# SCIENTIFIC AMERICAN

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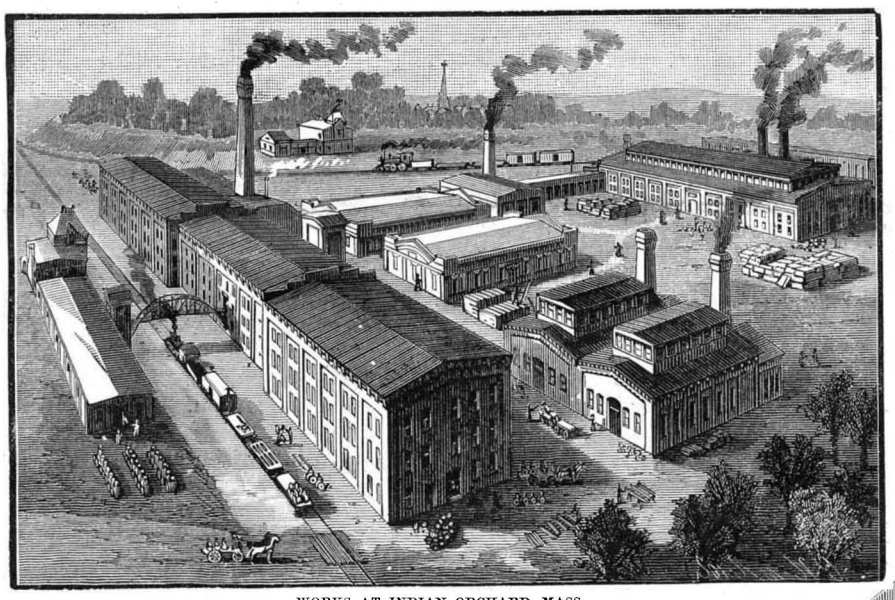
## VALVES AND HYDRANTS.

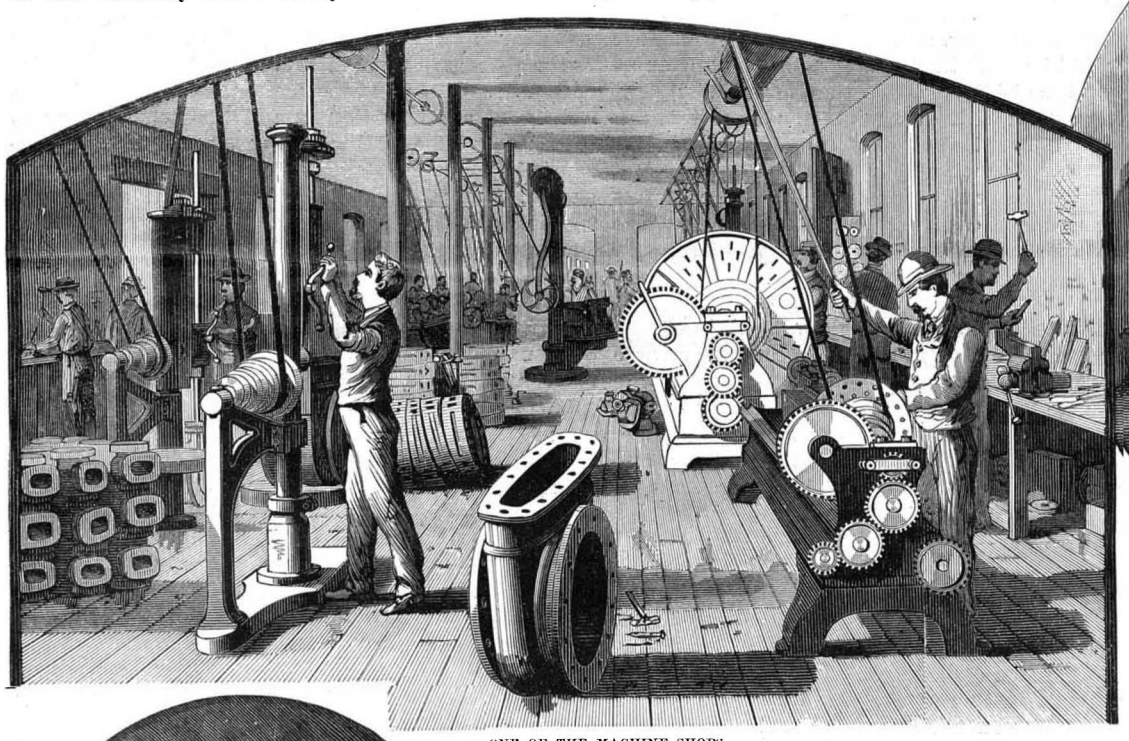
WORKS OF THE CHAPMAN VALVE MANUFACTURING CO., OF BOSTON AND INDIAN ORCHARD (SPRINGFIELD), MASS.

The multiplied uses to which straightway valves and gates are now applied in all the various services of steam, water, gas, etc., have of late years occupied no little attention from all parties concerned in their use, in order to overcome the difficulties incident to their services, such as water hammer, corrosion of parts, difficulty of operating, especially under heavy pressure, etc., and to determine if possible the best principles upon which they should be built to best serve the interests of the purchaser and user in points of real economy and security. The same or more might be said in regard to fire hydrants. Perhaps no appliance known so much needs the very best applied principles in construction as well as good and reliable workmanship as the fire hydrant, to enable it to perform its service perfectly under all of the varying contingencies to which it is subject.

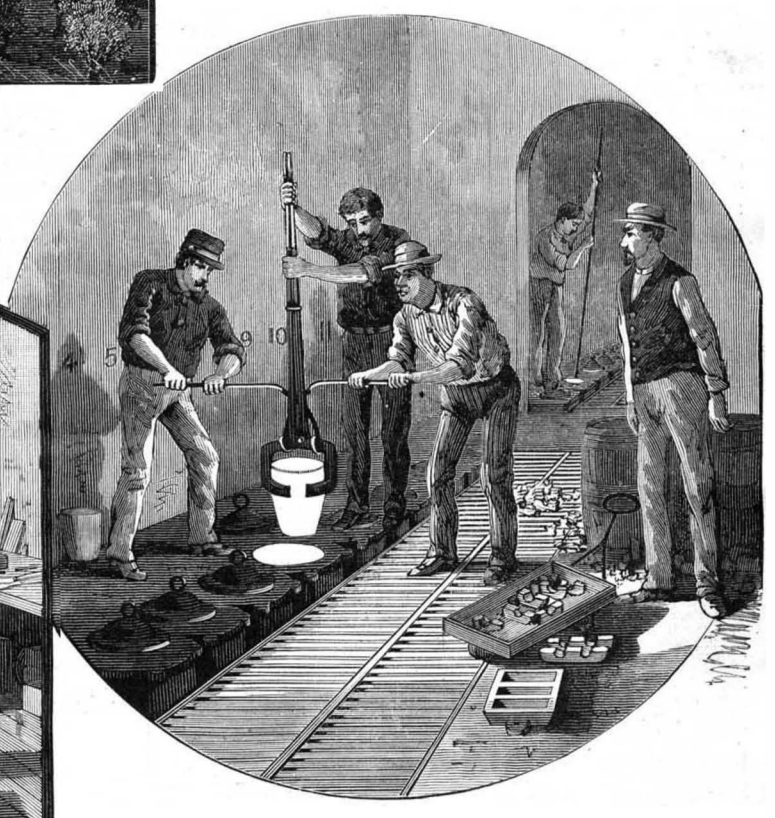


WORKS AT INDIAN ORCHARD, MASS.

The aim of the Chapman Valve Mfg. Co. has been and is to produce the best from designs both practical and symmetrical. The best of material, first-class workmanship, interchangeability of parts, all work thoroughly tested and promptly delivered to their customers, are among the claims they make for their manufactures; and they point to the testimonials of hundreds of the most reliable engineers and mechanics of the country, and to the unprecedented growth of their business without any solicitation on their part, to any extent, as proofs of their claims. Backed with these principles, plenty of capital, a first-class plant, splendid machinery, able and efficient management in all branches, we know of no reason why they are not justified in their claim of being the largest and best equipped manufactory in the country for the production of their goods.



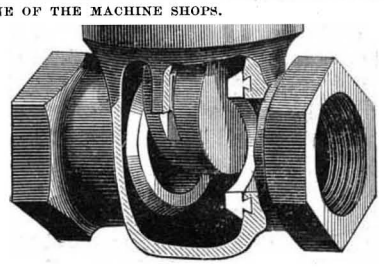
ONE OF THE MACHINE SHOPS.



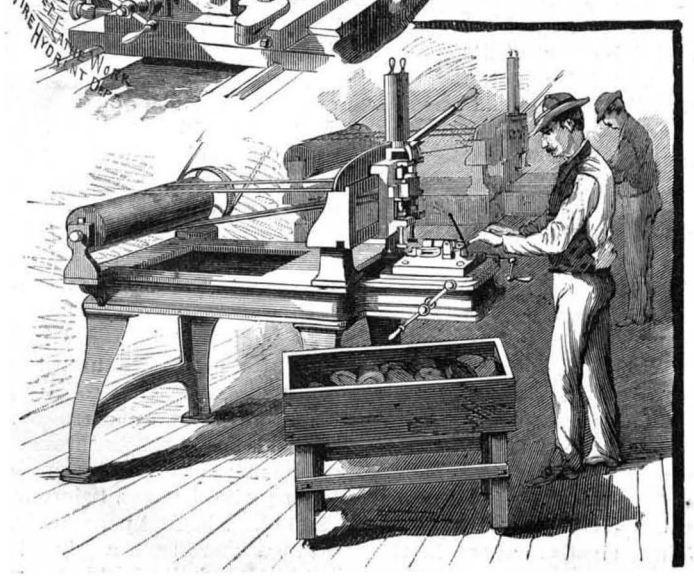
VIEW IN THE BRASS FOUNDRY.

The accompanying engravings represent their works at Indian Orchard (Springfield), Mass., and are so selected as to show the various stages through which a valve passes, from the foundry to the finishing and testing departments. The works occupy sixteen acres, and are situated on branch lines running from the Boston and Albany and Athol Railroads, spur trucks running around the entire plant, facilitating the receiving of material and the shipping of finished goods. The buildings are all of brick, and are constructed in a substantial manner. The interior arrangements are well calculated for the several kinds of work; everything inside and outside is kept thoroughly in order, and the utility of "A place for everything,

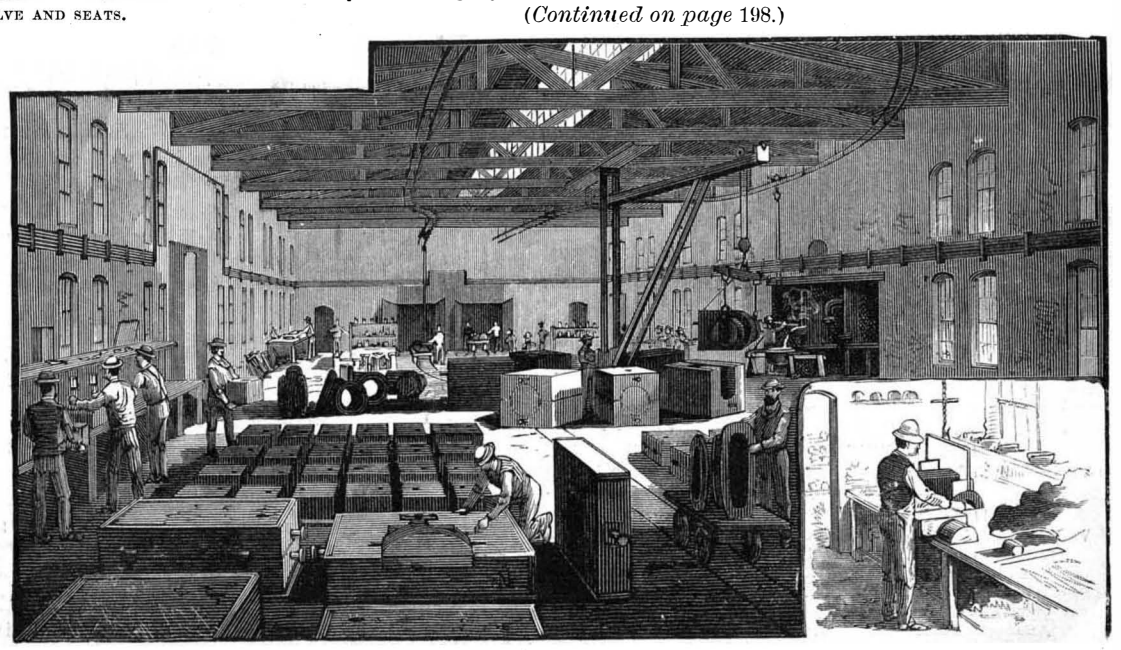
(*Continued on page* 198.)



SECTION SHOWING VALVE AND SEATS.



PROFILING MACHINE DEPARTMENT.



IN THE IRON FOUNDRY.

CORE MAKING.

**VALVES AND HYDRANTS.—WORKS OF THE CHAPMAN VALVE MANUFACTURING COMPANY.**

# Scientific American.

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NEW YORK, SATURDAY, SEPTEMBER 26, 1885.


**Contents.**

(Illustrated articles are marked with an asterisk.)



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**THE SCIENTIFIC AMERICAN SUPPLEMENT**

**No. 508,**

**For the Week Ending September 26, 1885.**

Price 10 cents. For sale by all newsdealers.



## THE BERDAN TWIN TORPEDO.

The Berdan system of torpedoes, illustrated and described elsewhere in this number, is both novel and interesting. As will be seen, it consists of sending twin torpedoes against an enemy, and is especially devised for service where torpedo netting is used as a protection. Its inventor claims that it possesses the accuracy of the best models now in use, while, unlike them, it cannot be thwarted in its purpose of destruction.

If Gen. Berdan can make good this claim, the science of attack in naval warfare will have been materially advanced, and, where his system is in use, the biggest warship be compelled to keep to the high seas.

It is difficult, however, to see how he can sustain his assertion that his system embodies the virtues without the fatal defects of the systems now in use.

The successful operation of the two torpedoes—supposing them to be safe from shot fired from the vessel, by being submerged—depends upon the continuous and perfect working of several mutually dependent parts, the failure of any one of which would render the attack abortive. The system resembles a train of wheels—one imperfect tooth stops the whole.

Again, the torpedo netting can be made to protect the bilges as well as the sides of a vessel. It is arranged at present to stop the ordinary torpedo, but it could readily be made to swing off from both sides of the anchor chains, encircle the ship, and be lashed to a floating bit swinging to a bridle in tow astern. In fact, the general use of such a torpedo would compel a remodeling of the torpedo netting. That seems to be all.

The nature of the twin torpedo, that is to say, a pilot torpedo towing another at the end of a line, would positively forbid an attack being made by means of it from any direction save with or against the current. For it will be readily seen that however straight a course the pilot may steer, the second torpedo must make leeway when towed athwart the tideway. This would, of course, serve to make its aim uncertain when close aboard the enemy, and there is reason to believe that it would be more likely under such circumstances to fetch up broadside on rather than nose on. But, if it can only attack with or against the current, it can only hope to strike the bow or stern of the enemy, for vessels invariably swing to the tide or current, and consequently it can only attack the two smallest surfaces, those most easily defended, and where the chances of miscarriage in its aim would be the greatest.

To attack at slack water would be too nice a calculation to offer any promise of success. The weight and dimensions of this torpedo would also seem to be against it when working in a heavy seaway, for there would be times when the pilot would be caught in the roll, and made to stand on end and constantly lose its course, while, were it made larger, it would offer a greater surface to attract the aim of the gunners, and consequently have less chance of bringing its convoy up to the enemy.

## AMERICA TO KEEP THE CUP.

The great International Yacht Race between the Puritan and Genesta has finally been accomplished, and the victory of the sloop at both trials leaves the cup still in America's possession. The greatest interest has been manifested on both sides of the water over the result of this contest, and when it became known that on two occasions the Puritan had proved herself the faster boat, the general enthusiasm seemed to reach all classes of people, and on this side of the water at least to cause great rejoicing.

As most of our readers know, the race was to be awarded to the yacht making the best record twice out of three times; and as both trials gave the victory to the Puritan, the third or 40 mile triangular race was not deemed necessary.

After four ineffectual attempts to sail a race, the first came off on Monday, the 14th, over the inside course of the New York Yacht Club, from Owl's Head in the Narrows between Staten and Long Islands to the Sandy Hook Light Ship, and return to the buoy off Fort Tompkins, on Staten Island, a total distance of 38 miles. The wind was light until Sandy Hook had been passed, and the conditions generally were regarded as slightly favoring the Puritan, as the Genesta is thought to sail under greater advantage when the sea and wind are somewhat heavy. The Puritan kept ahead from the start, making the course in 6 hours 6 minutes and 5 seconds, thus beating her rival 16 minutes and 19 seconds corrected time.

As the Genesta cracked her masthead cap in the first race, the second trial did not take place until Wednesday, the 16th. This was over the outside course from Scotland Lightship to the turning buoy, 20 miles to the southeast. There was a lumpy sea and strong lower sail breeze that made the friends of the Puritan who had never seen her in heavy weather somewhat doubtful about the result.

Though the sloop was not as well sailed as the English cutter, she made the course of forty miles, beating half the time against a heavy sea, in 5 hours 3 minutes and 14 seconds. When the turning buoy was reached, the Puritan was decidedly behind, but she made up the intervening distance on the home stretch, coming in 1 minute and 38 seconds ahead of the Genesta, and making the closest race, over so long a course, that has ever been sailed. The opinion prevails in Boston that though we don't build many boats, we build them pretty well. The Genesta has won in the race for the Commodore Cup, but the future of the Puritan is undecided, as she is to be sold shortly at auction.

Though the race is ours, its principal object—to determine which boat is the better model—does not seem to have been gained, for one cannot call a forty mile race conclusive where the rival yachts cross the line within two minutes of each other, even making all due allowance for the reported bad handling of the winner. Another trial over the triangular course would have left impartial judges better satisfied.

## EXAMINATIONS OF BEER.

The New York State Board of Health recently sent to the brewers in this vicinity for samples of their beer for purposes of analysis. These analyses are complete, and the Board finds that the beer sold hereabout is of excellent quality. What the Board really means must be that the beer brewed hereabout to stand analysis by State boards of health is of excellent quality. The brewers, we are told, are well satisfied with the fair manner in which the Board has conducted the examination.

This is not at all astonishing. It would be very surprising, indeed, if they were not satisfied, for they could scarcely attain better results had they made the examinations themselves.

The only people that will be dissatisfied with the way the Board has conducted their examinations will be the general public, or at least that portion of it which drinks beer and ale. These will be apt to regard the Board's efforts to discover bad beer as being more novel than effective.

Yet much was to have been expected from the act of last winter. This act was, in reality, an amendment to the already existing law relating to the adulteration of food and drugs. It was made to include spirituous, fermented, and malt liquors, and was deemed necessary by reason of the discovery of a very general adulteration of the articles specified. So far as beer is concerned, it was found that the existing rivalry among the brewers was leading to a cheapening, not only of processes of manufacture, which is not necessarily unlawful, but also to the use of inferior and even unhealthful ingredients. Lager beer, as its name implies, is beer that has been kept in store or lager, and is really quite unfit to drink immediately after being brewed. Nevertheless, it is very generally sold to the public in this condition; the brewers saving themselves the expense of from three to six months' storage by means of a process which they have discovered of artificially aging or maturing their beer.

When hops were dear, they substituted glucose, and though glucose is an entirely healthful ingredient, it may scarcely be regarded as a proper or natural constituent of lager beer; and now that hops, which fetched $1.25 per pound but a year ago, are a drug in the market at 15 cents, there would seem to be no excuse for using a substitute. Private analyses which have been made of lager beer sold hereabout show a very general use of grape sugar and glucose where the ash, and especially the phosphoric acid, is low as compared to the extract; and the excess of carbonates which they contain are said by the authorities to indicate the use of bicarbonates. The extract of catechu, used in some cases as a substitute for hops, though not necessarily injurious, may, under certain conditions, really prove so.

It may be set down as a rule that to secure a really good beer there should enter into the composition good water, good malt for body, good, sound hops for flavor, good yeast for fermentation, and plenty of time should be given it to age and mature.

In order to learn what was being done in this matter by the New York City Board of Health, the writer called at its office at Police Headquarters. Dr. Cyrus Edson, a careful and experienced man, said that so far he had devoted himself to the mode of drawing beer in the saloons and beer halls, for in this there was even more danger to the public health than was likely to be found in the adulteration of the beer. Lead pipes, he said, were generally used in drawing the beer from the cellar to the tap, a pernicious practice that often led to making really good beer injurious to health. He showed the writer a long copper spigot or tap similar to those in general use, and which he had taken out of a beer saloon. He had had it cut through lengthwise, in order to exhibit the corrosion that had taken place from the constant presence of beer. Its interior was a mass of corrosion, green and spongy. Beer, he said, which passes through such a spigot must always be more or less injuriously affected, that which remains the longest being, of course, the most contaminated. The first person who calls for beer in the morning, where such a spigot is used, would get beer which has stood all night in these poisonous surroundings. In other words, he would

get beer that is absolutely poisonous. Asked why the brewers continued to use glucose when hops are so cheap, Dr. Edson replied that it was because they had become used to it, and to use hops would compel them to change their processes, which might entail considerable trouble and expense. The fact seems to be that the demand for beer has grown at such a pace—it was 6,000,000 gallons last year—that at from $8 to $9 a barrel the brewers can readily dispose of all they make and no questions asked as to how long it has lain in store or lager. A few weeks' keeping and an application of the process of artificial maturing, and it is distributed and ready for the consumer; while in the Old World both the law and the taste of the beer drinker would compel the brewer to keep his beer in cellar for from four to eight months.

### Jumbo's Tragic Death.

After a career quite unparalleled in elephantine animals, Jumbo, the greatest of his family, has departed. The immense animal, the largest in captivity, had just been exhibited at St. Thomas, Ontario, on the 15th, and was being led along the railway track with Tom Thumb, the baby elephant, to be loaded into their respective cars, when a heavy freight train, running at the rate of forty miles an hour, bore down upon them. As soon as Jumbo saw the train, he made a rush for Tom Thumb, and grasping him in his trunk, threw him away across the tracks as easily as if he had been a kitten. Jumbo then tried to save himself, but it was too late, and he was crushed to death between the engine and the cars on the siding. The poor beast's devotion was unfortunately wasted, for Tom Thumb's leg was broken, and he had to be shot the following day. The engine and several cars of the colliding train were thrown from the track.

Jumbo was about twenty-five years old. His earliest appearance in polite society was as a baby elephant. at the Jardin des Plantes in Paris, but, when three years old, he was given in exchange to the London Zoological Garden, where, for almost nineteen years, he was the children's most favored pet. In 1882, Mr. P. T. Barnum purchased him for $10,000, but various lawsuits increased the cost to $30,000 before the animal could be brought from England. The news of the sale caused great consternation among the little people of the metropolis, and even some of the older Britons, Ruskin included, entered a protest againt the transfer. Jumbo's huge body weighed 7½ tons, and he stood 11½ feet high. His skeleton will be preserved at the Smithsonian Institution and his hide at Tufts College. Jumbo's name was known all over the country, and during his three years in America he made many friends, who will mourn with his disconsolate keeper over his untimely fate.

### Opening of the Novelties Exhibition, Philadelphia.

The Novelties Exhibition, under the management of the Franklin Institute, was formally opened on Tuesday the 15th, at the building situated at the corner of 32d Street and Lancaster Avenue, in West Philadelphia, where the Electrical Exhibition was held last year. The managers tried very hard to have all the exhibits in place at the time of opening, but this attempt of what in itself would have been a great novelty was not successful.

The exhibition will not be of so much importance scientifically as the electrical display of last year, but it promises to be of much greater popular interest. The Institute has carefully excluded everything that is not novel, and has limited that term to inventions made since 1876. The display covers a wide range in science and technology, since the admittance was limited by only the one consideration, that the exhibit should be unique. One of the most striking exhibits will be that of the De la Vergne Refrigerating Company, of New York, who will show a large iceberg in the center of the building, where the fountain stood last year. It is proposed to freeze the fountain just as it would appear if flowing at ordinary temperatures. To accomplish this, coils of pipe are introduced into the water, and a powerful freezing mixture made to circulate through them, in order to generate and maintain the necessary cold. This part of the exhibition was delayed several days on account of an accident to the "pickle tank," which inconveniently sprung a leak. When the ice mountain is complete, and illuminated by electric lights of various colors, the effect cannot fail to be very beautiful. The value of such spectacular attractions was demonstrated by last year's experience. The real wonders of the Electrical Exhibition were appreciated by very few of the many visitors whose attendance made the enterprise successful, yet the general effect of the whole affair, and the party-colored illumination of the fountain and shrubbery, served to attract a large crowd of people.

The display of the Women's Silk Culture Association will also be attractive. It will show a number of modern looms in operation, and will weave ribbons, embroideries, and other souvenirs.

The large and popular field of photography is also well represented, together with its kindred art of chemical engraving. There will be a good collection of isochromatic photographs, illustrating the correct reproduction of colored images.

From the partial lists which have already been published, there will be apparently few lines in modern technology in which the visitor will not find something of interest. There is some talk of making the display a permanent one, and of establishing, in connection with it, an industrial exchange for the sale of new devices.

It is too soon to comment upon the wisdom of such a proposition, but as a rule crystallized exhibitions have not proved successful.

### Apparent Resistance of a Body of Air to a Change of Form under Sudden Compression.

COMDR. THEO. F. JEWELL, U.S.N.

In some recent experiments on the explosion of gun-cotton at the U. S. Torpedo Station a phenomenon has been observed which, it seems to me, can only be explained by supposing that atmospheric air, when subjected to sudden and violent compression, acts like a rigid body.

The gun-cotton employed in these experiments has been first converted into pulp by the ordinary processes of making paper pulp, and then compressed into cylindrical cakes or disks, 3½ inches in diameter and 2 inches thick, in a hydraulic press, with a pressure of about 12,000 pounds to the square inch. In the press each disk has imprinted upon one of its faces the letters U.S.N. and figures 1885. These letters and figures are one centimeter in length. They are not in relief, like the markings on a coin, but are depressions in the disk, about one millimeter deep. Through the axis of each disk is a hole, into which is introduced the charge of fulminate of mercury which is used to detonate the gun-cotton.

When such a disk is placed upon a wrought iron plate, with the marked face in contact with the plate, and detonated, there is left upon the iron a depression somewhat greater in diameter than the disk and deeper toward the center than on the edge. Within this depression are found clearly and deeply stamped upon the iron, as though by a punch, the letters and figures of the disk, while the position of the hole in the disk is marked by a still deeper depression.

In view of the fact that since my arrival at the meeting I have found, in conversation, that the true technical distinction between an ordinary explosion and a detonating explosion, such as takes place with gun-cotton, seems not to be clearly recognized, I want to point out that detonation differs from an ordinary explosion in that it is a chemical change that takes place, if not simultaneously, certainly with immeasurable rapidity, throughout the whole mass. In the explosion of gunpowder the chemical action goes on with comparative slowness; but in the explosion of nitro-glycerin, gun-cotton, and their derivatives, the explosion is an upsetting of all the molecules of the mass at the same instant. It is of even a higher order of rapidity than the transmission of a blow through a set of ivory balls, with which we are all familiar.

The products of the explosion of gun-cotton are all gases, and these gases are heated to a very high temperature by the chemical action which takes place. The change from the solid to the gaseous state taking place simultaneously throughout the whole mass, the resulting pressure is enormous. I venture to suggest that when this enormous pressure is applied instantaneously to the air inclosed within the markings on the gun-cotton disk, the air acts like a hard body, and is driven into the iron. As is well known, in the use of the high explosive no "tamping" is necessary, the atmosphere acting as an envelope to the charge. I believe the fact that gases do resist a change of form under suddenly applied pressure has been demonstrated heretofore, and this phenomenon has been investigated by Stokes, Maxwell, and others, but it has never occurred to me that this resistance to a change of form could be as great as seems to be the case here. At any rate, the results which I offer will doubtless be interesting and suggestive. [From a paper recently read before the American Association, Ann Arbor, Mich.]

### Superstitions Concerning Eclipses.

From time immemorial, and to the present day, most peculiar ideas have been entertained in different parts of the world about eclipses and their cause. The Hindoos believe that a black demon seizes the moon with its claws, and as long as darkness prevails, the air is filled with lamentations, men, women, and children entering the rivers, where they remain up to their neck in water until the return of light.

The Siamese priests (talapoins) believe that when the moon is eclipsed a great dragon is devouring it, and in order to oblige him to let go his prey they make all sorts of abominable noises.

The Chinese, like the Laplanders, are convinced that an eclipse is the work of demons, and make a great hubbub to frighten them away.

The Romans believed the eclipses to be the work of magicians, and that a great noise could prevent them from hurting the moon. Plutarch says that Aglaonice, during an eclipse of the moon which she had predicted, persuaded the women of Thessalica that by her magic songs she had not only the power to darken the moon, but to oblige it to descend upon the earth.

The Greeks, and the inhabitants of Asia Minor, stood in such awe of eclipses that, according to Herodotus, in the year 610 B. C., while a battle between the Lydians and the Medes was raging, an eclipse of the sun occurred, as predicted by Phales of Millet. It not only put an end to the fight, but the contending parties hastened to make peace, cementing the treaty by the marriage of Aryenis to Astyages.

If we now turn to America, we find that the Peruvians, Mexicans, and others stood in great awe of the phenomenon. The Peruvians particularly dreaded the eclipse of the moon; they imagined that Luna was suffering from one of the mysterious diseases to which she was supposed to be subject, and feared that the queen of night might burst open and fall upon them. To avoid such a terrible calamity, and awaken her from her lethargy, they would sound loud instruments, shout at the top of their voices, and beat the dogs to make them howl.

The Mexicans imagined that eclipses occurred in consequence of a family squabble between the sun and the moon, and that the moon was wounded in the fray. The frightened men observed rigorous fasts, the women inflicted corporal punishment on themselves, and young girls drew blood from their arms.

In Yucatan, the most interesting State of Mexico, the descendants of the Mayas are convinced that when Luna loses her brilliancy, she has sickened in consequence of being bitten by some large and very spiteful ants called *Xulabs*, and that they will devour her if she is left without help. To frighten away her enemies they beat drums, blow shell trumpets, shout, beat their dogs, pinch the cats' tails, and fire rockets and guns toward the moon.

### The American Institute Fair.

The entries for the fifty-fourth annual exhibition of the American Institute, which opens on Wednesday, September 30, are already exceptionally numerous, and indicate that many novelties will be shown. This is particularly the case in the machinery department, where electric, steam, and compressed air motors of novel construction are promised. Something new in the way of sewing machines and various other labor-saving devices will be exhibited. One of the prominent attractions will be a combination organ, which can be played automatically, or by the use of the ordinary key board, either separately or together, thus enabling the organist to play a given tune while improvising variations at the same time.

The flower show will be a special innovation, and will continue only during the opening day and the remainder of the week. Among the horticultural novelties will be a collection of "calladimus" of unusual size and foliage. Special medals of excellence are to be given in addition to the other prizes for the best seedling carnation and the best seedling dahlia.

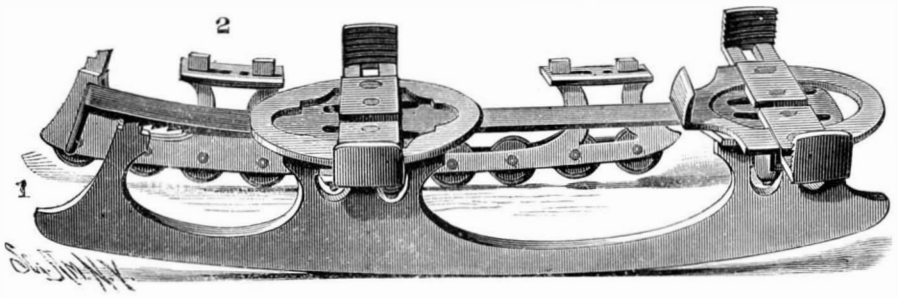
### Zinc in Plants.

The presence of zinc in plants has been repeatedly observed, and not only in such as grow near deposits of zinc ores, but also, though in minute quantities, in plants where no zinc could be traced in the soil. From a number of experiments the author found that the injurious action of zinc sulphate in solution was more considerable than it had been assumed. In solutions of 1 mg. zinc per liter all plants vegetated undisturbed, while with 5 mg. per liter all perished. Old plants of any kind died more rapidly than young plants. Insoluble compounds of zinc in the soil—such as zinc oxide, sulphide, and carbonate—have no perceptible action. The poisonous action of zinc on plants seems to depend on the destruction of the chlorophyl.—*Anton Baumann.*

BOXWOOD, which is almost exclusively used for wood engraving, is becoming more and more scarce. The largest wood comes from the countries bordering on the Black Sea. The quantity exported from Poti direct to England is immense; besides this, from 5,000 to 7,000 tons of the finest quality, brought from Southern Russia, annually pass through Constantinople. An inferior and smaller kind of wood, supplied from the neighborhood of Samsoun, is also shipped at Constantinople to the extent of about 1,500 tons annually. With regard to the boxwood forests of Turkey, the British Consul at Constantinople reports that they are nearly exhausted, and that very little really good wood can be obtained from them. In Russia, however, where some little government care has been bestowed upon forestry, a considerable quantity of choice wood still exists; but even there it can only be obtained at an ever-increasing cost, as the forests near the sea have been denuded of their best trees. The trade is now entirely in English hands, although formerly Greek merchants exclusively exported the wood. In the province of Trebizonde the wood is generally of an inferior quality; nevertheless, from 25,000 to 30,000 cwt. are annually shipped, chiefly to the United Kingdom. —*The Garden.*

### AN IMPROVED SKATE.

The runner is of the usual construction, and is held by screws and nuts on the circular front plate and the heel plate, both plates being formed with transverse grooves for receiving clamping jaws having upwardly bent ends provided on their inner sides with teeth. The clamps are slotted longitudinally, and have their inner ends held between plates in the grooves; these plates are held by screws passing through the slots in the clamping plates, and by means of which the clamping plates can be adjusted to project more or less so as to fit any size foot. A flat strip, extending the entire length of the skate, passes under the raised parts of the plates and over the grooves, and is formed at each plate with two inclined slots, through which pass screws on the inner ends of the small sliding plates. On the front end of the runner is an upwardly projecting stud adapted to engage with teeth formed on the forward end of the strip.




LAMONT'S IMPROVED SKATE.

The clamping plates, being adjusted to the width of the sole and heel, the front end of the strip is raised and pulled forward, thereby moving the clamping plates outward and permitting the foot to be placed upon the skate. The strip is then pushed toward the rear, when the clamping plates are moved toward each other, causing the serrated ends to clasp firmly the edges of the sole and heel. The teeth on the strip engage with the stud, and automatically lock the strip and clamps in place. To remove the skate, the front end of the strip is raised and pulled forward. In place of the single runner, the double runner shown in the background can be used. This consists of two parallel runners united by cross pieces and having rollers arranged between them. The rims of the rollers are made convex, to admit of running with the skate at a slight inclination.

This invention has been patented by Mr. Charles G. Lamont, of Astoria, Oregon.

### RAILROAD GATE.

The railroad gate herewith shown is constructed in such a manner as to be closed by an approaching train and opened by a departing train. The gate bar is pivoted at a little distance from its lower end to a post, and is made tapering toward its upper end. The long upper part is a trifle heavier than the lower part, so that when released the upper part will slowly descend until a spring attached to the lower end strikes a stop plate, secured to a short post, which gradually checks the movement of the bar, and holds it in a horizontal position. When open, the gate bar is held in an erect position by a catch bar, attached to its lower part, which engages with a hook secured at its lower end to a shaft journaled in supports anchored in the ground at opposite sides of the track. The hook is held forward in position to engage with the catch bar by a bar carrying a weight, the upper end of the bar being rigidly attached to the middle part of the hook. To the middle part of the hook is fastened the end of a wire extending along the outer side of the track to a downwardly projecting arm (Fig. 2), formed upon a short shaft journaled in bearings anchored in the ground. The inner part of this shaft passes under the rail, and has an arm so shaped as to be struck by the flanges of the wheels of the train, thereby turning the short shaft and swinging its arm in the opposite direction. In the case of a train approaching the gate, the arm will be swung from the gate, and will draw the wire in the same direction, causing it to withdraw the hook from the catch and allow the gate to swing down. In case of a train moving from the gate, the movement of the shaft will produce no effect upon the wire. A weight upon the shaft brings it to its normal position after having been struck by the flanges. To supports anchored in the ground at a suitable distance at the other side (shown at the right in the engraving) of the gate is a short shaft similar to the one just described. The wire from this shaft extends to an upwardly projecting arm formed upon a shaft rocking in bearings in the lower part of the main posts, and to which is rigidly attached the lower end of a curved arm having a friction roller pivoted in its upper slotted end. The roller is directly beneath the lower part of an inclined spring fastened to the gate bar.

When the wheels of a train moving from the gate strike the arm of the short shaft, the curved arm will be swung upward, and will press with sufficient force against the spring to raise the gate bar into an upright position, when the catch will lock the gate in place until released and closed by the approach of another train. It will be seen that this gate is designed exclusively for use upon double track roads.

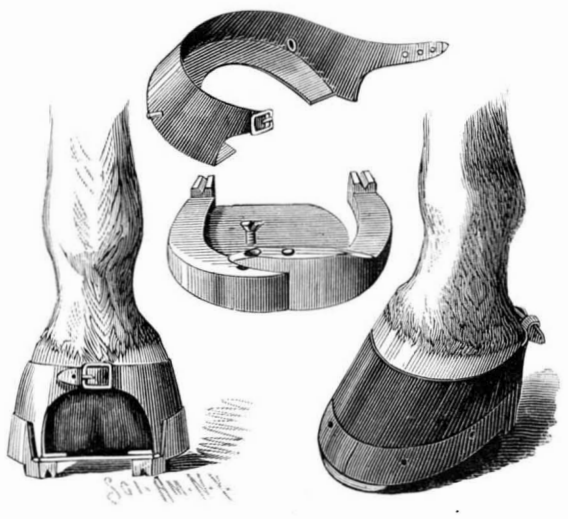
This invention has been patented by Mr. John J. Murray, Jr., of 68 South 2d Street, Brooklyn (E. D.), N. Y.




MURRAY'S RAILROAD GATE.

### IMPROVED HORSESHOE.

The horseshoe herewith illustrated is designed to facilitate the securing of the shoe to the horse's feet, and to prevent the hoofs from being injured by attaching the shoes or by traveling on rough surfaces. The construction of the shoe and the method of attaching it to the hoof are clearly shown in the engraving. The shoe is constructed in two parts, hinged to each other at their forward ends, and having an inwardly inclined rim upon their outer edges. Formed upon one part is a plate which overlaps the other when the two parts are brought toward each other. The shoe is provided with a pad having a buckle and strap at its rear end and projections upon its sides, which engage with apertures in the sides of the rim of the shoe. The pad serves to lessen, in a great degree, the effect of the concussion of the hoof upon the pavement, and also serves to hold the shoe securely to the hoof. The calks are so constructed as to prevent transverse slipping. The shoe can be easily removed, after work, to enable the horse to rest naturally.



SCHWAAB'S IMPROVED HORSE SHOE

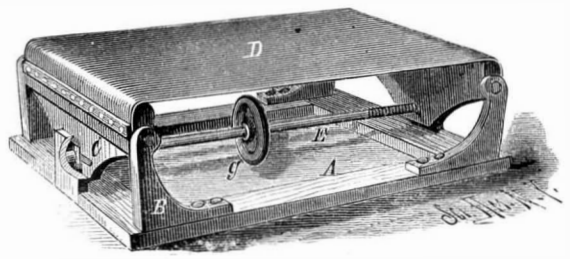
This horseshoe is the invention of Mr. Law. Schwaab, of 70 Varick Street, New York city.

### Treatment of Boils.

Halle recommends the following application in furuncle: Tannic acid, 1 part; powdered gum acacia, 1 part; tincture of arnica flowers, 2 parts. This is to be painted over the boil and for a little distance around it, several coats being applied until it forms a thick and firm covering. Halle states that this mode of treatment quickly relieves the pain and diminishes the swelling. When taken in time, the boil disappears without the formation of pus; and when this has already occurred, the application causes the extrusion of the core and prompt healing of the furuncle.

### VEHICLE SEAT.

The object of an invention patented by Francis W. Coleman, M.D., of Rodney, Miss., is to provide a soft, elastic, and cool seat for vehicles, and which may also be used for lounges, chairs, cots, etc. At the four corners of the frame, A, are secured the bracket-shaped standards, B, in the upper ends of which are bearings for the journals of the end frames, C. These frames are formed with straight upper edges, to which the flexible seat, D, is attached. Through the lower portions of the frames pass the opposite ends of a right-and-left screw rod, E, which is turned by means of the hand wheel, *g*. The ends of the rod enter nuts of peculiar shape, set in recesses in the frames. Short uprights at the ends of the frame, A, in line with the screw rod, prevent longitudinal displacement of the rod, and cause it, when turned, to given an equal inward or outward motion to the fulcrumed frames. The ends of the seat are clamped between the straight upper edges of the end frames and a metal strip by bolts or nuts, so that if the seat bags more than can be taken up by the screw rod, the strips can be loosened and the fullness taken up. This construction permits the seat to be readily removed when worn, and replaced by a new one.




COLEMAN'S VEHICLE SEAT.

### Human Electrotypes.

M. Kergovatz, a chemist of Brest, has proposed a new method of disposing of the human body after death, which he considers preferable in every way to either burial or cremation. His system is an antiseptic one, much simpler and less expensive than the old process of embalming, and is nothing more than a new galvanoplastic application. The body is coated with a conducting substance, such as plumbago, or is bathed with a solution of nitrate of silver, the after decomposition of which, under the influence of sunlight, leaves a finely divided deposit of metallic silver. It is then placed in a bath of copper sulphate, and connected for electrolysis with several cells of a gravity or other battery of constant current. The result is that the body is incased in a skin of copper, which prevents further change or chemical action. If desired, this may be again plated with gold or silver, according to the taste or wealth of the friends of the dead. M. Kergovatz has employed the process eleven times on human subjects, and on many animals, and states that in all cases it was perfectly satisfactory. In spite, however, of his warm recommendation, the idea is repulsive. It seems a mockery to give permanence to the temple, when all that once made it valuable is gone.

### Water Gas Steel.

Bull's patent process of steel manufacture by means of water gas—converting ore into steel without first making pig—is thus described: The gas producers are similar to the Strong and Lowe, or the *quasi* recuperative type. The coal is forced by a hot blast of air into partial combustion, the resultant heat of which is collected into separate recuperators. An interval follows, during which the air is turned off, steam is forced in a reverse direction through the recuperators, and, becoming highly superheated, is decomposed or transformed into a powerful reducing gas. This is led through conduits to the tuyeres of the blast furnace. It is expected from the careful arrangement of the crucible of the blast furnace, which is of the cupola form, that a bath of pure iron can be maintained in a fluid condition. When the metal is tapped it will be carried by ladle, and run into a Siemens open hearth steel furnace.

THE *Mexican Financier* thinks the best monument the United States can rear to the memory of General Grant is to put in operation the reciprocity treaty which he negotiated with Mexico. This monument, the editor thinks, would have the advantage of being a paying investment, a fact which ought to have weight with a very practical nation.

## UPRIGHT CUSHIONED HELVE HAMMER.

Many years of experience in the manufacture and a thorough knowledge of the wants of the trade have enabled the designers of the upright cushioned helve hammer shown in the accompanying engravings to produce a tool for which they can claim superiority in the following points: power and accuracy of blow, simplicity and ease of adjustment, range of work, economy of power, and durability.

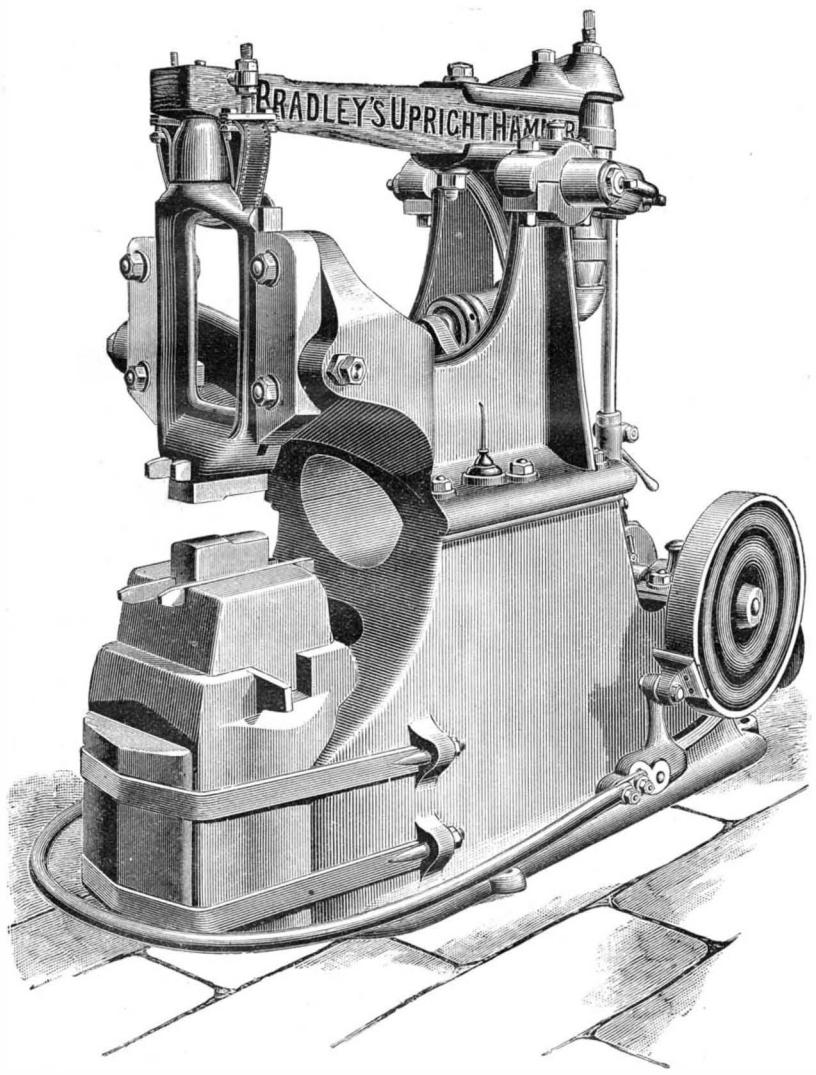



Fig. 1.—THE BRADLEY UPRIGHT CUSHIONED HELVE HAMMER.—FRONT VIEW.

The hammer is operated by an eccentric at the rear connected by a pitman to the saddle or oscillator carrying the helve, to the forward end of which the hammer head is attached. These parts are plainly shown in Fig. 2. By the use of rubber cushions the force of the blow is multiplied many times, and a degree of elasticity is imparted that effectually removes all danger of breakage, while so thoroughly cushioning the jar that none is perceptible in the working parts of the hammer when the blow is struck. In this way the blow is made to imitate almost exactly the action of a hand hammer. The head gets away from the work instantly after striking, and the piece is not chilled. The difficult blacksmith trick of heating a cold iron rod by repeated blows rapidly delivered is easily performed with this hammer.

Each working part is in full view of the operator, and the whole is so simple in construction and manner of adjustment that the experienced hammersman has no trouble in operating it to its full capacity at once. A matter of great value, when material greatly differing in size has to be successively worked, is that the length of stroke can be instantly adjusted by means of a friction sleeve on the pitman at the rear of the hammer. By a very simple arrangement the keys holding both the upper and lower dies are removed as well as driven in from the front, thus saving time and insuring accurate adjustment of the dies when necessary.

By the use of the friction sleeve on the pitman, the opening between the dies when at rest can be varied from the actual contact to six or seven inches in the smallest size of hammer and twelve to fifteen inches in the larger sizes; these variations can be brought about instantly, thus making the hammer especially valuable in jobbing shops. In making these various changes no other working parts of the hammer have to be adjusted, as the one operation of changing the length of stroke adjusts every other working part at the same time. The hammer is made of the best material, and the parts are so proportioned as to secure the greatest strength and durability. These hammers, manufactured by Messrs. Bradley & Company, of Syracuse, N. Y., U. S. A., who will furnish further particulars, have been in daily use in many factories for some time, and have given the greatest satisfaction.

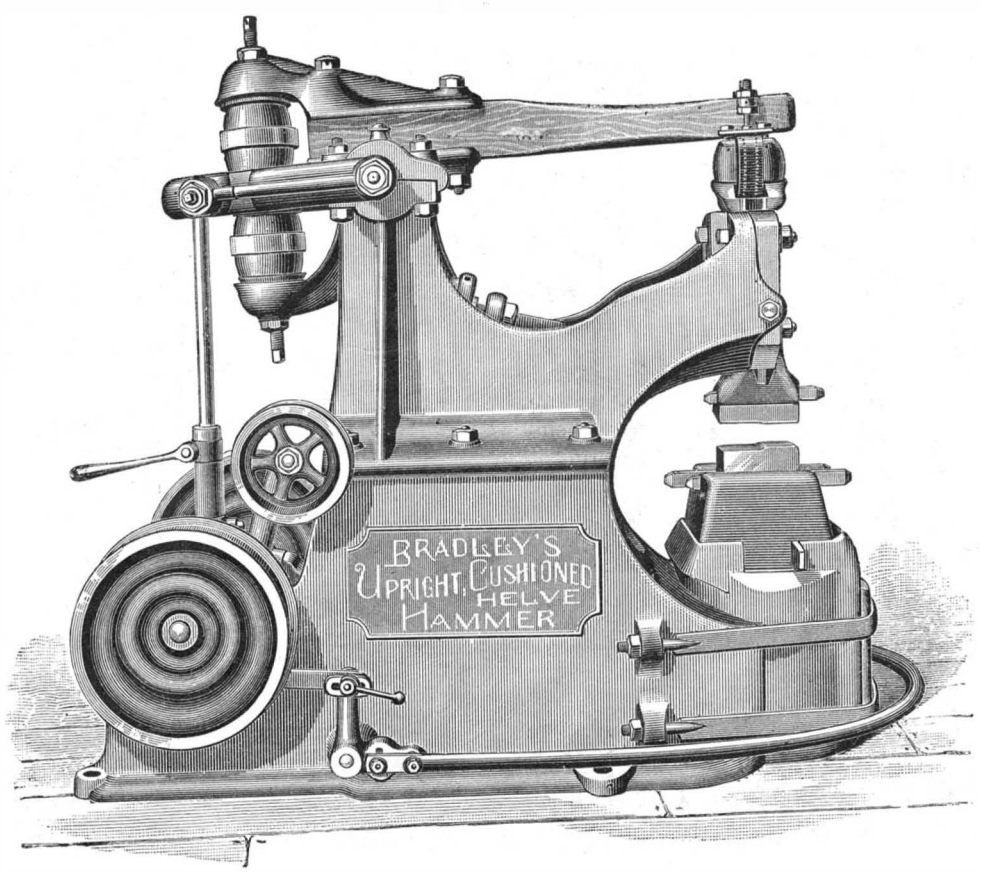



Fig. 2.—THE BRADLEY UPRIGHT CUSHIONED HELVE HAMMER.—SIDE VIEW.

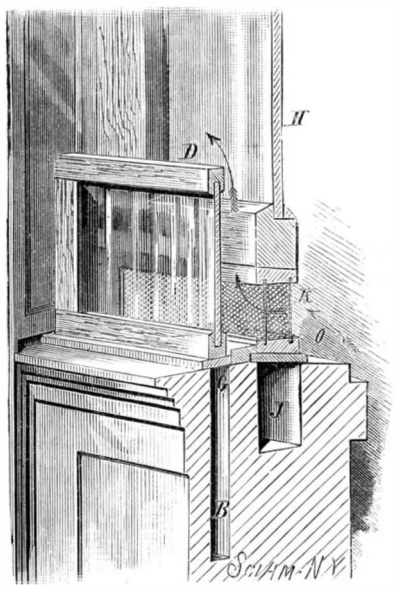
### Wind Pressure of Storms.

During the hearing by the Parliamentary Committee of the case for the promoters of the Tower Bridge over the Thames, Mr. B. Baker, who was called to prove the stability of the proposed structure, gave evidence upon the phenomena of wind pressure as observed by him in connection with the construction of the Forth Bridge. Mr. Baker stated that, from recorded observations in the Firth of Forth, extending over many years, he has come to the conclusion that no pressure at all approaching 65 lb. per square foot can prevail over a surface of any magnitude. He declared that no such pressure has for many years occurred in the Thames Valley; instancing, in proof of this assertion, the number of large gas holders scattered up and down the river side. If a hurricane of 56 lb. to the square foot had encountered any of these structures, Mr. Baker believes they would have been doubled up and blown across London, as they have no power of resistance to external pressure beyond the pressure of the gas from within, which he values at not more than 18 lb. per square foot.

If, therefore, not the slightest damage of this kind has ever been done by wind to any of the London gas holders (which is a fact), it is a demonstration that they have never been exposed to a heaver gale than one of 18 lb. per square foot, or thereabouts. It is Mr. Baker's experience at the Forth Bridge works that a gale registering by his improved instruments not more than 16½ lb. per square foot completely stops all ordinary traffic on the estuary, preventing the running even of powerful ferry boats. Mr. Baker believes that this pressure is rarely exceeded. He declines to place credit in ordinary anemometer readings, which sometimes show extreme velocities; and he points out that trains do not cease running in gales when anemometers will register 46 lb. pressure to the foot, though a pressure of 40 lb. of wind per square foot on its exposed side would certainly upset an ordinary train. Any street tramcar would likewise be turned over by a wind pressure of only 20 lb. per square foot. This is a class of accident that rarely happens, but it is not unexampled.

## WINDOW SCREEN AND VENTILATOR.

The deflector, D, consists of a wooden frame holding one or more panes of glass, and is adapted to slide into the pocket, B, which extends downward from the upper surface of the inner window sill, and reaches from one jamb to the other. The bar, G, has its ends passed into horizontal grooves in the jambs, and is arranged to slide toward and from the bottom stop bead, and to cover the top of the pocket. Below the lower sash, H, is the pocket, J, formed to receive the sliding screen frame, K, which is provided with both an inner and outer wire netting. The sliding bar, O, serves to cover the pocket, J. The fresh, cool air, entering through the screen, is guided upward by the deflector (as indicated by the arrows) to cause it to displace the warm air in the upper part of the room, and to prevent it causing annoyance to the occupants of the room. When the device is not in use, it is entirely out of the way in the pockets. To prevent rain from working through the joint between the inner edge of the strip, O, and the bead, the front of the latter is formed with a recess, into which the edge of the strip passes, thus making a tight joint. The device can be applied to any window, and its use will facilitate the ventilating of apartments without creating unpleasant draughts.




BRONSON'S WINDOW SCREEN AND VENTILATOR.

This invention has been patented by Mr. J. G. Bronson, of Chicago, Ill.

### To Get Rid of Cockroaches.

A correspondent writes as follows: "I beg to forward you an easy, clean, and certain method of eradicating those loathsome insects from dwelling houses. A few years ago my house was infested with cockroaches (or 'clocks,' as they are called here), and I was recommended to try cucumber peeling as a remedy. I accordingly, immediately before bedtime, strewed the floor of those parts of the house most infested with the vermin with the green peel, cut not very thin, from the cucumber, and sat up half an hour later than usual to watch the effect.

Before the expiration of that time the floor where the peel lay was completely covered with cockroaches, so much so that the vegetable could not be seen, so voraciously were they engaged in sucking the poisonous moisture from it. I adopted the same plan the following night, but my visitors were not nearly so numerous—I should think not more than a fourth of the previous night.

On the third night I did not discover one; but anxious to ascertain whether the house was quite clear of them, I examined the peel after I had laid it down about half an hour, and perceived that it was covered with myriads of minute cockroaches, about the size of a flea. I therefore allowed the peel to remain till morning, and from that moment I have not seen a cockroach in the house. It is a very old building, and I can assure you that the above remedy only requires to be persevered in for three or four nights to completely eradicate the pest. Of course it should be fresh cucumber peel every night."—*Confectioner's Journal.*

### Glycerine in Acute Nasal Catarrh.

Cotton saturated in glycerine and introduced into the nares relieves the congestion at once.

### A NEW TORPEDO.

In the accompanying engravings, representing the Berdan system of attacking with a torpedo a ship protected by netting, Fig. 1 shows the mechanism for steering the torpedo, and Fig. 2 shows the positions assumed by the following and principal torpedo in sinking, passing beneath the net and striking the bottom and unprotected part of the ship, after the leading torpedo has been arrested by the netting.

This system is of two-fold application: (*a*) either the first torpedo, which is explosive, strikes the net and blows it to pieces, and the second torpedo, also explosive, connected with the first by a line and following it

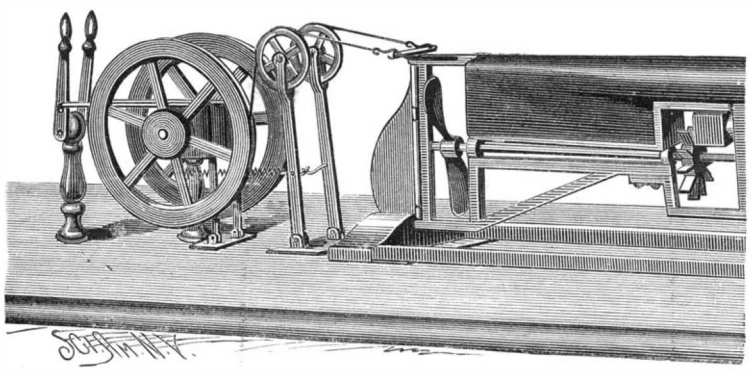


Fig. 1.—STEERING GEAR OF BERDAN TORPEDO.

at a distance of some thirty or forty feet, enters the rent which has thus been made in the net by the first, and so reaches the ship; or (*b*) the first torpedo, which is non-explosive, merely strikes the netting, stops, and serves as a fulcrum for the second—the real and explosive—torpedo to work upon.

In the first scheme each torpedo—the front and the rear one—resembles its fellow; each is explosive; the one is used to break up the netting, the other, proceeding through a clear passage, to break up the ship. The front torpedo is steered from the torpedo boat, and the rear one is guided by being connected with the first. Each has its own motive power, but that of the first is somewhat greater than that of the second.

The second scheme is, however, the one which attracts attention. The first torpedo here resembles the second one except that it is not explosive, is steered by rudder lines from the torpedo boat or from the shore, and that there are some peculiar contrivances in the second which cause it to make its dive under the net when the first torpedo becomes fouled in it. In approaching the ship each torpedo has its own motive power, the second being regulated to need a slight assistance from the first, afforded by means of a thin rope or wire cord. When the netting is reached, the first torpedo stops; the cord between the first and second torpedoes, formerly taut, at once slackens, and lets fall a species of rudder ledge or trap underneath the center of the second torpedo. The projecting ledge, being caught by the water as the second torpedo advances, is sufficient to drag the torpedo down into the water, where it will progress at an angle of 15° to the surface. In this manner it will dive under the ship's netting. Having gone the length of the tow line, the torpedo will be brought sharp up to the surface again; the surface in this case being the ship's bottom, not protected, as its sides are, by iron plates. Striking here the explosion follows. When the ship is not protected by nets, the only change made in the system is by using a shorter towing line. The rear torpedo does not float on the surface as it follows the first, but is balanced to sink a few feet below water, and so to escape destruction from the ship's shot.

The entire length of the torpedo is 31 feet; its width at midship section is 21 inches; its depth 31 inches; its displacement 2,800 lb. The explosive substance is guncotton or dynamite to the amount of 100 kilogrammes. This explosive is fired by a small copper pin being cut off when the impact takes place against the ship. A very slight shock is enough to effect this. Upon this pin being cut, it liberates a bolt, which shoots against the cap of an ordinary rifle cartridge, and the explosion follows. The motive power of the torpedo is obtained by the combustion of three rows of four one hundred pound rocket tubes filled with rocket powder; and this powder is compressed with a mixture of clay, which secures regular burning and the time required for the torpedo to run a distance of one English mile at the rate of twenty-four miles an hour. The pressure of gas given off will be about 2,000 lb. to the square inch; but if required, it may be increased safely up to 5,000 lb. The gas generated by combustion of the rocket powder rushes through a nozzle, and acts upon several compartments of a turbine which revolves the torpedo's screw.

The torpedo is to be steered from the torpedo boat throughout its entire course. The steering apparatus consists of two grooved wheels (Fig. 1), with a mile of fine plaited linen cord passing over dynamometers. Pressure is put on by friction brakes worked by two levers. In this manner the torpedo can be steered from leaving the torpedo boat to being fouled in the net. The second torpedo has no special steering apparatus, its direction being determined by that of the first. It is claimed that steering is facilitated by the fact that the steering lines and drag of the second torpedo keep the stern of the first always directed toward the steersman. As the first torpedo also runs just below the water line, a disk 3 or 4 feet above the water is used to steer by in the daytime, and a lamp reflecting only to the rear is used at night. Against torpedo boats or wooden ships the first torpedo only is used.

The claims made for this torpedo by its inventor, General Berdan, of Constantinople, are: 1, its steering apparatus; 2, its motive power; 3, the fact that it can be launched from any part of the coast or from any ship without any special arrangements for the purpose; and 4, the use of a pair of torpedoes acting together instead of a single one.

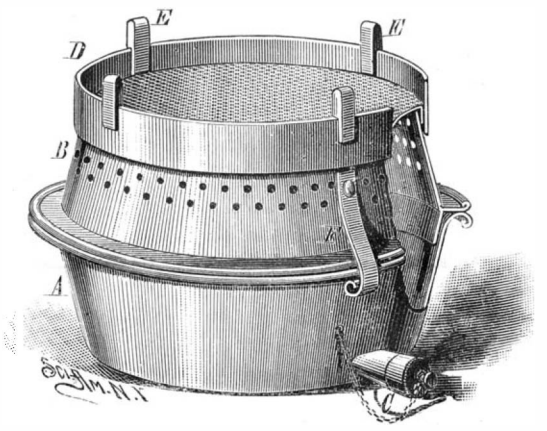
### Light from Water Power.

The beautiful falls of Montmorency, one of the chief points of interest to the tourist visiting Quebec, are to be utilized for a novel purpose, that of generating electricity for lighting Quebec. The water is led from the river above the falls, through a sluiceway, to the edge of a precipice, 165 feet high, and from here through a tube to the base. The lower three-fourths of this tube is made of quarter inch boiler plate iron, the upper fourth of three inch plank. The tremendous pressure exerted by this column of water, 165 feet high and 24 inches in diameter at its base, will turn a turbine wheel at the rate of 600 revolutions per minute, giving a force of 900 horse power. This is transmitted almost direct to eight dynamos on the floor above, and from these sufficient electricity will be generated to light 800 arc lamps in Quebec, seven miles distant. The apparatus is very ingenious and extremely strong, and will probably be a great success.

There is only one other place in Canada—Ottawa—where anything of the kind is in use. Even now the process is in use at Montmorency, in Mr. Hall's lumber mills, where nine lights are run by a turbine 8 inches in diameter, having a force of 60 horse power. The tremendous pressure is shown when Mr. Hall turns on a hydrant, letting out a huge stream of water with a deafening roar. Pipes are led all through the lumber yard, into which water can be turned at a moment's warning and flood the entire place. The lumber mills themselves are run by power from the falls.

### COMBINED MILK PAN AND CHEESE MOULD.

The pan, A, is provided with a tubular spout, C, for the purpose of drawing off the milk without disturbing the cream, which, as the milk runs off, will gradually




NOESSEL'S COMBINED MILK PAN AND CHEESE MOULD.

sink until it rests on the bottom. The spout stopper screws into an internally threaded outer end of the spout, and is attached to the pan by a chain, the end link of which connects with the stopper by a pin or rivet, so as to permit the screwing or unscrewing of the stopper without twisting the chain. The detachable hollow cover, B, is of about the capacity of the pan, and is made with sides inclining in a direction opposite that of the sides of the pan. The mouth end of the cover has a curtain which enters down within the pan to prevent leakage; the springs, F, hold the cover in place on the pan. The closed end of the cover is constructed to form a screen, and is provided with the legs, E. The cover serves a double purpose: it may be used as a strainer, through which the milk may be poured into the pan beneath; or if by accident the milk before being drawn off should form into clabber, then, after removing the cream with a spoon and replacing the cover, the whole utensil may be inverted to stand upon the legs, when the cover is converted into a curd or cheese mould, which will permit of the whey passing off through the screen and through holes in the side of the cover.

This article—the invention of Mrs. Sarah J. Noessel, of Benavides, Tex.—can be readily made by any tinsmith, and all the parts can easily be kept clean.

### American Exhibition at Rome.

A permanent exhibition of United States products will be opened at Rome on November 1 of the present year. The exhibition is projected by some of the most prominent Italians, and will be conducted under the auspices of the Italian government and the United States Consul-General. It will have forty-one branches in the different Italian cities, and its managers promise to do all in their power to encourage trade between the two great nations. The permanent exhibition is to be free to all, and only such goods are invited as are apt to find a sale or to meet a want in Italy or the Mediterranean ports. The charge to exhibitors is $15 for twelve months, and the exhibition company will take full charge of the exhibit on its arrival in Rome. There should be some customers for American goods among 30,000,000 Italians, and our manufacturers wil ldo well to investigate this market.

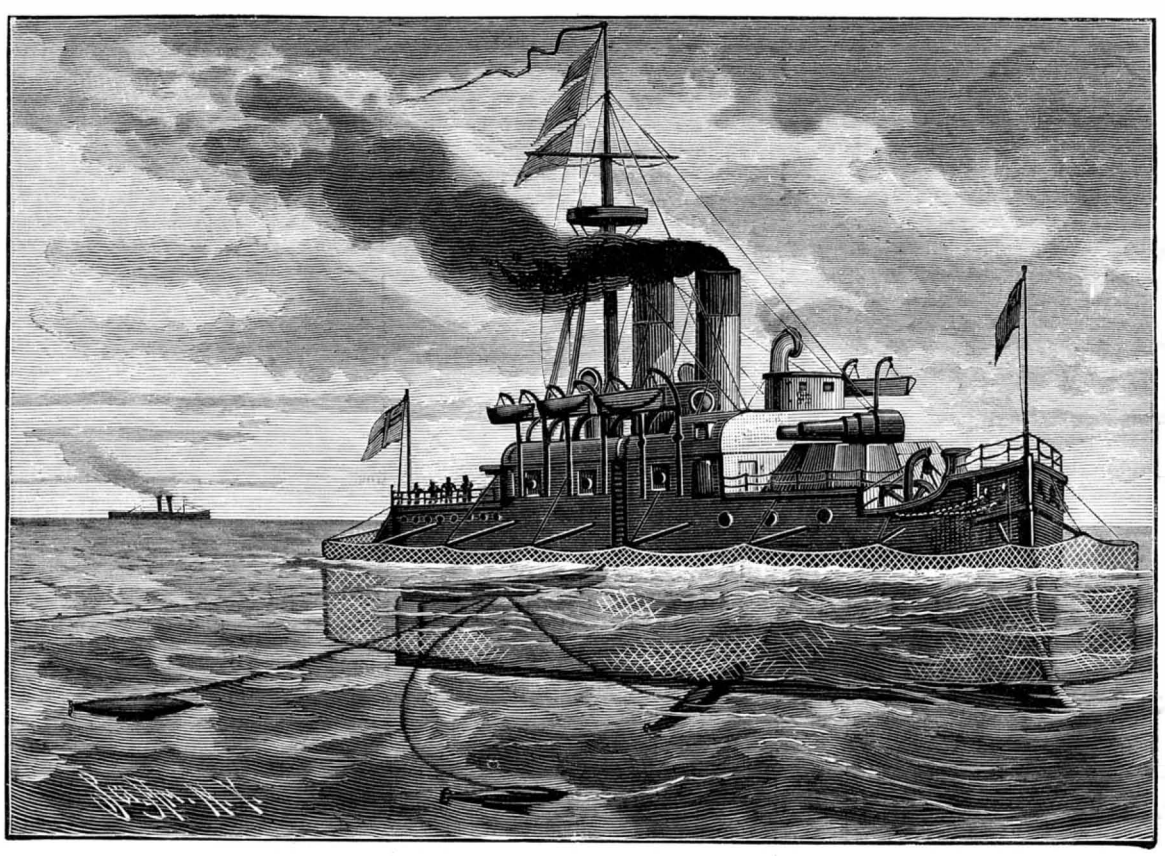


Fig 2.—THE BERDAN TORPEDO ATTACKING A SHIP PROTECTED BY NETTING.

THE *Manufacturers' Gazette* reports the sales of wool for the past week as having been the largest in the history of the Boston wool market. The sales amounted to a total of upward of 7,000,000 pounds, 6,800,000 of which are domestic. For the same week last year the sales were less than 3,000,000 pounds. This looks as if the woolen manufacturers were not going to remain idle.

### A FEW NEW MICROSCOPE ACCESSORIES.

The annexed engravings represent three new and valuable accessories which afford great satisfaction to every microscopist who is fortunate enough to possess them. They are all new, and consequently may not have come under the observation of the reader, but the writer, speaking from his own experience with them, is able to say impartially that they are excellent and very desirable.

Ward's eye shade, shown in Fig. 1, is applied to the tube of the microscope, and permits of removing the eye pieces without changing the shade. This device permits of keeping both eyes open, and renders working with a microscope less fatiguing than it would be were the unused eye exposed to the light or closed.

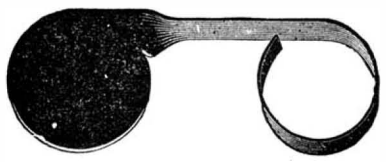
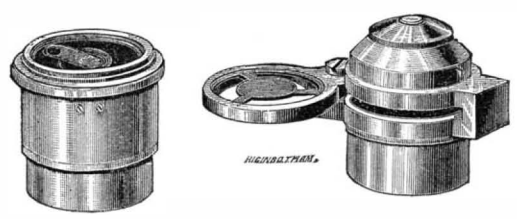


Fig. 1.—WARD'S EYE SHADE.

Fig. 2 shows an improved sub-stage condenser and two forms of mounting. The lenses composing this condenser are very large, and utilize almost all the rays which pass through the sub-stage ring. Its numerical aperture is about 1·42, so that it can readily be used with objectives of the largest angular aperture. The volume of light concentrated by it is quite sufficient with the highest amplification. The light may be concentrated at a single point, or it may be distributed



No. 1. No. 2.

Fig. 2.—NEW SUB-STAGE CONDENSER.

over a larger space by varying its distance from the object. It may be used either dry or with the immersion fluid. The mounting represented in No. 1 is for oblique light. It is provided with a diaphragm, which is moved in a right line across the tube by turning the milled edge, thus giving all angles of light between central illumination and the extreme limit. The mounting shown in No. 2 is provided with a swinging diaphragm ring, in which may be placed various stops or diaphragms without disturbing the adjustment of the condenser. By means of these stops and diaphragms either a dark ground illumination or oblique illumination of any angle may be secured. The graduated blue glass light modifier shown in Fig. 3 consists of a disk of glass which revolves upon a sub-stage adapter, and gives all shades between white and dark blue, both transparent and translucent. The difference in results secured by even a slight modification of the light by means of this graduated blue glass is surprising.

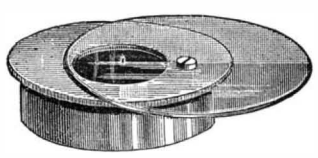


Fig. 3.—GRADUATED BLUE GLASS LIGHT MODIFIER.

These new accessories are made by the Bausch & Lomb Optical Co., of Rochester, N. Y., and 37 Maiden Lane, New York city.

### Phosphate in South Carolina.

The *Manufacturers' Record* has an interesting article on the phosphate industry of South Carolina, from which it appears that the total amount of phosphate rock mined in this State since the discovery of these deposits has been as follows:

| | Tons. |
|---|---|
| 1868-70 | 20,000 |
| 1871 | 50,000 |
| 1872 | 60,000 |
| 1873 | 90,000 |
| 1874 | 100,000 |
| 1875 | 115,000 |
| 1876 | 135,000 |
| 1877 | 165,000 |
| 1878 | 210,000 |
| 1879 | 200,000 |
| 1880 | 190,000 |
| 1881 | 265,000 |
| 1882 | 330,000 |
| 1883 | 355,000 |
| 1884 | 409,000 |
| Total | 2,699,000 |

Of this amount there was:

| | |
|---|---|
| Of river rock | 1,229,170 |
| Of land rock | 1,469,830 |
| Total | 2,699,000 |

The total, 2,699,000 tons, represents a value of about $16,000,000. In the amount of capital invested South Carolina stands second, with Maryland first. New York follows South Carolina.

### PHOTOGRAPHIC NOTES.

*Distortion in Photographs.*—Some recent investigations conducted by the *British Journal of Photography* show conclusively that distortion in photograph prints is largely due to carelessness in mounting them. This was proved by taking strips of photograph paper, some two feet long and a few inches wide, coating them on the back or plain side with the ordinary starch paste, and then laying them upon the heavy card mounts. If the paper was simply pressed down gently upon the mount and run through a pair of iron rollers, the extension of the length was but one-eighth inch. But if the surface of the print was rubbed in the direction of its length on to the mount, the degree of extension was increased one inch. The conclusion reached was that prints should be pressed on the mounts with a soft pad of cloth, and not rubbed lengthwise. We have seen instances in portrait photographs where the distortion was so marked as to greatly change the looks of the person. The negative was correct, but the paper in being printed and mounted had expanded, and distorted the picture.

*The Development of Paper Negatives.*—At a recent demonstration made by Mr. David Cooper and S. C. Jones before the Society of Amateur Photographers, of this city, on the development of paper negatives made upon the Eastman bromo-silver gelatine paper, an interesting point about their manipulation was brought out.

The strip of paper had upon it eight or ten instantaneous exposures of marine subjects; the different views prior to development in the dark room were separated from each other, and one by one immersed for a few seconds in a water bath, and then placed in a very weak developer made up as follows:

| | |
|---|---|
| Water | 36 ounces. |
| Pyrogallic acid | 30 grains. |
| Sulphite soda (crystals) | 180 " |
| Carbonate of soda (granulated) | 110 " |

After the tenth print had been placed in the above, the first sheet commenced to show signs of developing, and it was curious, to one who is accustomed to develop a dry plate, to watch Mr. Cooper handle each sheet as if the developer was a toning bath, that is, they were picked out, then dropped, and kept moving about in the solution.

After a period of ten minutes it was noticed that the images had developed out very fully, but on examining them by transmitted light they were quite thin and flat, looking apparently as if they had been overexposed.

At this point the following addition was made to the developer, from the solutions described below equivalent to

| | |
|---|---|
| Carbonate of soda | 110 grains. |
| Pyrogallic acid | 64 " |
| Sulphite soda | 360 " |

Which, it was stated, would act as an intensifier, and bring the negatives up to the proper strength. This it appeared to do quite rapidly, and as the negatives gained sufficient density they were, one by one, gradually removed from the developer, rinsed with water, and placed in an alum and then in a hypo fixing bath. As the paper was not as transparent as glass, it was necessary, in judging the density, to allow the negatives to appear 1½ times more dense than they would if on glass. The slow method of development was considered advisable, as it gave the operator more time to examine the negatives during development; and as they could be easily brought up to their proper density afterward by the addition of a stronger developer, the plan was a perfectly safe one.

The negatives produced at the meeting developed out as if fully exposed, and possessed fine, vigorous printing qualities.

Below we give the formula just as Mr. Cooper mixes the parts of his normal developer.

No. 1.

| | |
|---|---|
| Sulphite sodium, pure (480 grs. to oz.) | 6 ounces. |
| Distilled or boiled water | 32 " |
| Pyrogallic acid | 480 grains. |

No. 2.

| | |
|---|---|
| Carbonate soda, pure (437 grs. to oz.) | 4 ounces. |
| Water | 32 " |

Heretofore one ounce of Nos. 1 and 2, mixed with one ounce of water, has been advised as the normal developer, and in it the image should appear in twenty seconds. A few drops of a restrainer, composed of—

| | |
|---|---|
| Water | 6 ounces, |
| Bromide of potassium | 1 ounce, |

is used if the picture appears too quick and is flat.

When several negatives are to be made at one time, the former method of development is preferred.

*A Large Photograph.*—We were recently shown one of the largest instantaneous marine photographs that has probably been made in this country, taken, it is stated, with a Dallmeyer rapid rectilinear lens and an extra quick improved camera shutter, upon a Stanley gelatino-bromide plate, 17 x 22 inches in size.

The subject is the English yacht Genesta under full ail; every detail is brought out, and not a single defect observable upon so large a surface, which illustrates how perfectly plates can be made. The size of the image is over 11 inches each way. We are indebted to Messrs. E. & H. T. Anthony & Co., of this city, for a copy of this fine picture.

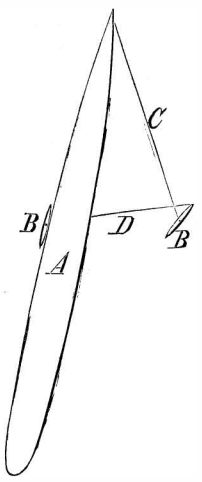
### IMPROVED STEERING APPARATUS FOR RUDDERLESS SHIPS.

We are idebted to Captain John P. Roberts, of Shanghai, China, a seafaring commander of long and varied experience, for the accompanying diagram and description of an improvised steering gear that enabled him to round the Cape of Good Hope in a gale with a high, confused sea, and bring his rudderless ship safely into a narrow and difficult harbor.

We quote from Captain Roberts' log as the clearest method of placing his steering apparatus before the readers of the SCIENTIFIC AMERICAN:

"CHINA SEA, July 1, 1875.

"Finding that a heavy sea had carried away our rudder, took a four inch line from each bow, brought the ends aft to midships, and bent them to spar buoys four feet from the forward end each, the spars being ten feet long. Bent ratline stuff to the forward ends for tripping lines, and put the contrivance overboard with the tripping lines shortened in and made fast on deck to keep the spars alongside (the steamer lying in the trough of the sea, pitching heavily); started ahead at full speed, and slacked away the port tripping line.



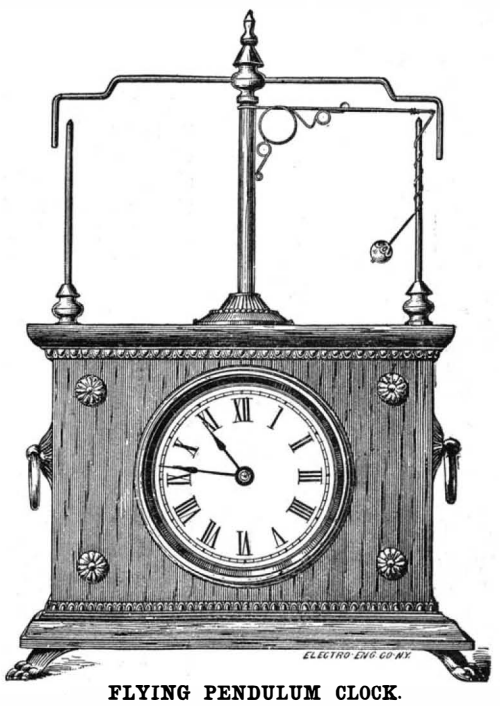

"The spar shot out until its tow rope formed an angle of about forty-five degrees with the central line of the steamer, pulling her head round rapidly. When nearly up to our course, hauled the spar gradually alongside, and by slacking away and hauling in on each side of the steamer, steered quite as well as could be done with a rudder."

This simple contrivance of Captain Roberts' would seem to solve the problem as to how ships may be steered, having lost their rudders, the means being at hand on board all steamers to be quickly utilized and put in operation.

Referring to the diagram, a clear understanding of this apparatus and the manner of applying will be readily obtained. A, steamer; B, spar; C, strong rope; D, small tripping line. Slacking away B from the starboard side is equivalent to porting helm, and *vice versa*.

### A NOVEL CLOCK.

The flying pendulum clock shown in the engraving exhibits a curious application of a phenomenon observed by almost everybody, but never before suspected of availability in a clock escapement. The boy who first whipped saplings and hitching posts with his string carrying at the end a horse chestnut, had the crude principle which the inventor has ingeniously embodied in this clock.



FLYING PENDULUM CLOCK.

The central vertical spindle tends to revolve continuously by virtue of its connection with the driving gear of the clock, but when the arm which it carries swings half way round, the little spherical weight, suspended from it by a thread, is thrown outward by centrifugal action; and when the thread touches one of the fixed vertical wires at the side of the clock, the momentum of the spherical weight causes it to wind the thread around the vertical wire and stop the arm and spindle. As soon as the thread is wound upon the spindle, the spherical weight unwinds it by its own gravity, and in so doing receives enough momentum to rewind the thread and still prevent the spindle from revolving. Then the thread winds and unwinds once more, when the arm is released, and makes a half revolution, when the thread is wound on the other vertical wire, and the operation just described is repeated. Made by the New Haven Clock Company, 16 Park Place, New York city.

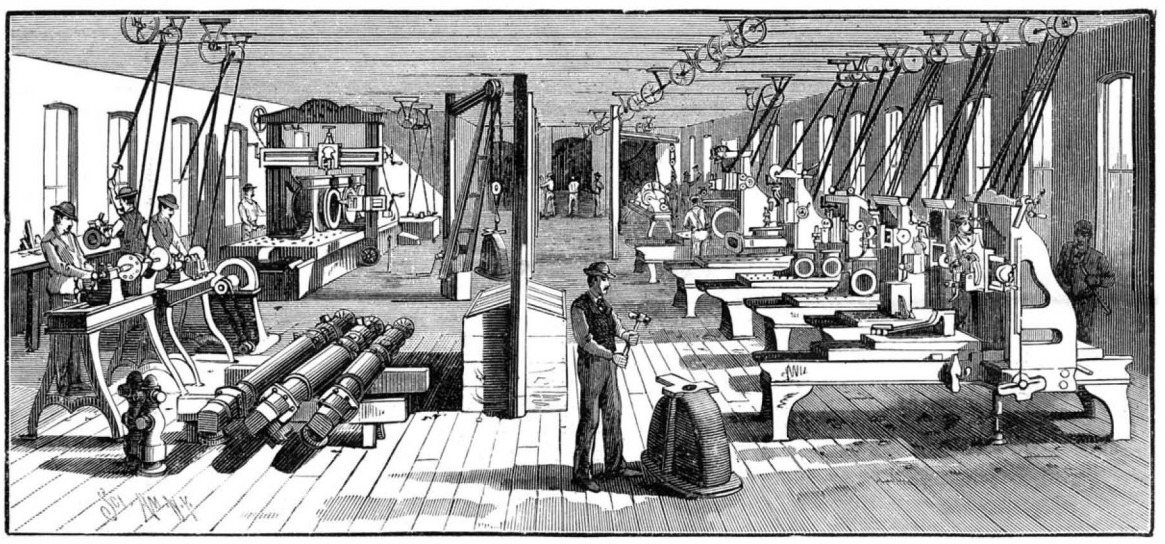
### VALVES AND HYDRANTS.

(*Continued from first page*).

and everything in its place" is well illustrated in every department.

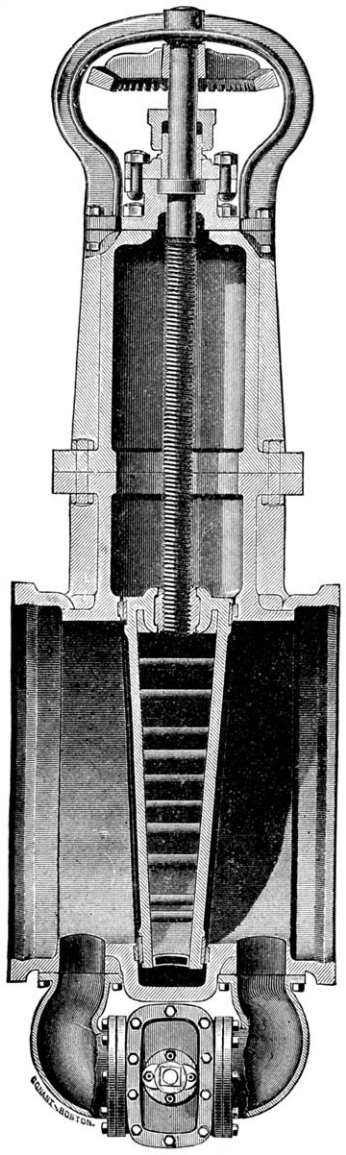
To give the reader some idea of the scale of their buildings, we will add that the finishing shops in front are 300′ × 50′, 3 stories high. Office and storeroom in front 150′ × 35′, part of which is 2 stories. The iron foundry, with annex buildings for power, cleaning, core making, etc., covers an area of 16,000 sq. feet; brass foundries, pattern shop, and pattern storage building, sand and coal storehouses, stables, and engine houses complete the list, and may be measured substantially by the scale already given.

Their motive power consists of three 50 h. p. boilers and two 50 h. p. Corliss engines. The buildings are protected inside and outside from fire by a well organized system of hydrants and standpipe, automatic sprinklers, etc., managed and operated by a hose company formed from the employes.



IRON PLANING SHOPS.

The Chapman valve has a straightway passage the full diameter of the connecting pipe. The engraving on first page shows the valve with part broken away, in order that the form and construction of the interior may be seen. The plug, or gate, is in one piece, made hollow and tapering, and guided upon its sides to prevent its coming in contact with the seats, until closed, by splines in the body, which engage with the plug, and which are of unequal thickness, to prevent the plug from being inserted wrongly in case of its being removed for repairs or otherwise. The plug is double faced and equally tight on either face, thus either end of the valve may be used for inlet or outlet. In stationary spindle valves the plug rises and falls on the spindle, and in rising spindle valves, with the spindle. The spindles are all of extra diameters, to prevent twisting, of solid gun metal composition for steam and water, and of best iron or steel for gas and ammonia.



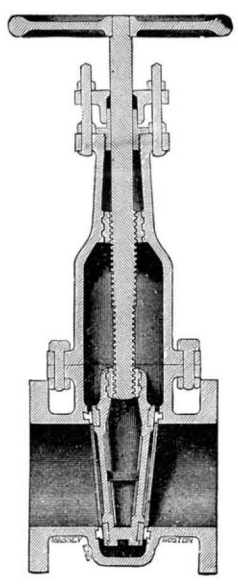
LARGE WATER GATE, WITH BY-PASS.

The seats of the valves and gates are composed of alloys similar in application to Babbitt metal. Different alloys are employed for different uses—one for steam, one for water, another for gas and ammonia, and a fourth for steam valves liable to be subjected to extreme heat. The seats are securely and firmly held to the body by means of dovetailed grooves in the body, and are formed upon the plug itself, producing an exact counterpart of the faces of the plug on both sides, thereby making a perfectly tight joint, which by the construction of the valve wears tighter in use and always preserves its bearings. These seats will not corrode either when in contact or when separated, and hence the valve may be easily started, even after it has been closed for years.

On account of the amount of space necessary to work the larger sizes of quick-opening lever valves, and the strain brought upon the pipes by the almost instantaneous stopping of the current by their use, a compound screw valve has been designed. In this, the gate rises on the spindle and at the same time the spindle rises out of the valve, thus giving a double motion. The valves open easily and quickly, a six inch valve opening in five turns.

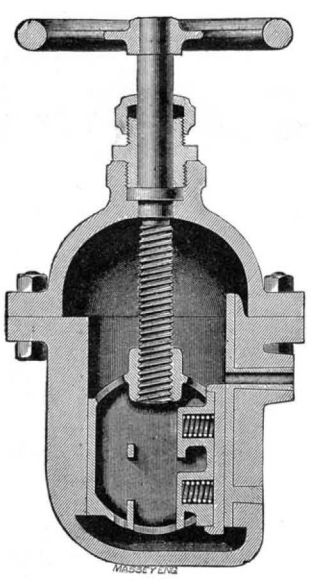
While, from the manner of construction, the Chapman gate will open and close comparatively easy under any pressure, for excessive pressure on large gates it is better to obtain relief by the by-pass. In water works having heavy pressure, while the smaller gates work comparatively easy, the larger ones, under the excessive load they have to carry, are always a source of anxiety whenever it becomes necessary to open or close them. To obviate these difficulties, the large gates are formed with a substantial cast iron by-pass, which engages with the body each side of the plug. The size of the by-pass valve is such as to constitute a material relief. All the parts are interchangeable, and the joints are made perfect without the aid of gaskets or packing.

Both in design and construction, great care has been taken to produce a hydrant that will perform its service without getting out of order, that will close tightly and remain tight even in muddy or gritty water, that will open and close easily at all times, and that will produce no water hammer or strain upon the pipe and joints in closing. The gate rises upon the spindle, in opening, into a recess below the hydrant pipe, large enough to admit the full passage of water from the main, and closes vertically, gradually cutting off the flow of water and preventing any hammer. The gate is tapering upon its face, with a tapering pressure bar on the back, which acts as a wedge to force the gate to its seat in closing, and is guided upon its sides to prevent turning or coming in contact with the seats until the passage is closed. The seats and pressure bar are of Babbitt metal. The drip outlet is formed in the side of the valve on a level with the water in the main, and is opened and closed by the direct action of the gate without intermediate mechanism. It is so arranged that the moment the gate begins to rise the outlet is sealed, and remains sealed until the gate is closed. The drip being always open when the gate is closed, there is no liability of freezing; when necessary, all the sizes of valves can be provided with similar automatic drips. The wedge form of the gate and its non-cohesion to the Babbitt metal seats render this valve easy to operate, no matter how long it may have been closed.



COMPOUND SCREW VALVE.

In order to meet the demand for a hydrant from which a large number of streams can be taken and concentrated on a fire at any one point, and yet have each stream under as perfect control as though taken from single or separate hydrants, the one shown in the engraving was designed. Independent valves for each outlet are placed on the inside of the post, each valve being operated by a spindle from the outside, independently of the other valves and of the main valve at the bottom of the hydrant. Each valve is perfect in itself, and does not depend on the water pressure to bring it to its seat. We have not the space to describe all the special forms of valves produced by this company to meet peculiar conditions; a mere enumeration would occupy more space than we can at present spare.

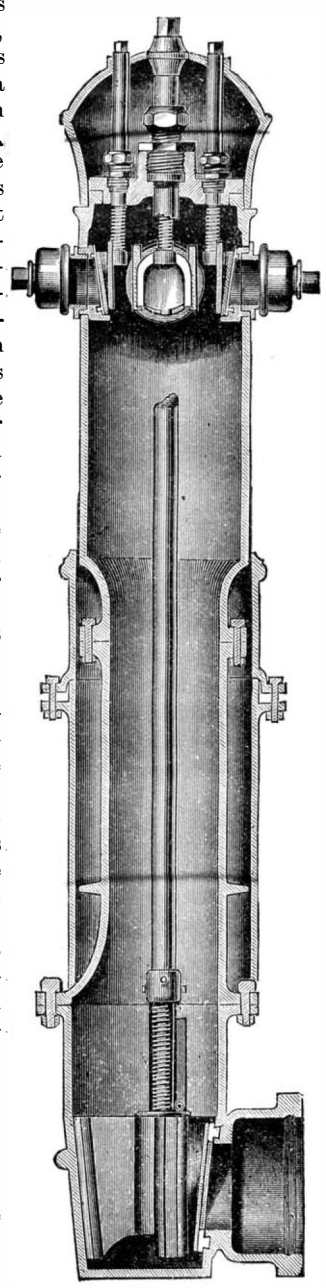


AUTOMATIC DRIP VALVE.

Notwithstanding the dull times, the force now employed by the Chapman Company is about 170 men; a part of the time it is necessary to run extra hours to fill orders. The product of the work is sold in every civilized country in the world. The officers of the company are: Samuel R. Payson, President; Percival L. Everett, Treasurer; and Jason Giles, General Manager.

### The Siphon Recorder.

Sir William Thomson's English patent for his siphon recorder (Patent No. 252 of 1871) has expired this year; and it is probable that the instrument will come into greater use than hitherto. The introduction of permanent magnets for the large electro magnets originally used to produce the magnetic field of the signal coil will probably be extended, says *Engineering*, and there is also a prospect that the troublesome "mouse mill" will be obviated. At all events, Mr. Pescad, an employe on the Central American cable lines, residing at San Juan del Sur, has invented a plan which reduces the friction between the marking siphon and the front of the paper without the necessity of electrifying the ink by means of the mouse mill. This plan has been tried successfully for some months on a cable about 1,600 miles long on the Central American coast. The plan consists in vibrating the siphon in such a manner that its point "jumps," as it were, on the paper. This is done by attaching a thread to the fiber which suspends the signal coil, about 2 inches above the latter. This thread runs behind the recorder at right angles to the suspending fiber, in a horizontal direction, and is connected to the hammer contact of a small induction coil. When the coil is started by a battery, the vibration of the hammer pulls upon the thread and vibrates the siphon connected to the signal coil, so that the point of the siphon rises and falls on the strip of traveling paper. This movement is, of course, very minute, but it is sufficient to diminish the friction between the siphon point and the moving paper without interrupting the fine ink line which the siphon marks upon the paper. Mr. Pescad states that this line is as good as the line made by the siphon of a recorder with electrified ink. The introduction of this plan, together with permanent magnets, would render the large tray Daniell batteries used with the recorder no longer necessary to its working.



FIRE HYDRANT WITH INDEPENDENT VALVES FOR EACH HOSE NOZZLE.

### Nitro-glycerine for Oil Wells.

There are nine glycerine firms at work in the Bradford field, and all their men are kept busy from morning to night. The size of the shot used is rarely less than eighty quarts. The constant enlargement of the cavity in the oil-bearing rock necessitates the use of dynamite squibs for exploding the shells, and the old method of dropping a "go devil" on the firing head of the torpedo has been almost entirely superseded. The cans in which the nitro-glycerine is transported about the field have been enlarged from six to eight quarts capacity, and each shooter's wagon carries ten cans, or eighty quarts, of the powerful explosive.

### The Manufacture of Cheap Artificial Teeth.

There are four, if not more, factories for the manufacture of false teeth for dentists' use in the city of Philadelphia and one in Camden. The materials used are feldspar, silex, and German clay, all finely ground, and mixed in different proportions, and kneaded with water to the consistency of moist putty. Another preparation is necessary for the production of the pink portion of the tooth, which forms the imitation of the gum. The tooth and the gum are made in one piece, and the pink tinge of the gum is given by the use of the oxide of gold in the enamel, of which platinum and titanium are the principal ingredients. The tinted enamel having also been prepared, the materials are ready for the moulders. Each mould is for a full set of sixteen teeth. It is flat, not of the shape of the jaw, for the set is broken up into twos and threes to meet the necessities of manipulation by the dentist in fitting different shaped mouths. Where the root of each tooth (were they natural) would fit in the mould are two tiny holes, in which a workman inserts the ends of two small platinum pins, with heads at each end. These heads are to prevent the pins from slipping out of the tooth at one end and at the other end out of the mouth plate, to which they are expected to hold the teeth.

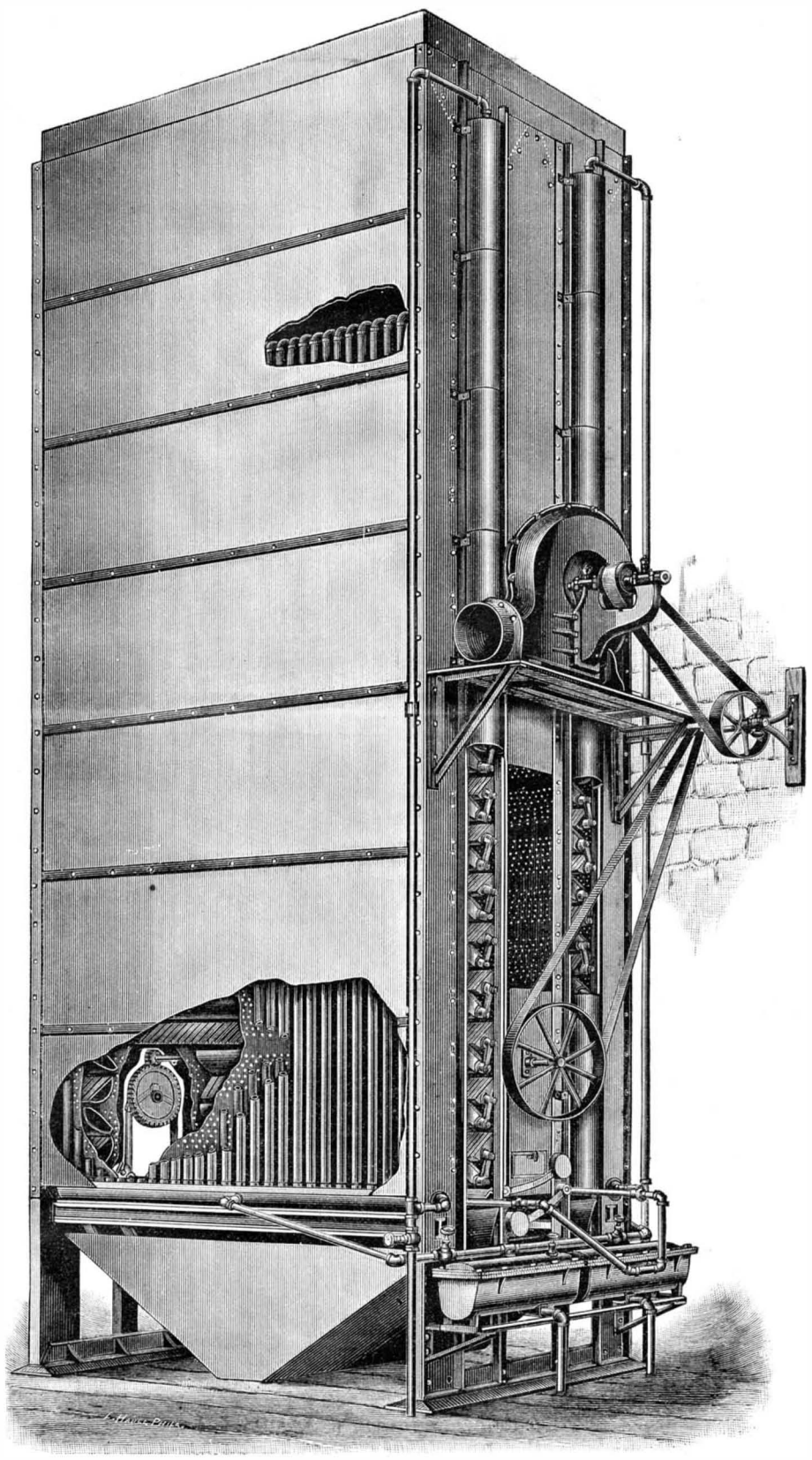
The insertion of the pins completed, the mould is passed to a fellow workman, who coats the indentations which receive the "putty" with the enamel. The mould again passes into another workman's hands, who gently presses into that part of the mould corresponding to the tinted gum the preparation of the oxide of gold. By still another workman the feldspar, silex, and clay mixture is pressed to complete the tooth. The mould is then closed, placed under enormous pressure, the excess of clay squeezed out, a clamp put on, and mould and clamp placed in the drying oven. After remaining in this oven until all the moisture is removed, the moulds are opened, and the teeth, with gum attached, allowed to drop out. They show no distinguishing characteristic, separate from that of the dirty chalk appearance of the single ingredient of the clay. The tooth and the gum appear to be homogeneous. They then pass into the hands of the finishers, generally women, who with fine saws and files cut away the rough edges and make more distinct the separation of the teeth. When these skilled fingers are through with them, eighteen sets of sixteen teeth are arranged upon a slide of fire clay, re-enforced with coarsely ground silex, which will not melt in the intense heat of the oven when uncombined with other substances. From this workroom the slides are passed to the baking ovens, which have been raised to a white heat. In these ovens one slide is baked at a time, the time of remaining therein varying from fifteen to twenty-five minutes, dependent upon the temperature of the oven. When the slides are removed from the oven, they are placed in other firebrick unheated ovens, where they are allowed to cool gradually. On cooling, the brilliancy of the white enamel and the delicate pink to which the heat has changed the oxide of gold gladden the baker's heart. The cooling process complete, the slides and the teeth are handled once more before the latter are shipped away. Thin pasteboard boxes, six inches square, and narrow strips of wax are provided. The teeth are pressed on the wax, the projecting heads of the pins holding them in place. The strips are arranged in the boxes, the lids fastened on, and the teeth are ready for the market.—*Philadelphia News.*

A NATURAL bow that is on exhibition at the Brownsville (Oregon) post office is described by the San Francisco *Examiner*. It is a maple about eight feet in length, has the curves of an ordinary Indian bow, and, strange to say, is already strung with a slender limb that grows out of one end into the other so perfectly that at first sight it would be quite difficult for one to detect at which end the limb began. The bow is about three inches thick, and the string part is about one-fifth of that thickness, and is strong enough to shoot an arrow 200 yards.

### AN IMPROVED GRAIN DRIER.

The illustration herewith shows a new form of grain drier, said to be capable of thoroughly kiln-drying from two to three thousand bushels of corn in twenty-four hours, and to be equally well adapted to drying other grain, so as to offer great advantages to maltsters and others at present using kilns. The machine consists of a series of inclined hollow shelves, supported by columns of channel iron, which form the frame of the machine, the shelves being ribbed on their surfaces and connected together at alternate ends by return bends, by which the steam introduced at the upper shelves will circulate through them consecutively until it reaches the lowest one and passes out to the steam trap. The ends of the shelves are covered by semicircular hoods, thus forming a channel, down which the grain passes, being turned over in its descent by each shelf. At the back of the shelves, also, are steam pipes to heat the air which is drawn through by a suction fan connected to the discharge chamber on the opposite side, thus carrying off the moisture taken from the drying grain. The temperature is under complete control, and can easily be regulated by changing the quantities of steam and air allowed to pass through, so that the grain may, if desired, be discharged at a normal temperature. Adjustable oscillating valves at the bottom, operated by a crank and rocker arm, regulate the discharge, the only moving parts of the machine being this discharge mechanism and the exhaust fan. This drier is said, from tests which have been made in mills at Philadelphia and Wilmington, to be much more effective and economical than the kilns in ordinary use, its work, with an ordinarily good boiler, being equal to the drying a bushel of corn for each pound of coal used.

This drier is manufactured by Mr. Henry G. Morris, of No. 209 South Third Street, Philadelphia, Pa.



THE PHILADELPHIA GRAIN DRIER.

### Natural Gas at Pittsburg.

On August 10 natural gas was introduced for the first time at the Sable Iron Works of Zug & Co., Pittsburg, under five puddling furnaces and under a battery of boilers. The process is a new one, and has been invented by the bricklayer of the work, Samuel Burton, which he has remodeled, giving entire satisfaction. Natural gas is also used at the following mills in the Smoky City, according to the *Telegraph:*

Star Iron Works, Lindsay & McCutcheon; La Belle Steel Works, Smith, Sutton & Co.; Singer, Nimick & Co.'s Steel Works; Pittsburg Iron Works, J. Painter & Sons; Clinton, Millvale, and Fort Pitt Rolling Mills, Graff, Bennett & Co.; Glendon Spike Works; Dilworth, Porter & Co., Republic Rolling Mill, American Iron Works, Wayne Iron and Steel Mill, Brown & Co., Hussey, Howe & Co., Steel Works; Park, Brother & Co., Solar Iron Works, William Clark & Co., Etna Iron and Tube Works, Spang, Chalfant & Co., at Etna; Crescent Steel Works, Miller, Metcalf, Parkin & Co., Vesuvius Iron and Nail Works, at Sharpsburg; Spang Steel and Iron Mill, ditto, and the Polished Sheet Iron Works and National Tube Works at McKeesport.

The mills still supplied with coal are: Oliver Brothers & Phillips, Pittsburg Forge and Iron Works, Eagle Rolling Mill, Sligo Iron Works, A. M. Byers & Co., Chess, Cook & Co., Elba Iron and Bolt Works, Soho Rolling Mill, Keystone Rolling Mill, Pennsylvania Tube Works, Pennsylvania Iron Works, Kensington Rolling Mill, Sable Iron Works, Juniata Iron and Steel Mill, Linden Steel Mill, and the Manchester Steel and Iron Works. Some on this list are idle, the last mentioned mill having been so nearly three years.

Zug & Co., of the Sable Rolling Mill, will introduce natural gas in all departments as soon as experiments they are now making demonstrate the best methods of using it. Wilson, Walker & Co. are building in their mill one of the Owens gas furnaces for heating purposes, and will soon be ready to use gas. The Canonsburg Iron Co. is also erecting a new natural gas furnace for the same purpose. The La Belle Steel Works, of Allegheny, which are now closed for repairs, will use natural gas instead of coal when operations are resumed. Carnegie Brothers & Co. already may be said to have perfected their plant in this direction, both as to capacity and reduced cost.

### Keep a Record.

Some weeks since a representative of the *Artisan* called upon an engineer friend who was thoroughly wrapped up in his machine. In the course of the conversation he produced a book in which he had for months kept a record of the coal consumed each day, and the horse power developed by the engine as shown by indicator cards taken in the forenoon and afternoon. These cards being filed served as a record of the condition of the engine in those respects which are apparent from the card. This was kept for a long time without his employer's knowledge, half in fear that some objection would be raised, but was at length produced to settle one of the innumerable little points which only such a record can definitely settle, and met with so hearty an approval that the engineer was supplied with a record book, purposely ruled and lettered, and a planimeter for the more convenient and accurate working up of the cards.

All engineers who are handling powers of any extent should inaugurate a system of this kind. Keep a record not only for your coal and power, but for changes which are made, and their effect upon your fuel consumption and the working of your engine. It will not only enable you to review your experience and retain valuable information, but suggestions will frequently arise from it which will be invaluable. It begets a habit of thought, and furnishes the material for deductions which will make you a success in your business, and gives you a means of proving what you have done and do, which no amount of assertion on your part or recommendation by others can equal.

### Reliable Paste for Labels for Glass, Wood, and Metals.

Starch, 2 dr.; white sugar, 1 oz.; gum arabic, 2 dr.; water, q. s. Dissolve the gum, add the sugar, and boil until the starch is cooked.

### ELECTRIC LIGHT ADAPTED FOR USE OF NATURALISTS, CHEMISTS, ETC.

In presenting to the Academy the apparatus for electric lighting for the use of naturalists, chemists, micrographers, etc., constructed by Mr. G. Trouve, Mr. De Lacaze-Duthers expressed himself as follows:

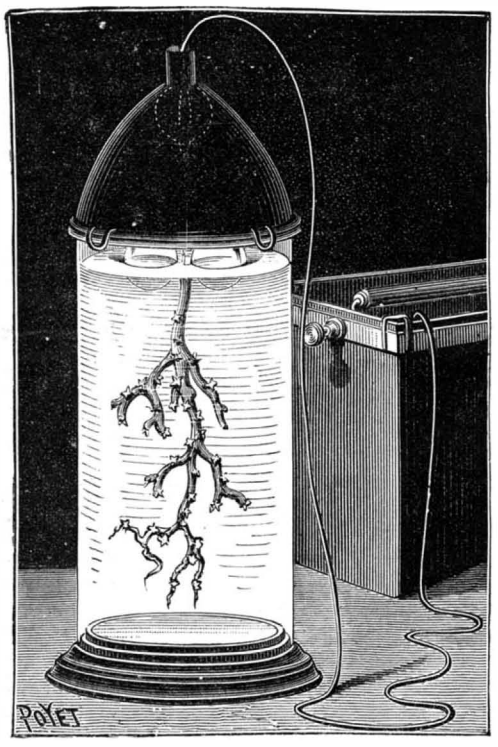



Fig. 1.—ELECTRIC LIGHT ILLUMINATING WATER.

"I have the honor of presenting to the Academy, in the name of Mr. G. Trouve, several apparatus for lighting by electricity, with which I have experimented in my laboratory at Sorbonne, and which rendered me important service in my zoological stations at Roscoff and at Banyuls, for which these instruments were constructed. There is no doubt that these apparatus will

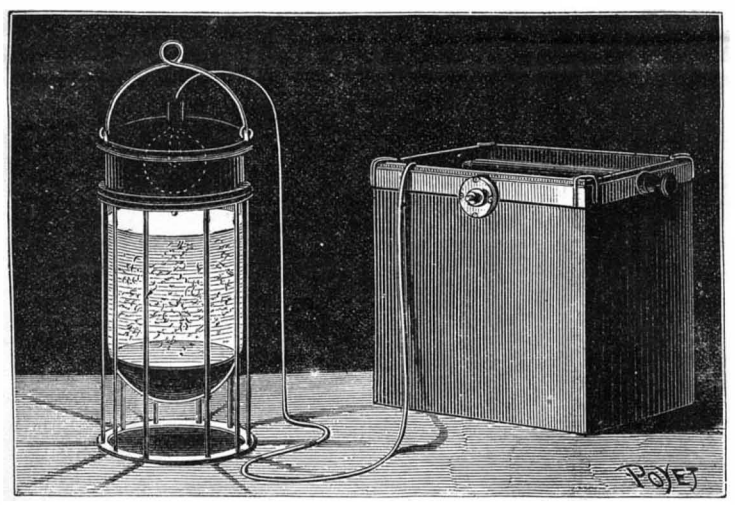



Fig. 2.—APPARATUS FOR STUDY OF FERMENTATION.

be of great assistance to chemists, botanists, and mineralogists, as well as to zoologists.

"This apparatus consists, as shown in Fig. 1, of a cylindrical glass vessel, at the bottom of which there is a

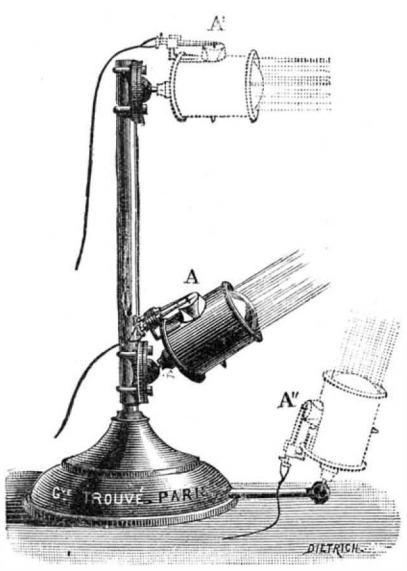



Fig. 3.—THE PHOTOPHORE.

silvered mirror. The vessel is provided with a parabolic cover, which is silver-plated and acts as a reflector, and from the center of which an incandescent lamp is suspended. It is filled with sea water in which are many small living objects, and also a branch of coral. The rays of light are reflected back and forth by the mirrors in the bottom of the vessel and in the cover in a direction parallel with the vertical walls of the vessel. Light arranged in this manner permits of the study of these delicate creatures in even the most minute details. With the aid of the magnifying glass we obtain truly remarkable results, considering the simplicity of the apparatus used. At Roscoff, as well as at the Arago laboratory, the electric light produced by M. Trouve's simple apparatus was of great assistance to us in our observations of the delicate and transparent animals which float on the surface of the sea.

"For the study of fermentation, the apparatus is slightly modified as shown in Fig. 2; the reflecting cover is screwed on a metallic ring fastened on the upper edge of the glass vessel, so as to keep the preparations from the air. The glass is protected by a metallic cage or frame.

"Fig. 3 represents the reflector (photophore) invented by Messrs. Helat & Trouve, and modified for my use; and with its help the finest dissections can be made. It will be of great assistance in the dark days at Roscoff and Banyuls, when the want of light would interrupt work which had been commenced. This light does not change the color of the animals, which look just the same as in bright daylight. The great advantages of this instrument are its small size and the ease with which it can be arranged to give any desired light, oblique or direct. For example, a glass vessel containing water and living creatures can be kept dark with the exception of part to be examined by the magnifying glass, which can be illuminated by a brilliant ray of light.

"By changing the angle of the light, and using a very powerful glass, I have dissected nerve threads which were so delicate as to be almost invisible by daylight.

"The electric generater used for operating these apparatus which I have just shown is very compact; it weighs scarcely 6 lb., and is very reliable. It is represented in Fig. 4, and was recently presented to the Academy by Mr. Jamin."

Mr. Peligot remarked that, having experimented with these apparatus in the mint, he is convinced that they would be of great assistance in the study of crystallization.

### Blood under the Microscope.

According to the *American Bazaar*, the only instance on record when the blood of two persons was compared in a criminal trial was in a murder case in Chicago. The comparison settled the innocence of the woman on trial for her life. A comely woman, with $20,000, married a man in Chicago, and placed her snug little fortune in his business. In the course of time he commenced to abuse her, and finally she decided to apply for a divorce. The double calamity of losing a woman to beat and the withdrawal of her $20,000 from his business made the brute furious, and the next morning he was found dead in one corner of his bedchamber, a bullet having gone through his heart. His wife was found wounded in another part of the room. She said that her husband had come home the night before in a rage and began to abuse her while she was in bed, that he hit her on the head with the butt of his revolver while her head was on the pillow, and spattered blood over the linen; that she jumped up, and he shot her, inflicting a slight flesh wound in her side.

She then rushed at him, and, snatching the revolver from him, shot him through the heart. He reeled to the corner where he was found, and died. The prosecution did not believe her story, and set up the theory that she shot him when he was asleep, and dragged him to the corner, and then inflicted the wound upon herself. The carpet where the dead man lay was saturated with blood. According to the theory of the prosecution, the blood on the pillow was his also. Dr. Piper put the section of the pillow with blood upon it under the microscope, and drew on a cardboard the shape of the corpuscles, enlarged about two thousand diameters. He then put the blood on the carpet under the microscope in the same way. The comparison settled the question at once.

The blood corpuscles were as different as day and night, and sustained the woman's account of the shooting. She was acquitted on that and other evidence.

As between human blood and dog's blood, the microscope enables the expert to determine precisely whether a specimen is from a human being or a dog. But it is

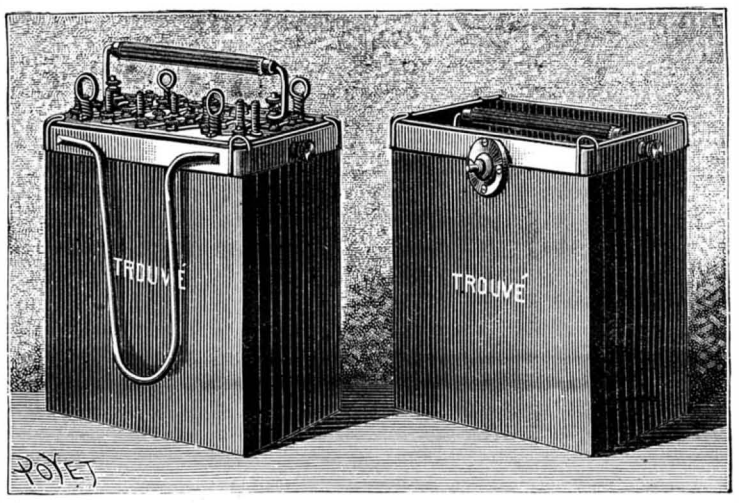
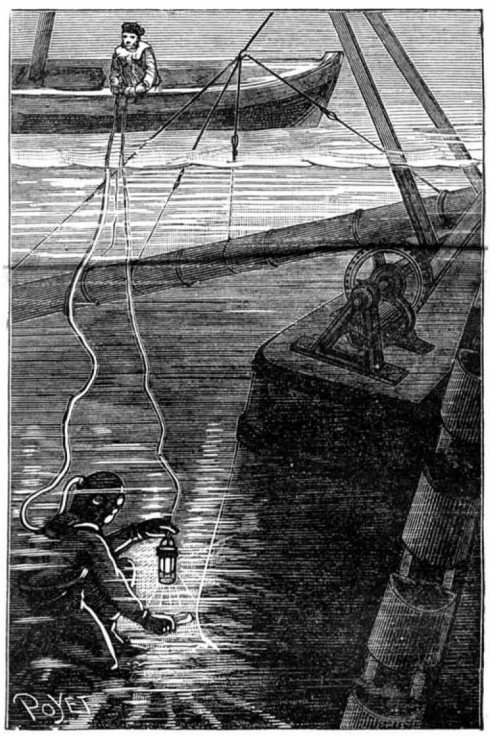



Fig. 4.—THE TROUVE BATTERY.

impossible to determine between human blood and a hog's blood.

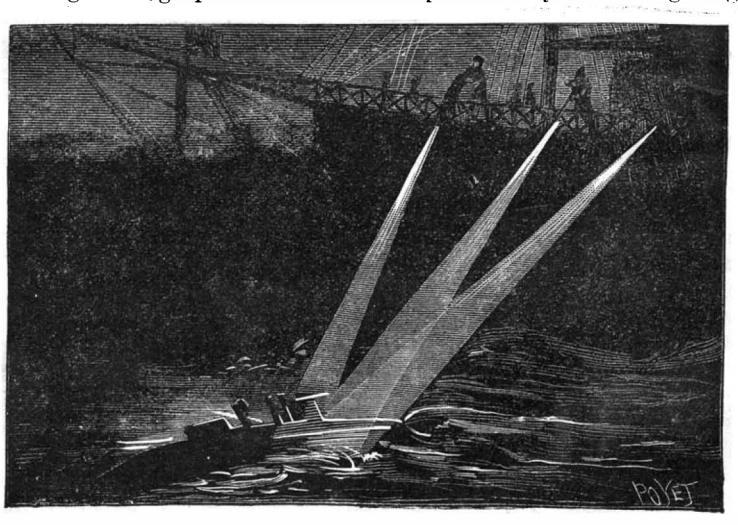
### ELECTRIC APPARATUS FOR SUBMARINE LIGHTING.

The accompanying illustrations represent the lighting by electricity of the dredge which was recently sunk in the Suez Canal by an English steamer. It will be remembered that this accident prevented the passage of vessels for some time. Attempts were made to




DIVERS WORKING BY ELECTRIC LIGHT.

blow up the sunken dredge by means of dynamite, but these attempts failed because the divers had not sufficient light for properly placing their cartridges. Being unable to clear the canal immediately, the company proceeded to widen it by 67 feet for a distance of 984 feet. In the mean time the Egyptian Agency telegraphed to Paris for a practical system of lighting.




WRECK ILLUMINATED FROM THE SHIP.

The company, after having addressed several houses, applied to the Minister of the Navy, who advised the use of the Trouve submarine electric lighting system, which he used. Several trials were made on Friday, July 3, and on Sunday, July 5, the necessary apparatus for clearing the canal were shipped.

The Trouve electric lighting system requires no steam engines, no gas motors, and no accumulators. This apparatus is the one in use for the great work at Port de la Reunion, where it is adapted for the divers' bells, and has been in operation day and night for six months. It is also used at Dunkirk, and can be used wherever a reliable light is needed; for instance, in the turrets of war vessels, where no light heretofore would resist the vibrations caused by the firing of the guns, and after each shot all lights were extinguished. Recent experiments at Villeneuve resulted in the acceptance of this new system of lighting, and all ports are to be supplied with it.

### ELECTRIC LIGHTING OF THE GREVIN MUSEUM.

Since April last the electric light has been used in the Grevin Museum instead of gas. The plant, which was furnished by the Edison Company, is very complete, and gives an example of all the cases in which this new mode of lighting may be applied.

Upon approaching the Museum, the visitor can judge of the effect produced over a wide space in open air, for two Cance lamps illuminate the boulevard and are seen from afar. These are the only arc lamps employed, all the others being incandescent ones. In the quite long corridor that leads to the entrance of the Museum, there are but three lamps. Here one's eyes have to rest, and prepare themselves to visit the interior. The light is sufficient to allow one to find his way and to distinguish all the better, over the door at the end, a window that is lighted by means of three lamps placed upon a silvered glass reflector. Finally, in the interior, the winter gardens, landscapes, halls, theatrical scenery, the jewels of the dancers, etc., show how the electric light can adapt itself to all exigencies. We have proof, besides, that it can be put in almost anywhere, even in an old building where nothing has been prepared to receive it, and which is situated in the most frequented business locality in Paris.

The machines are placed in the basement, and an aperture has been made in the wall, so as to put the room that contains them in communication with the vaults. These latter already contain a large number of tableaux that are much admired by the visitors, and here is another added that is none the less interesting. The steam generator is not visible, but is in a neighboring hall. To the right of the motor, and against the wall, is seen a Bourdon lubricator. Upon coming from the boiler the steam traverses this, and thus becomes charged with the lubricant necessary to keep the rubbing parts in good working order. In the rear, opposite the visitor, is situated a switch board for the different circuits that start from the dynamo at the left (Fig. 2). We shall now pass rapidly in review the principal elements of the plant.

The boiler, which was constructed by Collet & Co., produces 2,200 pounds of steam per hour. Its heating surface is 65 square yards, and the grate surface is 2 square yards. It occupies a ground area of 5¾x7 feet, and does not exceed a yard in height. This type of multitubular generator is of very original construction, by reason of the arrangements adopted for grouping and fixing the vaporizing tubes. The extremity of these is slightly conical in shape, and they are closed by conical plugs, against which they are pressed by a long bolt that traverses them. It thus becomes very easy to remove or replace a tube. The tubes communicate with each other through vertical boxes provided with partitions and internal tubes of thin sheet iron, thus permitting the steam to be freely disengaged without carrying along any water. A special drier placed upon the top of the boiler perfects the drying, and water is thus prevented from entering the engine. The product of this boiler may be estimated at 9 pounds of dry steam per pound of coal burned. The motor was constructed by Messrs. Lecouteux & Garnier. The piston is placed vertically at the top of the frame, and distribution is effected by means of a circular valve. Its power is that of 50 horses. It is very carefully constructed, and all its parts are so grouped as to occupy as small a space as possible. The total height is 8 feet, and the greatest width 4. As the velocity is 300 revolutions per minute, all the parts subject to friction are of steel, and adjusted by grinding. The regulator is something new, and is of the builder's inventing.

It is not visible upon the engine, since it is mounted upon the internal part of the fly wheel, which serves at the same time as a driving pulley. It is shown in Fig. 1. It is based upon a displacement of the eccentric, which is mounted, as usual, directly upon the shaft of the fly wheel; and, as may be seen at E, it contains an aperture that allows it to move in a straight line at right angles with the shaft. In this motion it is guided by a slide fixed upon the fly wheel, and is connected by two stiff rods with a weight on the one hand, and, on the other, with a piston filled with oil that has the effect of a hydraulic brake. Finally, the weight is kept in a given position by means of a spring, A. When the engine is running, it is clear that the weight will, through centrifugal force, tend to get so much the

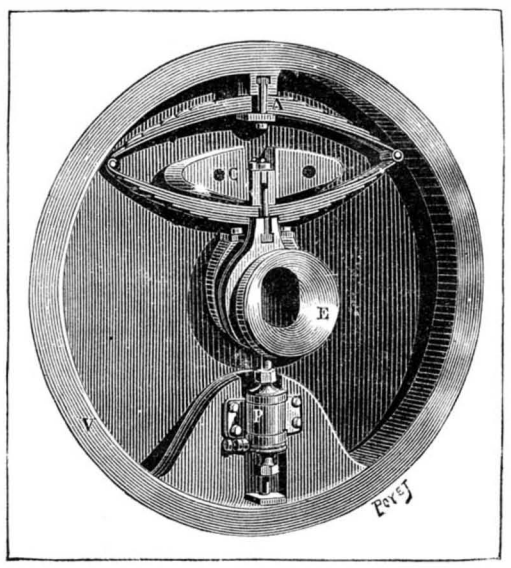



Fig. 1.—THE LECOUTEUX REGULATOR.

farther from its original position in proportion as the velocity is greater. It carries along the Canquel eccentric with which it is connected, and this motion has the effect of modifying the radius of eccentricity, and consequently the operation of the valve, that is to say, the periods of admission, compression, and expansion of the steam. The effect of the spring is to bring back the weight to its normal position as soon as the velocity diminishes; and all abrupt motions are avoided through the effect of the piston brake. This regulator has given good results.

The dynamo machine is of the Edison system, with straight electro-magnets. It is of recent construction, and is the only type of the kind that at present exists in Paris. Its velocity is 900 revolutions per minute, and under such conditions it is capable of supplying 400 16 candle lamps, the constants of which are from 100 to 110 volts and 0·75 a., or ¾ ampere. Its total height is 5 feet, and its greatest width, inclusive of the transmitting pulleys is 7.

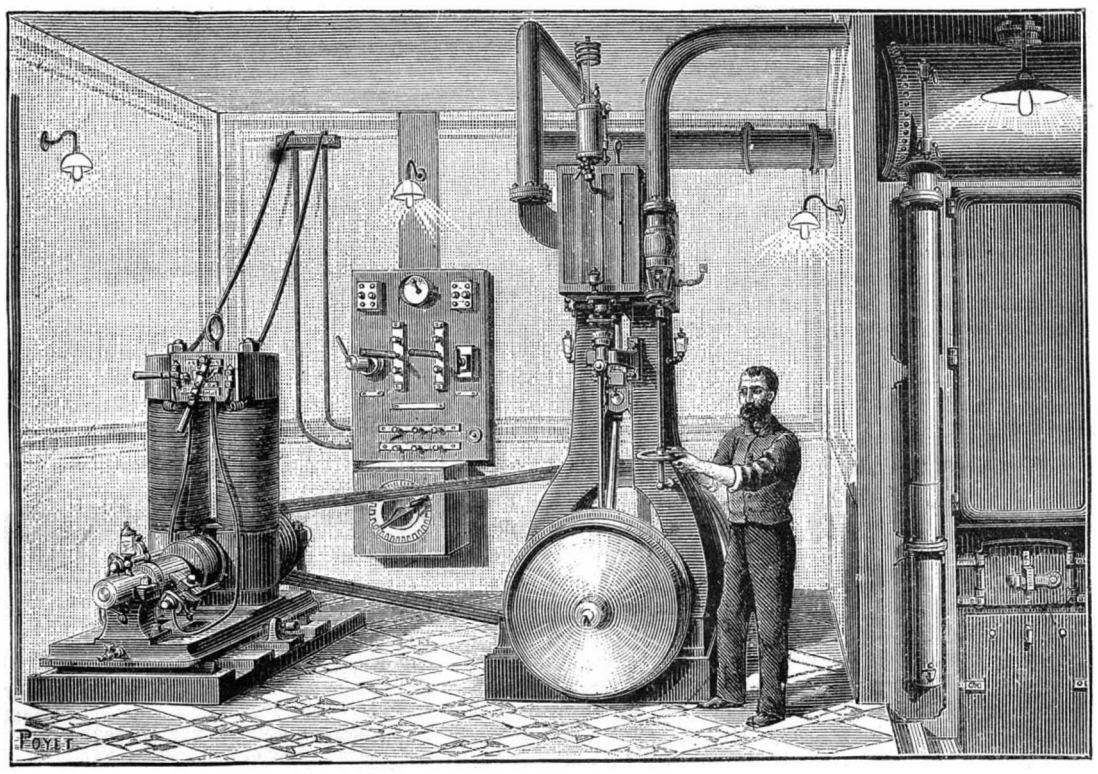



Fig. 2.—ELECTRIC WORKS OF THE GREVIN MUSEUM.

Three circuits start from the dynamo and run to the switch board in the rear of the engine room. One of these serves to supply 54 basement lamps, 28 of which are of 16 candle power and 26 of them 8 candle. These light the "History of a Crime," the "Burial of a Chartreuse," "Mr. Pasteur's Laboratory," the "Ruins of Ischia," etc. The other goes to the upper stories, where are located the offices, the sculpture, modeling, and dressing rooms, etc. Finally, the third goes to the ground floor, where it subdivides into secondary circuits that all start from a tableau near the cloak room. Two of them supply the Cance lamps, and for this reason traverse resistances formed of two German silver wire bobbins, that permit of regulating the current when it starts from the tableau.

Each of the other secondary circuits is especially designed, either for the chandeliers of the halls of the ground floor, or for one or several of the groups placed therein. Each part is thus rendered independent, and, according to the hour of the day and the needs of the service, it is possible to light up at the proper spot by means of a communicator placed at the origin of each circuit. Besides, it is possible to put out any one lamp by unscrewing the plug of the circuit cutter placed alongside of it.

The total number of lamps now in service is 170 of the type A and 204 of the type B, representing in all 4,350 candles. The force of the machine permits of lighting more if necessary, either for the service of the museum, or for lighting up neighboring establishments.

This plant has merited a notice because it shows perfectly the facility with which the electric light adapts itself to lighting of all kinds, and particularly the advantages that can be obtained from it from a decorative point of view.—*La Nature.*

### The Recession of Niagara.

Sir Charles Lyell, in 1841 and 1842, estimated the gradual recession of Niagara Falls by the undermining of its brink at the rate of about 1 foot per annum. Recent investigations of the subject by a commission for the establishment of a State reservation at the Falls have, however, shown that this and other estimates are more or less erroneous. A map, based on surveys of the Falls made in 1883 by Mr. Thomas Evershed for the New York State Surveyor, has shown that in the forty-one years ending 1883 the annual rate of maximum recession has been 6⅙ feet. For the eight years ending 1883 this rate is given as 16½ feet, so that the rate of recession has been higher of late. These results were obtained from the Canadian Fall, while the American Fall was found to have receded at the rate of 10 inches per annum during the forty-one years ending 1883. It has been shown by the surveys that these two falls were once united; and that, supposing the rate of recession to continue, the Niagara gorge will be cut through in some 10,000 years. Lyell's estimate was 35,000 years. Of course these attempts to calculate the cutting of the entire gorge, which terminates at the heights near Lake Ontario, assume that the hardness of the shale and lime rocks, volume of water, and height of the fall, continue much the same as they are now.

### An Iron Cement.

Usually, certain proportions of pulverized sal ammoniac in crystals, sulphur, iron filings or drillings, and urine or water has been deemed as quick and adhesive a cement for two iron surfaces as any that could be made. But this mixture sets slowly and requires days—or weeks—to get in its perfect work. The object of this cement is to oxidize the surfaces of the iron so that close contact will unite the rust, and thus hold the two surfaces as one. Natural specimens of oxidizing of iron as cement are not uncommon. Almost all specimens of bog iron ore show aggregations of iron by rust; sometimes quite large masses being held in one firm embrace by this means; the writer saw in Nova Scotia lumps of bog iron ore aggregated by rust so that there was a conglomerate globe of separate globes of at least thirty inches diameter. In fact, the "rusting" of joints is an old trick with mechanics.

But in place of sal ammoniac let the jointer use chloride of lime, one of the common disinfectants, and the fixity of the joint will surprise him. Two joints of three inch cast iron pipe, with flanges sufficiently wide to take in ¾-inch bolts, were secured with a mixture (in the usual proportions) of cast iron filings, water, and chloride of lime. The actual proportions were: fine filings, 10 parts; chloride of lime, 3 parts; water, enough to mix to a paste. These joints were bolted together after the mixture was placed between them, and after being left one night, when broken apart the cement scaled off a portion of the solid iron of one of the flanges.

This cement has stood the action of sixty pounds of steam in a pipe connection to a steam boiler where rubber glands and canvas and white lead failed.

## ENGINEERING INVENTIONS.

A steam actuated valve has been patented by Mr. John S. Bartlett, of Akron, O. This invention covers a novel construction and combination of parts for a steam actuated slide valve for steam engines, in which there is a long hollow piston, working in a cylinder immediately over the top of the slide valve.

A car coupling has been patented by Mr. George J. Ferguson, of Greenville, Texas. The invention consists mainly in a special construction of coupling device in combination with a spring for holding it to the opened or closed position, and co-operating with the same for automatic action, the ordinary link being used, and the draught being taken in the same way as by the common pin.

A car coupling has been patented by Mr. Otto C. Meusebach, of Marion, Tex. The drawhead has a raised portion in the bottom of its cavity, a shaft journaled in the drawhead extending to the sides of the car, and having a tongue with its ends bent and provided with weights, a lever being pivoted on the top of the car, with a rod connected therewith and with one bent end of the shaft.

A car coupling has been patented by Mr. Winslow Forbes, of Riverhead, N. Y. This invention covers a novel construction by which cars may be coupled or uncoupled without requiring the trainmen to go between them, and the device is of such a nature that, by providing a special link socket and pin hole, cars may be coupled to other cars having the ordinary link and pin drawhead.

A grate bar has been patented by Mr. Joseph B. Miller, of Wilkesbarre, Pa. It is made with perforated and grooved top plates having narrow spaces between their adjacent ends and cast upon lugs cast upon the supporting ribs, whereby air can circulate freely through and around the top plates, and the whole so made that the grate bars will not be injured by expanding and contracting when heated and cooled.

A car coupling has been patented by Mr. Thomas L. McKeen, of Easton, Pa. The drawhead has longitudinal guides, and a grooved, spring pressed follower, there being also other novel features, the invention being intended mainly to improve car couplers formerly patented by the same inventor. Another coupler also patented by the same inventor provides mainly an attachment for a sliding block which relieves the coupling pin of friction when being lifted, and supports it when raised, with a stop to prevent it from being wholly withdrawn from the drawhead.

## MECHANICAL INVENTIONS.

A lathe has been patented by Mr. Jackson O. Haas, of Hepler, Pa. The principal feature of this invention consists in providing a lathe with two stationary center plugs, so that the face plate or spindle of the lathe is not affected by the weight of the work placed between the two stationary pointed center plugs.

A lathe chuck has been patented by Mr. Calvin Wilson, of Caro, Mich. Combined with a centrally bored body having a slanting hole in its side, is a centering rod, spring, and pin, fitted to the slanting hole, with other novel features, the invention being more especially designed to facilitate the holding of work in a watchmaker's lathe.

## AGRICULTURAL INVENTIONS.

A rotary harrow has been patented by Mr. James R. Hicks, of Kansas City, Mo. This invention covers a novel construction, intended to keep corn or cotton stalks down among the harrow teeth, to break them and prevent their running up through the harrow, and also so to hang a pair of harrows that either may remain fixed on the ground while the other revolves around it in turning corners.

## MISCELLANEOUS INVENTIONS.

A wheel guard has been patented by Mr. Alma B. Cole, of Kingston, Ill. It consists of a metal frame with its top curved down toward the rear, upwardly projecting bars and a sheet metal covering, to prevent persons being killed or mutilated by the wheels of street or railway cars.

An automatic fan has been patented by Mr. Alister M. Richardson, of Charleston, S. C. This invention consists mainly in pivoting the standard in which the frame is pivoted so as to permit of adjusting the standard at different inclinations, being an improvement of a former patented fan of the same inventor.

A school desk has been patented by Mr. Elgin R. Shepard, of Northfield, Minn. By this invention the seat may be tipped to a vertical position, the back of each seat used as a receptacle for books and as a desk for the next seat behind, an arm rest is provided that may be folded out of the way, and the seats may be folded out of the way when not in use.

A still has been patented by Mr. Martin V. Monarch, of Owensborough, Ky. The object of the invention is, by a simple construction, to efficiently extract the volatile oils, especially fusel oil, before such vapor reaches the flake stand or condenser, together with other deleterious substances, and to conduct them back to the stills.

A siding gauge has been patented by Messrs. Leander C. Benson and Eugene F. Perry, of Susquehanna, Pa. It is a tool formed with two flat tongues that can be slipped up under the siding nailed to the building, and held in position by a cam-shaped holding blade, that cuts into the siding board against which the tool is placed.

A repeating watch has been patented by Messrs. Charles Morlet and Eugene Dupuis, of New York city. This invention is for simplifying the construction of repeaters, so fewer parts will be required, so the striking mechanism can be driven from the main spring and can be easily removed, and to materially reduce the cost of the watch.

A gas check for fire arms has been patented by Mr. John E. Tyler, of Roxobel, N. C. This invention covers a special construction and arrangement of parts to provide a means for preventing gas generated by the discharge of a cartridge from escaping through the space between the adjacent ends of the cylinder and barrel.

A thill coupling has been patented by Mr. Abijah L. Romans, of Sinclairville, N. Y. Combined with an axle clip is a spring held thereon, and a latch pivoted to the clip and acted upon by the spring, the latch preventing the withdrawing of the bolt, the object being to securely couple the thills and prevent rattling.

A burial vault has been patented by Mr. Leonard Dydynski, of Buena Vista, Ohio. This invention provides a special construction for a vault of stone or other indestructible material to be air and water tight, and with such locking that the lid cannot be taken off without breaking the slabs composing the vault.

A machine for making fellies has been patented by Mr. Henry D. Jeffrey, of Winona, Minn. Combined with a cutter head is a standard and gauge rod held parallel with the plane in which the cutter head revolves, with other novel features, to form seats on the inner edges of fellies, or on any stick around the mortises in the fellies.

A cork cutting machine has been patented by Mr. James L. Murphey, of Pittsburg, Pa. It has a sliding and revolving tubular shaft through which a rod passes loosely, a pivoted lever on which a cam acts being connected with the rod, the machine being adapted for cutting cylindrical and tapering corks, feeding itself and ejecting the corks.

A burglar alarm has been patented by Mr. Frederick D. Hill, of New York city. It has an angular plate carrying a clockwork with a bell, with an arm on its escapement post to engage with a pin attached to a pivoted lever connected by a rod and band and pulleys with a roller, whereby a movement of the window sash can be made to spring the alarm.

A wagon gearing has been patented by Mr. Henry Seeman, of Durham, N. C. Combined with a wagon box or frame is a segmental guide held on its under side at each end, axles being held against the outer edges of the guides by clips, and curved braces or bars uniting the axles, so no king bolts are required, and the wagon can be turned very short.

A bark mill has been patented by Mr. John McKendrick, of New York city. It is for grinding and reducing bark for tanners' use, and besides a rotary cutting cylinder with removable teeth, has a feed cylinder and pressure roller, both held to their work by springs, and the latter holding the bark in position upon the cutting or face plate.

A sign board has been patented by Messrs. William H. Bushnell and William H. Van Gilder, of Perrysville, O. It is of sheet metal or covered therewith, on which metal or other raised letters are to be used, and so made that the letters are protected to a great extent from snow, rain, etc., and so water cannot leak between the board and its metal covering.

A culm bar has been patented by Mr. Silas M. Hess, of Bloomsburg, Pa. It consists of parallel bars united by cross pieces and perforated sections having on their under sides transverse lugs, so that the cooling bars are not liable to get hot enough to burn out, and in case one burns out it can be replaced very easily and an entire new bar is not required.

A drawer for drawing paper and documents has been patented by Mr. Alexander Russell, of Hot Springs, Ark. The front and a portion of the bottom are hinged to swing out of the way, and the bottom portion has a shoulder joint to rest on a portion of the drawer bottom to hold the door in position to serve as a paper rest.

A nut lock has been patented by Mr. Alfred Fisher, of Edwards, Miss. The nut has a plane-sided stud on its back, the lock plate having an enlarged slot at one end to permit the turning of the nut-stud when screwing home the nut, and there is a dog adapted to act against the nut to prevent backward movement of the lock plate, with a shoulder to enter the slot of the plate.

A hoop for barrels, tubs, etc., has been patented by Mr. James H. Bard, of Jackson, Tenn. It is made of wire, the extremities of which have a lock consisting of a bend of each wire and a coil of the extremities of the wire loosely fitting upon each side of the bend, together with a spacing sleeve, to adapt the same wire hoop for different sizes of barrel or different sections.

A churn has been patented by Mr. Eli H. Wood, of Cherry Valley, Mo. Combined with a cream tub and frame is a rocking shaft having a rack on one end and cross piece on the other, the ends of the cross piece being connected with foot levers pivoted on the frame, and the rack engaging with a beveled pinion on the upper end of a shaft journaled in the top plate of the frame, its lower end receiving the dasher shaft.

An apparatus for concentrating ores has been patented by Messrs. Howard C. and James A. Henderson, of Cherokee, Iowa. It consists of an outer tank, an inner filtering tank with fabric ends, with perforated feed box and other novel features, to save and concentrate the light and fine particles of ore, such as sulphurets and chlorides of silver and gold, now frequently carried away with the waste water.

A cotton harvester has been patented by Mr. Charles L. Walter, of Boston, Mass. This invention covers a novel construction and combination of parts of a machine to enable the cotton to be picked from the plants and delivered to bags without damage to the picked staple or to the cotton bolls remaining on the plants, the machine to be drawn by one or two animals walking between the rows of plants.

A means for securing glass or mica in sheet metal structures has been patented by Messrs. Charles A. Fletcher and William H. Wilder, of Gardner, Mass. This invention covers a novel metal plate with a frame composed of open belts or bands united with the main portion of the plate by flexible lugs or projections, forming a yielding receptacle for glass or mica, more especially intended for securing mica in the chimneys of oil stoves.

A faucet has been patented by Mr. Henry P. Drew, of New York city. Combined with the stock, plug, spring, and screw plug, are a washer and screw, and the faucet is so made that the plug springs can be readily adjusted as the pressure to which the faucets may be exposed may require. The same inventor has likewise patented a cock for gas, steam, and water fittings, as an improvement of one of his former patented inventions, so that such cocks will be more convenient to use and less liable to break or get out of order.

## NEW BOOKS AND PUBLICATIONS.

PRACTICAL AND ANALYTICAL CHEMISTRY, BEING A COMPLETE COURSE IN CHEMICAL ANALYSIS. By Henry Trimble, Ph.G. Philadelphia: Blakiston, Son & Co., 1885.

The field of elementary chemical analysis is already very well occupied. What the analyst really needs most is a more advanced and complete work, such as a younger Fresenius would write; but still, there is always room for any book which presents even the elements in a simpler and more compact form, and such has been the purpose of the author of the present volume. The great secret of successful analytical work is the cultivation of accuracy in the various chemical manipulations, for it is this faculty alone which will yield trustworthy results. Many a student whose theoretical knowledge is unimpeachable fails utterly in practical work, because he lacks this requisite delicacy of touch, which seems almost to be intuitive in the born chemist. Professor Trimble has therefore done wisely in introducing his subject by a short preliminary course on the different operations of filtration, evaporation, ignition, etc., which are to form so important a part of the student's afterwork. The main body of the book is devoted to qualitative determinations. A few new features have been introduced in the grouping of the elements, but for the most part it follows Galloway and the older chemists. In this respect, indeed, any radical change is hardly possible. The merit of such a work must depend almost entirely upon its arrangement and material excellence. The third division, on quantitative analysis, is too fragmentary to be of much value. It is a book which will be found very useful where but little time can be devoted to the study of analytical chemistry, for it has been made admirably clear and compact, and these qualities will recommend it highly to a busy student.

THE AMERICAN ENGINEERING REGISTER. Lewis M. Haupt, A.M., C.E., editor. New York: *Engineering News* Publishing Company, 1885.

Some years ago, Professor Haupt began the practice of publishing a register which gave the names, occupation, and address of his own students in engineering who had graduated at the University of Pennsylvania; and though intended only for private circulation, it proved so very useful as a means of communication between the members of a profession necessarily widely separated that this larger work, including the whole brotherhood of American engineers, cannot fail to be greatly appreciated. It purpose is the same. It is intended to furnish a ready means of communication between our large and increasing class of constructive engineers. The general alphabetical list contains the names of all who could be reached, and though in this first issue there are doubtless many omissions, the system followed by the editor promises in time to render the register very complete. Classified lists are given in addition, so that the same names which appear in the general list also come under their appropriate heading. The value of the work is increased by the insertion of some of the fundamental formulæ in use by the several groups of engineers. An alphabetical list of American railways and the names of their chief officers is also added, and will be useful to engineers interested chiefly in locomotion. Professor Haupt's position in the engineering world, and his large acquaintance among members of the profession, eminently qualify him for the work which he has undertaken. With the co-operation of his fellow engineers, the register will become undoubtedly an authoritative reference, and the careful work already done has placed the profession under obligations to its editor.

A PRACTICAL TREATISE ON THE CONSTRUCTION OF TALL CHIMNEY SHAFTS IN BRICK, STONE, IRON, AND CONCRETE. By Robert M. and Francis J. Bancroft. Manchester: John Calvert, 1885.

The authors of this neat little treatise have acted on the principle that experience is the best teacher; and aside from a brief introduction on general questions of foundation, strength of materials, and requisites of good chimney construction, they have devoted their space to the description of shafts already constructed, and of various problems connected with straightening, moving, and demolishing, which have been solved in different localities. The examples selected are naturally for the most part English, but a number of American structures and a few on the Continent have also been described. American engineers will occasionally be amused at the indefiniteness of the information about localities on this side of the water, such as the statement that a foundation of piles was used for an iron chimney constructed *at* Ohio, U. S. A., but on the whole they will find much to interest them. The American shafts selected by way of example include the principal ones of any great height, such as that of the Merrimac Manufacturing Company, at Lowell, Mass., which is 282 feet, and of the Amoskeag Manufacturing Company, at Manchester, N. H., 255 feet. The descriptions are all brief and clear, and give usually just about such information as one would wish. In a number of cases the cost of construction has also been given, which, in spite of the wide variations in the price of material and labor, will be of value as offering a basis of comparison and estimation. The book is illustrated with 82 diagrams.

# Notes & Queries

HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

**Special Information** requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Minerals** sent for examination should be distinctly marked or labeled.

(1) R. P. asks: 1. The process of preparing photographs from pictures or natural scenery for use with a sciopticon or other magic lantern? A. They are usually copied, and a print is made from the negative to form a glass positive. 2. How the balsam is applied which causes adhesion between the photo and the protecting glass, without interfering with the requisite transparency? A. Balsam is not generally used in lantern transparencies, but you can place a small quantity of balsam in the middle of your glass, and then press down the glass cover upon it, squeezing out the surplus. The common way of applying covers to transparencies is to separate the two glasses by means of a paper mat, and then seal the edges with a strip of gummed paper. 3. How the colors are made of the necessary transparency? A. Transparent colors mixed with varnishes are employed for covering lantern transparencies, and some of the colored lacquers are used to advantage for this purpose.

(2) S. I. D.—To make ginger pop: Take 5½ gallons water, ¾ pound ginger root bruised, ½ ounce tartaric acid, 2¼ pounds white sugar, white of 3 eggs well beaten, 1 small teaspoonful lemon oil, 1 gill yeast; boil the root for 30 minutes in 1 gallon of the water, strain off, and put the oil in while hot; mix. Make over night; in the morning skim and bottle, keeping out sediment.

(3) J. L. asks how salmon is smoked. A. If the fish is salt, it is soaked for 24 to 30 hours, in order to remove the saline matters. It is then allowed to drip, and finally hung as high as possible in the smokehouse. The latter may be of any size, from a barrel up. The heat is generated from a smouldering fire of sawdust from some hard wood, such as cedar or hickory. The length of time depends upon the weather, condition of the fish, etc.

(4) C. M.—The introduction of steam into a pipe of natural gas would have no beneficial effect further than the absorption of such of the elements as have an affinity for water. Probably the steam in condensing would absorb ammonia. You would have to provide appliances for getting rid of the water of condensation. Mixed steam and gas, if combined as a jet, might be of value. Gas with 200 pounds initial pressure can be conveyed fifty or a hundred miles, and delivered at 10 pounds pressure with properly arranged pipes. Friction is in proportion to surface of pipe and velocity of current. The larger pipe will have less friction in proportion to the quantity delivered under a given velocity.

(5) E. H. R. asks how far an object on the surface of a level plane can be removed from a man before the curve in the earth's surface makes it invisible. A. The depression of the curve of the earth's surface is for 2 miles 2·67 feet, 3 miles 6 feet, 4 miles 10·67 feet, 6 miles 24 feet, 10 miles 66 feet, 15 miles 150 feet.

(6) W. C.—"Wing and wing" is sailing with the wind, with sails on opposite sides. Lateen sails are triangular in shape, carried by a long yard slung about one-quarter its length from the lower end. See "Galley" in Webster's dictionary. In a catamaran set the mast forward of the center for convenience of handling the sail.

(7) E. J. P. asks a definition and explanation of each of the following terms and figures used in the manufacture of steel boiler plate: 60,000 tensile strength, 25,000 to 28,000 elastic limit, 25 to 30 per cent elongation of area, 50 to 55 per cent reduction of area. A. 60,000 tensile strength is the breaking weight of a square inch of the metal. Thus, if a strip of boiler plate 1 inch wide and ¼ inch thick parted at 15,000 lb. pull, it would be called of 60,000 pounds tensile strength. The elastic limit is the number of pounds that a square inch will sustain without taking a permanent set, or in other words will spring back to its original length after removal of load. Elongation of area is the percentage of stretch of the gauged area or neck of the piece under trial, and indicates the homogeneousness of structure. Thus, if the elongation is even along the whole neck, the percentage will be large, and shows good quality, whereas if the elongation takes place at one point or with a sudden depression, it shows uneven texture—a faulty quality. The reduction of area shows the tenacity or toughness of the metal, and is indicated by the amount of the area of the neck at the line of parting as compared with its original size, and is measured in percentage by the amount of the reduction. Thus 55 per cent is a reduction of more than one-half of the area before the neck parts.

(8) H. H.—All parts of the periphery of a wheel move with the same velocity around its center. The top moves along the road twice as fast as the axle. The bottom does not move, unless the wheel is said to slip. This becomes self-evident by a practical trial of a small wheel on a table. All parts of a shaft move by its revolution. The center or axis of a revolving body or shaft is an imaginary line around which the body revolves. It has no breadth and no depth, and consequently has no physical existence. It therefore does not move.

(9) O. R.—For browning gun barrels: Wet a piece of rag with antimony chloride, dip it in olive oil, and rub the barrel over. In 48 hours it will be covered with a fine coat of rust. Rub the barrel with an iron scratch brush to the desired tint, and wipe with linseed oil.

(10) A. W. E.—Better use 16 wire on your armature and 14 on your magnet for larger machine. We cannot give the exact number of pounds of wire required. Such a magnet as you describe should support 150 pounds, if wound with No. 16 wire. The attractive force of a magnet is inversely as the square of the distance, so that at a distance of 1 inch it would be small.

(11) C. H. B.—For a short telephone line use an ordinary battery call. It is efficient and inexpensive. For a long line use a magneto call. It may be purchased at a small expense. We are unable to refer you to anything simpler than the call described in SUPPLEMENT, No. 162.

(12) W. M. asks: How many cubic feet of loose air will 1 foot of compressed air make at 100 pounds pressure? A. 13 cubic feet.

(13) G. S. would like to know from what kind of skins kid gloves are made. A. In Germany and Austria lambskins are largely employed; in France kid skins are used principally, and always for the best qualities.

(14) F. G. B. desires to stain articles made of spruce a bright yellow? A. Either of the following will answer: 1. Brush over the wood with the tincture of turmeric. 2. Warm the work, and brush it over with weak nitric acid; varnish or oil as usual. 3. A very small bit of aloes put into the varnish will give a rich yellow color to the wood.

(15) W. A. C.—A white precipitate produced by silver nitrate in drinking water is indicative of the presence of chlorine, and suggests contamination with sewage. The proper application of the test is described in the "Sanitary Examination of Drinking Water," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 462.

(16) B. T. E. asks a cure for a young horse with a wart near one eye. A. Tie around the wart as tightly as possible with a thread or horsehair until it rots away.

(17) B. S. writes: I have a telescope with which I want to make observations of the sun. I had thought of covering the object glass with a plain smoked glass, but thought you could tell me of something better. A. Place over your eyepiece a smoked glass, or, better yet, a piece of so-called black glass, which by strong transmitted light appears red, blue, or green.

(18) L. H. A. asks (1) if there is any cure for freckles, and what is it? A. Use the following:

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|---|---|
| Sulphocarbolate of zinc | 2 parts. |
| Distilled glycerin | 25 " |
| Rose water | 25 " |
| Scented alcohol | 5 " |

Apply twice daily for from half an hour to an hour, and then wash off with cold water. 2. What may be put in stereotype moulds to harden and not break them? A. See the "Stereotype Process," described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, under title of "Electro Metallurgy."

(19) J. W. L.—Caterpillars may be destroyed by spraying a solution of petroleum soap over the tree. They may be prevented from crawling up the tree by a girdle of cotton wool surrounding the trunk. The spindle of the microscope table is usually provided with a collar, which is adjustable up and down on the spindle and fastened with a set screw.

(20) J. H.—For repolishing a glass eye use the finest jeweler's rouge on a piece of soft leather with water.

(21) B. R. asks (1) how to prepare his own dry plates for instantaneous photography. A. Consult Abney's book on "Gelatine Emulsions," also Dr. Eder's work on "Modern Dry Plate Photography." 2. What developer should be used? A. Beach's potash developer, as per formula in the August 2, 1884, issue of the SCIENTIFIC AMERICAN; or the carbonate and sulphite soda developer as prepared by Cramer of St. Louis, Mo.

(22) C. W. H. asks for a wire to protect oysters and mussels in the sea. A. We know of nothing better and cheaper than galvanized wire.

(23) P. A. asks: 1. Is the distillation of wood an important industry? A. All of the acetic acid of commerce is obtained in this manner. It is therefore an important industry. 2. What woods do they distill? A. Most woods can be used, but the harder varieties are generally employed, such as the oak, birch, beech, ash, etc. 3. How many arrobas (25 pounds) of purified acetate (acetato), suitable for use in the arts, do they distill from 100 arrobas of the wood? A. From 1½ to 3½ per cent of crude pyroligneous acid is obtained, which is subsequently purified, thereby reducing the amount. 4. What is the price of the purified acetate per arroba? A. About 2 cents a pound (50 cents an arroba). 5. Is not the distilled wood useful for domestic purposes? A. The wood is sold as charcoal. Wood naphtha is likewise obtained, and the combustible vapors are used as fuel. Very full information on this subject is given in the article on acetic acid in Spons' Encyclopedia of the Industrial Arts and Manufactures.

(24) F. O. B. asks: 1. What kind of cement is there for mending rubber garden gloves? A. Use rubber cement. A formula for its preparation is given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158. 2. How to polish ivory, pearl, and bone, such as fans are made of? A. Ivory and bone may be polished by rubbing first with glass paper, and then with a piece of wet linen cloth dipped in powdered pumicestone. This will give a very fine surface, and the final polish may be produced by washed chalk or fine whiting applied by a piece of cloth wetted with soap suds. Pearl is treated with finely powdered pumicestone, and then putty powder and water. As a cement use 1 part isinglass and 2 of white glue dissolved in 30 of water, strain, and evaporate to 6 parts. Add one-thirtieth part of gum mastic, dissolved in one-half part of alcohol, add 1 part of zinc white. When required for use, warm and shake up. 3. What will take stains out of satin fans? A. It depends on the nature of the stain. See table in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(25) C. H.—Cerin is the waxy substance extracted by alcohol or ether from cork. The same term is applied to that portion of beeswax soluble in alcohol. We know of no animal fat having this name.

(26) C. E. C. asks: 1. How shall I clear the room of the vapor of bromine, and the length of time required? A. The room must be ventilated by opening the windows and doors before any one is permitted to enter. 2. Are the fumes injurious to persons? A. The fumes when inhaled produce great irritation, and affect the eyes very painfully. 3. Will it destroy water bugs and roaches, etc.? A. Life cannot exist where the fumes penetrate; suffocation ensues, and so it is supposed that all forms of insect life will be destroyed.

(27) C. W. B. asks (1) if there is anything that can be placed on zinc to keep paint from peeling off. A. Clean the surface with a strong soda water, wash clean, and apply with a woolen cloth a solution of hydrochloric acid and water equal parts for a few minutes, then rinse with water and dry. 2. Could there be sufficient power obtained from several coiled springs, if they could be wound up on the principle of a clock, to propel a light carriage? A. Yes, for a very short time. This scheme has been tried and found impracticable except as an experiment.

(28) C. F. asks: 1. What is the transparent waterproof glaze made of that is put on white oilcloth, such as is used for table covers? A. In a general way, the cloth selected is first coated with a weak solution of size, paint is then applied, which is rubbed down with pumicestone. Any waterproof and colorless varnish answers the purpose. 2. What is purple rubber stamp ink made of, and what will remove it from paper? Aniline blue or violet dissolved in water with a little alcohol and glycerin. It can be removed by bleaching agents, such as javelle water, chlorine water, etc. 3. Are the casings used by sausage makers the intestines of cattle? How are they prepared to preserve them? A. The intestines or guts are used. They receive no special treatment as far as we know. 4. Please give the common name of the inclosed plants; they grow wild by the roadside. A. No 1 is Panicum sanguinale, a variety of panic grass; No. 2, Plantigo major, or rib grass; No. 3, Polygonum persicaria, or lady's thumb; No. 4, Sisymbrium officinale, or blue-eyed grass; No. 5, Maruta cotula, or common May weed.

(29) F. J. K.—For a harness blacking, use boneblack 4 ounces; linseed oil, 2 ounces; sulphuric acid, ½ ounce; treacle, 2 ounces; gum arabic, 1 ounce; vinegar, 1 pint.

(30) E. W. asks what kind of mineral "stephanite" is, what its value is, and what used for? A. Stephanite is a sulphide of silver and antimony. Its value depends upon the amount of silver that it contains. It has no special use except as an ore of silver.

(31) A. C. B. desires a receipt for oiling shoes to keep them from cracking. A. One pint linseed oil, ½ pound mutton suet, the same quantity of beeswax, and a small piece of rosin. Heat sufficient to mix, and use when milk-warm with a brush.

(32) W. H. H.—Engravings and prints are bleached by immersion for a few minutes in water containing a little hyposulphite of soda.—The restoration of paintings is effected by dissolving a little common soda in urine, then add a grated potato and a little salt; rub this well over the painting till clean. Wash off in spring water, and dry with a clean cloth.—Running even a small number of electric lights by batteries is expensive and unsatisfactory.

(33) W. H. asks (1) the best method of burnishing brass. A. You will find the preparation recommended in answer to query 6 (SCIENTIFIC AMERICAN, April 4, 1885) to be an excellent material for burnishing brass. 2. Silver plating and burnishing same? A. Silver plating is fully described under the title of "Electro Metallurgy" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310. The burnishing is generally accomplished by rubbing the ware with brushes attached to a lathe in conjunction with some polishing powder. The one previously recommended can be used, or rouge alone. Pumicestone powder, crocus mastic, whiting, etc., are likewise employed. 3. A preparation for oil finish, and for reviving old work finished in oil? A. On page 193 of SCIENTIFIC AMERICAN, for April 18, 1885, you will find a furniture polish adapted to your wants.

(34) H. S. asks the botanical and common name of the within specimen. I find that the bark possesses tonic as well as laxative properties. Please state whether the bark, leaves, roots, or berries are used in medicine, etc., and for what purpose? A. The specimen sent is botanically called Rhamnus Californicus. It is a species of buckthorn. It bears a small berry-like fruit, with two or three berry seeds which have some resemblance to coffee, and they have been employed to some extent as a substitute for coffee. But if imperfectly roasted, the infusion is liable to produce colicky pains and vomiting. The bark probably possesses similar properties to the officinal buckthorn (Rhamnus catharticus) and to the California buckthorn (Rhamnus purshianus), which has been extensively introduced into medical use under the name of Cascara sagrada.

(35) K. asks for a cement to fix labels to tin boxes. A. Either of the following will answer: 1. Soften good glue in water, then boil it with strong vinegar, and thicken the liquid during boiling with fine wheat flour, so that a paste results. 2. Starch paste with which a little Venice turpentine has been incorporated while warm.

(36) A. C. B. desires the formula for indelible tracing paper. A. Transfer paper is prepared by rubbing the surface of thin post or tissue paper with graphite, vermilion, red chalk, or other pigment, and carefully removing the excess of coloring matter by rubbing with a clean rag.

(37) J. W. B. asks how fish food for gold fish is prepared. A. Their food is chiefly infusorial animalcules, with bread when in confinement. Another authority says: It is not good to feed them, as the food will only serve to render the water unfit for their existence, and if renewed every day, the water itself furnishes them with enough material for their sustenance.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

W. E.—The mineral is a quartz rock, and contains apparently no metal of any value.—A. G. C.—The material sent is ordinary clay, colored by iron. It has no value whatsoever.

# INDEX OF INVENTIONS

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**September 8, 1885,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

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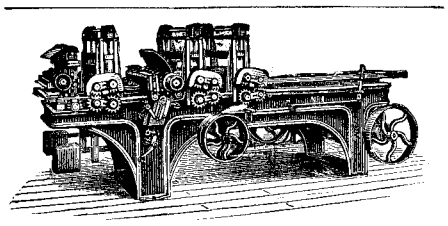



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