus very hard to arrange the ferrules and collectors properly. But the problem has since been solved quite easily by reversing the first construction of the machine, and inserting hollow poles in whose interior revolve the divided cylinders. A machine constructed on such a principle figured at the International Exhibition of Electricity, and is shown in the accompanying cut.

It consists of a long electro-magnet, E, arranged horizontally, and having for core a series of iron plates on each side of the bobbin, and which, considered two by two, represent a figure 8; the whole forming two hollow cylinders, L L,



SIEMENS' UNIPOLAR MACHINE.

L' L', on each side of the bobbin. Each of these hollow cylinders constitutes one of the poles of the electro-magnet. In its interior are placed upon one axis 4 copper plates, *n n*, each of which communicates at its extremities with two ferrules, *a* and *b*, that are insulated from the other bands. There are thus eight ferrules for each pole, and sixteen for the entire machine. Above these ferrules there are arranged fixed metallic arcs, into which are set at intervals collecting plates, *c c*, *d d*, so as to embrace about a quarter of the circumference of each ferrule. These collectors can be coupled so as to unite the movable plates either for tension or for quantity; and two wheels, R R', moved by one and the same cord, communicate to the two cylinders formed of copper plates a motion in the same direction.

We have not the exact figures in regard to the electromotive power obtained with this machine, but it is evident that with such an arrangement the power must be perceptibly increased.—*Lumière Electrique.*

Ships that Cannot Sink.

Capt. R. B. Forbes, inventor of the well known Forbes rig for ships, makes the following very practical suggestions:

Supposing this ship to be built of steel, and to be divided into at least ten compartments on two decks, exclusive of those occupied by the motive power and the fuel; supposing that the two lower decks are to be of metal, and the hatches secured so as to be water tight like the manhole in a boiler, the ship would have twenty water-tight cargo spaces. I assume that the upper of these decks would be near the mean or average water line, and that every compartment have means to pump *in* air and to pump *out* water. Such a ship, if laden with an ordinary cargo, could not very well sink even if the space devoted to the fuel and to the motive power should be fractured, leaving the working of the pumping gear intact.

Now, supposing that all the goods in the twenty compartments be packed in water tight bales, boxes, or casks, and that every package would float if left to itself, and supposing that every one of the compartments should have a fracture in it, the ship could not sink even if the means for pumping in air and pumping out water could not be availed of. The amount of water which could under such improbable conditions, be found in the cargo spaces would at the worst only bring the ship down a foot or two; but suppose the system which I advocate should be completely arranged, and all goods be packed in square or nearly square boxes or bales, the amount of water would be very much less than if the goods were packed in casks. Still I should, as a general rule, prefer casks, because they would have nearly their original value when unpacked, whereas bales and boxes would not. Casks would be available for return goods.

In the days of the East India Company, all the goods sent to China were in water tight bales, and valuable goods were sent to the Philippine Islands packed in copper cases; or, I should say, in wooden boxes carefully soldered. At first sight it would seem that this was costly; but it was not so, for the reason that the copper paid no duty and was worth more than it cost.

I assume that if we can afford to import Bordeaux wine, costing from $60 to $100 a cask, we certainly can afford to put goods of from two to ten times those values into the same sort of packages. I assume that insurers would be glad to take risks free from claims for partial loss on goods packed as I suggest for very much less than when packed as is now the custom, and subject to a claim for partial loss. This saving to the merchant would pay for the better packing ten times over.

It would be easy to cite statistics to show that the large amount of valuable goods coming from Europe to this country and to other countries would warrant packing in water tight packages. The *theory* of water tight packages is well illustrated in China, where every chest of tea is lined with lead; the object being to preserve the flavor of the precious herb, but not one chest in ten is really tight; raw silk and silk piece goods are packed in bales and boxes quite pervious to water.

Ostriches for an Experimental Farm.

There are now in Central Park twenty-two ostriches, probably the largest flock of these interesting birds ever seen in this part of the world. They belong to Dr. Prother, of Buenos Ayres, who has brought them here for the purpose of starting an ostrich farm. He already has a large farm in Buenos Ayres, which he has found quite profitable. He expects to succeed still better here owing to the large and protected market for the feathers, the abundance of food for the birds, and the absence of those protracted droughts which leave such heavy losses among the ostrich farmers in South Africa. The farm will probably be in one of the Southern States, as the birds cannot endure a temperature much below the freezing point, and the cost of warming the ostrich houses in winter would be a considerable item in the Northern States. The ostriches in Central Park are picked birds, yielding the highest grades of feathers, and are valued at $1,400 each.

Correspondence.

Brooks' Fragmentary Comet.

To the Editor of the Scientific American:

I beg leave to say that the reason why the search for my new fragmentary comet, made at Washington four or five days after discovery, was unsuccessful, is, that it was made during the period of a full moon, which would have rendered so delicate an object invisible even if it had maintained the same brilliancy it had at discovery. It did not, however, but grew rapidly fainter, for in twenty-four hours —at my second observation—it had become, as announced at the time, both fainter and smaller.

The small comet discovered by Prof. Schmidt, at Athens, four degrees southwest of the great comet, for which careful searches had been made, notably the one at Princeton, had as quickly disappeared, and likewise the cometary masses seen by Barnard at Nashville.

The probability is, that all these masses, thrown off from the great comet, were rapidly dissipated or diffused. Although of such short time visibility, the independent discovery by Schmidt, Barnard, and myself of these different cometary masses substantiates and confirms their reality.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., Nov. 4, 1882.

Success in Invention.

In view of the great activity that has prevailed in all branches of electrical research for a few years past, it might be thought, and doubtless it is felt by many young men engaged in pursuits connected with electricity, that there is very little of the electrical field left unexplored, and especially that it is useless to try to discover or invent anything in that field in competition with the great resources of capital and laboratories that are at the command of a few prominent electricians and inventors.

It is reassuring to turn to the history of the oldest of the sciences—astronomy—which of all others might be thought to be most completely worked out. Notwithstanding that for centuries many of the greatest minds have been devoted to the study of the heavens, the history of the science of astronomy is replete with instances wherein self-taught observers, with inferior instruments, have done valuable work by patient industry and keen observation. The splendid comet that is now leaving our skies was first discovered on this hemisphere, not by the astronomers who control the great 26-inch telescope at Washington, but by an unknown observer in Colorado, who probably had no instrument at all.

It is noteworthy that some of the most brilliant recent practical applications of electricity have been simply the development, by experiment and study, of familiar and apparently insignificant effects. Every telegraph operator has been familiar, ever since there has been a telegraph, with the phenomenon of the electric spark, and with the fact that a strong current will heat a conductor of high resistance; yet the electric-arc lamp is simply a development of the former, and the incandescent lamp of the latter phenomenon. In the same way, the "polarization" of batteries was known to telegraphists for years, and was regarded by them simply as an impediment to be got rid of; but the Planté and Faure accumulators are only developments of that same principle of "polarization."

There are many phenomena of electricity that are still in the same condition, as regards practical value, that the electric spark and the "polarization" of batteries were in before they were turned to account in the electric lamp and the electrical accumulator. Electricians are trying to get rid of the effects of electrical induction now, just as they formerly tried to get rid of the effects of polarization. Recent experiments of Messrs. Willoughby, Smith, and Dolbear seem to indicate that there may be in this troublesome phenomenon a promising field of research. There are other phenomena, long familiar, which have never been turned to practical account, such as thermo-electricity and diamagnetism, toward the study of which Faraday devoted so much attention, and which remains almost as he left it.

In connection with this subject we may refer to a brief discourse by Mr. Thomas A. Edison, which appears in a little book just published entitled "How to Succeed."

To succeed as an inventor, Mr. Edison says, a young man must have a natural taste for mechanical pursuits; though not necessarily so much as to amount to a genius. It has been his experience that men who have been successful in that line preferred, in boyhood, to work in a little shop, planning and contriving some mechanical device, rather than to engage in sports with boyish playmates.

The inventor must have a good constitution and be able to work long hours at a stretch. Mr. Edison often works from seven o'clock at night until eight or nine the next morning. He does not think anything is wearing that you like.

The power of continuity of thought must be cultivated. By long practice Mr. Edison can now keep his mind for hours on one topic without being distracted with thoughts of other matters.

Above all, patience is needed. There are probably one hundred disappointments to one success, and the things that are valuable seem to be very hard to do. "When I was at Menlo Park," says Mr. Edison, "I was once working with my assistants a long time trying to connect a piece of carbon to a wire; every time it would break. Then we would spend several hours in making another, and that would break. After working a day and two nights in this way, we finally accomplished our purpose. One of my assistants wearily got up and said: 'Well, I think Job got too much reputation on a small capital!'"

Neither a mathematical nor a collegiate education is essential, but Mr. Edison has a high opinion of the technical schools. The Troy Polytechnic School, he thinks, turns out the best men; but the Massachusetts Institute of Technology, the Stevens Institute of Technology, and the Washburn Institute are all good.

He thinks it best for the would-be inventor to confine his reading, study, and experiment to one subject. The domain of science is so broad that it is impossible for one man to master it all. "He can take hold of almost anything; the steam engine, for instance. Probably a million men have already worked at it. That would not deter me in the least; because that which is known, to what is possible to be known, stands, we will say, as one to ten millions. The best method of doing almost anything you can mention in mechanics has not yet been found out. We have not got the most perfect sewing-machine. Fifty years hence the sewing-machine we have now will be laughed at. The mind of man is so almost infinite that the field is unlimited. But the only proper way is to take up one branch; make yourself a specialist."—*The Operator.*

A Successful Artesian Well.

About one year ago several enterprising citizens of Mount Vernon, N. Y., formed a corporation for the purpose of obtaining an adequate supply of pure water. After thoroughly studying the various systems of obtaining water, they decided to sink an artesian well, reasoning from analogy that as wells in similar geological formations yielded bountifully, their chances of striking a water-bearing crevice at a reasonable depth were good. Geologically considered, the structure of Westchester County closely resembles that of Manhattan Island, and with but two or three exceptions, wells sunk on the island have been successful. A contract was made for the sinking of a well eight inches in diameter, and from 300 to 700 feet deep, according to the supply. On the 23d ult. the well was finished at a depth of 502 feet. A wrought iron tube was driven through the surface to a depth of 30 feet, when it struck solid rock. As the water rose above the surface, the well may be considered as a flowing one. The water was found to be soft, clear, and cold. A pump was attached, and when running at the rate of 100,000 gallons a day, was unable to diminish the supply. It is calculated that this is sufficient for 3,000 or 4,000 people. The well is 130 feet above tide water. With an expenditure of not more than $75,000 for pumps, pipe, well, etc., a sufficient supply will be obtained for both domestic and fire purposes.—*Engineering News.*

How Milk is Made.

That the animal organism is capable, under certain conditions, of converting various good elements into milk is one of the most familiar facts of nature. How the milk-producing glands perform their work remains to a great extent a puzzle. The later investigations and theories in this connection are clearly set forth by Dr. G. C. Caldwell in a recent issue of the *Weekly Tribune*, in answer to the question "How is milk made?" He says:

The essential milk-producing part of the udder is made up of a series of ducts or tubes branching out from reservoirs at the heads of the teats, joining one another at little sub-reservoirs, and separating and uniting again, till finally they end within minute organs called vesicles or follicles. Both Dr. Sturtevant, of the New York Experiment Station, and Mr. Arnold, have traced these ducts to their sources. These follicles are the fountain heads whence the milk is collected by the ducts and carried through one reservoir after another to the teat.

The three essential ingredients of the milk, beside the water, are the fat, in the form of minute globules suspended in the liquid; the caseine, partly in solution in the water of the milk and partly in solid grains suspended in the liquid; and the sugar, only in solution. Nearly all authorities agree that the formation of the milk is attended with a rapid production of new cells, very rich in fat, in the follicles; and the most generally adopted view is that these cells drop off and fall to pieces by what is called fatty degeneration, and that their investing membranes or cell-walls become dissolved; thus, especially, the fat of the milk is produced; and some think that all the constituents of the milk are really nothing but cell ruins, taken up by the water that must come directly from the blood even if nothing else does, and conveyed away through the ducts and reservoirs to the teats.

But Dr. Sturtevant maintains that the fat globules of the milk are really the cells themselves that are so rapidly multiplied in the follicles—that each globule began as a bud on a parent cell in the follicle, grew and then dropped off, and was taken up and washed along by the water containing the caseine and the milk sugar in solution, which has been transuded from the tissues; with him Mr. Arnold agrees. This theory requires that each milk globule shall consist of a membranous sac inclosing fat; but the existence of such a membrane or envelope around the fat globule is almost universally disbelieved by microscopists, for nearly all who have given the subject their careful attention failed to find satisfactory evidence thereof; it will be, therefore, a battle of a few against a multitude to establish the fact of such a structure of the milk-fat globule; but in a battle fought with such weapons the victory is not always with the party that is strongest in numbers.

Fleischmann, than whom there is no better authority on matters pertaining to milk, is not entirely satisfied with the theory that the milk is made up of cell ruins alone. He shows that if this were so, in the case of a good milch cow, the dry weight of cell substance broken down every day would be not less than 5·5 pounds, or more than twice the weight of the dry substance of the milk glands of a well developed udder. While allowing that there is much strength in the position of those who argue for milk production by cell destruction, he claims that there must be some secretion, or straining through, as it were, of a part of the substance of the milk, directly from the blood which circulates freely and abundantly through the glands.

But even with this partial acceptance of both explanations we are not yet altogether enlightened as to the manner in which the milk is produced. Unquestionably, however, an important and a peculiar work is done in these glands; there is produced that mixture of the three essential ingredients of food, the albuminoids, the fat, and the carbohydrates, which makes milk the type of a perfect food; and there originate those substances peculiar to butter fat, the butyrine and its associates, which are not found anywhere else in the animal body; they distinguish this fat in a marked manner from any other fat, whether animal or vegetable, and enable the chemist to tell with unerring directness whether a sample called butter is butter or something else.

History of Printing.

In an interesting article on printing in China, the *North China Herald* says that the first great promoter of the art of printing was Feng Ying Wang, who in 932 A. D. advised the Emperor to have the Confucian classics printed with wooden blocks engraved for the purpose. The first books were printed in a regular manner, and in pursuance of a decree in 953. The mariner's compass and rockets were invented about the same time, showing that at this period men's minds were much stirred toward invention. Twenty years after the edict the blocks of the classics were pronounced ready, and were put on sale. Large-sized editions, which were the only ones printed at first, were soon succeeded by pocket editions. The works printed under the Lung emperors at Hangchow were celebrated for their beauty; those of Western China came next, and those of Fokhien last. Movable types of copper and lead were tried about the same time; but it was thought that mistakes were more numerous with them, and therefore the fixed blocks were prepared. Paper made from cotton was tried, but it was found so expensive that the bamboo-made paper held its ground. In the Sung dynasty the method was also tried of engraving on soft clay and afterward hardening it by baking. The separate characters were not thicker than ordinary copper coins. Each of them was, in fact, a seal. An iron plate was prepared with a facing of turpentine, wax, and the ashes of burnt paper. Over this was placed an iron frame, in which the clay types were set up until it was full. The whole was then sufficiently heated to melt the wax facing. An iron plate was placed above the types, making them perfectly level, the wax being just soft enough to allow the types to sink into it to the proper depth. This being done it would be possible to print several hundred or thousand copies with great rapidity. Two forms prepared in this way were ready for the pressman's use, so that when he had done with one he would proceed with another without delay. Here is undoubtedly the principle of the printing press of Europe, although western printers can dispense with a soft wax bed for types and can obtain a level surface without this device. Perhaps the need of capital to lay in a stock of types, the want of a good type-metal easily cut and sufficiently hard, and the superior beauty of the Chinese characters when carved in wood have prevented the wide employment of the movable types which are so convenient for all alphabetic writing. The inventor of this mode of printing in movable types five centuries before they were invented in Europe, was named Pi Sheng.

Effects of Liquors.

Cheap brandy and absinthe are the cause of a large proportion of cases of insanity in parts of France. The United States Consul at La Rochelle, in his report on French brandies, points out the fact that no pure brandy is now made in Cognac and the district adjacent. He says that German alcohol, distilled from potatoes, is imported, doctored, and sold for brandy, and that the French artisans and peasants, who formerly used light wines, have of late years used much of this so-called brandy. He says: "Its characteristic effect is to produce an intoxication in which the patient is especially inclined to rage and physical violence, while hopeless insanity is the inevitable consequence of persisting in its use, even for a relatively short period of time." It is at least worth the physician's while to know that there is no such thing as pure Cognac now.

Preservation of Honey.

Honey, according to A. Vogel, contains on an average one per cent of formic acid. Observing that crude honey keeps better than that which has been clarified, E. Mylius has tried the addition of formic acid, and found that it prevents fermentation without impairing the flavor of the honey.

New Formulas for Preparing Gelatine Photographic Emulsions.

Into a ruby-colored hock bottle put the following materials in the order given, shaking after each addition to dissolve:

Water, just warm enough to dissolve.	5 ounces.
Nelson's photographic gelatine	12 grains.
Iodide of ammonium	3 "
Chloride of ammonium	6 "
Bromide of ammonium	20 "
Bromide of potassium	35 "
Hydrobromic acid	3 drops.

After well shaking to thoroughly dissolve, add ninety grains of *dry* nitrate of silver, and continue shaking until dissolved, which will be easily noticed from the absence of the sound of the crystals striking the bottle. The bromide of silver forms gradually as the nitrate dissolves. The above mixture is but the work of a few minutes, and can be done at night. Put the bottle, with its contents, away for three or four days, shaking occasionally, then immerse the bottle in a pan of water and raise to the temperature of the water the boiling point for ten minutes; then add one hundred grains of dry gelatine, shake again until dissolved, which it does quickly. Now pour the emulsion into a dinner plate to set; if done at night, it will be set by morning. Then place the dinner plate with its contents slanting-wise into a large basin of water; the nitrates will dissolve out and fall to the bottom of the vessel. By evening the emulsion will be ready for redissolving, which can be done by warming the dinner plate and filtering into a bottle. Plates may then be coated without being warmed. They should be laid on a level glass or slate slab; an amount of emulsion required to cover the plates should then be poured on, guided to the corners of the plate by a glass rod or a flat piece of glass. After lying on the slab for ten minutes, the film of emulsion on the plate will be set and the plates can then be reared up to dry. They can be dried quickly by being placed in a box through which passes a current of air.

Method of Cold Emulsification, by A. L. Henderson.—If bromide of silver be precipitated in an aqueous solution it only requires time to soften the particles; but if an alkali or acid be introduced this softening effect will take place much quicker. Heat will also help it.

Now, it is well known that gelatine, being a very variable, complex substance (no two samples being alike), great difference must take place when a precipitate of bromide of silver is made in gelatine. If we use a small quantity of gelatine to begin with, more or less of it is decomposed before the desired result is obtained.

I venture to say that boiling or stewing is not only unscientific but uncertain; now, if we add something that will prevent decomposition, one element of failure is got over.

Of the various substances tried, I find alcohol and ammonia the best. Here I have a solution of gelatine of ten grains dissolved in one ounce of water. When the gelatine is dissolved by gentle heat I add:

Carbonate of ammonia (the ammonia causes effervescence)	20 grains.
Bromide of potassium	150 "
Iodide of potassium	2 "
Alcohol	3 ounces.
Ammonia, 0·880	60 minims.

Mix the ammonia and alcohol before adding to the gelatine.

This may be kept in bulk ready for use; it will keep a long time good. When it is quite cold I stir in:

Nitrate of silver	200 grains.
Water	2 ounces.

I occasionally shake it, and in one hour it will be ripe enough for all ordinary purposes; in fact, when finished it will give results twice as rapid as most commercial plates.

The maximum sensitiveness seems to be reached in about ten hours. No further advantage is to be derived by prolonging the emulsification, except that of convenience. It should be apparent that, having a large reservoir of emulsion made in this way to draw from daily or at will, adding fresh to keep up the stock, perfect uniformity must be obtained.

To the above quantities I add four to five drachms of dry gelatine; warm gently to dissolve the same. When the gelatine is thoroughly dissolved I stir in twelve ounces of warm methylated alcohol, 100°. The emulsion, when cool, will be precipitated to the bottom of the vessel. It is to be broken up and well washed in a running stream from two to twelve hours. Make up the bulk to eight or ten ounces.

Gelatine dissolved in alcohol, ammonia, and water will not set so firmly as the same amount of gelatine in water; yet if the salts and ammonia are removed by precipitating with access of alcohol the gelatine recovers its setting powers.—*Br. Jour. of Photo.*

Improved Alkaline Developer for Gelatine Dry Plates.

SOLUTION NO. 1.

Distilled, melted ice, rain, or snow water	10 ounces.
Alcohol	2 "
Salicylic acid	160 grains.
Pyrogallic acid	1 ounce.

The salicylic acid should be dissolved first, and the pyrogallic acid next in the alcohol; the resultant solution should then be mixed with the 10 ounces of water warmed to 100° F. and shaken up.

If at the end of 24 hours white needle-like crystals of salicylic acid are formed in the bottom of the bottle, they may be redissolved by immersing the bottle for a few minutes in warm water. This should be done each time the crystals form in order to retain the full preservative qualities of the salicylic acid.

SOLUTION NO. 2.

Saturated solution sulphite of soda, in ordinary warm tap water	8 ounces.
Strongest water of ammonia	4 "
Bromide of potassium	1 "

The bromide of potassium should be dissolved in the soda solution, and the ammonia added last.

To develop a 4x5 plate with normal exposure, take 2 ounces of ordinary water and add 30 minims of No. 1 and 20 minims of No. 2. Development will proceed gradually, the shadows remaining clear.

Over-exposure is remedied by an increase of No. 1 and less of No. 2; under exposure by reversing the order. From three to four plates can be developed in the same solution, which, though it turns red, will remain clear.

Two important advantages this developer has over others are, that the pyrogallic acid is perfectly preserved in liquid concentrated form, and the sulphite of soda does not come in contact with the pyro until it and the ammonia are mixed.

The sulphite of soda prevents the yellow stain of the pyro from appearing, and makes the negative possess the brilliant qualities of a wet plate.

The developer combines the well known preservative quality of salicylic acid with the advantages of sulphite of soda.

The solutions being in concentrated form are easily carried about, and are always ready for immediate use.—*Dr. Stolz, in Br. Jour. of Photo.*

Some Important Statistics.

Production of pig iron in 1881, net tons	4,641,564
Production of spiegeleisen in 1881 (included in pig iron), net tons	21,086
Production of all rolled iron, including nails and excluding rails, in 1881, net tons	2,155,346
Production of cut nails and spikes in 1881, included in all rolled iron, kegs of 100 pounds,	5,794,206
Production of Bessemer steel rails in 1881, net tons	1,330,382
Production of open-hearth steel rails in 1881, net tons	25,217
Production of iron and all other rails in 1881, net tons	488,581
Total production of rails in 1881, net tons	1,844,100
Production of crucible steel ingots in 1881, net tons	89,762
Production of open-hearth steel ingots in 1881, net tons	146,946
Production of Bessemer steel ingots in 1881, net tons	1,539,157
Production of all kinds of steel in 1881, net tons	1,728,912
Production of blooms from ore and pig iron in 1881, net tons	84,606
Imports of iron and steel in 1881	$61,555,078
Exports of iron and steel in 1881	$15,782,282
Imports of iron ore in 1881, gross tons	782,887
Production of Lake Superior iron ore in 1881, gross tons	2,336,335
Production of iron ore in New Jersey in 1881, gross tons	737,052
Total production of iron ore in the census year 1880, net tons	7,974,705
Production of anthracite coal in the census year 1880, net tons	28,646,795
Production of bituminous coal in the census year 1880, net tons	42,420,581
Production of anthracite coal in 1881, gross tons,	28,500,016
Miles of railway completed in 1881	9,650
Miles of railway in the United States, December 31, 1881	103,321
Iron ships built in the United States in the fiscal year ended June 30, 1881	42
Net imports of foreign merchandise into the United States in the ten months ended April 30, 1882	$579,462,510
Exports of domestic merchandise, out of the United States, in the ten months ended April 30, 1882	635,867,349
Net imports of specie into the United States, in the ten months ended April 30, 1882	35,895,247
Net exports of specie out of the United States, for the ten months ended April 30, 1882	22,708,081
Immigrants into the United States, in the calendar year 1881	720,045

How Fire Sweeps a Wooden House.

The astonishing rapidity with which fire sweeps off a wooden building is well explained in an article on housebuilding, by E. C. Gardner, in *Our Continent:*

Let me show you how a wooden house is built. The sills and joists of the first floor are comparatively safe, because they are not boxed in with dry boards, and even with furnace and ash pits in the cellar, there would be little danger from a fire down below, if it were not for the careful provision made for carrying it into the upper part of the structure. This provision, however, is most effectively made by means of the upright studs and furrings that stand all around the outside of the building and reach across it wherever a partition is needed. Accordingly every wooden house has from one hundred to one thousand wooden flues of a highly inflammable character, arranged expressly to carry fire from the bottom to the top, valiantly consuming themselves in the operation. Furthermore, they are frequently charged with shavings and splinters of wood, which, becoming dry as tinder, will respond at once to a spark from a crack in the chimney, an overheated stove or furnace-pipe, or a match in the hands of an inquisitive mouse. They are, likewise, so arranged that no water can be poured inside them till they fall apart and the house collapses, for they reach to the roof, whose sole duty is to keep out water, whether it comes from the clouds or from a hose-pipe, but which, for economical reasons, is made sufficiently open to allow the air to pass through it freely, thus insuring a good draught when the fire begins to burn. To complete the system and prevent the possibility of finding where the fire began, the spaces between the joists of the upper floors communicate with the vertical flues, and these highways and byways for rats and mice, for fire and smoke, for odors from the kitchen, noises from the nursery, and dust from the furnace and coal-bin, are also strewn with builders' rubbish, which carries flame like stubble on a harvest field.

Brick houses, as usually built, are not much better, but that is not the fault of the bricks—*they* are tougher than good intentions; they have been burned once and fire agrees with them. In fact, there is no building material so thoroughly reliable, through thick and thin, in prosperity and in adversity, as good, honest, well-burned bricks. But the ordinary brick house is double—a house within a house—a wooden frame in a brick shell. Like logs in a coal-pit, the inner house is well protected from outside attacks, but the flames, once kindled within, will run about as freely as in a wooden building, and laugh at cold water, which, however abundantly it is poured out, can never reach the heart of the fire till its destructive work is accomplished. Thrown upon the outer walls, it runs down the plastering, washes off the paper, soaks the carpets, ruins the merchandise, and spoils everything that water can spoil, while the fire itself roars behind the wainscot, climbs to the rafters, and rages among the old papers, cobwebs, and heirlooms in the attic, till the roof falls in, the floors go down with a crash and an upward shower of sparks, and only the tottering walls, with their eyeless window sockets, or the ragged, blackened chimneys, remain.

But one thing is needful to retard the progress of hidden fire even in a wooden building, long enough at least for one to go up the hill and fetch a pail of water. This remedy consists simply in choking the flues and stopping the draught, which can easily be done by filling in with bricks and mortar between all the studs of both outer walls and inner partitions at or near the level of each floor. A cut-off half way up is an additional safeguard. The horizontal passages between the floor joists should also be closed in a similar manner. These occasional dampers are a partial remedy, and if carefully fitted in the right places will save many tons of coal and greatly diminish the chances of total destruction in case of fire. The complete remedy is to leave no spaces that can possibly be filled. One of the best and most available materials known for filling spaces is "mineral wool," a product of iron slag. If the open spaces between the studs and rafters of a wooden building, or in a brick building between the furrings, are filled with this substance, houses might possibly be burned, but the inmates would have ample time to fold their night-gowns, pack their trunks, take up the carpets, and count the spoons before vacating the premises.

[The inventor who has genius enough to study out an economical way of partitioning an ordinary dwelling so as to avoid the spread of fire, will deserve well of his fellowmen.—ED. S. A.]

Traffic on the Elevated Roads.

A statement of the number of passengers carried and the fares received by the elevated railways from January 1, 1872, to September 30, 1882, has just been issued. The following table is for the New York Road only from January 1, 1872, to September 30, 1877, as follows:

Period.	Passengers.	Cash Receipts.
Jan. 1, 1872, to Sept. 30, 1872	137,446	$13,744 60
Oct. 1, 1872, to Sept. 30, 1873	644,025	64,602 55
Oct. 1, 1873, to Sept. 30, 1874	796,072	81,047 25
Oct. 1, 1874, to Sept. 30, 1875	920,571	93,631 16
Oct. 1, 1875, to Sept. 30, 1876	2,012,953	202,675 35
Oct. 1, 1876, to Sept. 30, 1877	3,011,862	308,208 51

The figures for the New York Road all the year, and the Metropolitan four months only of the year, beginning October 1, 1877, and ending September 30, 1878, are: Passengers carried, 9,291,319, and cash received, $779,353 37. The following table is for both roads:

Period.	Passengers.	Cash Receipts.
Oct. 1, 1878, to Sept. 30, 1879	46,045,181	$3,526,825 26
Oct. 1, 1879, to Sept. 30, 1880	60,831,757	4,612,975 56
Oct. 1, 1880, to Sept. 30, 1881	75,585,778	5,311,075 85
Oct. 1, 1881, to Sept. 30, 1882	86,361,029	5,973,633 41

Aerial Navigation.

M. De Comberousse, in a discourse pronounced at the funeral of the late Henri Giffard, made this significant admission: "An intimate friend of Giffard told me yesterday that he carried to the tomb the secret which he had long sought for, and which had revealed itself to his eyes during his last years. He added that our colleague shrank back from his own discovery, and, filled with horror, put an end to his existence." In other words, he saw at length that aerial navigation must prove the suicide of civilization.

RECENTLY PATENTED INVENTIONS.

In the accompanying engraving are illustrated several novelties, and also some new and improved tools and appliances, that have been recently patented by inventors in different parts of the country.

Fig. 1 shows a very simple and ingenious shade-holding candlestick, patented by Charles E. Sherman and Louis Sachse, of Havilah, Cal. The socket for holding the candle is formed of four wires, or narrow strips of metal, rising from the base. The globe is supported by a ring placed on the top of the candle, so that, as the candle burns away, the shade will be lowered accordingly, shading the light as long as the candle lasts. The globe and ring are steadied on the candle by a rod attached to the base that passes up through a sleeve attached to the ring.

Mr. Jeremiah Schroy, of Indianapolis, Ind., has recently patented the fire-lighter shown in Fig. 2, by which coal oil may be safely and economically used for kindling fires. The device is made of two hollow perforated or slotted castings hinged together and provided with a handle. Between the castings is packed a quantity of asbestos fiber. In use, the device is first dipped in coal oil until the asbestos fiber becomes saturated. It is then ignited with a match, and placed under the fuel to be lighted, and left until the fire is well started, after which it may be withdrawn and extinguished. The absorptive and non-combustible properties of the asbestos fiber render the device durable and efficient for its purpose. The lighter is also adapted to be used as a torch.

In Fig. 3 of the engraving is shown a new form of ticket punch. The jaws or plates of the punch, which carry the dies, are slotted, and move on a central bar, and are adapted, when the handles are pressed for punching, to approach each other equally, thus always insuring perfect registration of the dies. The above is the subject of a patent granted to Mr. John Lippincott, of Baltimore, Md.

The can-opener shown in Fig. 4 has been patented by Mr. William A. McFarlane, of Ivenpah, Cal. The shank which carries the cutting blade is detachable from the handle, and the handle is made hollow, for inclosing the shank and all parts attached to it when the tool is not in use. The cubical block in which the blade is journaled is reversible on the shank, for holding the blade at right angles to the shank for making a circular cut, or parallel therewith for making a straight cut. The point at the end of the shank that passes through the top of the can, for furnishing a fulcrum and pivotal center for the tool in making a circular cut, is made a part of a pivoted plate, which may be turned back to occupy less space in the handle. In making a straight cut the tool will be used without fulcrum or guide.

In Fig. 5 is illustrated a modified form of hydraulic ram. The air-chamber is of glass, and is held in place upon the water-box by means of a hinged yoke, screw, and cap, so that it may be easily removed for repairs. The water-box is divided into induction and eduction chambers by a valved partition. The weighted, pulsating valve is placed in the induction chamber. The eduction chamber is provided with an air-pump for forcing air into the air-chamber. The above is the invention of Mr. Geo. W. McKenzie, of Harrington, Me.

An ingenious device for exterminating burrowing animals by suffocation is shown in Fig. 6. It consists of a perforated cylinder, contained in an outer casing that is open at the bottom, and of an air-pump that is connected with the perforated cylinder by a rubber tube. When the apparatus is to be used, it is placed over the outlet of this burrow, and the soil packed around the lower end of the casing to exclude the air. A small quantity of sulphur, together with some firebrands, is then placed in the perforated cylinder, and the air-pump is then operated, which forces air into the cylinder, causing rapid combustion of the sulphur, and forces the resulting gases and fumes out through the perforations and down into the burrow, causing the animals therein to be suffocated. This appliance was patented by Mr. Austin D. Palmer, of Abilene, Texas.

The crucible tongs shown in Fig. 7 were recently patented by Mr. Samuel C. Murdoch, of Pittsburg, Pa. They are intended to take the place of the hand tongs commonly used in making crucible steel, for placing the crucibles in and lifting them out of the melting furnace, and of the cradle commonly used for pouring the metal. The tongs are adapted to be raised and lowered, and moved to and from the furnace, by a crane.

The combined blow-pipe and soldering lamp illustrated in Fig. 8 employs a jet of steam for focusing the blaze. The lamp has two wick tubes—one for generating the steam in the boiler above it, the other for melting. The required pressure is maintained in the boiler by a stopper at the top of the boiler, which at the same time serves the purpose of a safety valve. This was recently patented by Mr. Chas. W. Dean, of Auburndale, Wis.

In Fig. 9 is illustrated a new apparatus for hatching fish eggs. It is the invention of Mr. Marshall McDonald, of Washington, D. C. In its simplest form the apparatus consists of a closed hatching jar and connected fish receiving jar, which latter is provided with a screened outlet or overflow pipe. The hatching jar is continually supplied with a forced current of water through a centrally placed supply pipe, that extends nearly to the bottom of the jar, so that the impact of the water upon the bottom of the jar will produce the necessary agitation of the eggs. and this supply pipe is made vertically adjustable, so that the agitation may be made more or less violent, as circumstances require. The young fish, as soon as hatched, will be caught in the current of water and transferred through the connecting pipe to the receiving jar, where the water is comparatively fresh and clean. When the buoyant eggs of salt water fish are to be hatched, the current through the apparatus will be reversed; that is, it will be made to enter and pass out at the bottom of the jars. By proper manipulation of the connecting pipe, the bad eggs, which, by virtue of their less specific gravity, will collect on the top of the mass of eggs in the jar, may be passed off with the current through the connecting pipe, so that the good eggs may be kept in the most favorable condition during hatching; and the apparatus requires but little attendance after being properly put in operation.

The fountain tooth-brush shown in Fig. 10 is the subject of a patent by Mr. Louis Chevallier, of Brooklyn, N. Y. The novelty of this brush consists in a rubber bulb placed on the handle of the brush, and a metal feed tube leading from the interior of the bulb along the handle to the center of the head of the brush, where it passes through an orifice for conducting the water from the bulb to the bristles of the brush while in use.

RECENTLY PATENTED INVENTIONS.

O. SILVESTRI has found that the basaltic lava in the neighborhood of Etna contains small geodes filled with solid crystallized paraffine. The paraffine is in large translucent plates of waxy appearance and yellowish-white color, with a melting point of 56°. It is soluble in ether and in boiling alcohol.

GARDEN DESTROYERS.—GALL FLIES OF THE OAK—"CYNIPIDÆ."

There are few more interesting insects to the lovers of plants and to entomologists than those which, in their immature states, inhabit the leaves, stems, etc., of plants, causing the plant in which they are to form an abnormal growth round them.

These peculiar formations are known as galls. They may be found on nearly all kinds of plants, and are caused by insects belonging to various orders.

It is not often that a plant is so infested with galls as to be seriously injured by them, but I have seen young oaks so covered with various galls that their growth was quite stunted; and it should always be remembered that though a certain insect is not common enough to be really injurious to plants, should circumstances favor its increase, it may, in the course of a few years, positively swarm.

The common marble gall was almost unknown in this country thirty years ago, when it suddenly became common and has remained so. Were it again to increase as rapidly our oak plantations would be in a dismal condition indeed.

Though these insects will always be looked upon with suspicion by horticulturists, we must always remember what we owe to a foreign gall fly (*Cynips gallæ tinctoria*), which

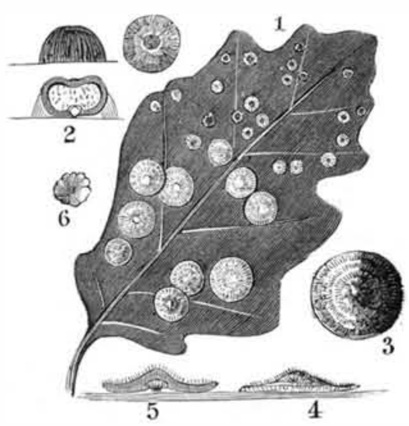


Fig A.—1, Oak leaf with spangle galls and button galls; 2, button galls (magnified); 3, 4, 5, spangle galls (magnified): 6, grub from spangle (magnified).

forms the gall so largely used in the manufacture of writing ink; these oak galls of commerce much resemble our common marble galls. In the present article I intend to draw attention only to those formed on oak trees by certain small four-winged insects which are known as gall flies, or cynips. They are members of the family Cynipidæ, a family in the same order as bees and wasps, but more nearly related to the ichneumons or parasitical flies.

The number of these insects which attack the oak is very considerable. Dr. Adler, of Schleswig, in a most interesting and valuable pamphlet on these insects (to which I am indebted for much valuable information contained in this paper), enumerates nearly one hundred and thirty species living on various kinds of oaks in Europe; but this number probably includes several which are, most likely, different forms of the same insect. I have selected a few of the common and more conspicuous galls for illustration. The various galls differ very much in appearance and substance. Some, the marble galls (Fig. F) and the artichoke galls (Fig D), become quite hard and almost woody: others, like the currant gall (Fig. B) and the oak apple (Fig. E), are soft. Another kind, which may sometimes be found on the catskins or mole blossoms of the oak, resemble a small mass of

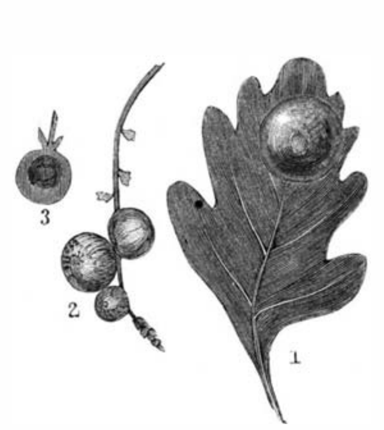


Fig. B.—1, Currant gall on leaf: 2, ditto on male flowers; 3, ditto and section.

cotton wool more than anything else. It is very curious that the grubs, which are so much alike in every way, though belonging to different species, should cause the growth of galls so very dissimilar in appearance. The marble and artichoke galls are both formed from buds, yet how unlike they are. The currant galls and the woolly ones just mentioned are both found on the male flowers of the oak, and have no point of similarity.

These differences may, however, be the result of the grub occupying a different position in the bud or flower, one species placing its eggs in a different layer of cells to the other. A question which has been much discussed among entomologists is: What is the cause of this growth of the gall? Does the gall fly, in puncturing the tissues of the plant, inject a fluid which promotes the abnormal growth? Or is it the action of the grub in obtaining nourishment from the surrounding cells? Dr. Adler is decidedly in favor of the latter solution, and has conclusively proved that the

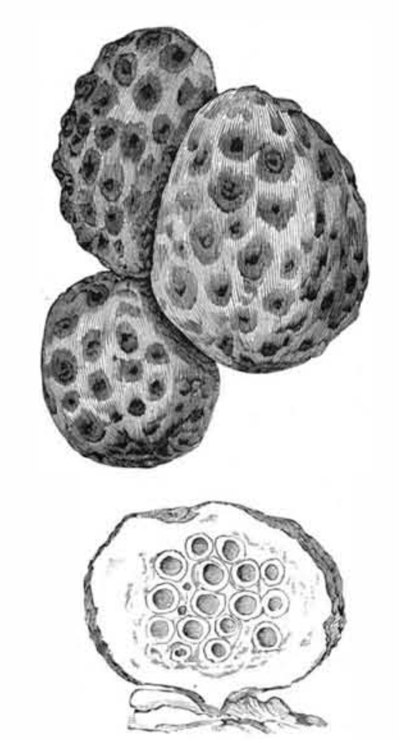


Fig. C.—Oak root gall and section.

formation of the gall does not commence until the grub is hatched, and that as soon as the grubs (which are furnished with sharp jaws) begin feeding a rapid growth of cells round

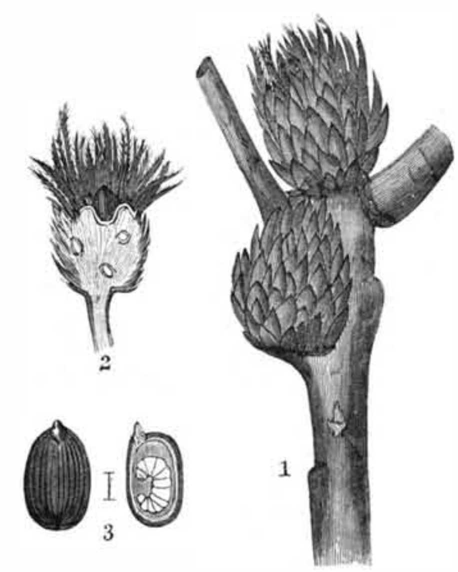


Fig. D.—1, Artichoke gall; 2, ditto, section; 3, internal gall (magnified).

them is induced; and that if a grub dies before the gall is fully formed its growth is arrested. The life history of the gall fly is most interesting. Dr. Adler, with the most unwearying patience and perseverance, has proved by very carefully made experiments that gall flies which had hitherto been considered as different species, which made very dis-

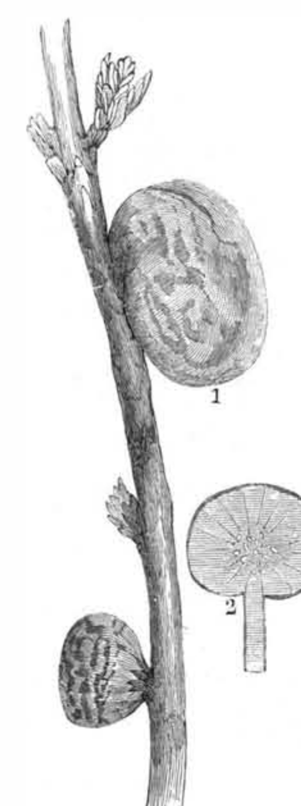


Fig. E.—Oak apple gall; 2, ditto, section.

similar galls, were in many cases really only the different forms which occur in alternate generations of the same, the insects and the galls they make resembling their grandparents and their galls, and not their immediate parents. For instance, the currant gall (Fig. B) produces an insect which, instead of piercing the male flowers of the oak, as its parents did, attacks the under sides of the leaves and deposits its eggs within them, the grubs from which cause the oak spangles (Fig. A, 3, 4). From these are produced, in spring, insects which, like their grandparents (and not their parents), attack the male blossoms of the oak, and thus the cycle of their transformation is completed. Another curious fact is that the generation which survives the winter consists entirely of females, or perhaps, to speak more correctly, I

Fig. F.—1, Marble galls; 2, ditto, section; 3, grub (magnified).

should say non-sexual individuals; I shall, however, for the sake of brevity, allude to them as females; while the generation bred from eggs laid in the spring is composed of both males and females.

The gall flies all resemble one another to a great extent, though different species, and even the alternate generations of the same, show marked difference in size, color, etc., their color varying from black to yellowish brown. The species (Fig. G) bred from the marble galls may be taken as an example of this insect. The grubs are scarcely to be distinguished from one another.

The female gall flies are each provided with a long ovipositor, which is hidden within their bodies when not in use. They are of a very curious and complicated construction (Fig. G, 4), and are composed of two plates, which form a kind of sheath, and the actual instrument which is used for piercing the buds, etc., and placing the eggs at the bottom of the perforations. This piercer is composed of three pieces, one stout, and deeply grooved longitudinally for the reception

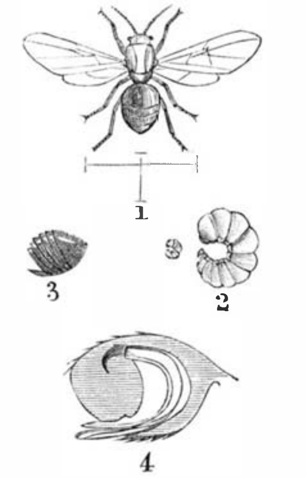


Fig. G.—1, Cynips kollari (magnified); 2, grub (magnified); 3, ditto, side view of body (magnified); 4, section of body (magnified).

of the others, which are hair-like and work within this channel, beyond which they can be protruded when in use. This apparatus has its origin at the back of the body, near the apex; it then passes in a curve toward the front, and afterward finds an aperture just below its point of origin. When the insect wishes to deposit its eggs, she (if it be a bud which she selects) settles upon it, and having carefully examined it with her antennæ, passes her ovipositor under one of the scales, and thrusts it, working the hair-like organs up and down, like saws, into the bud, until the position is reached which she wishes her eggs to occupy. This operation seems to require great exertion on the part of the insect. She then withdraws her ovipositor, deposits an egg at the entrance, and pushes it to the bottom. The eggs are oval and have each a long stalk. The only practicable way of keeping these gall flies in check is to collect and destroy the galls before the insect leaves them, and in every way to promote the healthy growth of the trees. If the galls are gathered when quite young they need not be destroyed, as the grub will certainly die as the gall shrivels. Some kind of birds, such as titmice, are of great use, as they destroy the marble galls to obtain the grub which they contain, and the pheasants devour large numbers of the oak spangles when they fall with the leaves to the ground. One of the most abundant galls on the oak is

The common oak spangle. (Fig. A.) I have counted as many as 184 on one leaf; they are formed by an insect known as Spathegaster baccarum, which deposited its eggs within the leaf on the under side at the beginning of June.

The galls begin to form in July, and are fully formed in September, when they are about two-tenths of an inch in diameter, or somewhat larger. They are flat and circular, with the center raised in a flat cone; they are of a greenish yellow color, with tufts of short brown hairs; in the center is the grub, a soft, white, footless maggot, lying in a curved position, with its head and tail in close proximity. The insects lie dormant during the winter within the galls, and appear in the winged form in April or May. It is known as Neuroterus lenticularis; it is about one-eighth of an inch long, and of a reddish brown color; in this generation there are no males. The virgin females deposit their eggs in the buds containing the male flowers, or on the under sides of the leaves. These galls (Fig. B) when mature are round, like small balls, of a transparent green color, often streaked and speckled with red; they are of a moist, soft consistency, with a considerable hollow space in the center, in which is the grub. The galls formed on the male flowers are called Currant galls, from their resemblance to a bunch of currants. The gall flies from these emerge in June, and are of both sexes; the females attack the under sides of the oak leaves; when the grubs are hatched oak spangles begin to form; thus the cycle of their existence is completed. The other gall shown on the leaf with the oak spangle is formed by Spathegaster vesicatrix, a small species scarcely one-tenth of an inch in length, both sexes of which are found. The female deposits her eggs within the leaves, attacking the lower surface in June, and the galls which result are about one-tenth of an inch in diameter when fully grown. They much resemble a small somewhat conical button covered with silk threads, and are slightly depressed at the top. Under a low magnifying power one of these galls is a very beautiful object. The gall fly does not emerge from these galls until spring, when only females are found; these attack the under sides of the young leaves, which causes small galls, somewhat resembling the oak spangles; from these perfect insects of both sexes are bred in June, which are the parents of the grubs forming the button-like galls.

The Oak root gall.—Fig. C is formed by Andricus noduli, a small species scarcely one-tenth of an inch in length, of which both sexes are present. The females deposit their eggs within the roots, which are sufficiently near the surface for them to obtain access to. A large number of eggs are laid near one another, and no doubt two or more females often lay their eggs so close together that they form one gall. Dr. Adler has bred more than one thousand from one gall, and finds that each female lays about five hundred eggs. This habit of the females laying their eggs together may be accounted for by the difficulty they may have at times of gaining access to the roots except at a few points. The eggs are laid in August, and the gall begins to grow in September; but from the fall of the leaf until the spring it does not increase. In May it is full grown, but the gall flies do not emerge until the following April. The galls vary in size from about three quarters of an inch to three inches in diameter, and will be found to be full of small oval cells, each containing an insect. When young they are yellowish white with brownish spots, and are soft, like a potato; as they become older they harden, and are darker in color. The gall flies which issue from these galls are known as Aphilotrix radicis, and only females appear in this generation. They are much larger than their parents, measuring nearly a quarter of an inch in length; they leave the galls in April or May, and deposit their eggs in buds which will form young shoots. The presence of the grubs causes gouty swellings to form at the base of the young shoots round the grubs. This insect attains maturity and leaves the galls in August. This species, therefore, requires two years to complete the cycle of its transformation. Another very interesting gall is

The Artichoke gall (Fig. D), so called from its somewhat resembling in form a globe artichoke. This species is very common, and I have seen branches of a young oak nearly every bud on which was turned into one of these galls, which are formed by Andricus pilosus. Both sexes appear in June. The females deposit a single egg in each bud, which they select, causing them to grow into bunches of scaly bracts. On cutting open one of these galls (Fig. D, 2), when fully formed, the interior will be found of a woody texture, and that partly embedded in the top is a small, hard, brown, oval, striated gall, which contains the grub. This gall (Fig. D, 3) eventually falls to the ground, where the transformations of the insects are completed. In the woody portion of the outer gall may often be found cells containing grubs of some other species which has laid its eggs in the gall after its formation was begun. The perfect insects (Aphilotrix fecundatrix) bred from the internal galls are about one-eighth of an inch in length, and are always females. They appear in April, and attack the buds containing male flowers, within which their eggs are laid. The galls which result are oval, pointed, about one-tenth of an inch in length, covered with stiff hairs, and of a green color. The perfect insects, which are of both sexes, escape from the galls in June, and attack the leaf-buds, as already mentioned. One of the commonest and best known of the Oak galls is

The Oak Apple (Fig. E), which is often very abundant. It is a large gall, varying from ½ in. to 1½ in. in diameter, of a greenish white color, streaked and spotted with red. Its consistency when young is much that of an apple, but it hardens when it reaches maturity. When opened it is found to contain a great number of grubs, each within a separate cell. These galls are generally found at the end of a shoot, but are at times formed on the buds at the side. The perfect insects (Teras terminalis), of which there are both sexes, emerge from the galls in July. The males are winged, but the females are wingless, or have only rudimentary wings; they are about one-eighth inch in length. The females puncture the roots of the oak and deposit their eggs within them. The galls vary much in size; some are only the size of a pea, but many are much larger. The gall flies (Biorhiza aptera) bred from these are wingless and are all females, measuring from two-tenths to three-tenths of an inch in length. They leave the galls in December or January, and climb up the stems and usually select the terminal buds in which to lay their eggs. The galls (the oak apples) begin to form in April or the beginning of May, and are full grown in about a month.

The common marble gall (Fig. F) produces an insect known as Cynips Kollari, a large species measuring ¼ in. in length (Fig. G, 1), and is of a brownish color, the body being darker than the head, thorax, or legs. The history of this insect is not yet fully made out, only one generation, that without males, being known. Where these females lay their eggs is a mystery, and the insects which pierce the buds previous to the growth of the marble galls are not known. These galls may often be found in clusters, and are exceedingly common at times on young oaks. I have counted twenty-four on a small bough, about two feet long, composed of four shoots; one bore eight, the others six, four, and six each. The full grown galls vary in size from ½ in. to nearly 1 in. in diameter. When young they are green and soft, but afterward they become hard and brown. The grub occupies the center, and lies in a very curved position. Other grubs may often be found in the gall, but they are the progeny of some species which pierces the already formed gall. These galls about thirty years ago suddenly became very common, whereas hitherto it was hardly known, and for some time was called the Devonshire gall, from its having been first noticed in abundance in that county.—*G. S. S., in the Garden.*

The Coming University.

The *Grocer's Bulletin* makes the following extracts from a recent lecture by Mr. James Parton, the historian:

"I have in my mind's eye," says Mr. Parton, "a glorious university, completely organized and equipped, to afford an education such as the future man will be given. It looks not at all like Oxford or Cambridge, nor even like Harvard. It looks more like a factory village situated in the midst of a finely cultivated farm of 1,000 acres, with beautiful gardens and parks, the whole the center of a thriving industry such as our factory villages might be, must be, shall and are just going to be, for man will not long be the submissive vassal that he is now. This university of mine shall have a chime of bells, which at 6 A.M. summons 2,000 men to rise and cast off cloth and put on workingmen's clothes and prepare for labor. At 7 they are in their different shops, workers in wood, in metals, in leather, in stone, in hemp, in cotton, in flax, in wool. For three hours they labor, being held to a strict account for the use or abuse of tools, material, and time. In summer a portion of each day is spent by all upon the land, so that they may have insight, some practical knowledge, of farming, of horses, of cattle, of the dairy, the garden, the orchard. At 10 all this is over, except in harvest and other periods of pressure. The chimes now send these workmen to their rooms, where they remove the dress and garments of manual labor, and come out to class and remain all day university students.

"Separated from the soil, man never yet has succeeded in thriving. At best, without it, he is a potted plant, and some of the pots are miserably small. I have visited many factories in New England, and I find that wherever the operatives have a reasonable chance at the soil, where every family can have a good sized garden, with access to pasture for a cow, the people are healthy, contented, and saving. Wherever this is the case, the factory population is able to live without actual starvation or extreme destitution in the event of the mills being closed for even a very long period. Whenever they are separated from the soil, as in some of our large cities, there is squalor, demoralization, and despair."

The Beni River Rubber Region.

The recent extraordinary rise in the price of Para rubber, and the manifest need of a new source of supply for that valuable commodity beyond the control of the parties who have cornered the Brazilian supply, serve to bring to notice the promising rubber district explored by Mr. E. R. Heath in Bolivia, two years ago. An account of Mr. Heath's discoveries along the course of the Beni River to its junction with the river Mamore, one of the tributaries of the Amazon, was given in this paper about a year ago. We learn from the *World* that a full account of Mr. Heath's researches, geographical and scientific as well as commercial, will soon be published by the American Geographical Society and the Royal Geographical Society of England. He describes the Beni River as navigable by large steamers for a distance of 525 miles from its junction with the Mamore, and for 300 miles more by craft of less than three feet draught. The forests on both sides of the river are full of rubber trees, offering a supply of rubber "practically inexhaustible."

On the north side of the Beni River the forest extends from the water's edge over fifteen degrees of latitude. Mr. Heath penetrated this dense forest at one place as far as twenty-one miles from the river, and the further he went inland he found the rubber trees increase in size and number. Each square league contains from 300 to 5,000 trees. On the south side of the river the forest is only from three to ten miles wide, but it abounds in rubber trees.

The supply of rubber, Mr. Heath says, is sufficient to give employment to 100,000 men, and as soon as the chain of communication by steamer and railway is completed that number of men will soon be engaged in that field of labor. The rubber, though at present commanding only the same market price, is of a slightly finer quality than that obtained from the old-established districts between the falls and the mouth of the Madeira River and on the river Tapajoz and other tributaries of the Amazon near Para. It possesses other more important advantages over the older districts. The climate is healthy. There is an abundant supply of cheap labor at hand, the Indians obtained from the department of the Beni, who are practically slaves, working at from $3 to $4 a month, equivalent to from $2.40 to $3.20 in American money.

The abundant supply of palm-nuts, which are used in smoking the rubber—a necessary process previous to evaporation—enables the collectors to work ten months out of the twelve, instead of six, as in the other districts.

The Best Door to Stop Fire.

A number of experiments have been made in this country to test the value of different materials for doors that may be exposed to fire, from which it appears that perhaps the best door yet devised is one made of wood and covered with tin. The door is formed of solid planks, or boards matched and fastened together and crossing at a right angle, or at forty-five degrees. There should not be less than two thicknesses in any door, and as many more should be used as the size of the opening to be closed demands. This solid wooden door is then to be completely covered on every side with tinned sheet-iron, all the joints being soldered as in making tin roofs. The tinned door is supported by hangers moving on an inclined rail or track over the doorway, so that when free to move it will close by its own weight. At the door-jamb opposite the door, when it is open, should be a wooden casing covered on every side with tin, and into which the door will fit tightly when it closes, by moving on its track, the inside of the casing being wedge-shaped. The casing on the opposite side must fit the door closely so as to leave no cracks at the sides of the door. To keep the door open a small bolt is placed on the inside of the door-jamb, the pressure of the door keeping the bolt in position. On the under side of the arch or top of the door is a wire having a joint or link in the center, this link being soldered with fusible metal that will melt at one hundred and sixty degrees Fahrenheit. Just above the bolt that holds the door open is a weight supported by a wire connected with the wire holding the fusible link. This weight moves in guides and is wedge-shaped below. The threshold of the door should be of brick or stone to resist fire, and high enough to keep out water in case the room is flooded. From the reports and experiments it appears that such a door is thoroughly reliable, the soft metal link parting even in the heat of a fire in a building on the opposite side of the street, and allowing the weight to fall, pushing the bolt one side and permitting the door to close. Such wooden tin-covered doors and window shutters are reported to stand unharmed through severe trials when iron doors have failed, melted, or warped under less exposure to fire. The door and the automatic device for closing it are officially recommended by some of the leading fire insurance companies of this country.—*Fireman's Journal.*

Wood Pavement in Paris.

The Improved Wood Pavement Company was authorized about a year ago to lay down, as an experiment and at its own expense, a pavement of wood blocks in the Rue Montmartre and the Boulevard Poissonnière, two of the most crowded thoroughfares in Paris. The city engineers have reported so favorably respecting the new pavement that the municipal authorities have just given an order to the same company for the paving of the entire length of the roadway of the Champs Elysees, from the Place de la Concorde to the Rond Point. The preliminary works necessitated by the change have already been commenced, and the laying down the blocks will begin next month. It is expected to be entirely finished by March 1, and will be executed in longitudinal sections, so as to interfere as little as possible with the traffic of the finest roadway in Europe.

TWELVE hundred head of sheep sold in England lately for $16,850, the highest price on record at a large sale.

RECENT INVENTIONS.

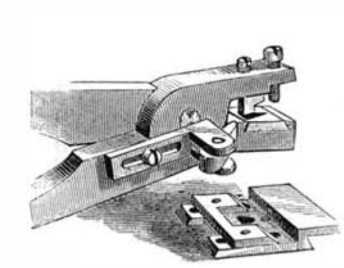
Adjustable Bracket.

This invention is applicable to brackets, stands, or shelves for holding pots or other vessels, containing water or other fluids to be heated over the flame of a lamp or gas burner. It consists in a bracket of novel and simple construction, in which provision is made for both the vertical and horizontal adjustment of the table or stand portion, and the projecting portions of the bracket when in the way may be readily removed from the fixed part, and the whole when dismembered knocks down into a flat space, to facilitate transportation or packing away. The bracket when in use in no way interferes with the light from the gas or lamp burner, and when used in connection with a lamp, the stand is situated so as to be about half an inch above the lamp shade. A portable bracket made in this way is very convenient in bed rooms and many other places.

This invention has recently been patented by Mr. John H. Eager, corner Penniston and Prytania streets, New Orleans, La.

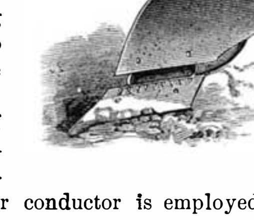
Combined Saw Set and Gummer.

This invention consists of a pair of tongs provided with dovetail grooves in the inner surfaces of the jaws for receiving dies, with a check screw and nut for limiting the motion of the jaws, and a saw guide formed of a block pivoted between two jaws projecting from a plate held adjustably to the side of the tongs by a set screw, so that teeth will be cut in a saw placed between the jaws when the jaws of the tongs are pressed together. The instrument is provided with a plate to be secured on the lower jaw, and provided with a saw guide extending across it, so that the teeth of a saw placed on the plate will be bent or set by pressing the jaws of the tongs together. This part of the invention is shown in the detached view. The tool is very simple, portable, and easily operated and kept in order. Further information in regard to this invention may be obtained by addressing the inventor, Mr. E. A. Parks, 109 St. Charles street, New Orleans, La.



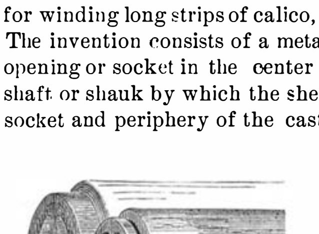
Improvement in Plows.

The engraving represents an improvement in the construction of plows for venting the surface of the share and mould board to relieve the atmospheric pressure and enable the plow to run easier. There is an open space along the joint between the share and the mould-board, with notches in the share at the margin of the open space to permit the air to circulate. A tubular air conductor is so applied as to discharge air into the air space if desired, a suitable air forcing apparatus being for that purpose applied to the plow. The surface of the mould board is arranged a little back of the surface of the share to facilitate the circulation of air under the furrow-slice. When the tubular conductor is employed the bars connecting the mould board and share are suitably curved to receive and hold the conductor between the mould board and share, but when the conductor is not to be used the bars may be straight or made in conformity to the curve of the share and mould board. This device has been patented by Mr. J. Etzler, of Tyrone, Pa.



Bushing and Ferrule for Winding Shells.

This is an improvement in the hollow wooden shells used for winding long strips of calico, cotton cloth, or other fabric. The invention consists of a metal casting having a square opening or socket in the center for receiving the winding shaft or shank by which the shell is revolved. Between the socket and periphery of the casting there are curved slots leaving a ring connected with the socket by short arms. The socket forms the bushing of the shell, while the ring serves as a ferrule for preventing splitting. The casting is forced into the ends of the wood before the shell is turned; the sockets facilitate chucking the shell in the lathe. This improvement adds greatly to the strength and durability of the shell without materially increasing its cost. This invention has been patented by Mr. A. N. Ackerman, of Passaic, N. J.



Balance Spring Holder for Watches.

The engraving shows a novel device for securing the hair springs of watches to the hair spring stud. The hair spring stud or holder is of the usual form, provided at its outer end with a transverse slot or aperture, through which the end of the spring passes, and fitted with the screw pin by which the end of the spring is clamped. The screw is cut out for about half its length, and the face of the cut-out portion is made convex. By cutting out the screw in this way it forms an eccentric that may be turned so as to bear upon the spring. To clamp the spring the end is inserted through the aperture, and the screw is then turned to clamp or bind the end of the spring securely, and the spring may be disconnected at any time by giving a slight turn to the screw. This simple device obviates all danger of bending or breaking the hair spring in taking it up or lengthening it. Usually hair springs are secured by a pin, which is put in place by using a pair of pliers for forcing the pin in and out; in that case there is always danger of injuring the spring. This holder obviates this trouble, as it can be moved by a screwdriver, and it is not necessary to take it from the stud. The rounded surface of the screw by which the spring is clamped touches the entire width of the spring, holding it firmly and in its natural position, so that the springs cannot be set sidewise or become loose. The screw may be applied either horizontally or vertically, and is adapted to any style of hair spring stud in ordinary use. This useful invention has been patented by Messrs. Theodore Smith and Merritt P. McKoon, of Franklin, N. Y.

A Breath of Fire.

Dr. L. C. Woodman, of Paw Paw, Mich., contributes the following interesting though incredible observation: I have a singular phenomenon in the shape of a young man living here, that I have studied with much interest, and I am satisfied that his peculiar power demonstrates that electricity is the nerve force beyond dispute. His name is Wm. Underwood, aged 27 years, and his gift is that of generating fire through the medium of his breath, assisted by manipulations with his hands. He will take anybody's handkerchief, and hold it to his mouth, rub it vigorously with his hands while breathing on it, and immediately it bursts into flames and burns until consumed. He will strip, and rinse out his mouth thoroughly, wash his hands, and submit to the most rigid examination to preclude the possibility of any humbug, and then by his breath blown upon any paper or cloth, envelop it in flame. He will, when out gunning and without matches, desirous of a fire, lie down after collecting dry leaves, and by breathing on them start the fire and then coolly take off his wet stockings and dry them. It is impossible to persuade him to do it more than twice in a day, and the effort is attendant with the most extreme exhaustion. He will sink into a chair after doing it, and on one occasion, after he had a newspaper on fire as narrated, I placed my hand on his head and discovered his scalp to be violently twitching as if under intense excitement. He will do it any time, no matter where he is, under any circumstances, and I have repeatedly known of his sitting back from the dinner table, taking a swallow of water, and by blowing on his napkin, at once set it on fire. He is ignorant, and says that he first discovered his strange power by inhaling and exhaling on a perfumed handkerchief that suddenly burned while in his hands. It is certainly no humbug, but what is it? Does physiology give a like instance, and if so, where?—*Michigan Medical News.*

Insulating Materials.

The immense strides which have been made in electrical discovery, particularly in practical applications, have compelled electricians to seek for new and cheaper insulating materials than those already in use. Hitherto they have been limited to glass, porcelain, stoneware, gutta percha, India-rubber, and ebonite. Owing to the greatly increased demand, the price of the last three named has risen very much, and is likely to rise still more, and, while the quality has deteriorated, it is impossible for the existing sources to supply what is needed, not only for telegraph and telephone work, but for the immense field opening in electric light work. The public require, before everything, safety in the use of electricity, and there is a corresponding demand for a cheap insulating material, the supply of which shall be equal to the demand likely to arise.

The Ether Spray an Immediate Cure for Neuralgia.

Dr. McColganan extols the value of the ether or rhigolene spray for the instantaneous relief principally of facial neuralgia. He first had occasion to observe its good effects upon his own person, he having suffered greatly from facial neuralgia. Since curing himself, he has had occasion to test its efficacy in about twenty cases. The result was invariably a most gratifying success. In many instances a permanent cure was established. He attempts to explain its action by supposing a complete change to take place in the nutrition of the affected nerve in consequence of the intense cold acting as a revulsive.—*Southern Practitioner.*

THEATER FIRES.—FIREPROOF FITTINGS DEMANDED.

The recent burning of two theaters in this city within two days—the Park Theater and the Alhambra—renews attention to the dangerously combustible character of such places of public resort and the ever impending danger of public disaster so long as the present state of things is maintained.

Fortunately both fires occurred when the theaters were empty, or nearly so. A few workpeople were engaged in the Park Theater making ready for a performance to come off three or four hours later, and one of them, the stage carpenter, was cut off by the rapid spread of the fire. As the origin of the fire was not determined, it is impossible to say that a fire might not have arisen from the same source at any time; and from the brief interval between the discovery of the fire and the destruction of the building it is certain that a multitude of lives would have been lost had the fire broken out a little later, or any time during a performance.

Usually, when such preventable disasters occur they are followed by a general discussion of the means of preventing and controlling fires in such places. The simple burning of these two buildings, however (although it served to demonstrate the utter inadequacy, if not uselessness, of the customary interior arrangements and apparatus for extinguishing fires in theaters, owing to the almost instantaneous spread of the flames), seems to have aroused but little popular attention.

The only significant utterance called out appears to be that Mr. Esterbrook, Chief Inspector of Buildings, who describes our places of public resort as largely fire traps which will yet burn up their hundreds of persons, simply because the "rascally politicians" will not have them otherwise.

Soon after the Vienna Ring Theater disaster he sent to Vienna for the report prepared for Government use in making arrangements to prevent another such horror. This report embodied suggestions of the most eminent architects, engineers, and builders of Vienna. He had it translated, and then, with the co-operation of architects here, draughted a bill which was presented to the State Legislature last April, but was rejected. The proposed law provided, in addition to abundant exits and broad passageways, that a space of ten feet be left all around the theater buildings; that all doors must be left unlocked and open outward; a brick wall must separate the stage from the auditorium, the only opening in it to be the proscenium arch; all stair-cases to be inclosed in brick walls; all floors, partitions, and stairs to be of non-combustible material; one-quarter of the roof over the stage to be of skylights, which will fall open when a single hempen cord is cut; stand pipes of water, tanks, hose, etc., to be provided at different parts of the house.

This bill, Mr. Esterbrook said, was defeated because it was too good a law to suit the purposes of "petty ward politicians." Save this, there is "no reason why a theater should not be safe from fire beyond all question."

Mr. Esterbrook said further that he is going to press the same bill again this year. That some such measure should be, and ultimately will be carried through, is practically certain; for the public interest will not always be held subordinate to that of speculative politicians. And in anticipation of the time when fireproof theater construction will be made imperative our inventors may well be making preparations for meeting the demand for the new order of theater construction, fittings, and appliances. The scope for invention in this connection is wide, and not limited to the specific requirements of theaters.

Liabilities for Injury to Patients During Operation.

The decision of Judge McAdam, in a recent suit before the Marine Court of this city, brought by Thomas J. Kelly against the dentist Colton, to recover for injuries caused by allowing a piece of tooth, which was being extracted, to drop down the plaintiff's throat while he was under the influence of laughing-gas, is one full of importance, not only to dentists but to general surgeons as well. It is alleged that the piece of tooth slipped from the forceps, and for four weeks thereafter the plaintiff was troubled with a cough until he finally expectorated the piece. The court held that while a patient was under the influence of an anæsthetic which deprived him of the use of his faculties the operator was bound to exercise the highest professional skill and diligence to avoid every possible danger, and in this case it was the opinion of the court that the circumstances shown were sufficient to carry the case to the jury on the question of negligence.

The judgment appealed from was in favor of the plaintiff for $500 damages, and this judgment was affirmed by the present decision.

Substitute for Cod-liver Oil.

Among the numerous substitutes for cod-liver oil which have from time to time been brought before the notice of the profession, dugong oil, which is an extract obtained from the dugong, an herbivorous cetacean inhabiting the warm seas of the coasts of Australia and the Eastern Archipelago, has met with a most favorable reception. Dugong oil is free from the unpleasant odor and taste which characterize cod-liver oil, and is much less liable to change in keeping. At ordinary temperatures it is opaque from the separation of its more crystalline constituents, but becomes clear and almost colorless when slightly warmed. The dose is the same as cod-liver oil.

ENGINEERING INVENTIONS.

Mr. Robert L. Stevens, of Albany, Oregon, has patented a double oscillating engine, which is an improvement on a patent granted to the same inventor October 18, 1881, No. 248,524. The object of this invention is to avoid the downward pressure upon the slide and the friction resulting from such pressure.

In a gravity steam engine patented by Mr. Robert L. Stevens, of Albany, Oregon, the power to rotate the shaft is obtained by weights that are hung upon the ends of reciprocating piston-rods moved by steam or compressed air to shift the weights in the proper order for obtaining a continuous rotary movement.

Mr. William H. Reece, of Springfield, Mo., has patented an oiler for engine cylinders, which secures a steady and uniform supply of oil to the engine, and also provides for the regulation of the supply according to requirements. The invention consists in the combination, with an oil receptacle, of a pressure-cup operated periodically by the engine to force a regulated supply of oil from the reservoir.

An improved car brake has been patented by Mr. Svend Lykke, of Omaha, Neb. The brake beams are coupled to the drawbar in such a manner that when the hand wheel brake is promptly set for the purpose, the back-pressure on the drawbars when the engine slows will apply the brakes, the arrangement being such that such application of the brakes is prevented whenever it is required to "back up" by letting off the hand brakes.

MECHANICAL INVENTIONS.

Mr. Delbert G. Miller, of Waterville, Minn., has patented an improved bob-sled, in which the standards have arched tops and inclined braces secured to the runners and standards. The transverse beam is recessed to secure the arched tops. The runners move independently of each other with an easy rocking motion.

An improvement in baling presses has been patented by Messrs. William M. Penniston and William H. Penniston, of Fox, Mo. The object of this invention is to improve the construction of the presses for which Letters Patent No. 155,671 were granted to William H. Penniston, October 6, 1874, in such a manner as to make them more reliable and more effective.

Mr. Joseph Spooner, of New York City, has patented a machine for scoring and cutting of paper for making paper boxes, and for other uses, and to economize time in setting and adjusting the cutters as the work may require. The invention consists in the combination, with the cutter-stock and the cutter-holder, of hinged right and left screws, a right and left nut receiving the said screws, and a lever whereby the cutters can be readily and quickly thrown into and out of a working position.

An implement for laying bricks in baking ovens, has been patented by Mr. Martin Boessler, of St. Louis, Mo. The invention consists in a plate or frame to which jaws for holding the bricks are hinged, the jaws being pressed apart at the upper ends by springs, and capable of being separated at the lower ends to release the brick by a pivoted lever and arms. The lever can be operated from the outside of an oven by a cord passing along the handle rod of the implement.

Mr. Joseph Laroche, of New York City, has patented an improved machine for removing pieces of fat, flesh, clotted blood, and like matter from the wool on sheep skins. The machine has a rotary brush for brushing the wool on the skin. The skin is placed on a movable platform resting on a vertically-adjustable truck frame. An inverted trough-shaped box covers the brush, and water flows upon the brush from spouts projecting through this box. The scraps of flesh, fat, skin, and like matter removed by the brush are thrown into a basket below the platform.

Mr. Edgar N. Gore, of Elkhart, Ind., has patented an improved panel raiser, which consists of a pair of rotary cutter-heads placed side by side for raising panels on both sides of the board at the same time, the cutter-heads having their axes arranged obliquely to the plane of the boards to be dressed, and the edges of the cutters beveled to correspond with the inclination of the axes to said plane, so that the cutters dress the panels parallel to the plane of the board, but at the same time act obliquely on the wood in such manner as to shave across the grain in a way that enables them to cut much smoother and better than when the axes are in a plane at right angles to that of the board and the cutting edges at right angles to the arbor.

AGRICULTURAL INVENTIONS.

An improved straw cutter has been patented by Mr. Orsemus M. Sacket, of Shippensville, Pa. This is an improvement in feed cutting machines, consisting in the application to such machines of a simple and effective driving arrangement that may be operated either by hand, foot, or other power.

Mr. Thomas M. Smith, of Batesville, Ark., has patented a machine constructed so as to scrape and cultivate a row of cotton or other plants at one passage along the row. This combined scraper and harrow can be readily adjusted to cause the scrapers and the cultivator teeth to work at any desired distance from the plants, and to work at any desired depth in the ground.

Mr. Andrew J. Grady, of Pecatonica, Ill., has patented an improved manure distributer, consisting of an open-bottom wagon-body provided with ways in its sides, extending downward at the rear and forward under the body nearly to its forward end, and a sectional bottom moved by a pawl and ratchet operated by the driver. The machine is provided with a toothed rotary distributer driven from one of the wheels of the wagon.

An improved harrow has been patented by Mr. Knude Tharraldson, of Ida Grove, Ia. The improvement consists of the attachment of the teeth to the harrow bars by means of cast metal sockets and heads on the teeth, the sockets being bolted on the under side of the bars of the harrow and holding the teeth by their heads in the sockets. By this construction the boring of the bars is avoided, and the expensive material of the teeth is economized.

MISCELLANEOUS INVENTIONS.

Mr. George J. Record, of Conneaut, O., has patented an improved sap spout. This invention consists in a sap spout made with a tapering tube having upon it a band provided with a radial projection, whereby the spout is strengthened and the sap pail kept in place upon the spout.

An improvement in that class of school desks in which the seat for one desk is attached to the front of another desk, and in which the seat is arranged to swing upward and the desk to swing downward, has been patented by Mr. Frederick E. McKinley, of Wellington, Kan.

Mr. William C. Nelly, of Brooklyn, N. Y., has invented an improved clothes frame, which is constructed in such a manner that it can be compactly folded for storage and transportation, and when extended will have a large clothes supporting capacity.

Mr. Horace F. Neumeyer, of Macungie, Pa., has patented an improvement in electric burglar alarm apparatus for preventing interference with the continuous sounding of the alarm by quickly closing the circuit by the burglar after entering.

Mr. James H. Street, of San Francisco, Cal., has patented an improvement in that class of fruit driers in which the trays are carried by suitable mechanism from the place of entry up through one section of the drying chamber, and transferred thence to and down a separate section to the place of delivery.

A novel felly clip has been patented by Mr. John Wheeler, of Denver, Col. The invention consists in a metallic device made to receive the adjacent ends of the felly sections of a wagon or other vehicle wheel within it, and to support the felly ends from their inner sides, for the purpose of keeping said ends from bending inward or from splitting.

A novel gold foil annealing apparatus has been patented by Mr. John William Smith, of Newport, R. I. This invention consists of an apparatus contrived for heating a plate of metal or other suitable material whereon gold foil or other preparations of gold for filling teeth may be annealed more uniformly than by the means at present employed.

Mr. Christian W. Hergenroeder, of Baltimore, Md., has patented an improvement in counting machines in which a ratchet disk having numerals thereon is rotated by means of a pawl and lever to bring the numerals successively to view through an opening in the case. The improvements render the machine more efficient and more easily operated.

An improvement in stove tops has been patented by Mr. Owen F. Evans, of Columbus, O. This invention consists of making the cross pieces of cook-stove tops of double plates, with spaces between the plates calculated to afford protection of the upper and supporting plate from the heat, and thereby effectually prevent its bending by the heat.

An improved broiling and roasting attachment for ranges has been patented by Messrs. Louis F. Duparquet and Peter Huot, of New York city. This invention consists of a movable partition placed between the fireplace and the oven, which can be swung aside so as to expose the contents of the oven directly to the heat radiated from the fire.

Mr. William H. Maxwell, of Rochester, Pa., has patented a new process for the manufacture of paper weights and other articles from glass, and containing names, designs, or pictures in colors, which consist in first painting or printing a design upon colored glass with vitrifiable colors, and then covering the same with clear glass by moulding or casting.

A nail made in such a manner as to ornament the object into which it is driven has been patented by Mr. John Hyslop, of Abington, Mass. The nail is made with a head having a raised center and an ornamental flange. With this construction the head has a wide holding surface, and will also be ornamental. The nail is especially adapted for upholstering and for harness.

A separable button made with a heed having a rigid stem provided with an oblong disk, and a foot having a recessed aperture and an oblong hollow stem, has been patented by Mr. Najah Taylor, of New York city. Upon the head stem is placed an oblong sleeve and a spiral spring, whereby the parts of the button can be readily locked and unlocked, and when locked will be held securely in place.

An improved method of and apparatus for press dyeing has been patented by Mr. Alphonse Tavernier, of Paris, France. The object of this invention is to provide an apparatus in which textile or fibrous substances in the form of ribbons or slivers can be clouded by means of dyeing in a practical, simple, and inexpensive manner, and with a small quantity of dyeing liquid.

An improved mill, designed for grinding all kinds of grain and for breaking and degerminating wheat, has been patented by Benjamin Nichols and George E. Watson, of Kennedy, N. Y. This grinding mill consists of a grinding roller, a grinding plate, and mechanism for adjusting these parts. The mill will pulverize or grind all kinds of grain, will degerminate wheat, and will grind wet or damp grain.

An improved skirt protecting coat has been patented by Katharine S. Lathrop, of San Francisco, Cal. The invention consists in a lady's coat provided on the inner side with a folding edge along the lower end of the coat, adapted to cover the lower parts of the skirts and dresses to protect them from mud and moisture, this edge being supported by a series of tapes fastened around the waist under the skirts that are to be protected.

Mr. Madison P. Briscoe, of Bairdstown, Ga., has patented a device for preventing a horse from getting the driving reins under his tail. The device consists of one or more upright rods secured at their lower ends to the tongue or shaft, on the upper ends of which is attached a horizontal frame, connecting the uprights. The device is placed over the hips of the horse and keeps the lines up, and also prevents the horse from kicking.

In a picture exhibitor, patented by Mr. Geo. W. Shirk, of Van Orin, Ill., the chain of pictures is passed around blocks and between the rollers, and the main part of the chain of pictures is folded between a guide partition and the rear side of the box. By means of a key the rollers are rotated, and they draw the pictures from between the partition and the rear side of the box, and carry the pictures across an opening in the front of the box, where they can be viewed.

An improved mechanical telephone has been patented by Mr. Francis R. Shaw, of Chatham Center, O. The object of this invention is to obtain a more perfect operation of mechanical telephones in respect to clearness of sound and length of line over which they may be operated, for which purpose the inventor combines with the vibrating diaphragm a vibrator of wood or other suitable material supported from the diaphragm and to which the conducting wire is connected.

Mr. L. P. Jeanne, of New York, has patented a new diamond setting. The setting is made of platinum, having a gold covering on the outer surface of the cramps. The outer cover gives the setting the appearance of gold, and the bright polished surface of the platinum at the inner surface of the setting reflects the light upon the diamond, enhancing its beauty. One of the cramps has a transverse aperture, through which a loop secured to the ear wire is passed, bringing the setting close to the ear.

Improvements in trunk locks, by which they are better adapted to stand the heavy strain to which they are subjected, have been patented by Mr. Frank W. Mix, of Terryville, Conn. A hinged hasp is formed at its free end with a key aperture, and with lugs on its back at opposite sides of the aperture, grooves being grooved in the inner sides of the lugs. The lock case is secured to the trunk, and on the turning plug of the lock is a button that enters the grooves in the hasp and retains it closed.

Messrs. Richard Simmons and William Tyack, of Beacon, Mich., have patented improvements in hand wrenches. The handle portion consists of a taper metal bar, its larger end being curved and serrated on its outer surface, and forming one jaw of the wrench. Near its front end is an opening to receive a pivot bolt which passes through openings in the forked end of a bent arm, which forms the other jaw of the wrench, and is opened by a rod pivoted to the jaw and to a sliding block in the handle of the wrench.

Mr. Fred Wisner, of Olean, N. Y., has patented an improved fastener for the end boards of wagons. A bar attached to the top edge of the end board extends through notches on the top of the side board, and also through notched plates secured to the side boards, and are provided with a curved rib below the notch. Nuts which screw on the extensions of the top iron have grooves which the ribs engage, and prevent the end board from rising from the sides of the box.

A combined kitchen table and cabinet for holding cooking kettles and utensils has been patented by Mr. John W. Wolcott, of Clyde, O. Beneath the top of the table is a deep chamber, a portion of the top of the table being hinged to give convenient access to the chamber. In the bottom of the chamber is a central upright pintle that supports in a horizontal position a circular iron rack whose central hub rotates on the pintle. The rack consists of rings in which the utensils may be placed when taken from the stove.

Improvements in brick presses and moulds have been patented by Mr. Edward Fales, of Keokuk, Ia. A shaft having bearings in heavy vertical standards supported on a frame has at each of its ends cranks and pitman bars, one of the cranks having a shorter stroke than the other, and giving greater pressure. The material is placed in a suitable hinged mould, and placed first under the lightest pressure. The hinged part of the mould is then removed and the mould placed under the heavy pressure and the brick completed.

Mr. John B. Frazer, of Rushville, Ind., has patented an improved sulky seat, spring, and foot-rest. The seat is secured to the rear end of two bars that are pivoted on top of the thills in front of the axle. The front ends of the bars are connected to the upper ends of links that extend down through apertures in the thills, and connect with springs secured on the under side. The links are also connected to the front slat of the foot-rest, the opposite end being extended back under the seat, the seat and foot-rest moving together.

An automatic heat regulator and alarm apparatus for furnaces has been patented by Mr. John M. Dolen, of Wiconisco, Pa. The apparatus consists of a device that holds the damper open, that will be released by melting apart in case the heat rises above the normal temperature, allowing the damper to be closed by a spring or weight. When the weight or spring operates it also operates an alarm apparatus. The alarm device is adapted to be set in motion by a melting block in case the damper should not be set free.

Mr. Jesse P. Bentley, of Sabina, O., has patented an improved washing machine. The tub is semicircular in form and made of sheet metal, and suspended from a rectangular frame, and a rubber of similar form is pivoted to the tub and rocks forward and backward to rub the clothes. In the bottom of the tub is a removable rubber consisting of cross bars, and a semicircular bottom bars suitably arranged with spaces between them, the whole resting on ledges to support the weight of the clothes from the sheet metal bottom.

Mr. Davis K. Hall, of Unity, Wis., has patented an improved device for imparting rotary motion for driving light machinery. Two hand levers are pivoted on a bed frame, and are connected by rods with the crank of a shaft journaled in uprights on the frame. The cranks are set at right angles to overcome the dead center, and to the outer ends of the shaft are secured longer cranks that operate levers that are attached to a band and balance wheel at the opposite end of the machine, and from which the power is transmitted by a belt.

An improved device for pumping oil wells has been patented by Mr. Eli S. Williamson, of Bradford, Pa. A working barrel of a diameter smaller than the well, is anchored near its bottom, and a pumping tube extends from above the top of the well hole to near the bottom of the barrel. On the lower end of the tube is a valve seated upward, and in the lower end of the working barrel is also a similar valve. The pumping tube works in a packing that prevents the oil from passing up around it when the tube is pressed down, but forces it into the tube and ultimately to the top of the well.

Messrs. Daniel J. and Lucius D. Norris, of Odell, Neb., have patented an improved weighing wagon. The platform of the wagon has attached to it a compound lever weighing apparatus arranged to fit upon the wagon bed. The apparatus is coupled with cranked rods, so arranged in bearings that when the rods are turned in one position the platform will be suspended on the weighing apparatus, and when turned back it rests upon the wagon bed. A suitable index and connections are provided for indicating the weight.

A device for destroying animals that burrow underground has been patented by Mr. Austin D. Palmer, of Abilene, Kan. The device consists of a furnace for the generation of sulphurous vapors or suffocating gases, having an outer cover that is open at the bottom. An air pump is connected with the furnace. The furnace and cover are placed over the hole of the animal and earth placed around the bottom, and when the air pump is operated the gases are forced into the burrow and the animals suffocated.

Improvements in trunk handles that prevent the handles from twisting upward and out of shape have been patented by Mr. Joseph Welter, of South Pueblo, Col. The handle of the trunk, consisting of a leather strap sliding in keepers, is attached in the usual manner across the ends of the trunk. A vertical strap is secured to the center of this strap at its midlength, its lower end working in a keeper. When the handle is grasped to lift the trunk the vertical strap prevents the handle from rising to pinch the hand.

A portable folding derrick has been patented by Mr. John P. Edmonds, of Jacksonborough, Tenn. The legs of the derrick are made in pairs, connected by stays and blocks, and diverge downwardly from each other to give a firm base. The upper ends of the pairs are connected to each other by braces, and between the braces, and centrally between the legs, is placed a pulley for the hoisting rope, which is connected to a windlass placed near the bottom of one of the pairs of legs. Constructed in this manner a wagon may be driven between the legs and loaded or unloaded.

Mr. John Brown, of Memphis, Tenn., has patented an improved baling press that is operated by steam and is compact and durable. The follower of the press is moved by the pistons of two steam cylinders. The frame of the press has four main posts, and at the base of these are shorter posts that are connected by plates, so as to form an angular frame surrounding the cylinders. The posts of the frame are hollow, and are united and held together by rods and keys. The head is firmly secured in the upper end of the frame. This construction of frame is strong and durable.

Improvements in tellurians for showing the operation of the phenomena of day and night and of the seasons have been patented by Mr. Jeremiah Spicer, of Taylor's Island, Md. Upon a suitable base a standard is mounted that is inclined from a vertical position at about the angle that the "equator" and the ecliptic make with each other, and having in its upper end a spindle. Arranged to rotate upon and around this spindle is an arm that carries a globe representing the earth, and on top of the spindle is placed a lamp representing the sun, the rotation of the arm giving the different positions of the earth in relation to the sun.

In furnaces for rolling mills the action of the heat causes the fire bricks lining the same to crack into very small pieces within a very short time, and as a matter of necessity the pieces of brick drop upon the bars of iron being heated and render them unfit for being rolled. Mr. Edwin A. Kern, of Girard, O., has patented a firebrick which will remedy these defects. This brick is made of the form and size usually employed, and provided with a series of small corrugations in its faces, so that any small particle of brick which becomes severed from the main part shall be held securely in its place by one or more corrugations.

An improved smoke stack for marine vessels which prevents back draught and does not interfere with the sails and booms, has been patented by Mr. Edgar M. Hallock, of Huntington, N. Y. The invention consists in a longitudinal box adapted to be fastened on the deck of a vessel, and provided with a horizontal transverse partition having an aperture for receiving the upper end of the stove pipe, the edge of this aperture being provided with teeth or serrations. The smoke passes into the upper part of the box, and is carried off at the ends of the same by the draught through the recesses between the serrations of the edge of the stove pipe opening in the horizontal transverse partition in the box.

A regulator for dynamo electric machines has been patented by Mr. Achille de Khotinsky, of St. Petersburg, Russia. This is an automatic current regulator which is based on the following principles: first, to establish by means of a conductor with variable resistances a derivation in the circuit of the current operating upon the bobbin of a dynamo electric machine (either an exciting or a generating machine) before its entrance into the coils of the inducing electro-magnets, and so provide means for varying the electromotive force of the principal current; secondly, to establish a derivation with variable resistance in the circuit of the current operating upon the bobbin before its entrance into the coils of the electro-magnets, and at the same time to place in the circuit of the current which excites the electro-magnets of the inductor another resistance, whereby variations in the intensity of the principal current can be obtained.

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An author's reputation was made by the pen; the pen he used was made by Esterbrook; the reader is requested to name the concluding proposition.

Woodworking M'ch'y. Bentel, Margedant & Co., p. 318.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Lubricator. See advt., Detroit Lubricator Co., p. 318.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Bostwick's Giant Riding Saw Machine, adv., page 318.

Gould & Eberhardt's Machinists' Tools. See adv., p. 316.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 318.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 318.

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See New American File Co.'s Advertisement, p. 318.

Vertical Engines, varied capacity. See adv., p. 316.

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Steam Pumps. See adv. Smith, Vaile & Co., p. 316.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

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The Sweetland Chuck. See illus. adv., p. 318.

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For Mill Mach'y & Mill Furnishing, see illus. adv. p. 300.

Red Jacket Adjustable Force Pump. See adv., p. 302.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 302.

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Cope & Maxwell M'f'g Co.'s Pump adv., page 285.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 285.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 286.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 286.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 286.

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Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) F. S. B. asks: Is there anything that will destroy the buffalo carpet bugs? A. One of the surest remedies for this pest that we know of is benzine, if thoroughly applied.

(2) J. A. C. asks: What can I mix with gas tar and apply to felting to make a fair roof—pitch of roof 1 ft. in 15? A. The pitch can be used without any addition if used hot; or it may be thinned somewhat with naphtha, and applied cold. In either case the felt should be roller-squeezed to equalize the absorbed substance, and drive out any large excess of it. Thus prepared, it can be used on a roof pitched 1 in 15 very well.

(3) R. F. H. writes: I have a sliding lens three-quarters of an inch diameter on a photographic camera. By use, the slide has come to work loosely in the mount, so that after focusing, in the subsequent manipulation of inserting diaphragm and uncapping for exposure, the slide is moved and the focus disturbed. Both slide and mount are of steel (or an alloy), nickel plated, turned on a lathe. How can I effect less freedom of motion of the slide in the mount? Would any sort of sticky substance answer, and if so, what? A. We have found the following to give satisfaction in similar cases. Remove the lens from the inner tube, warm the tube as hot as the hand can bear, then with a wide brush coat its outside evenly and quickly with shellac varnish as sold ready prepared. If this does not make it tight, give it another coat in a similar manner, and when found to fit snugly, rub over the surface with the fingers anointed with a little sperm oil, lightly wiping off any excess of oil with a clean soft rag or piece of chamois skin. Adhesive substances are objectionable, as they gather dust and harden and are unpleasant to handle. In some camera tubes the outer or stationary tube is lined with velvet. Perhaps yours is of this kind; if so, try relining the outer tube.

(4) A. N. H. writes: I am building this season, and use best pine shingles for roof, and intended to dip them in a bath of lead and oil, but find it will cost $3.00 per thousand for the bath, which on a large roof is quite an item. Can you tell me whether I can use some preparation of coal tar or lime or some cheap oil for the bath; it is intended only to fill the pores of the wood, and preserve the shingles? I intend to paint them with a good coat of lead and oil after they are on. A. You can preserve the shingles and render them waterproof by putting them through a bath of warm or hot "dead oil," one of the products of coal tar. The oil is quite cheap.

(5) L. C. asks: Will you kindly inform me as to the best method of dissolving white shellac? Have tried alcohol. A. Try absolute alcohol.

(6) H. C. asks: 1. What is the best form of electric engine? A. For small motors the Trouve form is best; for larger motors the Siemens or Gramme machine. 2. Is there any way of making a strong current of electricity from heat or light? A. A strong current may be generated by means of a thermo-electric battery. See SUPPLEMENT, 159. 3. Is there a steam cylinder that imparts a rotary motion to shaft other than by crank and piston rod, and has it any dead centers? A. Yes. See "Reuleaux's Kinematics of Machinery," for the various types of rotary engines. Many of these have no dead points.

(7) J. H. asks: What kind of a bit can I get that will bore a quarter inch hole through seven inches of hardwood without choking—I mean a quarter inch bit? A. We know of no better bit than the one known as the auger bit, that has the lip turned up instead of the old fashioned leading lip, which heats and wears away rapidly when driven hard. They are much used for mortising door frames. All reputable hardware houses keep these on sale.

(8) R. B. M. asks what polishing material is made of, called composition for polishing brass, iron, nickel, and steel; the different grades and the quantity of each ingredient for mixing the same? A. They are generally made of sesquioxide of iron mixed up with oil and pressed into bars, using finest of the oxide for the different metals as is best determined by experience. Frequently some sal ammoniac in powder is mixed in to the extent of twenty per cent, when the polish is to be used for gold or iron.

(9) W. J. F. asks: What liquids do manufacturers use in making "barrel paints," blue and white? The paints are made to dry very quickly, with a gloss, and are very cheap. A. Ultramarine blue mixed with a little boiled linseed oil in turpentine, and white lead similarly mixed for white.

(10) D. B. V. writes: I have a shaft 5 feet long on which there are four wheels, all of which weigh about one hundred and ten pounds, *i. e.*, the shaft and wheels together. One of these wheels is a water wheel, 32 inches in diameter, having 12 buckets, which are 5 inches deep and 7¼ inches long or across the wheel. Upon this wheel I had a stream of water 7 inches long by 2½ thick, under a 10½ inch head. I thus obtained quite some power, but I do not know how much, nor do I know how to find out. How much power did I obtain? A. Not over one-tenth or one-ninth of a horse power. 2. Can I obtain 1½ horse power by using 100 gallons of water per minute under a 15 or 18 inch head? A. With 18 inch head not more than seven-tenths to eight-tenths of a horse power. 3. Can I obtain 1½ horse power by using 200 gallons of water per minute under 15, 18, 20, or 24 inch head? A. Yes, under 20 inch or 24 inch head. 4. What size orifice should the water run through? A. An opening of 40 to 48 inch area, which can be reduced by a gate to suit demand.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

October 31, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Door stop, G. R. Elliott *et al.*, Boston, Mass.
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