SCIENTIFIC AMERICAN

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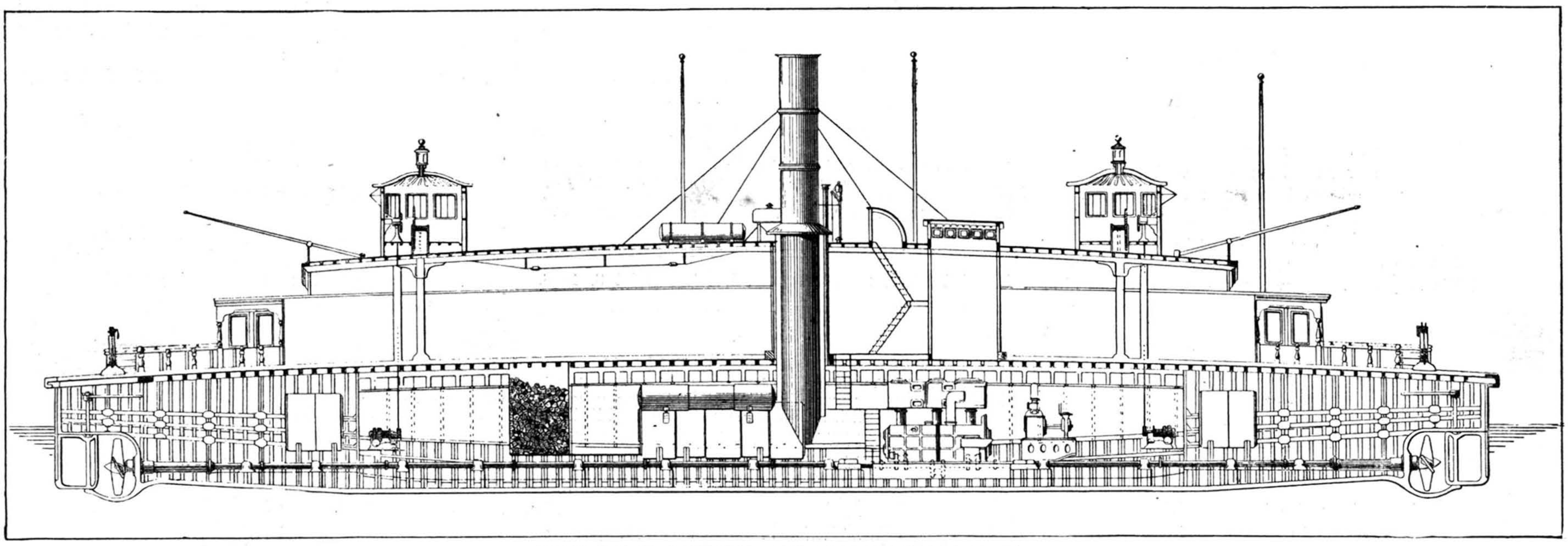
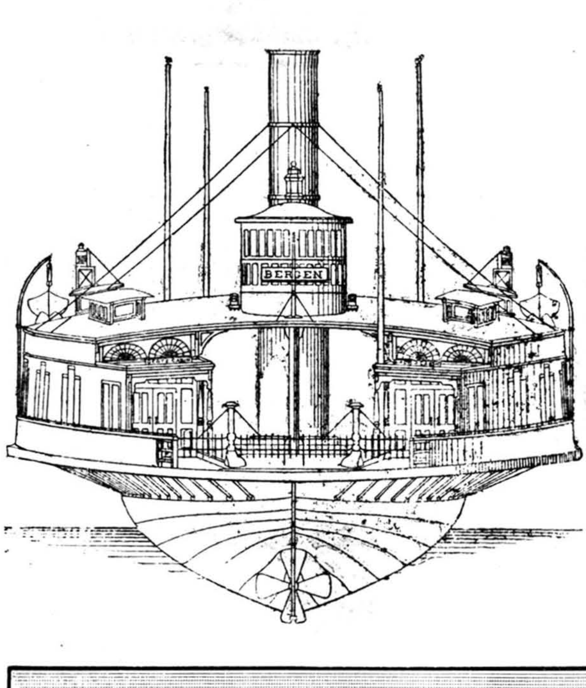
WEEKLY.

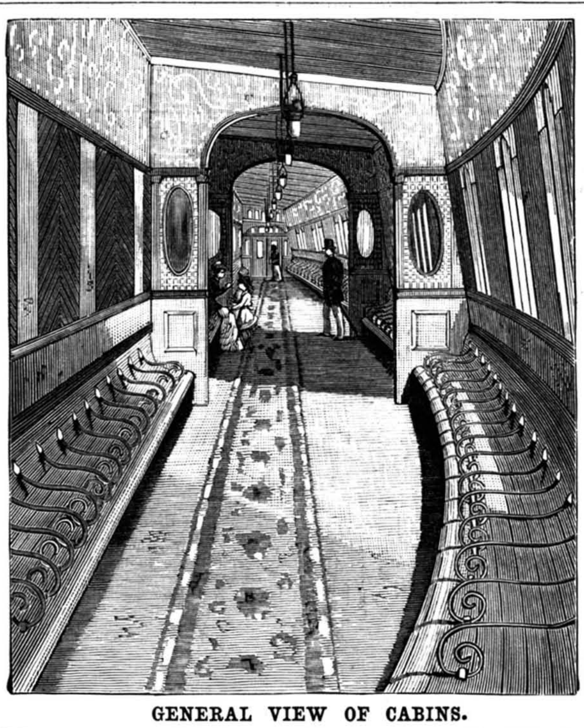
THE SCREW FERRY BOAT BERGEN.

In to-day's issue we illustrate the new ferry boat Bergen, recently launched from Thomas C. Marvel & Son's ship yard at Newburg, New York, and designed for service on the ferries of the Hoboken Land and Improvement Company of New Jersey. She is to ply between New York and Hoboken.

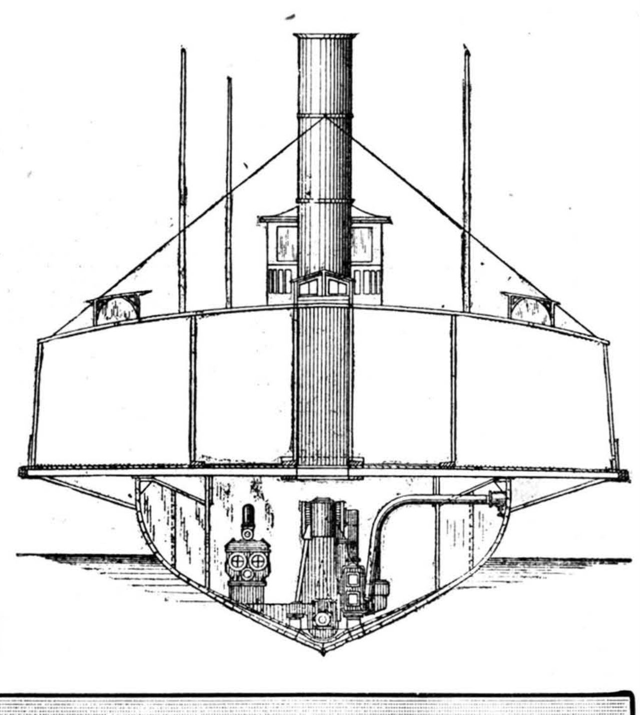
This boat represents a new type of vessel, and if the anticipations of the best judges are realized, she will effect a revolution in the ferry service of this vicinity. She is a double-ended boat, provided with a screw at each end. The shaft runs the entire length of the boat, so that the screws are rotated together, and cannot be driven independently. A single compound engine is provided for driving them. Several new points of advantage are obtained by the adoption of this type of vessel. The engines and boilers are all under the deck, so that much room is saved in the central trunk. In the new vessel this portion will be about two-thirds the length of the corresponding structure in boats of the present type of side-wheeler, and will be two feet narrower. In order to still further utilize the space-saving possibilities of the last named feature of the system, the smoke stack, from the main deck to the

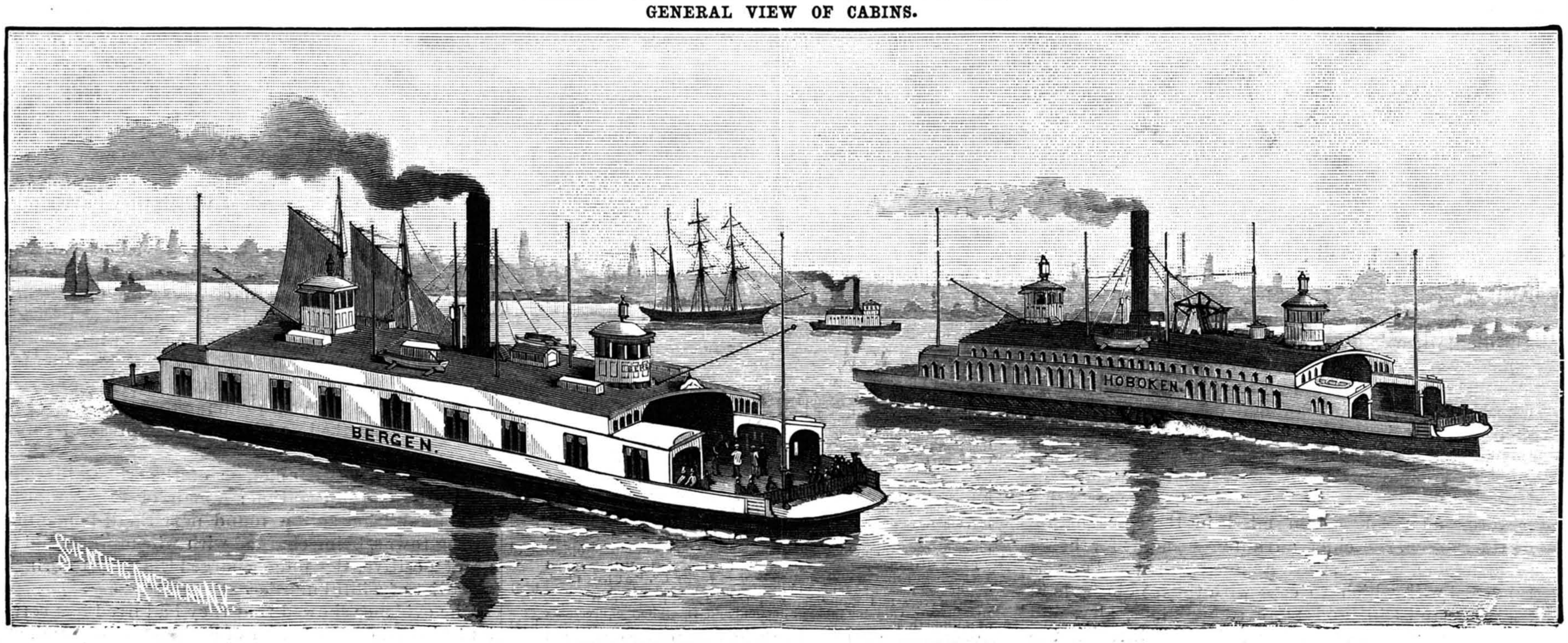






GENERAL VIEW OF CABINS.





THE SCREW FERRY BOAT BERGEN.

hurricane deck, will be elliptical in section, the long axis being parallel with the keel of the boat.

The effect of these changes will be to give 20 per cent more room for trucks and carriages. By abolishing side wheels, the large paddle-wheel boxes which now encroach upon the cabin spaces on either side of the present boats will be done away with, and unincumbered cabins will be provided. In this way the capacity for passengers will be increased 35 per cent.

But it is not only in these respects that the boat is expected to be an improvement on the old system. It has been found that ferry slips can be cleared of ice very advantageously by the use of a tug boat. This ice often forms to a very great depth, and paddle wheels are found quite inefficient in coping with it. A tug boat is driven into the slip until all the ice from its stern outward is expelled; it is then withdrawn and backed into the slip until the rest of the ice has been driven out. This has been found to be a most effective way of disposing of the trouble. Paddle wheels only drive ice twenty feet away, but the screw has a greater range of action. The new boat, with a screw at each end, both working in the same direction, will have a double effect. The front screw will create powerful water currents which will carry the ice toward the stern, and the after screw will supplement the work and send the ice out far into the stream. It is believed that even this one boat will play an important part in keeping the slips clear in winter for the other side-wheel boats that will run over the same route.

In order to be adapted to the requirements, the model presents certain peculiarities. A very clean run fore and aft is requisite, in order to give good water for the screws to work in, so that below the water line her model is very fine. On account of its overhanging guards and the crowds of people that it carries, and which are liable to crowd always toward the front end, a high initial stability is required in a ferry boat. The hull, therefore, as it rises swells out, so that for some distance above and below the water line it is characterized by exactly the opposite lines of those mentioned. The bow and stern, as she floats, will appear very full, while the model, further down, is a sharp one.

In general dimensions she is 200 feet in length, and 62 feet across her guards in extreme width. Her hull is 32 feet wide, and 17 feet deep. With engines and all in place, and her load of passengers on board, she will draw from 9½ feet to 10 feet. Her boilers, which are 8 feet in diameter and 23 feet long, are of tubular type, and will work at 160 lb. pressure. She has two furnaces, each one 3 feet 4 inches by 6 feet 9 inches. They will burn about 14 lb. of coal per square foot per hour. Her engine is a triple expansion one. It has one 18½ inch, one 27 inch, and one 42 inch cylinder, all of 24 inch stroke. The crank pins are of uniform diameter, because the engine will have to work as much in one direction as in the other. The shaft will vary from 8¼ to 8¾ inches in diameter. The screws, which were in place when she was launched, are 8 feet in diameter, and 9¼ feet pitch. In making them, both faces were made exactly alike, because they have to be worked first in one direction and then in the other. She is built of steel throughout.

In one of his papers read before the Naval Institute, Lieut. Zalinsky alluded to the use of ferry boats for harbor defense, stating that pneumatic dynamite guns might be mounted on them, and that such vessels would do good service against a hostile fleet. This new ferry boat emphasizes this suggestion. It has no paddle wheels to be damaged by shots or ramming. As will be observed, all its machinery is under the deck. By the addition of ballast it could be submerged still deeper, so as to bring most of it under the water line. Coal bunkers could be introduced on each side of the engine and boilers, to further protect them, while the guards could be used for the suspension of torpedo nets. The space included between the guards and the sides could be lined with cofferdam or other light resisting material as a species of armor. Should such measures be found necessary, she could readily have been made still more serviceable, a deflective deck could have been easily introduced, and the coal bunkers could have been disposed so as to protect her machinery.

The practicability of making use of the ferry boat type as a war vessel was abundantly proved in the late rebellion, when so many were called into active service. This new vessel would certainly be much more efficient if impressed into service than the old-fashioned paddle wheel type. With our present defenseless seaboard, such considerations are not wholly without weight, and the advantage of having a class of boats at our disposal that could be quickly converted into an efficient river fleet is not to be underestimated. Of course this feature was not borne in mind in the construction of the Bergen, the chief advantages sought for being greater room, higher speed, a more efficient and powerful vessel with which to cope with the ice blockade in the river and slip, and more commodious, airy, and handsome saloons, extending unbroken through the entire length of the boat.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 675.

For the Week Ending December 8, 1888.

Price 10 cents. For sale by all newsdealers.

ELECTRICITY AND PLANT LIFE.

From time to time, of late years, experiments have been made of the effect of the electrical light on flowers and plants, with results seemingly the same, to wit, feeble efforts of some plants to prolong their periods of bloom into the night and then premature decay. One has only to study their actions, as observed, to conclude that even plants need rest, or, to be more precise, they seem to thrive best under the conditions which Nature has imposed—the period of darkness and the period of the light, which is heat as well; or else that the family of plants, as now they are, sprung from these exact conditions, and will not thrive without them. It is the nature of some flowers, as every one knows, to open at one period of light and close at another; of others to open only at night and close before or at the moment when the orb of day tops the horizon. So strictly do some of these follow their unwritten laws, that floral clocks have been constructed, so that one may step out into his garden, of a bright day or clear night, and learn the time by the condition of bloom on the floral dial.

Prof. Wollney, of Munich, satisfied by experiment that electrical light will not advance or improve plant growth, recently tried the effect upon them of the current itself. We quote the following, being the means employed and its result:

He "took patches of ground 12 or 13 feet square, separated by boards penetrating the earth to the depth of a foot. In one case he applied two earth plates and interposed five earth cells; in another he inserted an induction apparatus; and in a third, a plate of copper at one side and a plate of zinc at the other side to form a natural battery. Peas, potatoes, carrots, etc., were planted on these and other patches, but the electricity, whether of high or low potential, seemed to have either no influence or a bad one upon their growth."

Plants being full of sap, and sap a fairly good conductor, every fiber must have been reached, and, so far as the Professor was enabled to perceive, the only effect of the current was to provoke a perturbation on the protoplasm.

"SCENES FROM A SILENT WORLD."

Behind prison bars there is a life little known for the curious phases of character, the strange moods and fancies, the result, not of imprisonment by itself considered, but of long-continued jailing among abnormal conditions—the despondency of hopelessness. Most of those with inclination and the time to study convict life have lacked the opportunity. Their visits to a State's prison have been under the guidance of officials, before whom all is made spick-span. On parade is the order of the day; the turnkeys put on their best manners, their charges are even more silent than is their wont. As well go a-ducking with a brass band ahead, or study an ant-hill in a thunder storm. A writer in the current number of *Blackwood's*, under the title quoted above, one who, indeed, seems to have had unusual opportunities to pursue such studies, declares that extraordinary revelations in human nature and in the possibilities of human destiny have been their fruit, and, with able pen and no little ingenuity, he has collated much evidence bearing directly upon the often doubted reasonableness of *lex talionis*.

There are those who have come into a legacy of vice, are criminals, not because they love the life especially, but because of the inclination inherited, who cannot keep straight, as he who has inherited a taste for liquor cannot keep aloof from it. These poor people, who come down from a long line of vicious ancestors, he has, and very naturally, much sympathy with. Had he chosen, he might have quoted Mr. Herbert Spencer to support him in his assertion as to hereditary vice, to prove that they came honestly by dishonesty, as one might say; and that entire unconsciousness of wrong-doing which he has observed them to possess, that belief that they are being punished unjustly, is, according to that eminent man, only the expression of that protest against civil and moral law that has come down the ages. Then there are those who have had time to repent their crime over and over again, who have been regenerated, so to speak, and move in that society against which they have sinned, more proof against offense.

But so long as they kept among vicious surroundings, so hopeless seems their fate, so cruel society, that they sink to the standard of those around them as water descends to its own level. The stages by which the real convict comes to his anomalous state of thought and action, the mental processes that lead him to a condition which, the author says, has no counterpart among that part of the human family not so restrained, is cleverly described and bears the impress of careful observation.

As to the unreasonableness of the criminal law, we will quote one illustration: A man of that low order, as to intelligence, often found near English manufacturing towns, being charged with wife murder, and the proof positive, the judge charged the jury to bring in a verdict of willful murder.

The evidence showed that they had lived in a sort of tent pitched on the border of a piece of moorland, and that for years he had done no labor, relying wholly upon the few weekly shillings she earned. He had been wont to beat her, and, upon coming out of an hospital, where he had been for rheumatism, he heard an evil report of her, and because of it beat her with unusual severity. But that he meant to kill her, our author denies, on the reasonable ground that without her, he would have to work for his own living. Therefore, though it was a murder, it could scarcely be called "willful," for it was not intended.

THE CELESTIAL WORLD.

VENUS AND MARS.

The principal feature of planetary interest during December is the approach of the planets Venus and Mars, the former gaining upon the latter, and overtaking him on January 2, 1889, at 7 h. 47 m. A.M., Venus being 40′ south at the time. The planets will not be visible at the time of conjunction, but will be near each other on the evening of the 1st, when Venus will be west of Mars, and also on the evening of the 2d, when she will be east of Mars. Both planets are moving eastward, Mars being in direct motion, slowly receding from the earth and approaching the sun. Venus is moving eastward, approaching the earth and receding from the sun. As she moves faster, on nearly the same track, she must overtake her rival. On the 1st they are 15° apart, on the 31st they are less than one degree, the difference in the time of setting being about six minutes. The rapid approach of the two stars will be easily discerned.

No planets in the system are more contrasted in tone and tint than Venus and Mars. The delicate pearly luster of the one and the ruddy hue of the other give a pleasing variety to the celestial picture that every evening adorns the southwestern sky, the two planets being the only "wanderers" among the countless throngs that glisten in the star depths. Our nearest inferior neighbor and our nearest superior neighbor hang side by side in the sky. They are simply stars to the unaided eye, the one the brightest starry gem the sky reveals, the other an unpretending ruddy star, his martial air and gorgeous coloring dimmed by distance, a king uncrowned.

How different is the picture revealed by the telescope! Venus is a sphere in gibbous phase, shining with an intense brightness, and surrounded by a dense atmosphere that hides her real face so completely as to leave but a faint hope that the impenetrable veil will ever be pierced by human eye. Her much talked of satellite is a myth and a nonentity. Even the time of her rotation on her axis and the inclination of her axis to her orbit are not determined beyond a doubt.

Let us turn the telescope upon Mars. He is in a condition unfavorable for observation, for he is drawing near the sun and will soon be lost to sight. But no one can look upon his ruddy face without a feeling of intense interest. The prestige of his appearance at his opposition on April 11 still lingers around him, as well as the distinction that he alone of all the planets displays his real surface to terrestrial star gazers. Perrotin, Schiaparelli, and Terby have made him famous for the marvelous sights they saw, as night after night, when skies were clear, they gazed upon his double canals, submerged continent, and polar ice, and watched the disappearance of old canals and the appearance of new ones in unexpected places. They are astronomers with practiced eyes, and saw objects which to ordinary observers are but cloudy haze. Men of science are waiting patiently for the next Martian opposition in 1890, when it is hoped that the Lick telescope will be in its best working order, and the telescope for the Los Angeles observatory, with its forty inch aperture, will be a new power in the field of observation. With such instruments and such observers, the capacity of the human eye will be the only obstacle in the way of obtaining all possible knowledge of the Martian planet.

Dosing Trees with Sulphur and Other Substances.

There is a prevailing and popular idea that insects may be driven from trees by boring holes through the bark into the wood, placing sulphur therein, and plugging the hole. There are some persons who profess to have tried the experiment with success, to have cleared trees, such as elms, of the destroying worm, etc. Prof. C. V. Riley, Entomologist of the Department of Agriculture, pronounces these remedies as fallacious.

"The belief in their efficacy," he says, "is founded on the supposition that the poison passes with the sap into general circulation and with it into the foliage, and is destructive to leaf-feeding insects. It is an entirely unfounded idea, and is based upon ignorance of the fact that the substance remains intact, and is not taken up in the circulation. Instances where it has seemed to succeed have been recorded, and in such cases its apparent efficacy was due to a coincident disappearance of the insect from some other cause. Sulphur which I plugged up in such holes many years ago was found to be perfectly unchanged after many months. All such remedies may be stamped as nonsense."

Waste in the Workshop and Counting Room.

One of the most common among the many sources of everyday expense incidental to the carrying on of an industrial business, and one most generally neglected by those whose duty it should be to prevent it, is that of waste in the workshop and among the employes. Although the amount in each particular case may be, and probably is, of small proportions, and is consequently considered of little or no consequence, yet in the aggregate it really becomes an expensive item, which tells heavily upon the debit side of the ledger when accounts are balanced up.

In some shops the quantity of small articles, such as screws, nails, panel pins, washers, etc., that may be seen lying upon the floor, kicked about by every passer-by, is astonishing. There seems to be no idea of their value either by the workmen or foreman. If a man drops such a slight article, he will not take the trouble to pick it up, and the result is that all around the ground is littered with them, they soon become covered with shavings, sawdust, and rubbish, and when the sweeper comes at stated times to clear up, he as likely as not shovels half of them into his barrow, wheels them away to the fire, where the rubbish is burnt, or throws them in with the ashes and other refuse of the ballast heap. Even if he carries a box, as he often does, into which he may throw say one half of what is dropped, they become of very little use, from the fact that nails and screws of all kinds and sizes become mixed and jumbled up together, unless properly sorted into their various kinds, and this is just what is left undone in the majority of cases. We do not imagine that it would be feasible for a man to stoop down every time he drops one of the small articles in question, but he at least might be made to take that trouble occasionally, and put them back in their proper receptacle in his nail box. As it is, whatever is once dropped may be considered lost. This looseness, too, leads to another and greater evil, and that is peculation and petty theft. It is not to be wondered at that a man, seeing these things treated as if of no value, says to himself, as he picks them up and puts them in his pocket, "These nails will come in useful to make that fence or fowl house in my garden," or "These screws will just do for the box I am going to make for my wife at home." In fact, the men almost look upon it as a kind of perquisite, to supply themselves. Even such comparatively large articles as bolts, nuts, and rivets are often seen strewn about the ground, especially out of doors, where they get trodden into the earth. The amount of old iron, etc., that is shot out at the heaps or tips of rubbish would well pay the employer to keep a man to look them over. As it is, women and boys may often be seen outside the works raking over these heaps, and making quite a good thing out of the cinders and old metal which they collect. The same waste often takes place at the saw mills, where good sized pieces of expensive wood, such as teak, mahogany, etc., too small to be utilized on the premises, are cut up for fire wood instead of being sold to makers of small articles, fancy goods, or others. Again, the brass dust and filings made by the fitters are collected in trays fixed to the vises in some establishments, but are swept up with the dirt and wasted in others. Another instance may be mentioned in that of oil, which is often allowed to drip and fall from the shafting pedestals upon the floor, making everything about them greasy and dirty, but which, if caught in tin dishes suspended beneath, may be used again for the same or other purposes. In the case of gas, too, extravagance requires checking in some factories, where it is allowed to flare away at full pressure all over the place without any control, the supplies being of the largest size and most extravagant pattern. If a man leaves his work for an hour or two, he does not think to turn down his gas, but allows it to burn all the time. In another better regulated shop, however, the burners are of the duplex or some other economical kind, pressure regulators being fixed upon the various branch pipes to control the consumption, which often varies very much at different times as some divisions are turned off or put on. The waste in this item alone in a large manufactory with some hundreds of jets burning every day would, if carefully examined into, be found rather startling. Even in the offices, the difference may be often noticed between a loose and thrifty system of using the stationery. The waste paper, such as envelopes, etc., are in some places thrown away or burnt, while the clerks think nothing of taking a new sheet of writing or foolscap paper, or a memorandum form, to work out their calculations. In others, the envelopes, fly leaves of letters, etc., are set aside, not only for this purpose, but are utilized, as are the backs of useless vouchers, invoices, etc., by printing on them and using them about the premises for instructions to foremen, reports, etc., being as good as new for such purposes. In some drawing offices the amount of tracing paper and cloth wasted, too, is considerably more than there is any necessity for. Some draughtsmen will cut their paper recklessly, leaving five or six inches margin, which has to be cut off ultimately, or will put the roll of paper back in a dirty drawer, or on a dirty table, thus making a soiled mark along the underside of the roll, which must be cut off by the next user, thus involving another waste of six or seven inches.

The greatest cause is carelessness among employes and want of sufficient supervision. It is their employer's material and not theirs, and so they do not trouble themselves to economize unless compelled to. The same men when they are at home are most careful of their own coals or gas, and if they are doing any little carpentering job of their own will drop on their knees and search for every nail in the most careful manner. A few words from the employer or foreman will generally suffice to put a check on the practices, while making an example by discharging a few men will have a wholesome effect upon the rest.

The Migratory Quail.

A correspondent of the *Forest and Stream* writes from the island of Anacapri, in the Mediterranean Sea:

The first quail arrived on the 23d of April, but not in great quantities; the pigeons straying along a few days before. *Le reti* or nets were in readiness, but the birds came very straggling. Every conceivable spot on the edge of the island was occupied, giving it the appearance of being fenced in. These nets are from nine to ten meters high, the higher the better, with rings on their sides, through which good-sized cords are run. These are securely fastened on the tops of immense high poles, and when the wind is not too strong are kept continually spread, otherwise they are unfastened and run down like a sail or a curtain. These nets are contrived in such a manner as to form a kind of sack, by leaving it in folds, or having a piece added to it, so at every interval of perhaps a meter or meter and a half comes one of these bags. The poor, unwary birds come flying, wearied and fatigued from their trip over the sea, on in full force, strike against the fence (no better name can I find for these nets, encircling the island as they do), fall into the bag, become entangled, and are immediately pounced upon by the greedy islanders. Sometimes, not often, after a lucky struggle, a bird frees itself and clears the net, but only to fall a victim to one of the numerous hunters with guns standing on the other side, scattered in all directions and distances from the shore.

From 50,000 to 60,000 quail are sent away from this island alive every year; how many are shot is more than I know. It seems that the renown of this island as a quail-hunting place is very old, for I have read that somewhere about the year 1786 the quail, doves, and other migratory birds were a source of increase to the revenue. The number caught varied every year, the greatest catch in one day was 12,000, and during the whole time of passage, which does not last more than fifteen days, they never caught more than 150,000 birds. Capri had a bishop who derived the most of his income from the quail, etc., and from this fact he was somewhat irreverently styled the Bishop of Quail.

A Novel Steam Launch.

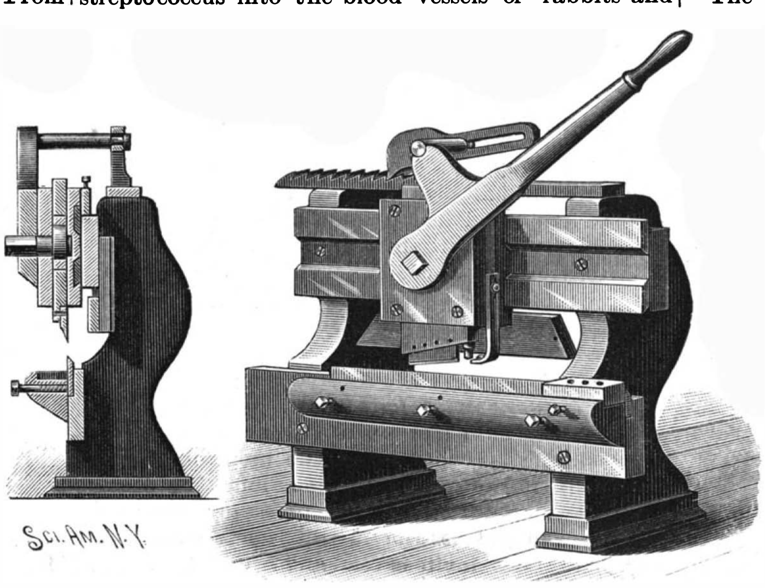
At the American Institute Fair is being shown just now a novel type of launch, burning kerosene and with the boiler and engine at the stern of the boat. The method of firing the boiler is also new. Instead of atomizing the oil, as formerly, it is vaporized in a coil by heat, then driven out into the fire box and mixed with the air. The gas thus formed burns without smell or smoke and does not foul the tubes or sides of the boilers. The generator is of two horse power, its dimensions 12 inches wide, 12 inches deep, 24 inches high, and weight 150 pounds. It is made of Damascus steel and drawn brass tubes, tested to 600 pounds hydraulic strain. Three to four minutes, it is said, is ample time to get up steam and a working pressure of 140 pounds. The hull has a fine entrance, well rounded bilges, and a long, clear run. The wheel, well dipped, meets plenty of solid water. Length on deck, 22 feet 6 inches; beam, moulded, 4 feet 6 inches; estimated speed, six knots an hour.

Chicken Cholera and the Rabbit Pest.

Pasteur's method for ridding the Australian fields of the swarms of rabbits that infest them has not proved altogether successful; at least in the experimental tests. At Rodd Island, Port Jackson, New South Wales, pens were built of close wire netting, and a large number of rabbits collected within; pains being taken to get the several varieties, so to mark the effects of the poison on each. Vegetables, sprinkled with liquid containing the microbes of chicken cholera, were distributed freely about among others not so tainted. Then Bunny was set free among them, and fell to feeding with his usual avidity. So far as the investigations of the commission go, those rabbits which ate of the poisoned vegetables died; but others, apparently selecting their food among the untainted, survived, and, together with still others forbidden access to the field of trial, but put in the same pen with those which had died of the disease, were in nowise affected. In other words, there was no proof of the assertion that those taken with the disease would carry it to others; no signs of contagion.

A COMBINED PUNCHING AND SHEARING MACHINE.

A machine to facilitate the cutting and punching of metal plates, as boiler iron, etc., is illustrated herewith, and has been patented by Mr. Henry A. Ridley, of Newport, Ark. The guideways on which the head slides form a bearing for the shear and punch blade, adapted to move vertically in the head. In the blade is an aperture in which turns an eccentric on a shaft, on the outer end of which is a lever, by which the shear and the punch are moved up and down. From this lever projects a pin passing through a slot in a pawl over a toothed bar secured to the tops of the standards. This pawl and toothed bar serve to move the head forward on its guideways when cutting metal plates. Directly below the movable shear blade is a stationary one, extending from one standard to the other, while the offset has a recess in which is fitted a punch die or block, with a number of apertures, into which fits the punch, the punch die being movable to any desired place on the offset. Guide bars hold the plates in place for either cutting or shearing.



RIDLEY'S PUNCHING AND SHEARING MACHINE.

The Empress Frederick and Sir Morell Mackenzie.

The following extracts, reprinted from the *Pall Mall Gazette*, are from a letter written by the Empress Frederick to Sir Morell Mackenzie. The letter is not printed in Sir Morell's work, and has never before been published:

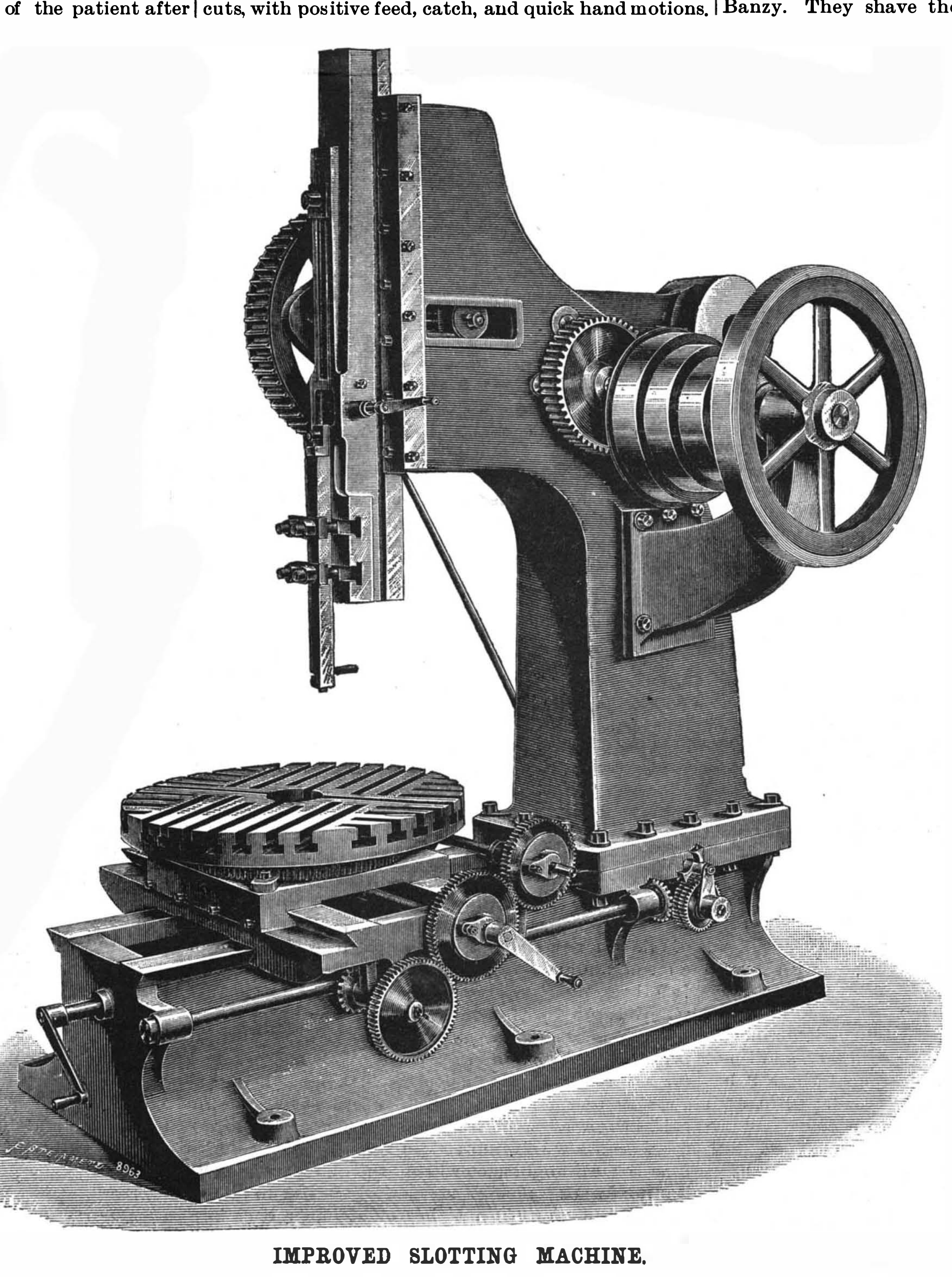
"I took care to tell all eminent German medical men with whom I came casually in contact that you had said to me the first time I saw you, that though what you saw was innocent, yet you could not be sure until it was examined by Virchow, and that *a malignant disease might be present somewhere out of sight*, though there was no proof of it, *the most unfavorable element of the case being my husband's age at the time.* You told me that benign growths and malignant growths were seldom found together, and that you thought the growth you could see on the vocal cord was a benign one. *You also said you could not hold out any security to me that a malignant growth might not appear some day.* You said that the operation proposed was running too great a risk, that it was exposing life, and that should it succeed, the condition of the patient after would be so terrible that his chances, if let alone, would be more favorable. I have since heard that different German medical men think this a reasonable and sensible view, and say that, under the circumstances, we could have done nothing better. You also said, *I think*, if I remember rightly, that you would not have laryngotomy or laryngofissur performed on your own throat on the surmise or suspicion of a malignant affection of the larynx without very positive proof, and not even then, as the tendency of malignant disease was to reappear in other places when removed from one. Consequently, there would be a possibility of having gone through the operation, and yet losing one's life after all, by the reappearance of the disease. Furthermore, you said, I think, that you did not know whether the Crown Prince's constitution could withstand so serious a shock as that inflicted on the whole system by so important an operation. I should have repeated all this at the time much oftener had not the prevailing feeling been one of joy and gratitude at having escaped the horrible operation. '*You can show this letter to whomsoever you please.*'"

Bright's Disease.

The coccus of acute Bright's disease, which has been expected for a long time, was born to science in Vienna recently. Dr. Julius Mannaberg, working in Nothnagel's clinic, has found a new streptococcus in the fresh urine of acute Bright's disease, and not found in two hundred examinations of urine in forty-five other patients not "Brightiques." Dr. Mannaberg has cultivated, inoculated, etc., his coccus, and concludes: In the majority of cases of acute Bright's disease, the streptococcus is found in large quantities in the fresh urine, which was not the case in the urine of healthy persons, or those affected with another malady. The pure cultures of this microbe essentially differed from all other micro-organisms hitherto described. The injection of this streptococcus into the blood vessels of rabbits and dogs produced an inflammatory lesion of the kidneys, whereas the other organs were only exceptionally affected. These results he believes have proved, with probability, that certain forms, and perhaps all the forms, of the idiopathic acute Bright's disease had a bacteriological foundation.—*Med. Record.*

IMPROVED SLOTTING MACHINE.

The slotting machine which we illustrate was constructed by Messrs. Wilkinson and Lister, of Bradford Road Iron Works, Keighley, Yorkshire, who have recently supplied one of this pattern to the Victorian Railway Company. The machine is self-acting in all cuts, with positive feed, catch, and quick hand motions. The ram is balanced and has a quick return motion; it is adjustable in height by a screw. Its maximum stroke is 22 in. The table is 4 ft. in diameter, and when in its central position under the tool will admit work up to 7 ft. 6 in. in diameter and 3 ft. 9 in. in depth. The movements of the slides are 3 ft. 6 in. and 3 ft. 9 in. The machine weighs 10½ tons complete.—*Engineering.*



IMPROVED SLOTTING MACHINE.

The Mobangi River, Africa.

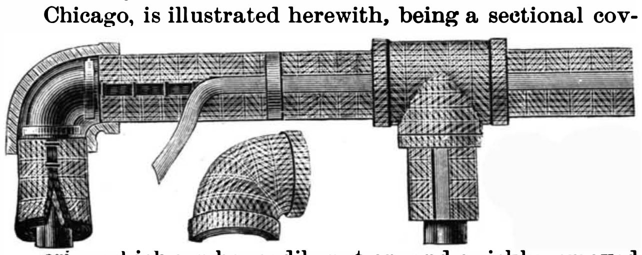
The *Mouvement Geographique* of April 22, 1888, contains details of Lieutenant Van Gele's recent ascent of the Mobangi. Van Gele left Equator Station Oct. 27, 1887, and on Nov. 21 reached the foot of the Zongo Rapids, the spot at which the Rev. G. Grenfell was turned back in 1884. These rapids extend over a distance of twenty-four miles, and are six in number, but the steamer En Avant succeeded in passing them, though she had to be unloaded before she could pass the fifth, which consists of a group of islands connected together and with both banks by a rocky bar forming rapids and two falls. The banks of the river on both sides along the line of the rapids are bordered with gently sloping hills, studded with villages and presenting alternations of woods, meadows, maize fields, and banana plantations. The villages on the river bank are palisaded in front, and watch posts are established in the cotton trees. As far as Belly, in the middle of the cataracts, the natives have their heads shaved, except at the nape, and wear fierce-looking mustaches. Above Belly the Bakombe form the population, and are distinguished from their neighbors by their method of wearing the hair, which extends behind in queues sometimes seven feet long.

After passing the sixth rapid, at Mukuangai, the river comes from the northeast free from all obstacles, and the view is described as superb. It has a width of about half a mile and an average depth of fourteen feet. After about twenty-two miles it bends eastward and continues in this direction as far as was navigated by Van Gele (above 172 miles). Along this stretch the natives call it the Dua. The people on the right bank of this portion belong to the Buraka and Maduru tribes, those on the left to the Bakangi, Mombati, and Banzy. They shave the head so as to leave a little triangle of hair on the forehead, and wear immense copper rings or wooden cylinders in their ears. The native huts are cone-shaped, rest on a wall of stone about two feet high, and are neatly arranged in rows forming broad streets around a central building used as a common meeting place. These people work iron into all sorts of implements, weapons, and ornaments. In this reach of river there are many islands, most of them inhabited and cultivated. A rapid was passed at about one hundred and thirty miles above the Zongo Rapids, and twenty-five miles further east another was met with, at which the steamer had to be unloaded. About twelve miles above this rapid (21° 30′ E. long.) the Bangasso discharges into the right bank of the Mobangi. Up to this point the natives had invariably been friendly, offering for sale all kinds of provisions, but here difficulties began. The Mombongo and Takoma tribes, which inhabit both banks, were decidedly hostile, so, as the navigation was obstructed by rocks and sand banks, Van Gele decided to turn back at 21° 55′ E. lon. At this point the river is a mile and a half wide, and is studded with islands, the larger of which are inhabited. As Dr. Junker coming westward reached 22° 55′ on the Welle, and as both points are in 4° 20′ N. lat., there can be little doubt of the identity of the Welle and Mobangi.

CHARCOAL is recommended as an absorber of gases in the milk room where foul gases are present. It should be freshly powdered and kept there continually.

INSULATED COVERINGS FOR PIPES, BOILERS, ETC.

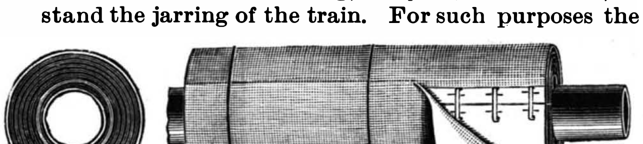
The saving effected by jacketing boilers and steam pipes with an insulating covering is a point very frequently neglected in establishments where the steam plant is only a small one, or of moderate size, although justly deemed an elementary consideration whenever the consumption of fuel is large. The careful insulation of pipes is also of vital importance in every case where it is desired to convey steam to a distance, either for purposes of power or heating, without regard to the direct cost of fuel. Engineers and inventors have, therefore, given much study and made many experiments, to the end of making the best possible and most easily applied coverings for pipes and boilers, to save fuel and insure a supply of hot and dry steam at a distance from the boiler. Such a covering, as manufactured by the Shields & Brown Co., of New York and Chicago, is illustrated herewith, being a sectional covering which can be readily put on and quickly removed and replaced by an ordinary workman, while it is adapted to every shape of steam surface and every bend and angle in a job of pipe fitting.



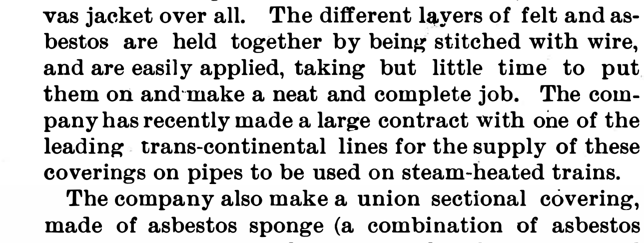
These coverings are made on the principle of employing two or more layers or sheets of felt, or other non-conducting material, held together longitudinally by being fastened or cemented on the edges where the sections are divided, confined air being contained in larger proportion throughout the covering by the use of corrugated sheets of felt.

These coverings are made in sections three feet long, and are composed throughout of alternate layers of asbestos sheathing and corrugated soft-wool felt. The layers are secured together by being stitched longitudinally of the section with two rows of small wire staples, and then the sections are cut open between the two rows of staples. By this combination of asbestos, wool felt, and air in combined cells, a sectional covering is produced that is not only neat and attractive in appearance, but one which can be applied with the utmost facility by ordinary workmen, while it is unsurpassed as a non-conductor for steam-heating surfaces. The large amount of asbestos sheathing used in these goods makes them more durable than any other felt coverings, and their use has been approved by insurance underwriters in all the leading cities.

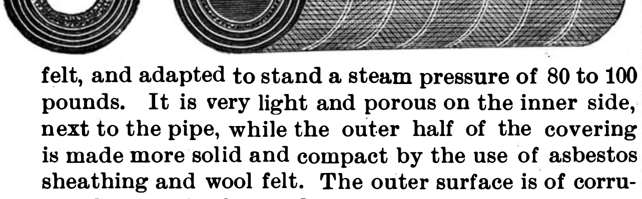
The adaptability of these coverings to special uses is perhaps best shown in their employment on recently introduced systems of steam heating on railroad trains. In such uses it is especially important to protect the exposed pipes running under or between the cars, while the covering must be strong, compact, and durable, to stand the jarring of the train. For such purposes the company make a covering of a heavy wrap of asbestos next the pipe, then three-quarters of an inch of wool felt, then a wrap of asbestos on the outside, and a canvas jacket over all. The different layers of felt and asbestos are held together by being stitched with wire, and are easily applied, taking but little time to put them on and make a neat and complete job. The company has recently made a large contract with one of the leading trans-continental lines for the supply of these coverings on pipes to be used on steam-heated trains.



The company also make a union sectional covering, made of asbestos sponge (a combination of asbestos fiber and sponge) with asbestos sheathing and wool felt, and adapted to stand a steam pressure of 80 to 100 pounds. It is very light and porous on the inner side, next to the pipe, while the outer half of the covering is made more solid and compact by the use of asbestos sheathing and wool felt. The outer surface is of corrugated wool felt, the goods being stitched with wire, and put up in such shape that they possess a high degree of durability as well as the best non-conducting qualities.



Another variety of the same goods made by this company is their indestructible sectional coverings, made entirely of asbestos and sponge, incased in a canvas jacket. They are very light in weight, while strong and flexible. They are made in sections three feet long, to fit all sizes of pipe, and a full line of fittings is also made of the same material. They are intended to cover pipes carrying the highest pressure of steam, being absolutely fireproof, and can be supplied with an asbestos waterproof jacket if desired.



All of the coverings of the Shields & Brown Co. are adapted to be fitted to pipes and boilers in such way as to provide an air chamber between the pipe or boiler and the covering if desired. For this purpose asbestos rope collars are supplied, to be placed on pipes at intervals of about a foot, small clamps being furnished with each collar, by which they are readily attached. By applying sectional coverings in this way, the covering is raised above the rivets and bolt heads, making the outside surface symmetrical, while affording a confined air space which makes the best of all insulators.

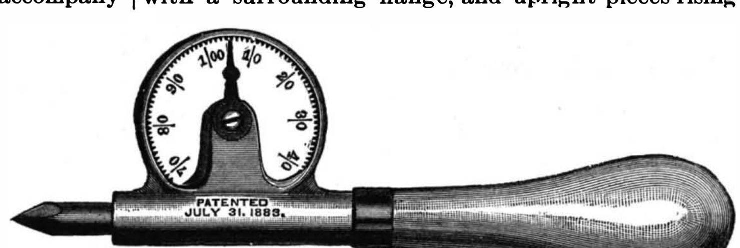
The Shields & Brown Co. also manufacture a special quality of covering largely used by gas companies for covering service pipes, as well as supplying complete coverings for all steam surfaces, in such shape that any ordinary mechanic can apply them. The offices of the company are at 143 Worth Street, New York, and 240 and 242 Randolph Street, Chicago, Ill.

Willow and Willow Wares.

The willow ware industry has been slowly increasing in our Eastern States of late years, but is as yet in its infancy. The immense unutilized areas of land along our many rivers, portions of the sea coast, and of some uplands and prairies not suitable for any other agricultural pursuit, invite capital and energy to invest in the production of osier, chiefly for the manufacture of basket ware. According to the census of 1880, there were in the country 304 willow ware establishments, with a capital of $1,852,917, engaging 3,119 hands, paying annually the sum of $657,405 for wages, and producing $1,992,851. The value of materials consumed was $867,031, of which, however, but a portion was produced here. The importation of both raw and manufactured material will be greatly reduced, and the demand for willow ware materially increased, if the profit to be derived from a systematic production of osier becomes once better generally understood.—*Insect Life.*

AN IMPROVED SPEED INDICATOR.

An extremely simple speed indicator, which can always be readily applied, is shown in the accompanying illustration. By simply pressing the point against the end of a shaft, the dial will indicate the speed at which the shaft is running, an extra-hardened point being made for use on dynamo machines that will indicate up to 5,000 revolutions per minute. It will indicate either a right or left hand motion, and is so simple in construction that it is not liable to get out of order. The index point can be put at zero with the finger, instead of turning the dial all around. The owners and manufacturers of this speed indicator are Messrs. Chandler & Farquhar, No. 179 Washington Street, Boston, Mass.



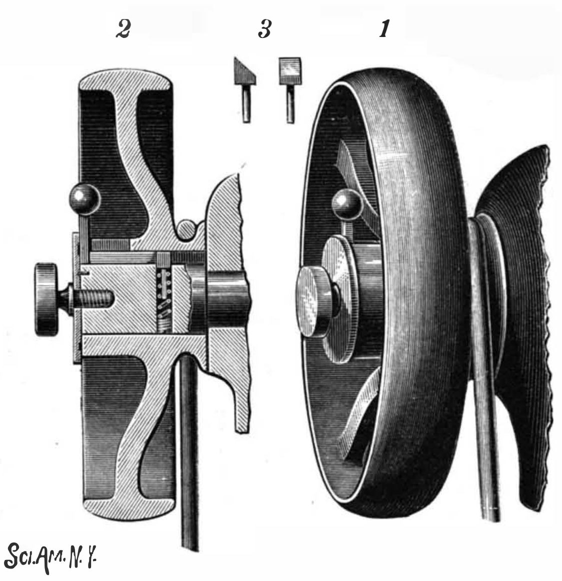
FOWLER'S SPEED INDICATOR.

A Successful Inventor.

We wish all American inventors could reap as bountiful a harvest of fortune as Hiram Maxim, of New York, who has received $850,000 for his last production, the quick-firing gun, in England. The first Maxim essay, the small one-barreled mitrailleur, has not been a success except in theory, the tremendous discharge of 1,000 shots per minute soon being too much for any single bore, however excellent of design or material. Maxim may be fairly accounted a prospective millionaire, having previously to his ordnance inventions received some $100,000 in the United States for his electric lighting patents. He is still a young man, and resides at Thurlow Lodge, which he has purchased, about twenty miles from London. The old mansion, surrounded by very fine grounds, is one of the historical English houses, having been the property and home of Lord Thurlow, the great English Chancellor.—*Army and Navy Jour.*

AN IMPROVED FLYWHEEL CLUTCHING DEVICE.

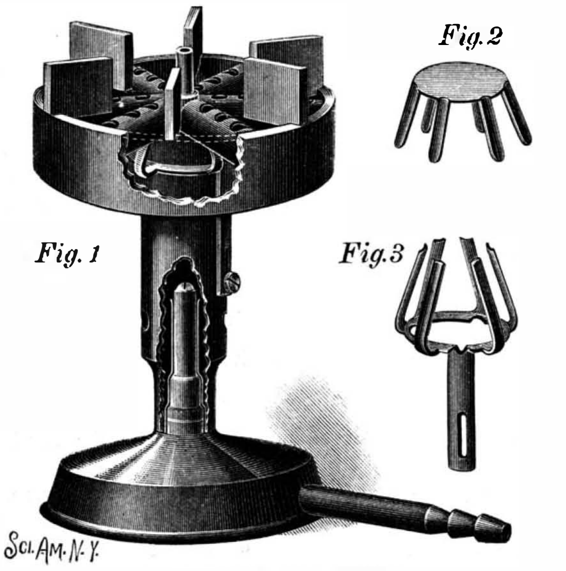
An automatic loose and fast attachment for sewing machines, whereby the flywheel may be made to revolve with the shaft in one direction and independently of it in the opposite direction, and may be virtually disconnected therefrom, to turn independently of the shaft in either direction, is illustrated herewith, and has been patented by Messrs. J. A. Romano and Ernest A. Barton, of Celaya, Guanajuato, Mexico. The portion of the driving shaft on which the flywheel is hung has a diametrical aperture, mostly rectangular, but circular at one end, in which is held a latch, shown in Fig. 3, surrounded by a spiral spring. The hub of the flywheel has a horizontal groove on its inner face, and an opening in its outer surface intersecting the groove, a locking bolt being held within the groove and opening, a horizontal member of the bolt sliding in the groove, while the vertical member is adapted to the opening. The lock bolt has, at the extremity of its horizontal member, an inclined or beveled surface adapted to engage the inclined surface of the latch head. When the flywheel is turned from right to left, the shaft is rotated, as the side wall of the groove in the flywheel then engages the perpendicular face of the latch head; but in turning the flywheel the other way the groove comes in contact with the beveled surface of the latch head, pressing the latch downward against the spring into the shaft, so that the flywheel revolves free of the shaft. By passing the locking bolt to the inner extremity of its groove, the latch in the shaft will be held in its aperture to permit the flywheel to revolve freely in either direction without operating the machine.



ROMANO & BARTON'S FLYWHEEL CLUTCH.

AN IMPROVED GAS STOVE.

A gas stove which can be readily regulated to burn a small flow as well as a large, full flow of gas is illustrated herewith, and has been patented by Mr. Clarence L. Bisbee, of No. 198 Seventeenth Street, Brooklyn, N. Y. A cylindrical chamber, having draught openings in its lower portion, is made to fit upon the gas jet tube, and cast with this chamber, as one casting, are hollow arms, with a surrounding flange, and upright pieces rising from the upper edge of the flange, so that the whole stove is made in one piece. There are upper and lower openings in the hollow arms, the gas burning at all the upper openings when fully turned on, and when the gas is partly turned on it is burned at the inner openings only, being cut off from the outer openings by the air passing therethrough. The regulator, shown in Fig. 3, may be attached to the circular chamber by a slotted arm and set screw, and has upwardly projecting plates, slightly concaved, to fit against the inner edges of the upper apertures in the hollow arms, to impede the flow of gas to the outer ends of the arms, but will be burnt mainly, when turned down, at the angles of and between the arms, insuring a perfect combustion within a small limit. In Fig. 2 is shown another form of regulator, to be placed upon the cylindrical chamber, when the side plates project down into the openings of the hollow arms to effect the purpose of a regulator.



BISBEE'S GAS STOVE.

Wine from Berries and from Dried Grapes.*

There are numerous factories in Germany which, under the name of "artificial wine" (*kunstwein*), introduce beverages into the market which are intended to satisfy this want. But these factories of artificial wine have their very doubtful point, inasmuch as great quantities of their productions, when they get into the second or third hand, are sold as genuine wine.

In order to avoid paying a good price for an inferior article, the farmer may, with some attention and industry, prepare himself his own domestic beverage, and have thus a much better and cheaper article than he can buy in the factory under the name of artificial wine, or as wine, if he buys it from an agent

For the manufacture of a good domestic beverage, different sorts of fruits, the residuum of pressed grapes, wine lees, berry fruits (also some kernel fruits, as cherries and plums), and dried grapes may be used.

WINE FROM BERRIES.

Currants and gooseberries yield almost every year a good crop, and even on a small area of land they furnish so much fruit that, by adding the necessary water and sugar, a great quantity of wine can be produced. Whortleberries are very abundant in some districts.

The price of sugar being rather low, the expenses are but small. For one hectoliter (nearly 26½ gallons, wine measure) of good domestic beverage, sugar for only about 7 or 8 marks is wanted ($1.75 to $2).

The berries contain too little sugar and, with the exception of thoroughly ripe blackberries and sweet cherries, too much acidity. The acidity must, therefore, be attenuated and sugar added. If too little water is used, the wine becomes too sour.

At the exposition in Bruchsal, Baden, in April of this year, all the new sorts of prize wines and seven of twelve wines having received diplomas were attenuated with water in the proportions given below.

The wine becomes stronger or weaker, according to the quantity of sugar added. By adding too little sugar, the wine becomes weak and not durable.

The subjoined table shows the average contents of sugar and acid in the different sorts of fruit, and also the addition of water and sugar necessary for 10 liters of juice or 11 kilogrammes of fruit, in order to make either a weak kind of artificial beverage, a good table wine, or a liquor wine:

Fruits.	Contents in 100 parts of fruit.		Addition to 10 liters juice or 11 kilogrammes of fruit.				
				Sugar—kilogrammes.			
	Sugar.	Acidity.	Water—liters.	Domestic beverage.	Table wine.	Strong wine.	Liquor wine.
Currants	6·4	2·1	30	4·2	5·8	7·4	1·3
Gooseberries	7·0	1·4	18	2·7	3·7	5·1	8·8
Blackberries	4·0	0·2	..	0·8	1·2	1·6	3·0
Whortleberries	5·0	1·7	24	3 6	5·0	6 3	11 0
Raspberries	3·9	1·4	18	3 0	4·1	5·2	9·1
Strawberries	6 3	0·9	8	1·6	2·3	3·0	5 5
Red bilberries	1·6	2·3	35	5·3	7 1	8·9	15 2
Agriot cherries	7·5	1·3	16	2·4	3·4	4·5	8·1
Sweet cherries	10·0	0·4	..	0 2	0·6	1·0	2·4
Plums	6·1	0·8	6	1·3	2·0	2·6	4·8

From the stone fruits the stones are to be removed before weighing them and before fermentation takes places. Strawberries, gooseberries, blackberries, and agriot cherries are particularly qualified for strong and fine wines. For the purpose of mashing the berries and removing the stones the fruits may be grated through sieves, the holes of which are small enough not to allow the passing through of either berries or stones. Then the mashed fruits are to be pressed out or soaked in water, as will be described below. The latter proceeding is, of course, only possible with fruits which require a large quantity of water. During the process of mashing and pressing the fruits great care is necessary to prevent the dissolution of iron in the juice, as even very insignificant particles of it will give a bad taste to the wine and also a bad, muddy color.

Iron wine presses and the lower parts of the spindles are to be painted with iron varnish. In order to avoid the dissolution of iron, the soaking out of the residuum of grapes is to be preferred to the pressing. Sieves made of brass are preferable, but must be kept very clean. The riper the fruits, the better the wine will be. Rotten fruits must be removed as much as possible.

The fermentation will be the quicker, the nearer the degree of heat is to 30°; but the danger of the formation of acid of vinegar (acetic acid), lactic acid, slime, etc., increases with the heat. If the residuum is not kept in the liquid, it often grows very hot by contact with the air, and injurious decompositions are formed. The most favorable degree of heat for fermentation is from 15° to 20° C. (12° to 16° R.)

Berries picked in the hot part of the day are warm, and if gathered in large quantity in receptacles, they often become very hot. In these warm, partly already injured berries, an alteration can take place which is injurious to the wine produced therefrom. Such fruits which ripen in summer should, for this reason, be picked in the morning or evening or on a cool day. In no case should they remain for any length of time in large filled-up receptacles.

If the mash is too warm, it ought to be brought to the correct degree as soon as possible by adding cold water.

There are cases where great quantities of grape wine were spoiled only because the grapes, though of very good quality, had been harvested in the heat and had been transported a long distance.

In those years in which the grapes are harvested in very warm weather, there are always more poor wines than when the grapes are cool before they are put into the tubs. It has been observed that fermentation does not commence soon if the berries are picked soon after rain.

If the alcoholic fermentation at the correct degree of heat does not sufficiently commence within twenty-four hours, there is danger that other dissolutions will take place, mucilage or lactic acid formation, or, in case of slow fermentation, even vinegar formation. The fermentation can be produced by adding compressed artificial dry yeast or fluid corn yeast; 50 grammes of the former or about one-fourth liter of the latter to 1 hectoliter are in the first place added to one part of the mixture of sugar water and juice or mashed fruits. As soon as this is in good fermentation it is mixed with the rest of the mash. As a matter of course, only the very best and freshest yeast is to be used. Yeast of beer is of no use.

One of the greatest difficulties in preparing berry wines is caused by a too slow and often incomplete fermentation. This is produced either by the mash having been filled into a barrel smoked with sulphur, or by the formation of acid of vinegar at the beginning of the fermentation, or also by the berries not containing sufficient nutritious matter in proportion to the yeast necessary for the fermentation of the sugar.

Fermentation will be greatly accelerated by adding currants or raisins or cristated currants to the mixture of berries or their juice with sugar water. From 1 to 2 pounds of currants or raisins may be added to 10 liters or 11 kilogrammes of fruits. They must be quickly washed with cold water, then cut, added to the mixture of juice and sugar water, and left therein during fermentation. For 1 pound of raisins 1½ liters of water more may be added. The air is to be carefully excluded from the surface of fruits left standing after having been either lyed or washed, and also during and after the process of fermentation, else a part of the alcohol will turn into acetic acid, causing the wine to remain muddy and slimy and to receive a disagreeable taste. Besides this, wine containing much acetic acid does not agree with many persons. Generally, but especially with fleshy or slimy fruits, such as gooseberries, whortleberries, cherries, plums, etc., it is quite to the purpose to submit the mashed fruits, with an addition of a certain quantity of water and sugar, to the process of fermentation; but this requires great precaution, for as soon as the fermentation commences, the husks will get on the surface and thus form a loose mass into which the air will penetrate, and in a short time produce acid of vinegar.

For producing berry wines or red wine on a large scale, and when the wine ferments on the husks, the mash in a tub may be covered with a perforated tub bottom and burdened with weights or tightly fastened in order to prevent the husks from rising, and then the whole may be covered.

In preparing berry wine on a small scale, but yet up to 1 or 2 hectoliters, it is best to use vessels of stoneware for fermentation.*

On the lower part of these vessels there is a sink bottom, and the mashed fruits contained in it are again covered with a similar one, water is poured in the channel on the upper part of the vessel and the cover laid upon it. The border of the latter must reach into the water and entirely exclude the air.

As soon as the fermentation has commenced, the liquid is let off; it is then replaced by sugar water, poured off again after twelve hours; water is first poured on it and then poured off again after a lapse of time. This is repeated until the required quantity of water is spent.

If correctly executed, the husks are so thoroughly washed that it is altogether useless to press them. In the fluid collected in a tub or bottle the corresponding quantity of sugar not used yet is dissolved. Wines of blackberries, strawberries, sweet cherries, and other fruits for which little water is used may be left in these vessels until fermentation is completed. For the fermentation of fluids, fermentation vessels in glass may be used to advantage. Such air-tight vessels have been tried repeatedly last year, and they proved excellent. Grape and berry wines remained in a warm room in partly filled vessels without being in any way injuriously affected by the air.

The family (home) beverage and the table wine must, as soon as fermentation ceases, be drawn off the lees and filled in a slightly sulphurated tub. The strong wines and liquor wines may be left on the lees until they are quite clear, and then they are likewise to be filled into a slightly sulphurated tub, but they are filled in bottles only when they do not thicken or ferment any more. For the preservation of wines in bottles intended to stand, bottles provided with patent wire locks are to be selected, or else after the tops of the corks are cut off, and when quite dry, the heads of the bottles must be dipped into hot paraffine.

Concerning cleanliness and the storing of the wine in barrels, the explanations given in respect to domestic beverage from dried grapes are to be observed.

DOMESTIC BEVERAGE FROM RAISINS.

One hundred kilogrammes of raisins are placed in a tub, and cold water enough is poured over them just to cover them. After the lapse of twenty-four hours the fluid is to be drawn off in a tub. The now sufficiently soaked raisins are then pounded or pressed through a sieve provided with such wide holes that whole berries cannot penetrate, water is then poured over them, and removed after twenty four hours. This is to be repeated until 4 or 6 hectoliters of fluid are collected in the tub, just according to the wished for strength of the domestic beverage. The fluid is then left to ferment. The most favorable degree of heat for this is from 15° to 20° C. (12° to 16° Reaumur); a much higher or lower degree is to be avoided. If fermentation does not begin within twenty-four hours, then 100 grammes of good, fresh, compressed yeast or one-fourth of a liter of good liquid grain yeast are to be added to the hectoliter. Yeast of beer is not fit for use, but from 1 to 10 liters of yeast from good wine may be added to 1 hectoliter, provided it be very fresh and the wine has not been drawn off from it too late, at least in the beginning of February.

Old, especially slimy, wine yeast is carefully to be avoided, as it would make the beverage slimy and not clear. As soon as fermentation ceases, the beverage is to be drawn off from the lees and put in a tub slightly sulphurated, one slice for 10 hectoliters. If the beverage is desired to be a little astringent, which would render it more refreshing, 100 grammes of vinous acid would have to be dissolved in a hectoliter. In the season of currants, to 100 kilogrammes of raisins about 10·15 kilogrammes, or to 1 hectoliter of domestic beverage before, at, or after the fermentation, 3 4 kilogrammes of mashed berries, or 3·4 liters of juice of currants, may be added. In a similar way sour grape wine or cider, or mashed ripe and green apples (fruit fallen off the trees), or their juice, may be used. The greatest cleanliness is to be observed in regard to all the vessels or receptacles into which currant wine or domestic beverage is put. The air is to be kept off carefully from the surface of the water on the raisins and from the fermenting and fermented fluid. The tub is to be covered with a lid, the bung hole is to be closed by a clean sand bag as long as fermentation lasts, and then by a well fitting bung. Store barrels must be kept full as much as possible, and must be bunged up with bungs of acacia or oak wood, reaching at least 15 centimeters into the cask. The wrapping of the bungs and corks in rags must be avoided. For barrels on tap (*kuhnenheiter*) fungus guards are to be used, or the bung, after each drawing off, must be firmly fastened again. All bungs must be kept free of mould, fungi, or other injurious mushrooms, which, especially after this, are apt to spread over the beverage or wine. For this purpose the bungs are now and then to be dipped into spirits of wine entirely free of bad liquor, or, better yet, into a mixture of one part of acid *calcarea sulphurica* (*saurer schwefelsaurer kalk*), which may be kept ready for use in the cellar in a glass cylinder with glass cork. E. JOHNSON, *U. S. Consul.*

Kehl, Baden, Germany, August 16, 1888.

* U. S. Consular Report, No. 46.

* One containing a liter costs 30 pfennigs at Flochstetter & Kunst's in Flohr, near Coblenz, Prussia, and in their branch business at Offenburg, Baden, each sink bottom of from 30 to 50 liters = 1 mark 20 pfennigs. Receptacles with this air-close may also be used for the preservation of sour cucumbers (pickles) and other preserves. Instead of water, a little oil is now poured into the channel.

The Fever Microbe.

An illustration of a strange fact is found in the experience with the Jamestown, now the training ship at Baltimore. On one of her trips yellow fever appeared on board, and several deaths followed. Subsequently the vessel was thoroughly renovated and extensively repaired. Her woodwork was steamed. Then she remained in northern harbors for several winters. She was finally ordered south again, and before she reached the fever district a case was developed and the man died. Above his hammock was found a quantity of filth. The woodwork was torn out, and the filth removed. But she is still a fever ship, and I would not like to go south in her. Then, again, is the case of the Portsmouth. She once had fever on board. Long afterward she was ordered to Norfolk for repairs. Naval Constructor Hichborn had charge of the work. A number of his workmen died, and he himself was taken down with typhoid fever, and his life was despaired of. It is true, that once a fever ship, always a fever ship.—*Washington Capital.*

Softening Water.

For all washing and cleansing operations, says a little pamphlet on "Softening Water, Making Soap, Wool Washing, and Bleaching," if good and economical results are to be obtained, it is indispensable, *first* to soften the water before using soap of any kind for scouring, fulling, or milling purposes. Softening water simply consists in removing the soluble lime salts with which all water (with the exception of pure rain water) is more or less impregnated from contact with the lime strata in the ground. If this is not done, the soluble lime forms an insoluble lime soap from the decomposition of the soap used for washing. This substance is a greasy, sticky, oily compound, perfectly insoluble, and more difficult to wash away afterward by any treatment. It is this that causes the yellow grayish deposit on the edges of collars and cuffs washed simply with hard water and soap, and the sticky, greasy deposit on wool when treated in a similar manner, and also on the sides and edges of all washing machines.

It is a most uneconomical proceeding to wash anything in water and soap alone, without previously softening the water. Not a particle of soap can become available for washing purposes until all the added lime in the water has combined with the amount of soap it requires to form the insoluble lime soap. As compared with the pure 98 per cent powdered caustic soda, such as the "Greenbank" brand, it requires *twelve* pounds of the very finest pure soap, or twenty to thirty pounds of ordinary soap, such as is usually sold to manufacturers, to do the same work that can be done with *one* pound of this soda. Or, as compared with refined carbonate of potash, which should always be used for softening water when wool or woolens are to be washed, for reasons which will be explained afterward, six pounds of best pure soap or ten to fifteen pounds of ordinary soap are necessary to do the same work that can be done with one pound of refined carbonate of potash. It is, therefore, pretty evident, for economy's sake, as well as in order to do good work, that all water used for washing or cleansing purposes should be softened previous to use.

SOFTENING WATER FOR COTTON OR LINEN MANUFACTURERS, DYERS, BLEACHERS, AND LARGE STEAM LAUNDRIES.

The exact quantity necessary can only be ascertained in each individual case by chemical analysis, but general directions can be given, which in most cases are sufficiently accurate. They are as follows:

Good Water.—Add one pound of 98 per cent powdered caustic soda to each 1,000 gallons of water.

Medium Water.—Add two pounds of the soda to the same quantity of water.

Hard Water.—Add from three to four pounds to the same quantity of water.

Water is generally hardest in limestone regions, and in these cases three to four pounds of caustic soda of a high degree of purity (98 per cent) will be necessary; elsewhere, in ordinary cases, two pounds of this highly concentrated soda is sufficient. Common caustic soda does not do at all well for softening water. Being in large, solid blocks in drums, it is both difficult and dangerous to handle. Besides this, three or four times the quantity of common caustic soda is necessary, as it contains so much salt, sulphate of soda, and other impurities that the water is often considerably hardened by its addition.

Method of Use.—The powdered 98 per cent caustic soda simply requires to be thrown into the water tank, when full, in the quantities given above. It dissolves almost instantly, and the whole tank only requires to be stirred once or twice to mix the powdered caustic soda through and throw down the lime. If the tank is then left for three or four hours undisturbed, the lime falls and settles at the bottom of the tank, and the clear, softened water can be drawn off by placing the exit tap rather above the bottom of the tank, thus leaving the sediment behind. This settling, however, is not absolutely necessary, except for fine work or dyers' use, as the lime, when once it becomes insoluble, is rendered harmless, and will not interfere with the soap or washing. If it can, however, be accomplished, it is better to settle out the lime. It is easy to calculate the contents of the tank in gallons in the following manner: Multiply the length, breadth, and depth of the tank together; this will give the capacity of the tank in cubic feet; each cubic foot of water is equal to 6¼ gallons; consequently, the cubical capacity of the tank requires to be multiplied by 6¼ to get the contents in gallons.

Example.—Suppose the tank measures 10×8×4 feet deep; the cubical capacity is therefore 320 cubic feet; this multiplied by 6¼ gives 2,000 gallons as the contents of the tank. Suppose that it contains medium hard water that requires to be softened, then four pounds of powdered 98 per cent caustic soda will be required to be added to it for that purpose.

If desired, the powdered caustic soda may be added to the washing machine in the proportions given just before entering the goods to be washed, and *before* adding the soap. In this case, the machine must first be turned round once or twice to mix the water and caustic soda, and throw down the lime. If, however, it can be conveniently managed, it is decidedly recommended to soften the water previously in the stock tank, as it can be done more accurately, and to soften a large quantity of water at one operation is less trouble.

SOFTENING WATER FOR WASHING WOOL AND WOOLENS.

For softening water for washing wool and woolen goods, the refined carbonate of potash is much to be preferred to anything else. Soda in *any* form, when used with wool, has a tendency to make it hard and brittle, and give it a yellowish color. Potash renders wool soft and silky to the touch, and also has a slight bleaching action; therefore potash for softening water and potash soap only should invariably and without exception always be used for washing wool or woolens. This is no theory, but the practical experience of some hundreds of the largest wool washers and woolen and worsted manufacturers of England and America, besides being borne out by chemical investigation. Nature largely associates potash with wool in the yolk, or grease, with which it is found when growing on the sheep's back, and to the total exclusion of soda.

The teaching of nature in such matters is invariably correct, and therefore it is certain that potash, and potash soap only, and *not* soda in any form, should be used when treating wool. It is only necessary for a manufacturer to give this a practical trial to be thoroughly convinced of the superiority of potash for wool and woolen washing. The raw wool, when it is treated with potash and potash soap, is soft and silky to the touch, and the loss in weight is decidedly less than when soda or soft soap is used—one item alone which far more than counterbalances the slight extra cost of potash. Woolen goods milled or fulled with potash soap have quite a different handle from that of the same goods when finished with soda soap, and the colors of dyed goods will look brighter and altogether different. This matter cannot be too strongly insisted upon with woolen manufacturers. It is no theory, but the result of long practical experience of the subject.

What is the Best Way to Treat Men who, while Working in the Trench, are Overcome by Gas?

The above was one of the questions asked at the recent meeting of the American Gas Light Association at Toronto, and was answered as follows:

MR. CLARK.—I have a recipe which was given us by a prominent physician, and which seems to be a very good one. The rules are as follows:

Rules to be followed when men are overcome with gas:

1. Take the man at once into fresh air. *Don't* crowd around him.
2. Keep him on his back. *Don't* raise his head, nor turn him on his side.
3. Loosen his clothing at his neck and waist.
4. Give a little brandy and water—not more than four tablespoonfuls of brandy in all. Give the ammonia mixture (one part aromatic ammonia to sixteen parts water) in small quantities, at short intervals—a teaspoonful every two or three minutes.
5. Slap the face and chest with the wet end of a towel.
6. Apply warmth and friction if the body or limbs are cold.
7. If the breathing is feeble or irregular, artificial respiration should be used, and kept up until there is no doubt that it can no longer be of use.
8. Administer oxygen.

Some of these rules I have myself used, and I think very successfully.

MR. WHITE.—I have been told by a physician who has had considerable experience in the treatment of those overcome by gas that there is no more direct or certain way to overcome the effects of the gas, if the man is sensible enough to swallow, than to give him a tablespoonful of olive oil or of common sweet oil. If he can swallow it, give him a tablespoonful of oil, and then give him a little milk, or some brandy or whisky, or whatever stimulant may be at hand. Of course, you should loosen his garments and place the man in easy position to breathe freely, and, if you can, create a circulation of air by fanning, or by placing him in a draught. The handiest thing usually for gas men to get when a man is overcome in the trenches is to go to a neighboring drug or grocery store and get a bottle of sweet oil and some milk; and it is my experience that, whether the man is overcome with water gas or coal gas, nothing acts so quickly in restoring his breathing as sweet oil. It is not unpleasant for him to take, it lubricates his breathing apparatus, and the man will recover very much more quickly. It is founded upon many years' experience with men who have been overcome with gas, and I have used it myself when suffering from the same cause.

MR. SOMERVILLE.—I was once engaged in taking off the top of a station meter, inhaled too much gas, toppled over, and was carried out insensible. I understand that I was taken to the open air, my collar and waistcoat were loosened, and I soon recovered consciousness, but I did not get well until the contents of my stomach were out of me. The whole system seemed to be affected by the gas. A few weeks ago I had to take my foreman out of a hole. It was a very serious matter. He was a nice man, and I was sorry to see him tumble off like that. We dragged him out as quickly as we could, unbuttoned his vest, fanned him, and he soon recovered. That was with coal gas. Still he felt the effects the balance of the day. With water gas it is entirely different. Then it is a very serious matter indeed. We always take extra precautions in dealing with water gas. It does not seem to produce the same effects as coal gas. It seems to touch the blood, and it takes men some weeks to get over its effects. In fact, I know a man who has never gotten over it. If anything can be devised which will overcome the effects of the inhalation of water gas, it is very important we should know it. I have no doubt some one is asking this question in all sincerity, and if we can think of anything which would be an effectual remedy, it will be a good thing to come before the meeting.

MR. SCRIVER.—I believe that very recently an inspirator has been invented which fits over the nose and mouth, and enables the man to remain in an atmosphere where gas is escaping for a great length of time.

MR. HARBISON.—Two or three years ago I had some experience in this matter, and it was a little different from anything which has been stated here. I was not within reach of physicians at the time, and so could not avail myself of their services. Some workmen were laying a large main, connected with two six-inch pipes, and had to make a temporary connection over night in order to maintain the supply of gas in one section of the city. The gas escaped, and within ten minutes seven men became insensible in the ditch. We took the pressure off as soon as we could. We removed the men to open air, put water upon their faces and necks, got a mixture of whisky and water and gave them, and then as soon as they could swallow anything I gave them apples to eat, and the acid of the apples immediately started the gas out of the stomach. Just as soon as I could reach it I got some strong, hot coffee, without sugar, and gave them, and very soon they were ready to take their supper pails and walk home.

MR. WATSON.—I have had men in the same condition, but I administered vinegar to them, which, I suppose, acted in the same way as the apples. I gave them vinegar with eggs in it, breaking the egg in the vinegar and letting them drink it. I found it very effectual.

MR. KUEHN.—On two different occasions, when one of my men was overcome with gas, I called a physician, and he injected the carbonate of ammonia. The man was ill eight or ten days after it from the effects of it. He became so bad the second time, I did not put him back to that kind of work again.

Supreme Court Patent Decisions.

An interest in the net proceeds of collections for infringements of a patent does not necessarily involve an interest in the patent itself.

The infringer is liable for actual, not for possible, gains, for the fruits of the advantage which he derived from the use of the invention over that which he would have had in using other means then open to the public are adequate to enable him to obtain an equally beneficial result.

If there was no advantage in the use of the plaintiff's invention, there can be no decree for profits, and the plaintiff's only remedy is by action at law for damages.

If the defendants gained an advantage by using the plaintiff's invention, that advantage is the measure of the profits to be accounted for, even if from other causes the business in which that invention was employed by the defendants did not result in profit.

A court of equity will itself administer full relief by awarding as an equivalent or a substitute for legal damage a compensation computed and measured by the same rule that courts of equity apply in the case of a trustee who has wrongfully used the trust property to his own advantage.

A court in equity will require an infringer to account for the gains and profits which he has made from the use of a patented invention instead of limiting the recovery to the amount of royalties paid to the patentee by third persons.

International Lamp Competition.

At the recent petroleum exhibition, held in St. Petersburg, a competition was opened by the Russian government for the purpose of obtaining a cheap and serviceable lamp suitable for burning the heavy Russian naphtha oil for the poorer classes in that country. A prize of $1,600 was offered for the best lamp, and one of $559 for the second best. The competition was then a national one, but as the results obtained with the lamps sent in by the Russian inventors were not entirely satisfactory, the government considered themselves justified in not awarding the prizes. The competition, however, has now been thrown open to all comers, and lamps must be sent in not later than by the 13th January, 1889. There is thus afforded to American inventors an opportunity of trying what they can do in the matter.

THE NEW FRENCH SYSTEM OF MOVABLE BATTERIES.

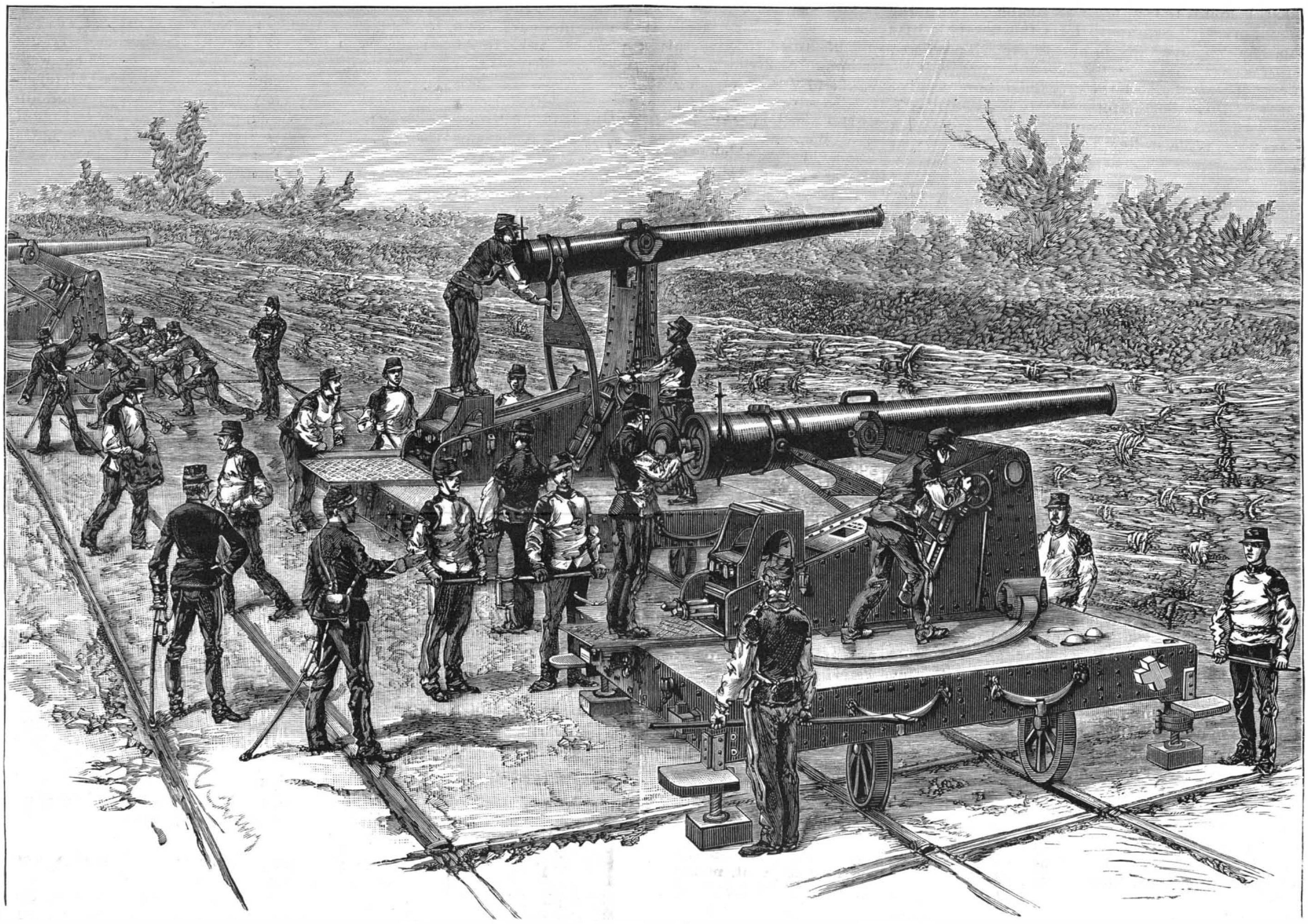
At a recent session of the chief council of war, the question of the transformation of the frontier fortifications was discussed at length. From the artillery experiments made at the camp of Chalons and at St. Chamond, it has been found that armor-clad batteries are rendered untenable by the penetrative power of the new projectiles of the new siege guns. Conformably to the views of General De la Jaille, president of the artillery committee, it has been decided to substitute, as far as possible, for the iron-clad batteries, movable ones mounted upon carriages running upon a very ingenious system of tracks, which has been recently experimented with at Toul, and which is shown very accurately in our engraving.

Let us imagine an intrenched camp, that is to say, a line of permanent forts provided with a circular railway passing in the rear of each of the forts at a distance of a hundred yards from them and skirted by a parapet of field fortifications *en saucisson* and of earth, high enough to cover the guns without extending above them. Upon this line are distributed the siege guns, each of which is established upon a rolling platform with a disappearing carriage, of which our engraving gives an idea. As soon as the enemy, through the opening of his first parallel and the construction of his first siege batteries, has outlined his attack, the carriages bring their guns together on the radiating tracks and carry them to the circular line. This arrangement secures to the firing a mobility that permits of striking the enemy and his batteries in every position. The guns, loaded and pointed in the eclipse position, that is to say, depressed, appear but for a few seconds at the moment of firing. If the enemy's fire becomes too hot for the exposed gun, the latter, without changing its aim, can be shifted to the right or left by the gunners to a distance of 20, 30, or 100 yards, and begin firing again without losing the benefit of its regulation, thanks to a mathematical correction of extreme simplicity.

The besieger, obliged to fire at an object a mile or more in extent, can rely upon chance blows only to dismount here and there one of these movable pieces. Admitting that he succeeds in this, the damaged gun, without disturbing the firing, can be removed from its park by transverse tracks and be easily replaced. The superiority of the besieged over the besieger is therefore overwhelming.

It is true that the projectiles carrying new explosives can make breaches in the railway parapet, but these can be easily repaired or filled in a few hours. The same is the case with the railway; if it be partially carried away, the squads of the railway battalions can soon lay it again. At all events, the firing of the movable pieces will not be interrupted.

The system represented in our engraving was constructed in the establishment of St. Chamond (Loire). It does the greatest honor to Commander Mougin, who studied the project of it.—*L'Illustration.*



THE NEW FRENCH SYSTEM OF MOVABLE BATTERIES.

New Electric Lighting Building in Philadelphia.

The Edison Electric Light Company, of Philadelphia, has its central station under roof and the machinery is being put in. The building is put up for solidity and strength rather than for appearance or decoration. It is six stories high. On the first floor will be placed twenty engines of 250 horse power each. On the second floor there will be forty dynamos, with a total capacity of 60,000 lights. The third floor will be used for the workshop. The fourth floor for ten boilers of 500 horse power each. The fifth floor will accommodate 1,000 tons of coal, which will be fed by pipes to the furnace under each boiler. The sixth floor will be devoted to the general offices of the company and will be fitted up in a very elaborate manner. The company has already about 28 miles of electrical conductor underground. Its underground system is through metallic tubes, with three copper wires, which are insulated by composition. The tubes have junction boxes at every 20 feet. It has 84 miles of copper wire underground. It considers the station well located, as it is in the geographical center of the district. Already 9,000 lamps are engaged, and expect to have 10,000 when they start up, which will be about the middle of December. The station when completed will be the finest in the world. All the large new buildings for banking institutions and trust companies will be lighted by this company, and the new Bulitt building will have 2,100 lamps. The company will also furnish power for motors, and will not discriminate between any motors for which it serves power.

This is one of the finest electrical buildings ever erected in the United States. It cost $150,000. The total investment, including wires, will be $1,000,000. It will be ready for operation inside of a month, at least this is the present anticipation.

Long Range Cannon.

According to a recent statement made by General Maitland a Longridge wire gun made at Woolwich has thrown a shot 12½ miles, with an initial velocity of 2,300 ft. per second.

The Pneumatic Torpedo Boat Vesuvius.

Of the Vesuvius the New York *Tribune* says:

One of the old navy officers, who was one of the actors in the notable Monitor-Merrimac fight, who served with distinction in other naval engagements during the civil war, and who has made a careful inspection of the new vessel, said he was much disappointed with her design. No attempt whatever seems to have been made to protect the vital parts of this "infernal triumph" in the slightest. Her boilers and engines are as much above the water line as below, and no protection is given to the boilers except coal, which, of course, will not be there when most needed to protect them from the solid shots of the enemy. Both of her engines are in one compartment, so that if a hole is made in that compartment, or a shot goes through the steam pipes of one engine, it would disable the motive power completely. In fact, a single shot from a revolving cannon of the size which is carried in the tops of vessels of modern build can easily penetrate the main steam pipe and completely disable the boat. It is easy enough to make a vessel go when you are not hampered with the weight of protective decks or armor, or obliged to keep the machinery below the water line, but I cannot conceive that such a design for a boat of this character, and for the service for which she is intended, is calculated to do more than to demonstrate whether or not the dynamite gun can be worked from a floating platform. The same thing could have been shown or proved by putting one of the guns on one of our old ships. The Vesuvius could not possibly go into action and fire one of her guns unless she took the enemy by surprise.

Photography of Projectiles.

The well known photographer, Anschuetz, of Lissa, has for some years been experimenting with photographs of the flight of cannon balls from the moment of their projection to their striking the target or object aimed at. Last month, on the trying grounds of the Gruson Works, near Buckau, he demonstrated the perfection of his studies. He succeeded in obtaining remarkable and highly interesting results. His plates were submitted to the expert, Professor Dr. Koenig, of the Berlin University, who was perfectly able to make therefrom the desired practical calculations. He established the fact that the projectile thus photographed had a velocity of over 1,300 feet a second, and that the duration of the light thrown on the photographic plate did not exceed the ten-thousandth part of a second.—*Court Journal.*

SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

A simple pendulum, which is a purely theoretical thing, is defined as a heavy particle suspended by a thread having no weight. The nearest possible approach to a simple pendulum is a heavy body suspended by a slender thread, as shown at A in Fig. 1, and although this is known as a compound or physical pendulum, its action corresponds very nearly with that of the simple pendulum. In the present case the pendulum consists of a heavy bullet or lead ball suspended by a fine silk thread. This pendulum, to beat seconds in the latitude of New York, must be 39·1012 inches long. That is the distance between the point of suspension and the center of gravity of the weight. This length varies in different places; for instance, it is 39·1948 at Hammerfest, and 39·0207 at St. Thomas.

A seconds pendulum is one that requires one second for a single swing, or two seconds for a complete to-and-fro excursion. The distance through which the suspended weight travels in one swing is the amplitude of the pendulum. Galileo's discovery of the law of the pendulum in 1582 is a matter of common knowledge. He observed the regularity of the swinging of a lamp suspended from the roof of the cathedral of Pisa, and noticed that, whatever the arc of vibration, the time of vibration remained the same. He also determined the law of the lengths of pendulums by experiment. He found that, as the length of the pendulum increased, the time of vibration increased, not in proportion to the length, but in proportion to its square root. For example, while in New York it requires a pendulum 39·1012 inches long to beat seconds, the length for two seconds would be 156·4048 inches. The length of a pendulum for any required time is found by multiplying the length of a seconds pendulum in inches by the square of the time the pendulum is to measure. In the above example, 39·1012 inches is the length of the seconds pendulum. Two seconds is the time to be measured. $2^2 = 4$. $39{\cdot}1012 \times 4 = 156{\cdot}4048$, the length of the 2 seconds pendulum. It is found that, barring the resistance of the air, all materials act alike when used for the weight of a pendulum. This is one proof of the uniformity of the action of gravitation on all substances.

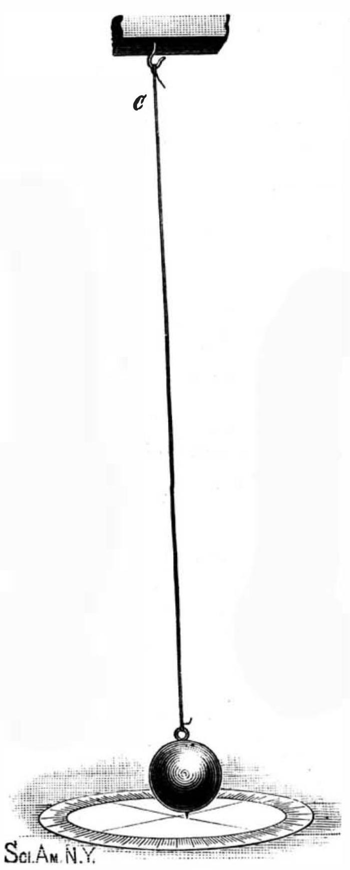


Fig. 2.

FOUCAULT'S EXPERIMENT.

In Fig. 1, at B, is shown a conical pendulum. It differs from the pendulum, A, only in the manner in which it is used; whereas the pendulum, A, is made to swing to and fro in a vertical plane, the pendulum, B, is started in a circle, as indicated by the dotted line. It is found by comparison that the pendulum, B, completes its circular travel in the same time that pendulum, A, requires to complete one to-and-fro vibration. The conical pendulum derives its name from the figure which it cuts in the air. The pendulum has been used to determine the figure of the earth, also to demonstrate the earth's rotation. Foucault's celebrated experiment at the Pantheon at Paris consisted in vibrating a pendulum having a period of several seconds over the face of a horizontal scale. While the pendulum preserved the plane of its oscillation, the scale indicated a slow rotation. This experiment may be repeated easily on a small scale in the manner illustrated in Fig. 2, at C. The ball, which must be a heavy one, is suspended by a very fine wire of considerable length, say from 10 to 20 feet. It must be started very carefully to secure the desired result.

To start it, a fine wire is tied around the equator of the ball. To this wire is attached a stout thread, by means of which the ball is drawn one side and held there until the pendulum is perfectly quiescent. The pendulum is then released by burning the thread. Some motion will be indicated in the course of a few minutes.

A pendulum capable of producing audible beats is often desirable. Fig. 3 shows a simple, well known arrangement for producing audible beats by the aid of an ordinary telegraph sounder. The ball, in this case, is suspended by a fine wire. Exactly under the point of suspension of the pendulum is placed a small wooden cup containing a globule of mercury, which touches a wire leading out of the wood and communicating with one binding post of the sounder; the other binding post is connected with one pole of the battery, the remaining pole of which is connected electrically with the support of the pendulum. The under side of the pendulum ball is provided with a platinum

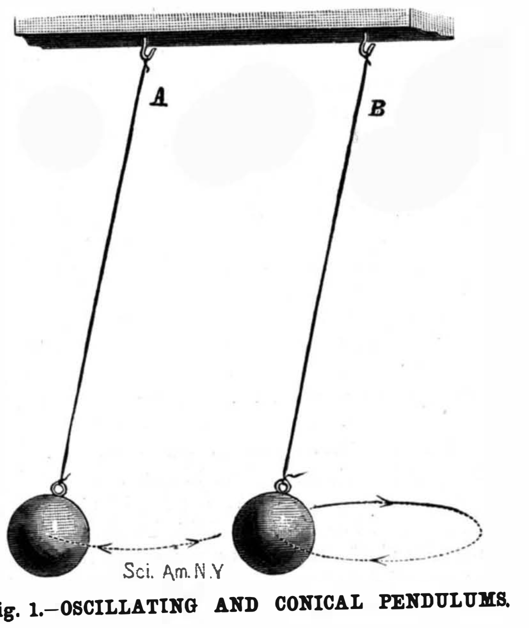


Fig. 1.—OSCILLATING AND CONICAL PENDULUMS.

or copper point, which is capable of just touching the mercury globule as the pendulum swings. By this arrangement an electrical contact is made for each swing of the pendulum, and the sounder is made to click each time the circuit is closed.

By means of Kater's reversible pendulum, the length of a simple pendulum having the same time of oscillation as the compound pendulum may be accurately determined.

In Fig. 4 is shown a slightly modified form of this pendulum, in which the rod is formed of two parallel bars of wood, separated by blocks at the ends and provided with two swiveled cylindric rings, between which are placed two adjustable lead weights, held in place by crossbars secured to the weights by screws, and extending over the edges of the wooden bars. Below the lower swiveled ring are clamped lead weights, one upon either side of the bar, with a screw extending through one weight into the other. These weights are cheaply made by casting lead in small blacking box covers.

This pendulum is suspended upon a knife edge projecting from a suitable support, and the weights between the bars are adjusted until the time of vibration is the same for either position of the pendulum, it being reversed and oscillated first upon one of its rings as a center, then upon the other, until the desired adjustment is secured. Then the distance between the bearing surfaces of the rings will be the length of a simple pendulum which would vibrate in the same time as the compound pendulum.

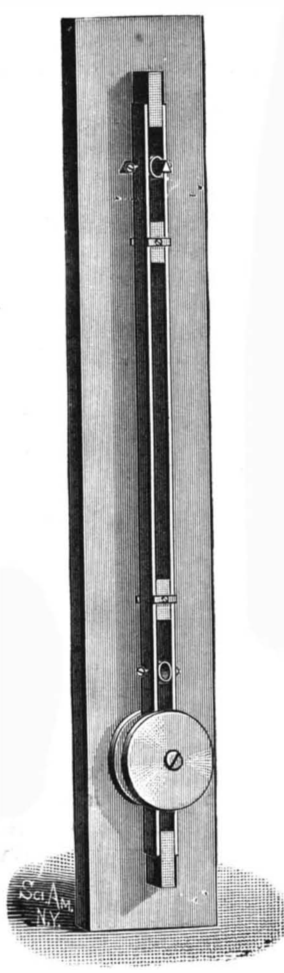


Fig. 4.—KATER'S REVERSIBLE PENDULUM.

A Petroleum Rocket Boat.

A novel craft, in the shape of a yacht, named the Eureka, 100 feet long, 12 feet beam, and 6½ feet draught, was launched from Poillon's ship yard in this harbor on the 27th ult.

This boat is to be propelled by the explosion of a gaseous mixture of air and petroleum, which enter at one end of two pipes arranged along the bottom of the boat, and discharge their contents under the water at the stern. The *N. Y. Herald* gives the following:

The mechanism lies in the after part of the yacht, and consists of a starboard and port cylinder, each 10 feet in length with an internal diameter of 20 inches. These cylinders are closed at the forward end, but open aft and in direct contact with the surrounding water, against which the gaseous products of successive explosions of fuel and air will issue. On top of each cylinder is an automatic valve that will be opened and shut by the force of explosion and exhaust.

Fuel in the shape of vaporized petroleum will be forced from a tank into the cylinders and ignited by an electric arrangement. The electric spark will be generated between two electrodes, which will feed and regulate automatically.

The thermal principle that will propel the new yacht is one on which the combustion will yield a maximum amount of heat instantly without the necessity of draught; and as the conversion of heat energy into mechanical force is possible under a law of thermodynamics, there will be no limit to the speed of this class of vessel except the vacuum created by them in being forced through the water. From any point of view the system is purely scientific and simple, and whether it is equally as efficient will be demonstrated by future experiments. The most revolutionary part of the system is the novel method by which the mechanical force is applied to propel the vessel, and as the whole apparatus is motionless when in operation, no power is lost by friction or the overcoming of inertia.

Following are some of the advantages claimed by the inventor, Mr. John H. Secor·

The supply of fuel to the combustion chambers is automatic, and the combustion occurs in airtight chambers without draught.

There is complete combustion of fuel instantly following its introduction. This is succeeded by an instantaneous conversion of heat into power. All this occurs in the furnace or combustion chamber, and losses of heat are avoided on the one hand and losses of power, from friction, on the other.

The functions of the shaft and screw are also performed by the combustion chamber, and the room occupied by this is, for equal power, naturally much less than for boilers, engines, and shafts.

There is a saving of more than two-thirds of the cost of fuel and room required for its storage.

Such occurrences as disabled shafts and screws are impossible, and overpressure cannot occur under any circumstances. As the power is not stored, either as hot water or steam, this, of course, dispenses with "getting up steam" or "blowing off."

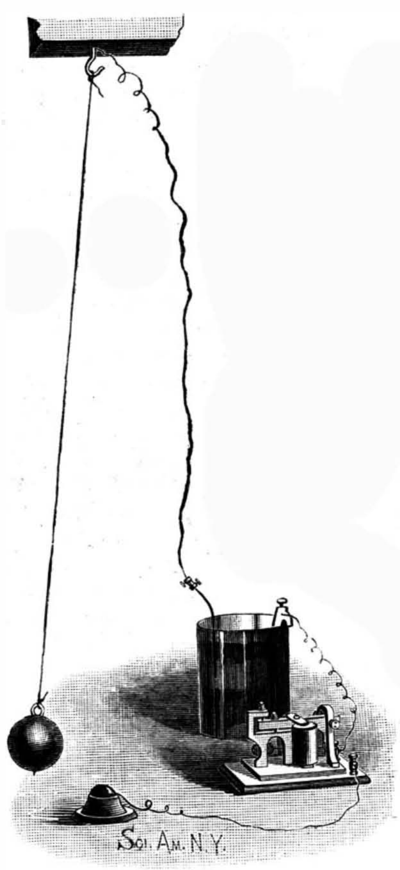


Fig. 3.—PENDULUM WITH AUDIBLE BEATS.

The power is applied in propulsion in such a way as to produce the greatest resistance from the water with the least disturbance of its inertia, *per contra* the greatest reactive effect.

In the largest vessel afloat, the captain from his bridge can stop the propelling force more quickly than an engineer can stop the engine of a launch, and in those of moderate size it is possible to maintain high speed for long distances.

We may add this vessel is a modification of Mr. Secor's boat, the construction and mechanism of which were illustrated and described in the SCIENTIFIC AMERICAN of July 24, 1886.

The Heating of Railroad Cars.

If some inventive genius will turn his attention to the contriving of a better apparatus for the heating of railroad cars by steam than is at present in use, he will stand a fair chance of making a fortune if he is successful. He will also save travelers from a great deal of suffering this winter, and thus earn the gratitude of the traveling public.

Owing to the new law forbidding the use of stoves in cars, the railroad companies have been obliged to resort for heat to steam, which is supplied by the engine. Railroad men admit that it will be almost impossible to heat long trains of cars by these means in the coldest weather, while any accident to the pipes, or any necessity that would take the engine away from the train, would leave the cars unsupplied.

The law prohibiting the use of stoves is a good one, but travelers on the railroad are already beginning to feel the effects of it in an uncomfortable way. Now, let the inventive mind apply itself to this problem and avert much discomfort.—*Evening Telegram.*

The Mitchell Monument.

An interesting address, delivered on the 16th Oct., by Dr. William B. Phillips before the University of North Carolina, describes the erection of a monument on Mitchell's High Peak, N. C., in memory of Elisha Mitchell, D.D., for thirty-nine years a professor in that university.

American scientists of middle age will remember that Professor Mitchell lost his life on the 27th of June, 1857, while engaged in measuring the heights of the peaks of the Black Mountains, in Yancey County, N. C. He had left his party about half way up the highest peak, with the intention of crossing the mountain alone and on foot, to visit an old guide with whom, on a former occasion, he had made the ascent. By some fatal mishap, the particulars of which must remain forever unknown, he fell over a precipice into a deep pool of water, and (probably rendered helpless by the fall) was drowned. His body was found after a careful search lasting ten days. It was interred first at Asheville, N. C., and from this place was subsequently removed to the top of the highest peak, where it was buried June 16, 1858.

Since that time, several attempts have been made to secure the erection of a monument to his memory on the spot where he had been finally laid to rest, but, for one cause or another, these plans came to nothing, and the breaking out of the war, followed by years of distracting excitements, caused the matter to be comparatively forgotten by the public. Recently, however, the surviving members of Professor Mitchell's family have become able to revive and carry out the project. Affection has paid the debt for which science and patriotism should have been equally liable. Dr. Phillips was charged with the execution of the work, and erected, during the summer just passed, a plain shaft of white bronze at the grave.

This peak, which now bears Dr. Mitchell's name, was first measured by him in 1844, and found to be 6,711 feet above sea level. A subsequent measurement, which he made in 1856, gave 6,700 feet. The United States engineers, in 1881–82, reduced this determination to 6,688 feet. It is beyond doubt the highest point in the United States, east of the Mississippi River. The ascent is best made from Patton's, on the Swannanoa River, from which point the distance to the summit is about twelve miles. Mere figures of altitude give no conception of the difficulty of the ascent, and especially of the transportation of heavy freight. Dr. Phillips' work was really a piece of engineering by the use of "main strength," worthy to be ranked with some of the feats of war times, in the movement of artillery over "impossible" ground.

The monument was cast by the Monumental Bronze Company, of Bridgeport, Conn., in nine sections, with interior bolts of copper and brass. The total weight is 900 pounds, the weight of the heaviest piece 140 pounds. As it now stands, it presents a pyramid, three feet square at the base and nine feet high.

"White bronze," as manufactured by the works above named, is almost pure spelter, containing only a few tenths of one per cent of ingredients other than zinc. After casting, it is treated with the sand blast, to impart a finely granular surface, closely resembling in texture and color light gray granite. It is practically weather proof, years of exposure only darkening somewhat its original hue.

A good deal of trouble was encountered in securing a firm foundation, the rock of the peak being a coarse and very friable gneiss. Two stones, weighing about 1,800 pounds, were united for this purpose with Portland cement. The structure is anchored to these by eight ½ inch copper bolts and four 1 inch zinc bolts, screwed into the first and third sections and secured to the stones by metal pourings. These anchors extend four inches into the bed rock. All the bolts are fastened from within, so that they do not show on the outside.

It was hauled by wagon from Black Mountain station, on the Western North Carolina Railroad, to a point two miles above Patton's, whence it had to be carried on men's shoulders ten miles further. In this distance, the grade for the first two and a half miles was about 800 feet per mile, and the average grade throughout was about 300 feet per mile. The transportation from the railroad to the top of the peak required thirteen men for three and a half days, and one boy and two oxen for one and a half days. When we add that the total expense was $46.96, we think it will be admitted that the money was well earned.

This monument is believed to be the highest of the kind in the United States. The grave of Mrs. Helen Hunt Jackson, near Colorado Springs, is said to be 8,500 feet above the tide, but is not marked by a structure of this kind, and the Ames memorial of stone, at the highest point of the Union Pacific Railroad, with an altitude of 8,247 feet, may also be ruled out of comparison, as presenting no difficulties of transportation or construction, being within a few yards of the railroad.

We must not omit, however, while we record the successful erection of the Mitchell monument, to recall the merits and services of him in whose honor it has been raised. At the time of his death, Professor Mitchell occupied, in the University of North Carolina, the chair of geology and mineralogy. He had been a constant contributor to *Silliman's Journal* for more than thirty years, and was a well known authority in many departments of science.

Born in Washington, Conn., August 19, 1793, he was, on his mother's side, a descendant of John Eliot, the "Apostle to the Indians." Graduating from Yale in 1813 (a classmate of Denison Olmsted, afterward his colleague at the University of North Carolina), he taught school on Long Island and Connecticut for three years, was a tutor at Yale College for two years, and finally, in 1818, found his life work at the University, where he labored thenceforward.

For nearly forty years his beneficent and powerful influence was felt in North Carolina, especially at the University, where, with Olmsted, Andrews, Caldwell, James Phillips, and others, he laid the foundation for sound and liberal learning. In 1832 he assisted Professor Caldwell in building at that institution the first astronomical observatory in the United States, and these two, assisted by Professor James Phillips, determined the correct latitude and longitude of Chapel Hill, and made observations on the fixed stars.

Professor Olmsted had started in 1819 the geological survey of North Carolina, the first in this country. Upon his removal to Yale, in 1825, Professor Mitchell took up the work, and was engaged in it until 1852, when it passed into the hands of Dr. Emmons.

These names of the great pioneers of American science must not be permitted to die out of our grateful recollection. How they would rejoice to-day, could they behold the tardy but abundant harvest of their sowing, in the awakening of the South to science and industry, the fulfillment of their hopes and prophecies, the march of organized armies of progress along the lines of their painful and solitary surveys!

If the Mitchell monument, looking down upon a busy and fruitful land, may symbolize the joy of these early toilers in the result of their labors, surely, on the other hand, the sons of the South will look reverently up to it as the type of those who gave their lives to her service, in the day of lowly beginnings, but lofty faith.—*Engineering and Mining Journal.*

Practical Work in a Practical School.

H. C. Spaulding, a graduate of the Institute of Technology, in a recent paper read before the Electric Club, tells how laboratory work and boiler and fuel tests are conducted at the Institute as follows:

Visitors are often surprised and amused at the transformation after seeing several rather dudesque young men enter the outer door and appear only a few moments later in flannel shirts and leather aprons ready for two or three hours at the anvil or forge or prepared for work in the mining laboratory. The mode of operation here is rather different from that in vogue in some institutions where the assistants do all the work and the students look on, making comments and taking notes of the operations.

In the Institute every man is obliged to go into matters for himself, dirt and such minor disadvantages being considered of no importance. The estimation of time, too, is considered of little moment, especially in case of advanced students, as it is a common saying among the boys that in order to meet the entire approbation of their own and their teachers' consciences they must study till three o'clock in the morning and then get up at midnight and begin again.

I recall with pleasure, not entirely unmixed, however, with other sentiments, several cold winter mornings when, with other poor wretches, I reported for duty at the Institute buildings at six A. M. Seven or eight of us were on for a boiler test, which necessitates being on hand at this unearthly hour.

In these boiler tests different stations are allotted to each student, as, for instance, weighing the coal, weighing the feed water, weighing ashes, etc., are recorded every five minutes during a ten hour run, and calorimeter tests are made two or three times during the day to determine the quality of the steam. Great care is taken that the conditions of the boiler at beginning and ending the tests shall be as nearly similar as possible. Toward this end the fires are drawn at about five minutes before the time of beginning and the steam pressure brought to the average point, the level of the water being also noted. At the given signal, a known quantity of fuel is put on the grate and the fire started.

At the end of the test, the boiler being as nearly as possible in the same condition as above, the fires are drawn again and the exact weight of the fuel thus removed deducted from that used in firing during the day. I think this method of carrying on the test will, for the actual value of its results, compare favorably with that recently proposed by a prominent educational gentleman in New England, who advocated using a small boiler upon platform scales for this purpose.

During the past year quite an amount of interesting work has been done in the electrical laboratory, including electrical and mechanical tests of some different makes of motors, also upon the efficiency of the Westinghouse converter. A new method has been used for testing the converters, which requires no measurements not obtainable with an alternating current.

Tests have been made upon incandescent lamps of different makes, including the customary ones, upon life and efficiency, and also upon the rise of candle power with increased voltage, and it is expected that the results of this latter line of work will be shortly in condition for publication. The specific inductive capacity of different materials has also been investigated, with some very curious results. Different makes of storage batteries have also been tested and compared.

Natural History Notes.

Effect of Climate upon Seeds.—According to Schubater, the majority of plants produce larger and heavier seeds at the North than at the equator, and this, according to him, is due to the long duration of the days of summer and to the long exposure to the sun. Beans carried from Christiania to Drontheim have furnished in the latter locality seeds that had gained sixty per cent in weight. Thyme from Lyons, planted at Drontheim, has gained seventy-one per cent in weight. On the contrary, the seeds of Northern plants, developed in more temperate climates, lose in weight.

Symbiosis of Alga and Sponge.—A very interesting case of what may be perhaps included under symbiosis is described by Messrs. Murray and Boodle in the *Annals of Botany* (p. 170). Under the name of *Spongodendron* and *Spongocladia*, two or three species of chlorospermous algæ have been described, which present a remarkable resemblance in outward contour and aspect to a digitate sponge. These have been examined carefully by the authors, who find that each alga is intimately mixed throughout its growth with a species of sponge bearing sponge-spicules. This growth does not appear to be accidental, since in each of the three species described a different species of sponge uniformly accompanies the alga, and the algæ are derived respectively from the Mauritius, New Guinea, and New Caledonia.

The Volcano Fish.—In the year 1803, Von Humboldt was fortunate enough to witness an eruption of Mount Cotopaxi, a well-known peak in the northern Andes, during which, among other products, a large number of fish were ejected. The inquiries immediately instituted and the investigations of more recent travelers have brought to light the astounding fact that, from time to time, though at irregular periods, fishes are cast up from the interior of the mountain during volcanic eruptions. The phenomenon is not confined to Cotopaxi, but has been observed also in other centers of volcanic action, viz., Tungurahua, Sungay, Imbaburu, Cargueirago, etc., all in the same range. From the craters of these volcanoes, or from fissures in their sides, it is an ascertained fact that fish are vomited to a height of some 16,000 feet above the level of the sea, and about half that height above the surrounding plains. The animals all belong to the same species, the *Argas Cyclopum*, as it has well been named. Nor is it a mere chance fish or two that find their way to the outer world through this strange opening. They are ejected in such countless shoals that, on more than one occasion, the fetid exhalations proceeding from their putrid bodies have spread disease and death over the neighboring regions.

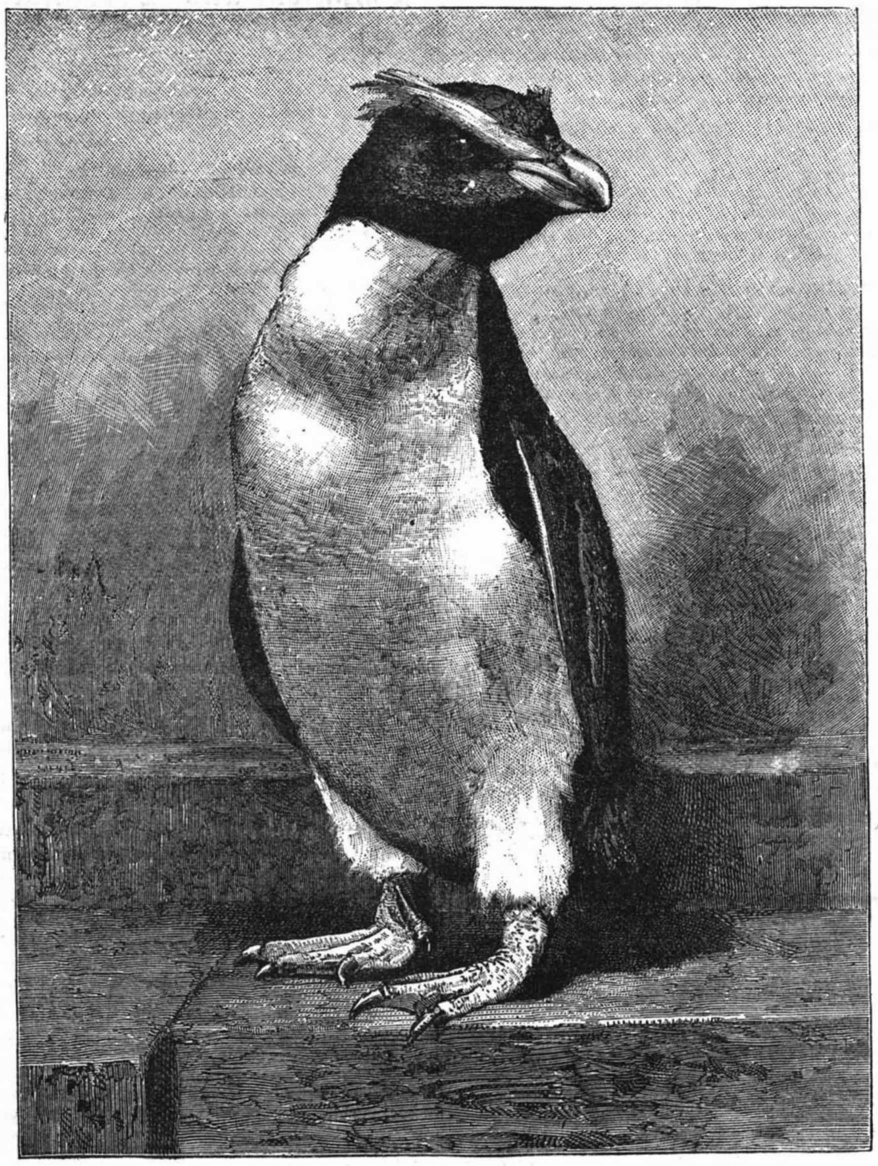
As far as the external world is concerned, the fish is known to exist in some lakes on the sides of these mountains, and it is possible that these lakes communicate with reservoirs in the interior, where the pregnadillas are generated, and thus find their way through the crater. But this is mere conjecture.

Puzzle to an Insured Man.

Nobody knows what an insurance policy means until he has been burned out. The proprietor of a Buffalo repair shop has been for years carrying a policy, says the *Courier*, not only upon his goods, but also upon articles left with him for repairs. These latter were specifically mentioned in the policy, which was a very broad instrument in its terms, and appeared "to be horse high, bull strong, and pig tight" in its power to protect the man who paid for it. It called for a larger amount than he would have placed upon his own property alone, and he was in the habit of telling people who left their property with him that it was amply protected. He was burned out the other day, and when he came to settle with the insurance people they declined to recognize his claim in behalf of property left with him for repairs, unless he had in each instance specifically agreed with the owner that its loss by fire should be made good, and charged a consideration therefor. They took this position on the ground that he was not otherwise responsible for the property left in his shop. They asserted that a watchmaker, for instance, is not responsible for watches left with him for repairs, unless he makes a special agreement to this effect with their owners and charges them for it. If this be true, it is a good thing for people generally to know. In the case referred to, the owner of the repair shop wonders what he has been paying for all all these years.

THE ROCK HOPPER PENGUIN.

Among the additions made lately to the collection of birds in the Zoological Society's Gardens, Regent's Park, the specimens of the rock hopper penguin, from New Zealand, are certainly worthy of attention. The one forming the subject of our illustration is an exceptionally handsome representative of that, in many ways, remarkable group of aquatic and flightless birds known as penguins, constituting the family *Spheniscidæ* of ornithologists. In these birds the wings are totally unfitted for flight in the air, but, being small and covered with short rigid feathers, they are, by being used as paddles, admirably adapted for swimming beneath the surface of the water. As their legs, which are not so long as those of an ordinary sized duck, are situated far back on the body, the birds stand perfectly upright upon them—a formation that renders their movements on land somewhat awkward and ungainly. In the water, however, when engaged in hunting their finny prey, they are extraordinarily active. The name "rock hopper" was given to this genus of the family by the sailors, who noticed the peculiar way they had of jumping, with curious little hops, from one rocky projection to another. They are also known as "macarones" and as "yellow crested penguins," for from the base of the upper mandible on each side a broad line of golden yellow passes over the eyes, and is continued for two inches beyond the head in a crest of fine pointed feathers. Although these birds are plentiful in their chief *habitat*, the Falkland Islands, yet, strange to say, they are rarely seen in confinement. The specimens the Zoological Society have lately acquired are lodged in the fish house in a large cage, which is well supplied with water and artificial rock work, so that the peculiar actions of the birds in both elements can be observed. At feeding time a large glass-fronted water tank also enables visitors to watch and admire their rapid flight through the water in pursuit of the fish with which it has been previously stocked. The crowds that daily assemble here at the hour when this performance takes place testify to the fact that it is one of the sights of the Zoo. Our illustration is from a photograph taken by Major J. Fortune Nott, F.Z.S.—*The Graphic.*



THE ROCK HOPPER PENGUIN.

RUNNING ELEVATED RAILROAD TRAINS BY ELECTRICITY.

Quite an interesting electrical experiment took place on the rainy night of November 27, on the Ninth Avenue elevated railroad in this city, being a trial of a new Daft-electric motor, named the Benjamin Franklin, weighing about ten tons. Its four wheels are connected for the purpose of increasing the tractive power. Notwithstanding the driving rain, it hauled a train of three regular elevated railroad cars very easily up heavy grades for a mile and a half. At the end of the route, the motor switched off, backed, and hitched on to the other end of the train, with the same facility as with the steam locomotive; in fact, it seemed to be done with greater ease. The total weight of the train was estimated at sixty tons. The current was supplied from dynamos located in a station in Fifteenth Street. The electrical current is conveyed from the station and alongside of the track by a copper rod ⅝ of an inch in diameter. The current is taken from this rod into the motor by a metallic brush which presses upon and slides along the rod. The trial was undoubtedly a severe one, inasmuch as the rails and connecting rod were saturated with water. A number of prominent railroad engineers, officials, and electricians were present, and were perfectly satisfied as to the result of the trial. It appears to be only a question of time when our city elevated trains will be hauled as rapidly by electricity as with steam.

The *Electrical Review* says: In the power station, four dynamos, of 50 horse power each, supply the current, and a fifth, of smaller size, serves to light the place. The power dynamos are connected with a switchboard, which permits of their being used "in parallel" or "in series," as may be desired, without trouble or delay.

These terms merit a word of explanation, as the first of them describes a disposition which is an important factor in the economical generation of dynamo electricity. When two machines are connected—both positive poles to one leading wire, and both negative to another—they are said to be "in parallel," and the current obtained is greater than the sum of the currents of both working separately, in direct ratio to the reduction of their internal resistance brought about by the coupling.

This arrangement may be carried further, but with a rapidly lessening degree of advantage. Coupling machines "in series" consists in passing the current of the first through the second, and so on.

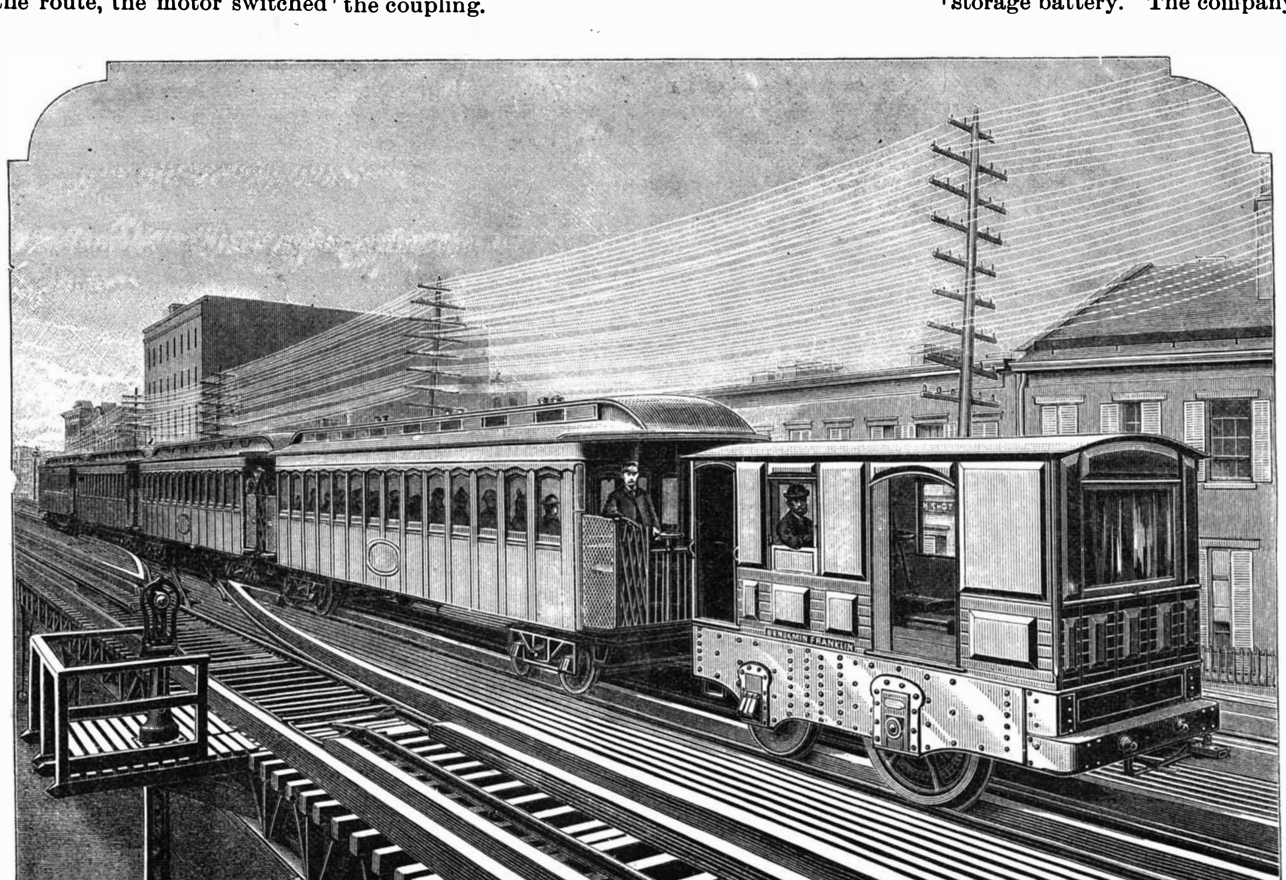
An important instrument is the automatic cut-off, which is brought into play by the occurrence of a "short circuit" on the track, and opens the *ketee*, or chain, as our German friends term it, at a fixed point, sounding at the same time an alarm. This contingency, which might befall through accident or mischief, would have the effect of unduly lessening the resistance, and so increasing the quantity of current that it might develop enough heat in the insufficient circuit to destroy the insulation of the field magnets and armature coils, and disable the machines.

The steam engine that drives the generators is of 250 horse power, and the potential of the current developed 280 volts, a step beyond that used at Baltimore, but still within the danger limit.

The illustration of this article shows the Franklin with a four-car train. In her experimental runs she has repeatedly drawn this train with less than three-fourths the current-generating capacity in use, up and down the line at a speed of 25 miles per hour.

With the same current and three unloaded cars, a speed of 30 miles per hour was kept up uninterruptedly for a long time.

The commercial outcome of the achievements of the Franklin could hardly be forecast; but, in consideration of the well substantiated claim that the substitution of such motors on the New York elevated railways would reduce the running expenses about 50 per cent, and this even when including, as a fixed charge, the interest on the cost of re-equipment, and also without allowing any rebate for the sale of the present steam locomotives, which are of standard gauge and available on any ordinary track, there should be little doubt as to the probable line of action of such a sagacious and far-sighted management as that of the New York elevated railways.



THE DAFT ELECTRIC MOTOR ON THE NINTH AVE. ELEVATED RAILWAY NEW YORK.

Electrical Storage Street Cars.

The Julien Electric Company is running three cars on Fourth and Madison Avenues, this city. Until recently, the batteries were changed after each round trip of 12 miles. Now they are changed after the second round trip, or 24 miles. Even then, the battery requires but about three hours' charge before it is put on the car again. The company hopes very soon to make three round trips, or thirty-six miles, with one charge. If it can accomplish this, there will be required but one charge of battery a day, thus making a great saving of time and labor. In other words, horses will be changed but once a day. All this is due to the scientific progress the Julien company is making, more especially in the storage battery. The company has done a great deal of experimental work on the three cars now in use, and has put them to such practical tests as to be able to settle on a standard. Hereafter, the standard car of the Julien Electric Traction Company will be an 18 foot body, mounted on an independent rigid truck, with a 6 foot wheel base and, on Fourth Avenue line, a 15 horse power motor, geared to each axle. The car will carry 144 cells in six groups of 24 each. This novel grouping is for economy; for by this means, the motors will be run most of the time in series, instead of all together in parallel, as at the present time. Not one of the Julien cars has yet broken down or become disabled since they were put in service.

RECENTLY PATENTED INVENTIONS.

Engineering.

PETROLEUM ENGINE.—Adolf Spiel, Berlin, Germany. This engine is run by the explosion of a compressed mixture of air and petroleum, the supply being drawn into the cylinder by the movement of the piston in one direction and compressed by the return movement, while a governor automatically controls the admission of oil to regulate the speed.

GAS MANUFACTURING PROCESS.—Gustaf M. Westman, New York City. It consists in forcing superheated gases through a charge of coal, then passing the resulting gases through glowing coke, and finally superheating part of the gases and passing them through the coal, the process being preferably carried into effect by means of a novel form of furnace, to save labor and increase the quantity and quality of the gas.

CAR COUPLING.—William Latimer, Wilmington, N. C. The coupling hook is pivoted to swing in the drawhead, and has a weighted shank arranged to be butted or struck by an entering link, thereby coupling the hook with the link, a dog automatically engaging a shoulder to lock the hook in coupling position. The coupling is designed for use with the standard link, in connection with the common pin coupler or another coupler like itself.

DYNAMITE CENTRIFUGAL GUN.—Walter E. Hicks, Brooklyn, N. Y. It has twin disk wheels, with four oblong firing chambers, near their peripheries, the disk wheels to be rapidly rotated, and solid shot, or shot and an explosive shell, are to be discharged by and through the action of the resultant of the central forces, centripetal and centrifugal.

CENTRIFUGAL ORE AMALGAMATOR.—James B. Brewster, New York City. This invention is an improvement on a former patented invention of the same inventor, and consists in providing the outer part of the rotary amalgamating pan, having a series of concentric grooves, with an upwardly and outwardly flaring rim or edge.

Agricultural.

HARROW.—John H. Higgins, Charleston, Me. This invention relates to a spring tooth harrow, in which the frame is formed in two sections hinged together, and adapted to be rigidly locked parallel to each other, to improve the efficiency of the harrow in leveling the ground, while there is a special construction of the harrow frame, and of the clips used in securing the spring teeth.

CONVERTIBLE HARROW AND CULTIVATOR.—John H. Higgins, Charleston, Me. This improvement is designed to furnish a device whereby the teeth always retain their parallel position with the line of draught for effective work, whether the cultivator or harrow is opened to its widest extent or closed for use in the narrowest rows of crops.

ATTACHMENT FOR CULTIVATOR SHIELDS.—John T. Downey and George P. Funkhouser, Plattsburg, Mo. It is designed to be readily connected to the arch of the cultivator, whether the same be vertical or horizontal, and provides a means whereby the shield may be carried to the right or left, as desired, and raised or lowered to any height required by the condition of the ground.

RAKE.—E. William Gunn, New Woodstock, N. Y. Combined with the head or cross bar of the rake and its handle are rake teeth constructed of a continuous piece of wire coiled around the bar, doubled and twisted to form teeth, and twisting around the forward end of the handle answering as a ferrule therefor, in hay and other like rakes.

Miscellaneous.

LIFE BUOYS.—Thomas L. Reed, Laporte City, Iowa. Apparatus is provided by this invention whereby the float, held by a cover or support to the vessel, may be conveniently detached therefrom, while a connection will be still maintained between the vessel and the float, while means are provided to effect communication between the vessel and the shore.

STOVE PIPE THIMBLE.—William H. Packham, Dresden, Ontario, Canada. This device is designed to protect the flooring, wall, or partition in which it is inserted from the heat, and also to serve as a ventilator if desired, while being of simple and durable construction, so that it can be readily taken apart and cleaned.

WAGON WHEEL.—Herman and Henry Wesle, Medford, Wis. It is made entirely of iron or steel, the hub being in two sections, each having arms alternating with arms of the other section, forming adjustable mortises for receiving the sockets of the spokes, the arrangement being such that the various parts of the wheel may be readily tightened when worn or accidentally loosened.

BRICK PRESS.—Charles F. Stout, Trenton, N. J. This press provides for an increase of the power of the operating lever as the compression of the clay in the mould increases the resistance to the plunger—for facilitating the removal of the plunger, mould cover, and operating devices—and for readily taking up the wear of the bearings, while the construction is designed to give great strength and durability.

BALING PRESS.—William P. Martyn, Harrisburg, Oregon. This machine is one which may be used for baling while traveling or moving, by keeping a pair of horses on the tongue and another to press the bale, in such way baling from a cock or windrow, the invention providing various novel features of construction and combinations of parts.

REGISTER FOR WATER METERS.—Franklin T. Gilbert, Walla Walla, Washington Ter. The shaft of the rotating wheel of the meter is rigidly attached to a small gear wheel in a shallow chamber, this small gear wheel communicating motion to a unit wheel, and thence to wheels of larger denomination, all resting in the same plane, making a register of most compact form, and one not liable to be easily deranged.

APPARATUS FOR DISPENSING BEVERAGES.—Ernest Hague, New York City. It may be combined with a water cooler and waste water receptacle, and is designed to dispense aerated or mineral water by the glass, without an attendant, by the dropping of a coin or other token in a lock and receptacle to receive it.

BOTTLE CLEANER.—Anders G. A. Ekroth, Ishpeming, Mich. Folding rods, on which are bristles or equivalent brush-like material, are adapted to be inserted in the neck of the bottle, to be opened out by a hand lever in cleaning, there being a projection from one side of the bottom to clean the ring-shaped cavity in the bottom of some bottles.

MEMORANDUM BOOKS.—Samuel J. Young, Brooklyn, N. Y. This invention provides a memorandum book having on the inside of one cover a cross piece or pocket for the reception of the leaves, and the other cover making a fastening which gives a neat appearance to the book, and is durable, holding the book securely closed.

UPHOLSTERY EDGING.—William Furl, Lockhaven, Pa. This is a new article of manufacture, consisting of a filling compressed into shape, with a covering stitched to form a loop or attaching edge, making a sharp corner edging for upholstery purposes, which will stand out the same as a hand-stitched edge, and will be durable and of fine finish.

BALL JOINT FOR CHANDELIERS.—Walter Smart, Jersey City, N. J. This invention covers a novel construction of joint for hanging chandeliers, in which a coupling sleeve, adapted to be screwed on a gas pipe projecting from the ceiling, is provided with an internal socket to receive a ball having a depending shank for connection to the main pipe of the chandelier.

WASHING MACHINE.—Thomas L. Barker and Joseph C. Hornbaker, Westfield, Ind. This invention combines a clothes roller and wringer with a washing machine, the improved machine being simple and durable in construction and designed to be very effective in operation.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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 Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) D. C. M. asks: How is mercury best cleaned from gold jewelry, rings, etc., after it has once spread all over the surface of the gold? A. Heat to a temperature of low red; be careful, or you may melt the gold.

(2) H. S. W. writes for the best cement to use for a large aquarium where the water pressure is very heavy. Have had great trouble in keeping it tight. Depth of water is 5 ft. Also what is best to paint the bottom and uprights with, to prevent rusting. Are of cast iron. A. Try Burgundy pitch melted in with hot iron. A little boiled oil may be melted with it. Paint uprights and bottom with zinc white.

(3) S. V. P. asks: What preparation to use in painting a black board. He has used ivory black and oil, with about 1 oz. drier to half pint of mixture. The board is dry; but such colors of crayon as red and yellow will not wash off. A. Mix lampblack and flour of emery or ground pumice stone with shellac varnish (2 oz. shellac to 1 pint of alcohol).

(4) E. H. asks: How are autumn leaves kept bright and glossy for winter decoration? A. They may, after pressing, be dipped in melted beeswax; the same may be applied solid to the surface and be melted with a hot smoothing iron; or they may be varnished with dammar varnish or Canada balsam. Varnishing is objectionable on account of time required for drying.

(5) J. K. H. asks which is the best season for tree planting, and best method. A. An excellent method for hardy trees is, in frosty weather, in fall, to dig a trench around them, and remove the earth from underneath them as much as possible. Then the ball of earth is to be well moistened and allowed to freeze solid. The tree with frozen ball of earth attached is then moved and placed in the desired spot, where a hole large enough for its reception has been made. It is well to "top" or remove some of the branches. Delicate trees, such as arbor vitæ, should be transplanted in spring. They should be firmly attached to stakes for the first season, and it is well to place a couple of heavy stones on the ground near their stems.

(6) Mass. asks: Is there any law or regulation that obliges one to have periodicals or papers sent in individual wrappers where free delivery is in practice? A. No. Each paper should be separately addressed.

(7) F. W. C.—The fungus which you send is commonly known as an earth star and scientifically as *Geaster hygrometricus*—the specific name referring to the plant's habit of expanding or contracting its outer, stellate coat according to the hygrometric state of the atmosphere.

(8) F. B. H. writes: I want to print on tin and glass with one inch common block letters, the sign to be about seven by four inches. What shall I use? A. Use colored printer's inks. You will have trouble in printing on glass, unless you use India rubber type.

(9) H. D. W. asks for the formula for "Vesuvium;" it is used for lava work. I know it has whiting and glue, but do not know the proportions or the other ingredients. A. 7 lb. best glue are boiled in 3½ pints of water; 3 lb. white resin are dissolved by heat in 3 pints raw linseed oil; the two are mixed and simmered for ½ hour, and are then poured out on a quantity of whiting and mixed to the consistency of dough. Or, boil 1¾ lb. best glue into thick solution, stir into it 10 oz. of resin or, still better, Venetian turpentine. Add enough whiting or mineral color to bring it to a stiff paste and add a few drops of olive oil. These are the best formulas approaching your requirements that we can give.

(10) G. R. J. asks: Will carbonic anhydride, worked under the same pressure as anhydrous ammonia, be equally effective; *i. e.*, say 150 lb. pressure, and what is the relative expansion pressure? A. No. Carbonic anhydride requires a pressure of 38·5 atmosphere for its liquefaction at freezing temperatures; ammonia requires much less, only 4·4 atmospheres. The carbonic anhydride would be perfectly efficacious, but would need very powerful machinery.

(11) O. I. F. asks: 1. How many 16 candle power incandescent lamps (Mather system), 103 volt, can be used on the dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600. A. Eight to ten. 2. Can I make and sell the dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600? A. You can.

(12) W. H. D. asks how to mix the bisulphide carbon for a bright silvering. I tried it with a bottle of strong silver solution, in which I put 2 oz. bisulphide of carbon, but I cannot get it to mix. A. The process is only adapted for work on the large scale. A mere trace of bisulphide is required. Below we give two receipts: 1. 6 ounces bisulphide of carbon are put in a stoppered bottle with 1 gallon of silvering solution; the mixture is shaken and allowed to stand 24

hours. Of this solution, 2 ounces are added to every 20 gallons of ordinary solution in the plating vats, and the whole stirred. 2. To 1 quart ordinary plating solution, containing 2 lb. cyanide per gallon, add 4 oz. liquid ammonia, 4 of bisulphide of carbon, and 2 of ether; shake occasionally, and allow to stand 24 hours. Use 2 oz. for 2 gallons of silvering solution, adding it every alternate day.

(13) G. F. writes: 1. I have a photograph lens made up of two pieces glued together. Could you tell me of any solvent which will dissolve the glue, as I want to use only one piece of the lens? A. Opticians separate lenses by boiling them in water. The temperature must be very gradually raised, as there is danger of cracking the glass. 2. How could I prepare a piece of steel for magnetizing? I have bent it into the shape required, and I would like to know how to temper it, so that it could be magnetized. A. Harden the steel and draw the temper just below a straw color.

(14) O. G. asks: 1. If a plank 12 ft. long and weighing 24 pounds is supported by two props, one 3 ft. from one end and the other 1 ft. from the other end, what is the pressure on each prop and how do you find it? A. The center of gravity of the plank is at its center. Each prop supports a weight inversely proportional to its distance therefrom. The prop 3 ft. from the end is 3 ft. from the center of gravity. The other prop is 5 ft. from the same. The first, therefore, carries 5/8 of the weight and the other 3/8, or 15 and 9 lb. respectively. 2. How many candle power can I get with a dynamo of suitable size for a two-horse engine? How many candle power are the incandescent lights equal to, such as are used in private houses? A. About 400 candle power. An ordinary incandescent lamp gives from 12 to 16 candle power. 3. How large a cell could I store in one hour with a dynamo suitable for a two-horse engine? A. You could charge 30 to 40 cells in seven hours. You should not press the charging. 4. Can you give me a receipt to apply to the skin to cure blackheads? A. For acne or blackheads see SCIENTIFIC AMERICAN SUPPLEMENT, No. 522.

(15) F. H. D. asks: I wish to know if, in the case of electric railway motors, extra weight is required for adhesion or would be required for heavy work, as for drawing heavy trains. A. Extra weight is needed if a heavy train is to be drawn, but it is the universal practice to use a large proportion of motor cars, or to place a motor in every car.

(16) F. H. B. writes: I have made an electrical machine, and fail to get a shock from it. I wound the core with No. 18 covered wire, and wound the spool, about two inches in diameter, with No. 36 silk-covered wire. I didn't have enough of silk-covered, so I wound about half of the spool with No. 32 cotton-covered. I can't get any shock from it, only just as I take hold of the handles, but when I grasp them firmly I can't feel anything. I have one bichromate battery on it. I don't think it is the core, for the vibrator works very well. A. Either your connections are wrong or your insulation is defective. It looks as if your secondary was in electric connection with your primary coil. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 160 and 569, for descriptions of induction coils.

(17) C. E. S. asks: Can you advise me of any process by which alcohol can be mixed with copal varnish on any solvent for dragon's blood that can be readily mixed with the varnish? A. Dissolve in turpentine and mix with the varnish.

(18) B. F. K. asks: What can I use to dissolve gum shellac that will be cheaper than alcohol or wood naphtha? A. Use a solution of borax in water.

(19) J. K. asks: 1. How could I melt rubber without smell, so as to produce a very thin sheet, about 4 by 8 in., or could I purchase such sheets? If so, where? A. You cannot make such a sheet by melting. It can be bought from dealers in India rubber goods. 2. Would it take more battery for a ground circuit than for a metallic circuit for a short telegraph line, having the sounder work as loud on both lines? A. The ground circuit, if it has good grounding, has the lowest resistance. Solder your wire to the gas or water pipe for ground.

(20) J. K. asks: 1. Why is the word or term engine used in speaking of lathes? Some will say, "back-geared screw-cutting lathe," and some say "back-geared screw-cutting engine lathe." A. An engine lathe is properly one provided with automatic feeding mechanism, screw-cutting gear, etc. 2. Of what is Paris green composed, and how made? A. Copper is exposed to action of diluted acetic acid and air, which produces verdigris. Copper plates are wiped over with a solution of verdigris, are dried and heated and piled up with layers of fermenting grape lees. In time the verdigris is formed, the plates swelling up and increasin thickness. This is boiled with arsenious acid, forming Schweinfurth green. The impure Schweinfurth green is called Paris green. The latter is often adulterated with barytes. The formula is $3CuAs_2O_4+2(CuC_2H_3O_2)$ or cupric aceto-arsenite. 3. What is London purple made of? A. London purple is a waste product from aniline factories. It consists of arsenious acid colored by aniline. 4. What is the inclosed mineral? A. The mineral is iron pyrites, of no value.

(21) E. B. N. and H. A. B. write: I have my electric motor complete and now wish to make the batteries, but do not know how to make carbon plates. A. Mix ground charcoal with water and molasses to a thick paste, press it in a mould to the right shape and heat to white heat. It should be kept in the mould while being heated and should be protected from the air. The great point is to use as little liquid as possible. After one heating it may be soaked in the sirup and may again be heated. It is better to buy the carbons. Zincs can be cast in a wooden mould. Stone jars, if vitrified, will answer for the battery.

(22) C. C. B. asks (1) a varnish for paper maps. A. Use dammar varnish or Canada balsam. 2. Directions for staining sole leather some three or four different shades, varying from white to dark red. A. Sole leather is bleached with oxalic acid and whitened with French chalk, and may be darkened by dry ochers. 3. I am directed by my doctor to drink lager beer, and I find that when I bottle it myself and let it stand twenty-four hours (tightly corked in regular air tight rubber corked beer bottles), it becomes flat and a little sour and does not have the life in it or the taste that it had when corked. Is there any process by which I could keep it sweet, and like that bought ready bottled? A. Add a little baking soda, about half a salt spoonful, to each bottle after filling and cork as quickly as possible. 4. What will mend hard rubber? A. Sealing wax, or a mixture of asphalt and gutta percha melted and thoroughly incorporated with each other.

(23) F. W. M. asks if three barrels placed in a row on end are connected with one another by a pipe six inches from the bottom, and have an inlet at the top of the first and an outlet at the bottom of the third, which is kept closed, will all three barrels fill with water at the same time or in what order. A. The three barrels will first fill to the level of the top of the connecting pipes, six or seven inches. Then the first one will fill while the water in the other two, maintaining a lower level, will rise simultaneously a few inches above the connecting pipes.

(24) R. M. H. writes: 1. We have had many discussions as to how the water gets into the float which is in the water supply hogshead. The water is sometimes hot and then cold, and in less than a year the ball is so full that it sinks. They were mostly of copper, but the foreman put in a cast iron one, which he first tested and then plugged the hole tight, but it got too heavy after a while. How is this? A. The balls were not perfectly tight, and water leaked into them. The alternation of heat and cold would greatly increase the probability of their leaking. 2. What can I do to flower pots to keep the white formation off the outside and not spoil their usefulness? A. Try rubbing with glycerine and water from time to time.

(25) W. H. asks how to manufacture Worcestershire sauce. A. Mix together 1½ gallons white wine vinegar, 1 gallon walnut catsup, 1 gallon mushroom catsup, ½ gallon Madeira wine, ½ gallon Canton soy, 2½ pounds moist sugar, 19 ounces salt, 3 ounces powdered capsicum, 1½ ounces each of pimento and coriander, 1½ ounces chutney, ¾ ounce each of cloves, mace, and cinnamon, and 6½ drachms asafœtida dissolved in pint brandy 20 above proof. Boil 2 pounds hog's liver for twelve hours in 1 gallon of water, adding water as required to keep up the quantity, then mix the boiled liver thoroughly with the water, strain it through a coarse sieve. Add this to the sauce.

(26) C. H. K. asks for a recipe for making artificial honey. A. Soft water 6 pounds, pure best honey 3 pounds, white moist sugar 20 pounds, cream of tartar 80 grains, essence of roses 24 drops. Mix the above in a brass kettle, boil over a charcoal fire five minutes, take it off, add the whites of two eggs well beaten; when almost cold, add 2 pounds more honey. A decoction of slippery elm will improve the honey if it be added while cooling, but it will ferment in warm weather and rise to the surface.

(27) W. E. C. writes: I desire now to know how the chloride of silver cell or battery is made. A. Cast a cylinder of chloride of silver around a silver wire. This forms the negative element. Use a plate of zinc unamalgamated for the positive and immerse both in a solution of salammoniac. The chloride of silver and zinc should not touch each other. Instead of salammoniac, caustic potash solution, 75 potash to 100 water, may be used. The chloride of silver may be pressed into a parchment or cloth bag instead of being cast.

(28) W. C. S. asks for a formula for making an artificial stone that will percolate water. A. We give three formulas:

Mix	Parts by weight. I.	II.	III.
Clay	10	10	15
Chalk	1	1	1
Glass sand, coarse	55		
Glass sand, fine		25	65
Flint powdered		30	5

(29) C. F. M. asks for the best method of exterminating moth (tineites) from carpets without removing them from the floor. I have been told that very hot water heavily impregnated with sulphur will answer the purpose, but if this is efficacious, is it not deleterious to the fabric of the carpet? A. Soaking with naphtha is supposed to be efficacious, but is very dangerous as regards conflagration and would affect insurance. We should advise taking up the carpets and having them thoroughly beaten. Sulphur will be without any effect or will have very little.

(30) A. M. W. asks what other and cheap insulators there are besides glass, rubber, porcelain, ebonite, silk. A. Gutta percha, paraffin, petroleum, sulphur, dry wood, silica, lime, chalk and many other substances are ranked as insulators. The term is a comparative one, as they vary in the perfection with which they work.

(31) C. D. F. asks: 1. How many patents have been obtained, in this country, on car couplings? A. Up to the middle of November 1888, 4,137 patents have been granted in the United States Patent Office for car couplers. 2. Where, in the United States, is the best school for learning mechanics, theoretical and practical? A. Cornell University, Ithaca, N. Y., stands, with some other institutions, in the lead. It is impossible to award precedence to a single college.

(32) A. W. H. asks whether February, 1892, will have twenty-eight or twenty-nine days. A. It will have 29 days.

(33) B. C.—A fusible alloy kept melted will generally oxidize and gain weight. Bismuth is sold by dealers in metals and chemicals.

(34) C. C. C.—You can probably obtain a patent, and it may prove of value.

(35) S. H. T.—The substance sent is a fungus of the genus *Merulius*, probably *Merulius himantoides*. Some of these fungi are very injurious in houses and especially in greenhouses.

(36) J. G. B.—The plant is *Spiranthes cernua*, or ladies' tresses. It is an orchid.

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Proposals for Machines and Tools for the Navy Yard, Mare Island, California.—NAVY DEPARTMENT, WASHINGTON, D. C., *November* 7, 1888. Sealed proposals will be received at this Department until 12 o'clock noon, on Thursday, the 27th day of December, 1888, at which time and place they will be opened in the presence of attending bidders, for furnishing machines and tools required by the Bureau of Construction and Repair, and for the delivery of the same at such place in the Navy Yard, Mare Island, California, as the Commandant of that Yard may direct. Printed schedules particularly describing the machines and tools, blank forms on which proposals must be made, and all other information essential to bidders can be obtained by regular dealers in, or manufacturers of, the articles required, on application to the Commandant of said Navy Yard, or to the Chief of the Bureau of Construction and Repair, Navy Department. Proposals must be made in duplicate, and enclosed in sealed envelopes marked "Proposals for Machines and Tools for the Navy Yard, Mare Island, California," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C. All proposals must be accompanied by either plans or descriptive cuts of all the machines and tools which the bidder offers to furnish. The Secretary of the Navy reserves the right to reject any or all bids, in whole or in part, as, in his judgment, the interests of the Government may require.
D. B. HARMONY, *Acting Secretary of the Navy.*

Dredging at Wilson's Point, Norwalk Harbor, Conn.—ENGINEER OFFICE, U. S. ARMY, Room 57, Army Building, cor. Houston and Greene Streets, New York, *November* 13, 1888.—Sealed proposals in triplicate for dredging at Wilson's Point, Norwalk Harbor, Conn., will be received at this office until twelve (12) o'clock M. on Thursday, December 13, 1888. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information, specifications, and forms of proposals can be obtained at this office.
D. C. HOUSTON, *Lieut.-Col. of Engineers.*

Breakwater at New Haven, Conn. -ENGINEER OFFICE, U. S. ARMY, Room 57, Army Building, cor. Houston and Greene Streets, New York, *November* 13, 1888.—Sealed proposals in triplicate for breakwater at New Haven, Conn., will be received at this office until twelve (12) o'clock M. on Thursday, December 13, 1888. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information, specifications, and forms of proposals can be obtained at this office.
D. C. HOUSTON, *Lieut.-Col. of Engineers.*

Dredging in Five Mile River Harbor, Conn.—ENGINEER OFFICE, U. S. ARMY, Room 57, Army Building, cor. Houston and Greene Streets, New York, *November* 13, 1888.—Sealed proposals in triplicate for Dredging in Five Mile River Harbor, Conn., will be received at this office until twelve (12) o'clock, M., on Thursday, December 13, 1888. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information, specifications, and forms of proposals can be obtained at this office. D. C. HOUSTON, *Lieut.-Col. of Engineers.*