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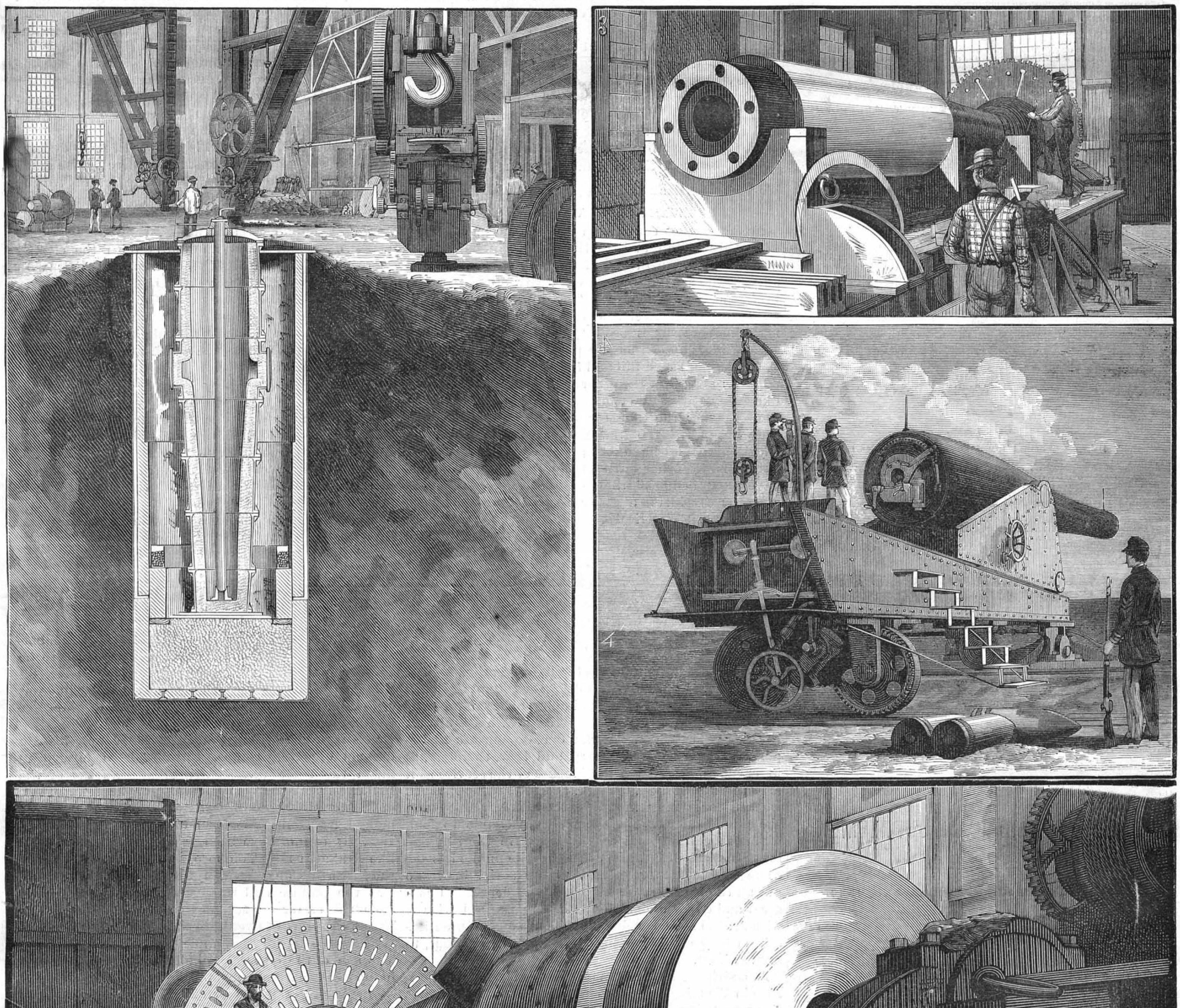

1. INTERIOR VIEW OF ORDNANCE FOUNDRY, SHOWING PIT IN SECTION. 2. BORING OF 54 TON RIFLE. 3. TURNING 53 TON RIFLE. 4. 12 INCH B. L. RIFLE MOUNTED ON SIEGE CARRIAGE.

THE FABRICATION OF HEAVY ORDNANCE AT THE SOUTH BOSTON IRON WORKS.—[See page 197.]

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NEW YORK, SATURDAY, SEPTEMBER 25, 1886.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 560.

For the Week Ending September 25, 1886.

Price 10 cents. For sale by all newsdealers.

THE NEW YORK WATER SUPPLY.

In a recent issue we spoke of the fear that might be reasonably entertained that the new aqueduct, as dependent upon the Quaker Bridge reservoir for its supply, would not fulfill the popular anticipations. We gave grounds for the belief that it might prove detrimental in many respects, and a failure as regards purity, pressure, and sufficiency of the water to be delivered by it. An exhaustive paper on the subject was given in the SUPPLEMENT of the same week, by Mr. R. D. A. Parrott. On this our article was in great measure based. In the New York *Times* of the 17th inst., we find a discussion of Mr. Parrott's paper. The *Times* finds that the points in it are well taken, and while hesitating to pass judgment on his suggestions for a new watershed in the Catskill Mountains as a question within the scope only of an engineer, seems fully to appreciate the benefits to be derived from the appropriation of so thinly settled and mountainous a region for a watershed.

The exactness of Mr. Parrott's figures are fully appreciated by our contemporary. The subject in general is one that will bear ample discussion. It is a subject of congratulation that it has been begun while there is yet time to adopt the new aqueduct as a connection between the city and a new region of water supply.

ARRANGEMENT OF WIRES IN CITIES.

At the recent convention of the National Electric Light Association, no little time was occupied in a discussion of the expediency of burying the wires. The sense of the convention was decidedly opposed to the project at the present time. The speakers, for the most part experienced electricians and practical men, urged many cogent reasons for delay; and it seems only fair, since what is known as the public's side of this question has found such full and frequent expression in the popular press, that the other should receive something like the attention and consideration it deserves. Since the bill fixing the time for the compulsory burial of the wires passed the New York Legislature, the electrical companies have been threatened with similar exactions in other parts of the country, and affairs have now assumed what, under the circumstances, must be considered a grave aspect. It was believed by many, the electrical companies included, that by the time the New York law went into effect, a practical means would have been found to operate the wires underground. Unhappily, this has not been the case, if we are to believe the best authorities. Continued experiment and study, while they have done much to remove the obstacles in the way of success, have not yet resulted in finding a solution of the problem in hand.

None of the speakers at the recent convention claimed that the project was impossible nor even impracticable, but that experimentation had not yet shown the time for burying the wires to have arrived. That is all. If the service is to be a popular one, economy is as important a factor as efficiency, and it is, therefore, as necessary to keep down the expense of the service as it is to check induction, leakage, and retardation. When we consider the fact that air is the best insulation and the ground the worst, it is scarcely reasonable to look for an expeditious and easy conquest in the struggle for a similar service underground as the public has become accustomed to receive over the aerial lines. To put all the wires in the metropolis underground is a great and costly undertaking; and to proceed with it without the most conclusive evidence of the practicability of the means employed would be hazardous, to say the least.

As a striking illustration of this, we have the experience in Washington. Two years ago the wires in that city were taken down and buried in plaster, and for a time so much success was had that it was used as a principal and, it must be said, a powerful argument in support of the assertion that an efficient means of burying the wires had been found. It seems, however, that the system has proved defective and troublesome, good service has been the exception, and recently it was found necessary to take them out on F Street and suspend them on poles in the old way. On Pennsylvania Avenue, too, there has been much trouble of late with the underground wires, and, according to one of the speakers before the recent convention, the electrical generators—we speak now of lighting apparatus—have frequently been found to be running dead on account of difficulties, the nature and location of which it has not always been easy to discover.

Cost is an important factor in the sinking of the wires. The Philadelphia authorities are so well aware of the expense of underground construction that, though ordering all private companies to bury their lines, they make an exception in the case of the lines belonging to the city, because of the large sum required.

Again, that description of arc light wire which is used for aerial lines costs only $1\frac{1}{2}$ cents a foot, whereas, so says an authority, that for use underground costs 6 cents. The conduit now being laid in the New York streets, which is a series of ducts, ten to a prism, is in most of its essentials purely experimental. Proof of this is shown by the reports and contracts that have been made, and which leave some of the most important problems in the way of efficient and cheap service to be solved during the progress of the work; problems, it may be said, which skillful and experienced electricians have been unsuccessfully struggling with for many a day.

This is one way of burying the wires; and while it may satisfy the requirements of the statute books, it may not, when completed, give a like content to the general public, in whose interest the law may be presumed to have been made.

Progress of the Daft Electric Railway Motor.

A new and more powerful electric locomotive for the experimental section of the Ninth Avenue elevated railway, in this city, is now nearly ready for operation. The intermediate conducting rail, which is now of iron, is to be replaced by a bronze rail, as the rusting of the iron rail interfered with the conductivity. When these improvements are completed, the motor, it is believed, will prove to be a great success.

The Daft motor has been used for over a year in Baltimore on the Hampden Street Railway, which is two miles in length, and is one of the most difficult roads in the country to operate. There is one grade of 353 feet to the mile on an 89 degree curve; another of 319 feet to the mile on a 75 degree curve; and a third of 275 feet to the mile on a 40 degree curve. With horses and mules, they were able to make only four miles an hour. With the electric motor, eight are made. The cost of operating with horses and mules during eight months and twenty days was between $4,700 and $4,800. With the Daft motor during a like period, 32,907 more passengers were carried, and the cost was only $3,160. The motors that do that work each weigh 5,000 pounds, draw nine tons, and cost $2,500.

Crater Lake, Oregon.

A party sent out under the command of Captain Clarence E. Dutton, of the army, has succeeded in making a complete survey of Crater Lake, in Oregon, a body of water whose shores, with the possible exception of one point on the south, have never before been touched by the feet of white men. The party's boats were hauled 100 miles by mule teams, dragged by a detail of soldiers up the snow-clad sides of the ridge which surrounds the lake, and lowered by ropes from the crest to the water, 900 feet below. One hundred and sixty soundings were made, the result of which gave the general character of the lake bottom. Two large submerged cinder cones were found, respectively 800 and 1,200 feet high, the rest of the bottom being flat. Captain Dutton believes this to be the deepest body of fresh water on the continent. The greatest depth attained by the sounding line was 2,005 feet. He writes to Director Powell, of the Geological Survey:

"As regards the origin of the basin, I now have a decided opinion. It has, I think, been formed in much the same way as the great *calderas* of the Hawaiian Islands, by the melting of the foundations of the original mountains, the blowing out of the molten material in the form of light pumice and fine tufa. It cannot have been formed by an explosion, like Krakatoa and Tomboro, for there is no trace of the fragments anywhere in the country round about. But the pumice and tufa which surely emanated from this crater are seen in vast quantities anywhere within a radius of twenty to sixty miles, and in quantities ample to fill the whole vast crater twice over. The age of the crater is wholly post-glacial. I have found at the extreme crest of the wall on the western side splendid examples of glacial striation, while the old moraines are half a mile to a mile below. That the age of the *caldera* cannot be great is evident from the fact that though the walls are crumbling at a very rapid rate, the talus has not only not reached the water surface anywhere, but the sounding discloses little of it at the bottom."

Photometry.

In a note to the French Academy of Sciences, M. Charpentier points out a curious defect of the human eye, which is of great consequence in photometry. Take two sources of light, red and green; let them form on the photometer screen two disks of apparently equal brightness. Now approach the screen so that the disks appear to the eye to be larger; the green appears the brighter of the two. If the disks appear smaller, the red gains in brightness.

A new photometer has been introduced by Messrs. Yeates & Son, of Dublin. It consists of two prisms of solid paraffine connected together on one side, but with a layer of silver foil between them. This foil acts as a reflector for each, while, at the same time, it prevents light rays traveling from one prism to the other. When two illuminants are to be compared, they are placed on either side of the double prism until the illumination of each paraffine surface is equal. The distances of the two lights can then be measured, and the result recorded in the usual way.

A Successful Gas Locomotive.

For several months past, a locomotive propelled by gas has been in successful operation on one of the street railways at Melbourne, Victoria, Australia. A paper on the subject was lately read by Mr. John Danks before the Victorian Engineers' Association, from which we extract the following:

It was when talking over and comparing the great cost, with its labyrinth of ropes, wheels, and heavy machinery, of the cable system with the heavy engines used in Sydney, it occurred to us that by the application of the gas engine and a quantity of gas stored under pressure and carried to keep the engine supplied, a motor could be made to work roads of ordinary grades as effectively as the cable, and of not more than one-third of the weight of an ordinary steam motor. We put our ideas into form, and saw that by the application of friction gearing for giving motion to the wheels, we could allow the engine to continue working in one direction, and so avoid the delay of stopping and starting. Having matured our plans and having got the consent of the Commissioners for Railways to make use of the Alphington line, we procured a 3½ horse power Otto gas engine, and constructed the experimental car which the president described at the last meeting. The president was greatly interested in our first gas tramcar; we invited him to inspect and test it in any way he thought proper, and we placed it at his disposal for that purpose. He took great pains in experimenting and making notes of its performances, and very kindly furnished us with the result of his investigation, a copy of which, with his permission, I will now lay before the members of this society. During a period of some ten weeks, we ran a number of experimental trips, and exhibited it to all who wished to see it. Being anxious to put our invention to a more practical test, we entered into an arrangement with the government to carry passenger traffic and to work the Alphington line as a tramline. Under the arrangement, it was stipulated that we should supply a motor which would draw a carriage in which the passengers should be carried; for this purpose, we constructed a new motor with a six horse power engine and fitted with friction gear similar to our first experiment. The motor weighs 4½ tons, and the carriage 35 cwt., making a total of 6¼ tons without passengers. The supply of gas is carried in four copper containers each 16 inches in diameter and about 6 feet long, which were tested by hydraulic pressure, before being used, to 200 pounds to the square inch. The total cubical capacity of the four containers is 28 feet. These containers charged with gas compressed to ten atmospheres, or say 150 lb. per square inch, represent 280 cubic feet of gas stored, which is sufficient for a run of fifteen miles. We have never yet exceeded the pressure of 100 pounds, which we find gives ample supply to carry us to Alphington and back twice. We have, for compressing the gas, an engine and compressing pumps fixed near the line; with this we take the gas from the Metropolitan Company's main and force it into receivers, where it remains under pressure until required for use. When the motor requires a fresh supply of gas, it is brought opposite the receivers, and the containers on the motor are connected by a short India rubber hose to a pipe leading from the receivers. A tap is then turned, which allows the gas to pass from the receivers to the containers until the pressure is equal, when the tap is closed, the hose disconnected, and the motor is again ready to resume duty. The time required to charge the containers does not exceed two minutes. The engine, compression pump, and receivers need not be near the line; they may be placed one or two hundred yards away, in any convenient place, and the gas under pressure led to the line through a high pressure pipe. The time usually taken in running the distance from Clifton Hill to Alphington, some 2½ miles, is about sixteen minutes, and the same time is occupied on the return journey. The heaviest gradients are 1 in 50, of which there are three, and the sharpest curve is 18½ chains radius. The number of trips run each day is eight, or a total of about 40 miles per day, except Saturday, when an extra trip is made. The motor has now been working about four months, and the average consumption of compressed gas is 702 cubic feet per day, as measured by the meter through which it is taken.

The tram wheels are 2 feet in diameter, made of cast iron, chilled, and cast from a pattern found at one of the foundries. The friction wheels are also of ordinary cast iron, and are actuated for going forward, going back, or stopping by the movement of one lever. The motor runs round the carriage at each end of the line. We have, on one or two occasions, had as many as 40 passengers at one time, but I regret to say that good loads are very much the exception, the traffic on the Alphington line at this time of the year being very light. The repairs up to the present time have been almost *nil*.

The power of the gas engine is derived from a fuel which has no weight, of which a large quantity can be carried without adding to the load, and the supply of it has been shown can be replenished with the greatest ease. No boiler, coal, or coal bunker is required, and one man, not necessarily a mechanic, is all that is needed to take charge. It is true that the motor we have working is running upon a railway, and there may and no doubt would be more power required to work it on a street tramway. This, however, appears to be but a question of a larger engine; if a 3 horse will not do the work, then a 6 horse, and if a 6 horse will not do the work, then a 12 horse. It is only a question of more power and a larger expenditure of gas, which the president has shown is not a matter of great importance. The fact of our having run a motor 40 miles a day for 4 months has, I think, established the principle, and has proved to a demonstration what can be done.

The Salt Mountain of Palestine.

BY SELAH MERRILL, LL.D., U. S. CONSUL, JERUSALEM.

Palestine possesses a remarkable salt mountain situated at the south end of the Dead Sea. The length of this ridge is six miles, with an average width of three-quarters of a mile, and the height is not far from 600 feet. There are places where the overlying earthy deposits are many feet in thickness, but the mass of the mountain is composed of solid rock salt, some of which is as clear as crystal. How far this deposit of salt extends below the surface of the ground, no one at present knows. At some points, this ridge, which is on the shore of the Dead Sea, approaches very close to the water, and at others it recedes until it is fifty or more yards from it. Just here the water of the Dead Sea is much more salt than it is at the north end, where the Jordan enters the lake.

This salt is a government monopoly. The same is true of the salt that is contained in solution in the Dead Sea itself. If Arabs or the natives of the country were found getting salt from the shores of the Dead Sea or from this salt mountain, they would be arrested at once. Most of the salt used in Hebron, Jerusalem, and elsewhere in this part of Palestine, comes from these sources, but it is gathered under the direction of government officers, and the revenue is supposed to go to the government.

In this salt mountain, to say nothing of the salt of the Dead Sea, there is a mine of wealth; and if capitalists were allowed to come in and work it, the prosperity of this part of the country would thereby be greatly increased.

I have examined personally this salt mountain, and talked with the Pasha of Jerusalem, who is also the Governor of Palestine, as to the desirability of companies being formed which should prepare this salt for use and ship it to the markets of the world; but at present the Turkish government is hostile to any such project.

Specimens of salt from this salt mountain were sent by me to the care of the Department of State, designed for the exposition at New Orleans in 1885.

Jerusalem, August 9, 1886.

Electric Boat.

The Spark, which has recently been launched at the Royal Gunpowder Factory, Waltham Abbey, is an electric boat about 25 ft. long and 5 ft. beam. It was designed by the superintendent, Col. W. H. Noble, R.A., mainly as a means of lighting up some of the powder houses in the factory, which are at a considerable distance from the dynamos used for general electric lighting purposes.

The details of construction have been worked out by Mr. Thomas Webb, the chief engineer in the gunpowder works, who has given much attention to the subject of electric lighting. The lighting and motive powers of the boat are derived from a battery of accumulator cells, stowed under cover amidships, and a small 1½ horse power motor, which turns the shaft to which the screw propeller is attached. The accumulator cells were supplied by the Electrical Power Storage Company, of which Mr. Drake is the manager, and are those known as No. 23 S type. Each cell consists of a wooden (teak) box 7⅜ inches in length by 8¼ inches in width by 10¼ inches in height, and weighs 45 lb. complete. Inside the box are a number of lead plates of special form surrounded by acidulated water, which is poured in through a small hole in the top of the box. Two strips of lead project about a couple of inches from the top of the box; these are the positive and negative poles, and by attaching the positive pole of one box to the negative pole of another, and so on, a number of boxes are coupled together so as to form a battery.

When a current of electricity is passed into a battery of this construction, certain chemical changes take place, and the battery becomes capable of retaining, or rather absorbing, the electric energy due to such a current and of subsequently discharging or giving it out in the form of light, heat, or power as required. In fact, a certain quantity of electromotive force is, so to speak, bottled up, and a battery of accumulator cells thus takes the place of a gasometer as regards lighting and of a steam boiler as regards motive power. The total number of cells in Colonel Noble's boat is 30, and these are connected together as above described and stowed away under a kind of deck in the center of the boat. To charge the battery, the boat is brought up one of the factory canals alongside the "dynamo house," and the two wires leading from this electric generator are attached respectively to the positive and negative poles of the battery. The dynamo, which is driven by a steam engine, is then started, and a charge of electricity is run into the battery until the acidulated water assumes a milky appearance and begins to give off gas bubbles. The battery has now taken in as much electromotive force as it is capable of absorbing, and the poles are disconnected from the dynamo.

The boat is now ready for use, and the poles are connected with the motor or dynamo electric discharger in the stern through a "reversing switch," controlled by a handle, which when turned in one direction causes the motor to act and the screw to go ahead, and in the other direction to go astern. Now, if it be desired to light up any powder house, the boat is run alongside, the poles disconnected from the motor and reconnected to the wires which communicate with the electric incandescent lamps in the house. Most dangerous operations are carried on in many of these houses, and hitherto no light of any description was permitted even to approach them. The consequence was that as soon as it became dark all work had to cease. With the aid, however, of the electric light accumulator boat and special safety lamps, work can now be carried on by night as well as by day. The speed of Col. Noble's boat is from five to six knots an hour, and so far as can be judged from the trials made up to date, it is a perfect success.—*London Times.*

A Watchmaker's Epitaph.

As one of the "Curiosities of Literature" connected with watches, we may cite the following, which can be seen in the churchyard at Lydford, Devonshire, England:

"Here lies in a horizontal position
The outside case of
George Routledge, Watchmaker.
Integrity was the main spring and prudence
the regulator of all the actions of his life;
Humane, generous, and liberal,
His hand never stopped till he had relieved
distress;
So nicely regulated were his movements that
he never went wrong,
Except when set a-going by people who did not
know his key;
Even then he was easily set right again.
He had the art of disposing of his time so
well
That his hours glided away in one continued
round of pleasure,
Till in an unlucky moment his pulse
stopped beating.
He ran down Nov. 14, 1801, aged 57,
In hopes of being taken in hand by his
Maker,
Thoroughly cleaned, repaired, wound up, and
set a-going
In the world to come, when time shall be
no more."

Penetration of Light in Water.

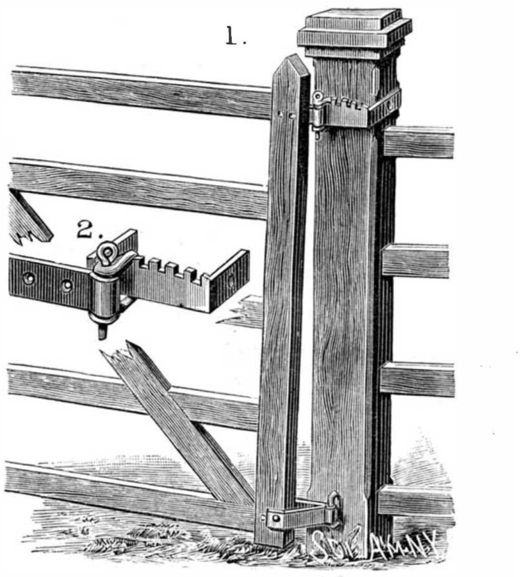
Further experiments have been made by MM. Fol and Sarasin to determine the depth to which light penetrates the water of lakes and seas. Their method of observing consisted in placing gelatino-bromide photographic plates at different depths under the water; the plates being lowered by a sounding lead, and protected from the action of the sea water by a varnish. Experiments were made about 1,300 to 1,400 meters off the Cape of Mont Boron, at Villefranche in the Gulf of Nice, and in water about 550 meters deep. During April the limit of penetration of the daylight about midday, during fine weather, was found to be about 400 meters; an observation which confirms the previous conclusions of the authors as given in our columns. Other observations showed that there is a penetration of 300 meters all the time the sun is above the horizon, and of 350 meters during eight hours of the day. According to experiments of Bunsen and Roscoe, the active intensity of blue sky on April 21, at Vienna, was 33 at 8:30 A.M., 38 at noon, and 14 at 6 P.M., while that of the sky and sun together was 75 at 8:30 A.M., 133 at noon, and 15 at 6 P.M.

Gun Forgings and Armor Plates Called for by the Government.

The Secretary of the Navy has recently issued proposals inviting the steel manufacturers of America to compete in furnishing the government with gun forgings and armor plates suitable for the new vessels which Congress has authorized to be built. In the official advertisement, which will be found on another page, it is stated that no bids will be considered except such as engage to produce "within the United States" the steel required, and the bidder must prove that he "is in possession of, or has made actual provision for, a plant adequate for its fulfillment." Nearly 6.000 tons of steel, of the highest quality and sizes, difficult of manufacture, are thus called for, and its production here will tend to still further stimulate the activity in the iron and steel business, which has become so pronounced within a few weeks past.

IMPROVED GATE HINGE.

This hinge is so arranged as to hold the free end of the gate at any desired elevation to free it from snow, to compensate for sagging, and to adjust it so that it will close by its own gravity. The lower hinge consists of an eye formed on a strap, which embraces both sides of the stile of the gate, the eye receiving a pintle attached to the post. The upper hinge consists of a

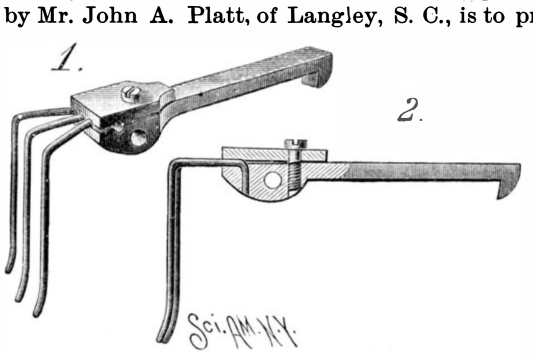


COLE'S IMPROVED GATE HINGE.

piece of round iron which is bent U-shaped, and has its ends flattened and perforated to receive the hinge pin. The U-shaped bar is received upon a curved notched bar bent twice at right angles and secured to opposite sides of the post, with the notched portion parallel with and a short distance from the face of the post. To adjust the gate at the desired angle, it is lifted up, when the upper shank of the U-shaped bar may be inserted in the proper notch in the curved bar, to hold the free end of the gate at the desired elevation. This invention has been patented by Mr. Carey W. Cole, of West Hartford, Mo.

FILLING FORK FOR LOOM STOP MOTIONS.

The object of this invention, which has been patented by Mr. John A. Platt, of Langley, S. C., is to pro-

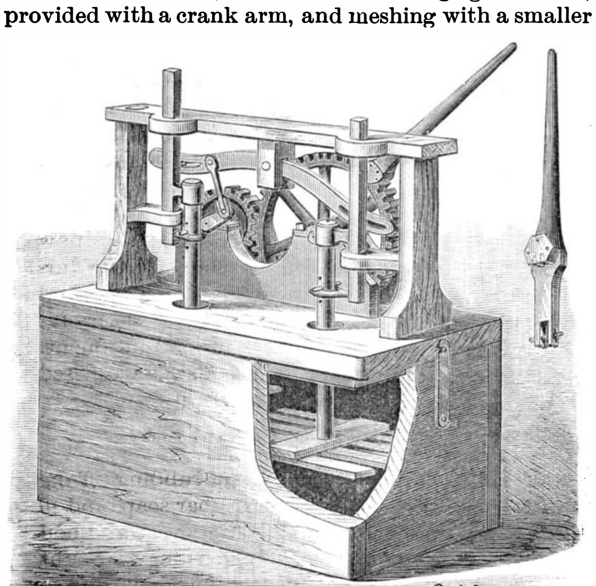


PLATT'S FILLING FORK FOR LOOM STOP MOTIONS.

vide a filling fork for the stop motion of looms, so constructed that the tines may be taken out, for replacing them if broken, without removing the fork from the loom. The body of the fork is formed at one end with a hook and at the other with an orifice in the usual way. The tines are bent to the shape clearly shown in the sectional view, Fig. 2, and are held to the body by a clamp through which passes a screw. Shallow grooves are formed in the body and clamp to form seats for the tines. By constructing the fork in this manner, a broken tine may be replaced by a new one at a small cost, and without causing delay.

IMPROVED CHURN.

The driving mechanism of the churn here illustrated is fixed to the cover, and consists of a large gear wheel, provided with a crank arm, and meshing with a smaller



LASSWELL'S IMPROVED CHURN.

wheel carried by a crank. This crank is connected by means of a pitman with a beam lever, whose ends are formed with elongated slots, in which rest pins carried by vertical strips sliding in ways formed in the frame. The upper ends of the dasher rods fit within sockets carried by the vertical strips. The weight of the dashers and their rods is supported by loops that project inward from the lower ends of the strips, the rods being made with holes through which pins are passed. The upper portions of the dasher rods are of irregular shape, so that the relative position of the dashers may be changed by raising or lowering the dashers, and by changing the position of the pins. The beam lever is provided with a number of apertures, so that, by changing the position of the end of the pitman, the throw of the dashers may be increased or decreased. The churn may be driven by the crank arm or by a lever which is shown in place on the large wheel and also detached.

This invention has been patented by Mr. John Lasswell, of Augusta, Kansas.

Machine to Make Conductors Honest.

A checking apparatus for indicating and checking distances traveled by passengers on tramcars, omnibuses, cabs, and other vehicles is being made by Mr. H. Woolfe, of Barrington Road, Liverpool. The apparatus is small, and is to be fixed in a conspicuous position at the entrance of the car, and connected with the axle or wheel. The hand on a dial indicates the distance traveled. A gong on the top of the apparatus sounds every quarter of a mile, and the figures on the stamping or checking apparatus alter every quarter of a mile, corresponding with the number of miles indicated on the dial. The passenger on entering the car receives from the guard a ticket, which is stamped by the apparatus with the number of miles then shown on the indicator. This ticket is retained until the passenger gets off, when a glance at the indicator shows exactly how far he has traveled, and he pays accordingly. The guard again stamps the ticket, and the difference between the two numbers stamped thereon is the distance traveled, which must be accounted for by the guard when he delivers up his tickets at the office every journey.

To laundry shirts to give the fine gloss to the bosoms, take of white wax one ounce, spermaceti two ounces, melt them together with a gentle heat. When you have prepared a sufficient amount of starch, in the usual way, for a dozen pieces, put into it a piece of the polish about the size of a large pea, using more or less, according to large or small washings. Or thick gum solution (made by pouring boiling water upon gum arabic) may be used. One tablespoon to a pint of starch gives clothes a beautiful gloss.

Adulteration of Silk.

The weighting of silk by means of tin is, according to M. Moyret, increasing every day, and some surprising results are obtained on raw, boiled off, or souple silk, an increase of from 100 to 120 per cent in weight being obtained. The bichloride of tin obtained by the oxidation of ordinary tin salt (or stannous chloride) by means of aqua regia is in favor for black dyed silks, but for whites or colors it has some drawbacks, and is therefore not used. For the purpose of charging or weighting white or light colored silks, better results are obtained from the tin bichloride produced by the oxidation of tin salt by means of chlorate of potash and hydrochloric acid.

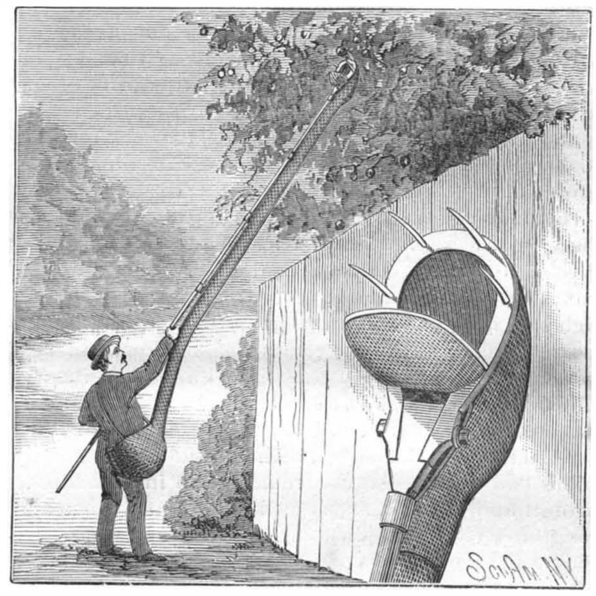
FORCE PUMP.

This pump is designed to be submerged in the water of the well or reservoir, and is supported by suitable framework. The lower end of the discharge pipe, B, is provided with a T-piece, C, each branch of which is connected with the small end of a conical water chamber, E. To flanges on the lower ends of these chambers are secured annular blocks, F, to the upper surface of each of which is hinged a valve which closes over an opening through the block. To the flaring lower edge of each block is secured a bellows, to the lower edge of which is secured a board, H, having a suction opening covered by a valve hinged to the board. The rear edge of each board is connected by a flexible strap, *g*, with the annular block, forming a hinge upon which the board is swung in the operation of pumping. To the front edge of each board is secured a plate, to which is attached a rod, *i*, leading to a lever pivoted to a standard on top of the casing. By oscillating the lever, the bellows are expanded and contracted alternately, and the water is forced through the discharge pipe.

This invention has been patented by Mr. J. W. Van Order, of Arlington, Oregon.

FRUIT PICKER.

The pole is made in two sections, connected by ferrules. On the upper end of one pole is held a bow, from which pins project. Projecting from the lower part of this bow is a second one, to which an apron made of suitable fabric is secured. This apron is connected with the pocket secured to the first bow and with the fabric tube which extends down the pole. The lower end of the tube, which is held to the pole by loops, is united by snap hooks and rings with a bag provided with a shoulder strap for supporting it. In using this picker, which is the invention of Mr. Washington B. Mayfield, of South West City, Mo., the bow is placed under the fruit, which is loosened by means of the pins

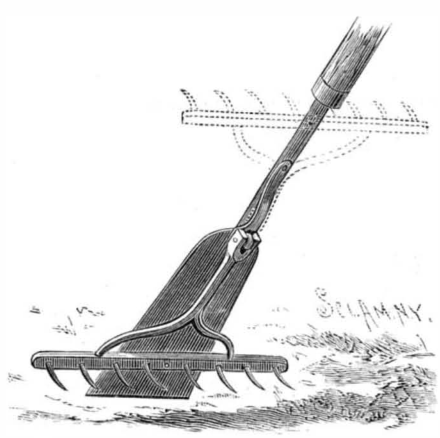


MAYFIELD'S FRUIT PICKER.

or by either of the bows. The fruit drops into the pocket, and slides down the tube into the bag. The apron prevents it from falling outside of the pocket. When not in use, the picker can be folded very compactly.

GARDEN IMPLEMENT.

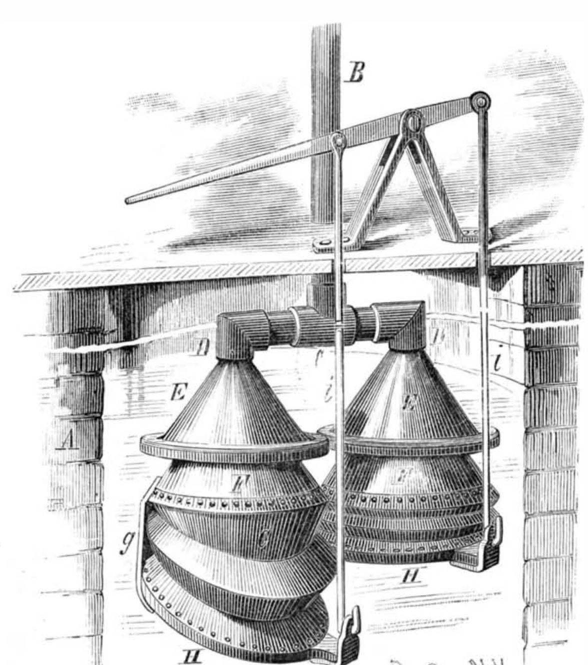
This simple and efficient implement may be arranged as a rake, or adjusted for use as a spud. Upon the shank is formed a spud of the usual size and shape, and projecting from the side of the spud at the top of the blade is an ear, to which is pivoted



RANKINS' GARDEN IMPLEMENT.

the shank of the rake. A spring is so arranged as to hold the rake in position for use and to hold it in a folded position, as indicated by the dotted lines. Dowel pins project from opposite sides of the head of the rake. One of these enters a hole in the spud blade when the rake is extended for use, and the other enters a hole in the shank when the rake is in a closed position. This implement is especially useful for working among roots, for loosening up the earth; also for exterminating plantain and similar weeds.

This invention has been patented by Mr. William J. Rankins, of Augusta, Kentucky.



VAN ORDER'S FORCE PUMP.

SHIP MODEL SHAPING MACHINE.

We illustrate the model shaping machine which is in use in the experimental department of W. Denny & Brothers' shipyard at Dumbarton. This machine is a modification of the well-known apparatus invented by the late Dr. Froude. It is so designed that it can be made to cut any number of water lines on a model not exceeding 20 ft. in length, 3 ft. in breadth, and 2 ft. in depth.

As may be seen by the illustration, the machine consists of a horizontal bed, on which the model to be cut is fixed, in its proper position, by means of central pins passing through two wooden beams attached to the model. The latter, as most of our readers are aware, is made of paraffine wax, a substance that lends itself admirably to this description of work. The bed is supported on a traveling carriage by means of four screws. The carriage is made to move longitudinally by means of the hand wheels shown to the left of the operator's seat. There are two revolving cutters, which run at high speed, for removing the material. These are not shown in place in the illustration, but are held by the two supports depending from the cross beam. Vertical adjustment of the model is obtained by means of the four screws referred to, which are all operated by one handle.

The two cutters revolve at a speed of about 1,500 revolutions a minute. They are attached to vertical spindles, which in turn are supported by two frames. These can be made to move, by the second hand wheel shown, either toward or away from the middle line of the bed of the machine. A half breadth drawing of the water lines of the model is placed in a vertical iron frame. The latter is geared to the bed of the machine in such a way that it moves parallel to it, the ratio of travel of the frame being adjusted by means of gear wheels to the same ratio as the length of the drawing is to the length of the model. A tracer is brought to the lines on the drawing, and connects with the revolving cutters by means of lever and bell cranks in such a manner that, as it moves vertically on the face of the drawing, the ratio of travel of the tracer to the travel of the cutter is the same as the ratio of the breadth of the drawing is to the breadth of the model. This ratio can be regulated by means of the adjustable fulcrum shown in the engraving. The tendency of the cutters to vibrate is checked by a cataract, or "dash pot," shown in the center of the framing.

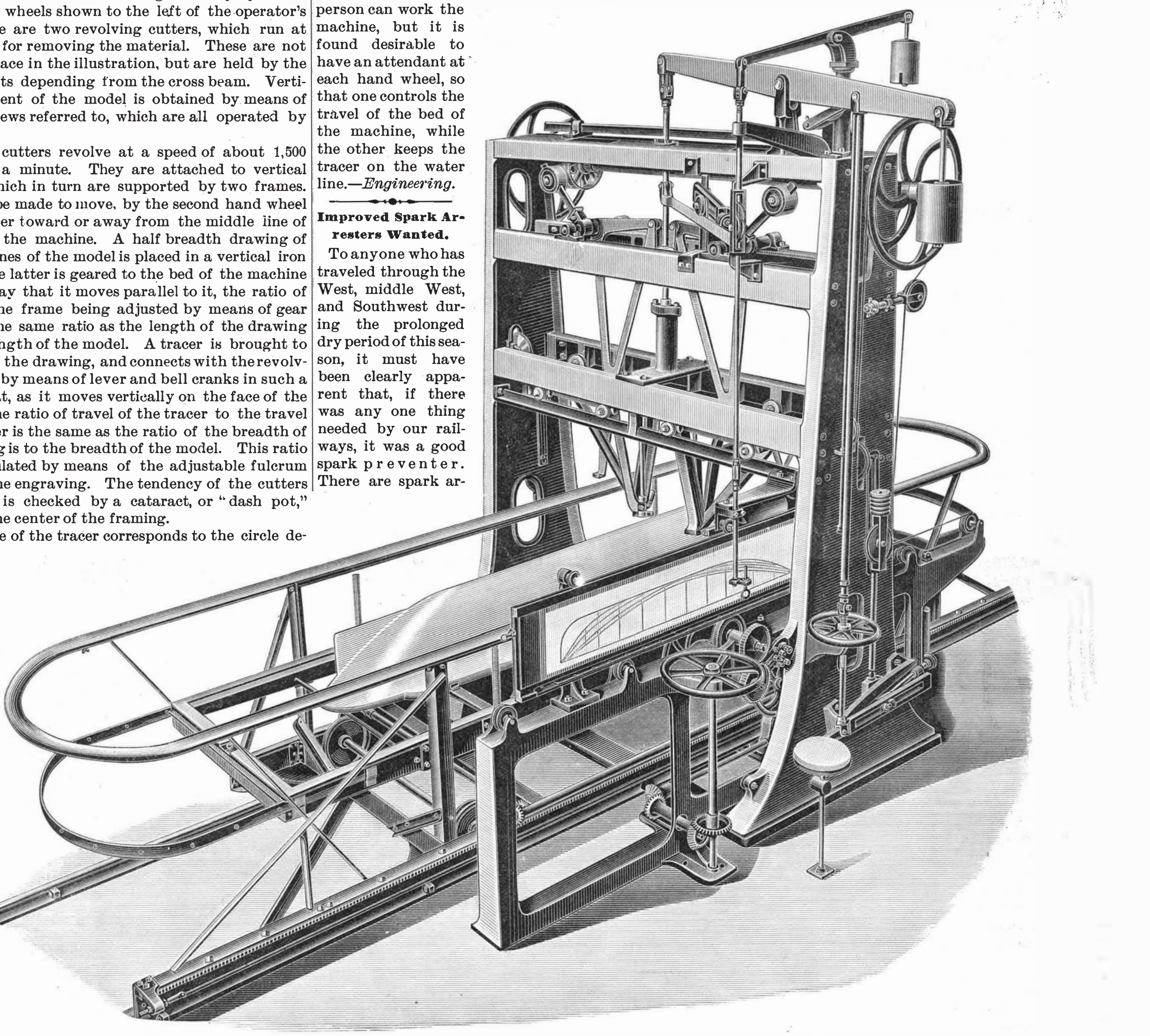
The shape of the tracer corresponds to the circle described by each cutter. It is generally an ellipse, the major axis being vertical. The reason for this is that the breadth scale is, for convenience, usually made greater than the length scale. The ellipse is drawn in ink on a gummed surface of glass, the line being very close to the drawing when the tracer is in position.

To set the machine for working, the height of the model is adjusted so that the position of the cutters, with respect to it, will correspond to the position of a particular water line. When the model is at the required level, it can be seen by means of a pointer moving vertically on a scale, the scale being divided according to the water lines of the model. The pointer is fixed to the bed of the machine, and the scale is attached to the carriage which supports the bed. The tracer is adjusted by means of a right and left handed screw, cut on the rod carrying it. When the cutter circles touch, the tracer is at the center line of the drawing.

To work the machine, the operator moves the two hand wheels on the right and left of the seat. By means of these, the tracer is made to follow the lines on the drawing, and it will be easily seen, from the foregoing explanation, that the cutters will move in harmony with the tracer, and so reproduce the lines on the model. In order to insure greater accuracy in tracing, the stool on which the operator is seated is connected to the moving levers, so that the vertical rise and fall of the stool is exactly the same as that of the tracer. In this way, the operator keeps his eye always on the same level as the tracer.

After cutting one line, the height of the model is adjusted to another water line position, and the corresponding water line is cut. The operation is then repeated until the whole of the lines have been reproduced on the model.

In our illustration, a finished model is shown. The machine, however, does not produce a smooth surface as represented, but cuts the material away in a series of horizontal terraces. These have to be removed by hand, the operator working to the lines left by the machine, and only removing superfluous material. One person can work the machine, but it is found desirable to have an attendant at each hand wheel, so that one controls the travel of the bed of the machine, while the other keeps the tracer on the water line.—*Engineering.*



SHIP MODEL SHAPING MACHINE.

Improved Spark Arresters Wanted.

To anyone who has traveled through the West, middle West, and Southwest during the prolonged dry period of this season, it must have been clearly apparent that, if there was any one thing needed by our railways, it was a good spark preventer. There are spark arresters almost without number, but they do not seem to arrest the sparks. Field after field has met our view this summer all ablaze or blackened with the ruin of burned crops. It is all well enough to carry a device that will prevent fires when the fields are snow covered or rain soaked, but the time for spark arresters and extension fronts, etc., to demonstrate their usefulness is during the dry summer months, when sheaves and shocks of treasured grain rest upon a dried stubble that blazes with the first hot cinder. The fact of the matter is that the problem of spark arresting has been given a labored attention that should have been given to spark burning. The work has been done at the wrong end of the engine. Provide good combustion, and your sparks will take care of themselves. We do not wish to depreciate the industry and talent directed to the problem of spark arresting, but do contend that more ought to be done in the way of finding out how to burn sparks. It would be interesting to know how much it has cost our railways in the way of damages for fires caused by sparks from locomotives. We already know that locomotive sparks caused five-tenths of 1 per cent of the fires of 1884 in the United States. And we would add that this percentage covers only those fires coming under the immediate notice of the fire insurance companies, and does not include the multitude of minor field and fence blazes. Perhaps, if the figures regarding these expenses were gotten together, we might have a wider recognition of the fact that there is more money to be saved by studying the firebox end of the locomotive than by unceasingly tinkering with the front end.—*Railway Review.*

Electrical Foot Warmers.

The acetate of soda foot warmers now used for French railway carriages gradually become cool by radiation; but M. Tommasi, the French electrician, proposes to keep them up to a certain temperature by means of the heat due to an electric current traversing a high resistance. Only the heat lost by radiation is thus compensated for, so that the original high temperature is obtained on the cheaper plan of heating by a fire, or rather by plunging the warmers in boiling water. The current employed to maintain their heat is to be supplied by a dynamo driven off an axle of the train, and the circuit passes through all the warmers. A simple device allows of the foot warmer being thrown out of circuit should it become unbearably hot. The plan will require fewer foot warmers than are now used, since it will be unnecessary to change them during a lengthy journey. This combination of fire and electric heating is perhaps more likely to be successful for the present than a purely electrical arrangement. Warmers on the latter plan which have been devised are of feeble power.

FOR a soap to clean clothes without rubbing: Take 2 pounds sal soda, 2 pounds yellow bar soap, and 10 quarts water. Cut the soap in thin slices, and boil together 2 hours; strain, and it will be fit for use. Put the clothes in soak the night before you wash, and to every pailful of water in which you boil them, add a pound of soap. They will need no rubbing, but merely rinsing.

Lake Tahoe.

So many reports are spread about concerning the depth of this wondrous sheet of water that but few really know which to accept. Some reports go to show that no soundings were ever obtained in the center of the lake, and others that the greatest depth is 2,300 feet. The following, ascertained from John McKinney, one of the oldest residents on the lake shore, and who assisted in taking the soundings, may prove interesting to the general public:

Fifteen miles of the lake on the State line average 1,400 feet. The center of the line is 1,500 feet deep. Three hundred yards from the mouth of Emerald Bay the water is 790 feet deep, and four miles east thereof the soundings are 1,400 feet. At Rubicon Rock, 300 feet from shore, the water is 850 feet deep, and four miles out, easterly, it reaches 1,460. At Sugar Pine Point, one-half mile south, the depth is 770 feet, and four miles out, pitching to the north, 1,500 feet. Half a mile from Idlewild the depth is 780 feet, and six miles out, 1,525 feet. At Saxton's old mill, near Tahoe City, 772 feet of water is found one-quarter of a mile from shore, and five miles east by north 1,603 feet is reached. At Observatory Point, one-quarter of a mile northeast from Tahoe City, soundings are 1,300 feet, and four miles east 1,640. Four miles south of Hot Springs 1,645 feet, the greatest depth in the lake, is found. Blue water in any portion of the lake averages 1,300 feet.

The temperature of the lake water at 800 feet is found to be 42°; at 1,506 feet, 39½; at the surface in winter time, the temperature is 44°, and in deep water, during the summer, 65°.

The above will doubtless attract both interest and comment, but coming from the source it does, must be entitled to consideration. The theory of Mr. McKinney as to the original formation of the lake is that it occurred in the glacial period, and not from volcanic action, and if space permitted, his opinions on the subject would be given at this time; but it is certain that the bottom of the lake is riven, as are the surrounding mountains, into chasms and ravines, leaving plateaus that extend for miles, as do other valleys or land. Could the water be drained from the lake, the bottom would be several hundred feet lower than Carson valley, which valley was undoubtedly caused by the same operation as the lake, and was itself an inland sea or fresh water lake.

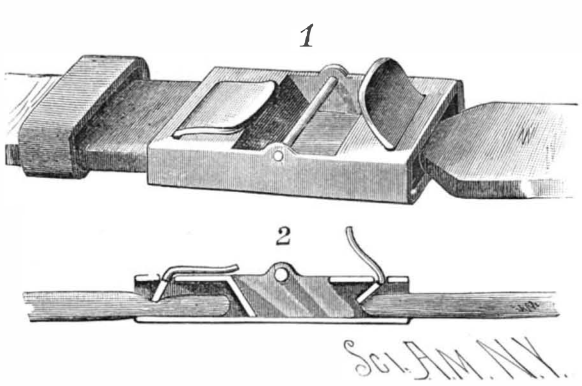
A deal of sound sense and deep study is evidenced by Mr. McKinney's theories and argument, and it would be much to the benefit of science if they could be published.—*Carson Tribune.*

African Indigo.

In his report on the trade of Tunis during last year, Mr. Consul Sandwith remarks that the cost of dyeing calico with indigo is a much more expensive operation in England than it is in Tunis. While the cost in England is, he estimates, from 5d. to 8d. per lb. of cloth, in Tunis the dyeing of a piece of cloth weighing 5½ lb. costs only 10d., or less than 2d. per lb. If, he adds, cotton goods were allowed temporary admission into Tunisian territory, so as to permit of their being dyed for re-export without duty, the establishment of indigo dye works on a large scale, and the importation of large quantities of cotton goods for dyeing and re-export to central, eastern, and northern Africa, where the color is so much appreciated, might be expected.

IMPROVED BUCKLE.

The engraving represents a buckle of simple construction, designed particularly for use on pantaloon and vest straps, to which it can be applied without stitching. In the top of each end of the frame is a slot,



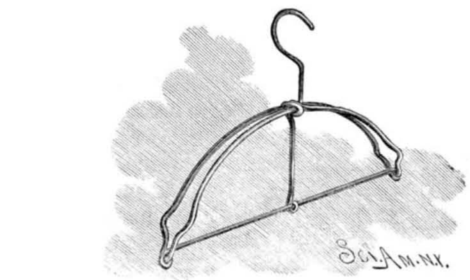
SCOVIL'S IMPROVED BUCKLE.

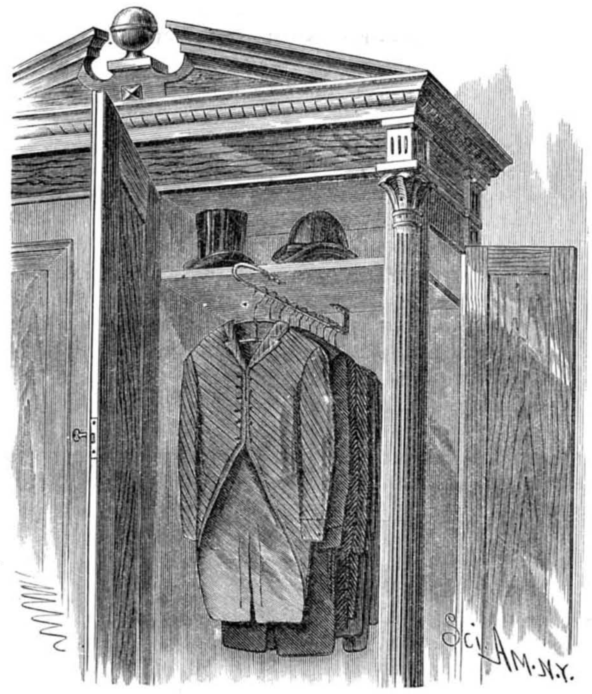
in which is pivoted a lever, bent at an angle, as shown in the sectional view, Fig. 2. The lower end of this lever forms a jaw for grasping and holding the strap, and the upper end forms a handle piece, by which the lever can be turned to release the strap. At the right in the lower figure the strap is shown just entering the buckle, the handle of the lever being raised, and at the left the strap is shown held by the lever, whose upper arm rests upon the top of the frame.

This invention has been patented by Mr. Samuel J. Scovil, of Jamaica, N. Y.

WARDROBE ATTACHMENT AND GARMENT HANGER.

This wardrobe is so arranged that its available storage capacity is doubled, and any garment hung in it can be readily reached without removing any other garment hung within it. Secured to the rear end of the usual upper shelf is a metallic rod which extends forward beneath it in a line substantially parallel with it. The forward end of the rod is curved to form a





CAZIER'S WARDROBE ATTACHMENT AND GARMENT HANGER.

nose-like projection, and is secured to the shelf. The garment to be suspended is hung upon a yoke formed with a hook, which is caught upon the rod. In the end panel of the case is a door, so that after the garments have been hung up, any one of them may be removed without disturbing the others, by simply opening the door and taking out the garment. In a large sized wardrobe two rods may be used, and a door placed in each end panel. Or the rod can be attached to the shelf of a closet or clothes room, and used in the same way.

The garment hanger is clearly shown in the small view. A length of wire is bent in a peculiar way to form the suspending hook and upper portion of the yoke, the extending looped ends of the wire being united by a horizontal brace. This forms a cheap and durable yoke, which may be made from much smaller wire than the ordinary form.

These inventions have been patented by Mr. M. H. Cazier, of 100 Lake St., Chicago, Ill.

The Products of Coal.

Few persons have any idea of the wonderful products from a lump of coal—a lump of coal that is placed in the retort of a gas manufactory. Ordinarily burned, the combustion of a lump of coal results in carbonic acid smoke (which is merely soot, or, rather, the visible portion of smoke is soot) and the ash, in which are found silica, alumina, oxide of iron, phosphoric acid, sulphuric acid, potash, sodium, combined sulphur, sometimes traces of chlorine, titanic acid, and other substances. In the gas retort a variety of products are obtained. The gas as it is carried through the hydraulic main to the purifying rooms takes with it tar and ammonia, the latter evolved from the nitrogen. The ammonia has to be washed out with water in an arrangement by which the ammonia is gathered and saved. Tons and tons of sulphate of ammonia are thus made, and become an article of commerce. The sulphur is removed by caustic lime or oxide of iron. The carbonic acid is also removed by lime, but the sulphurous acid cannot be removed, and, with several others, remains in the gas after all efforts to remove it. The others give the gas its smell.

By distillation, naphtha and asphaltum are obtained. Asphaltum is a dead oil, very useful to preserve wood. From this, too, carbolic acid is obtained—very important in surgical operations, as being the most valuable antiseptic known. From naphtha, benzole, eumol, toluol, and cymol are obtained. Naphtha, as is well known, is used as a burning fluid. Benzole is a solvent for grease and oils, very useful in cleaning kid gloves and things of that kind.

Benzole treated with nitric acid produces nitrobenzole. This, singularly enough, is used as a flavoring extract by confectioners and for perfuming soap. When used for this purpose, it is known in commerce as the essence of myrrhbane, which it is not, although it smells and tastes something like essence of myrrhbane or oil of bitter almonds. Nitrobenzole is terribly poisonous, but not more so than other adulterants used by confectioners.

From nitrobenzole, aniline is obtained. This when first obtained is a perfectly colorless liquid, but darkens as it grows older. From aniline are obtained the coal tar colors, which are so very brilliant. The colors are of all hues. The one known as "Turkey red" is exactly similar to the red that used to be made from the madder root. Since the discovery of this aniline, it has almost completely broken up the raising of madder in Holland. There thousands of acres were devoted to the raising of madder root to get the Turkey red dye. It can be made much cheaper from the product of a gas factory.—*The Coal Trade Journal.*

Eugenol.

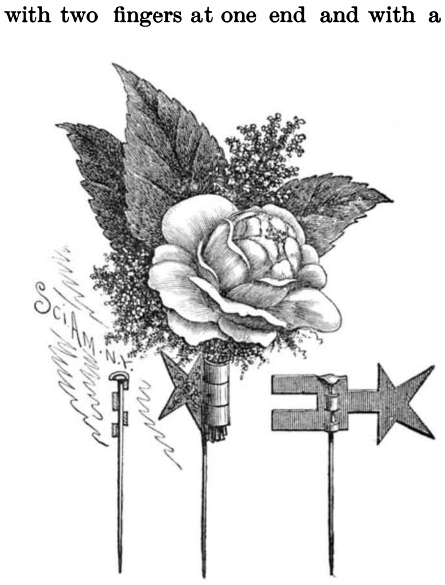
I do not remember to have seen anywhere a fully appreciative notice of *eugenol* among the lists of drugs used as disinfectants, antiseptics, deodorizers, and obtundents. It is a superior agent in all these particulars, and is free from the objectionable characteristics usually belonging to the class. Though sharp to the taste, it is not especially disagreeable. It is not caustic, like carbolic acid and creosote. It is not destructive to the tissues, and there is nothing to fear from a little excess in using. It can be employed without extra caution for thorough saturation of infected dentine, or passed freely to the extreme points of root canals. While it thoroughly disinfects, it does not cauterize. It does not coagulate the albumenoid surface, leaving material for putrefaction beyond in pulp canal and dentinal tubules, as carbolic acid does, but penetrates, saturates, mummyfies, and *stays.* A root canal in which it has remained a day and a night is safe to fill, though previously septic.

Eugenol represents the strength of the essential oil of cloves. Whether its virtue comes from additional oxygen, as claimed by some, or mere exclusion of non-essential elements, I know not; but this I do know, that it is good. I have used it, to the exclusion of other agents in most cases, for nearly three years, and with great satisfaction. No other agent has contributed so much to my success in the treatment of pulpless teeth. As a pain obtundent, by application to super-sensitive dentine, eugenol has the virtues multiplied of the time honored oil of cloves. This, with its disinfectant qualities and general innocence, gives it a value above any other agent with which I am acquainted for use in teeth containing living pulps.

I believe eugenol has not yet found its way into the stock of druggists generally. Care must be exercised in ordering, that the common oil be not substituted. Every dentist should have it. It is indispensable.—*Garrett Newkirk, Dental Cosmos.*

BOUQUET HOLDER.

The pin held to the head or clasp is passed into the article to which the holder is to be held. The clasp is made with two fingers at one end and with a central



McLANE'S BOUQUET HOLDER.

finger at the other end. These fingers, being made of thin, flexible metal, can be easily bent by the hand around the stem of a flower or other article to clasp and hold it. The extremity of the single finger may be provided with an ornament of any preferred design. This holder can also be used for fastening price tickets to goods in show windows, and is adapted for holding a variety of articles, for purposes both useful and ornamental.

This invention has been patented by Mr. Alexander McLane, of 157 Oliver Street, Paterson, N. J.

MAKING MAMMOTH GUNS.

To the casual observer, an immense gun is nothing more than a bored mass of iron or steel provided with suitable loading and firing devices, and mounted upon a carriage. But the study of the history of the gun shows that at every step in its manufacture great skill and exceeding care were exercised, and colossal machinery, working with exquisite precision, was employed. From the first process, the making of the pit and mould, to the final finishing, a misstep is liable to destroy all the work, and therefore long experience and the highest skill are necessary to insure perfection. In the following article we have endeavored to plainly describe the various operations in making a mammoth gun, from the pit to the carriage.

The South Boston Iron Works has manufactured ordnance and war material for the United States Government for upward of fifty years, and during the rebellion worked night and day to keep up its supply for the war.

We publish four engravings showing ordnance machinery and the guns in process of construction, and one view of the 54 ton B. L. rifle, mounted on a pneumatic siege carriage at the ordnance proving grounds.

No. 1 is an interior view of the large ordnance foundry, where the 54 ton guns are cast, the ground being broken away so as to show a section of the pit, which is placed in the center of the foundry. On the right are two 40 ton reverberatory furnaces for melting the iron for the casting, and another 40 ton furnace is on the left of the pit, but is not shown in the engraving. The combined capacity of these monster furnaces is 125 tons. A trough or runner leads from each furnace to a pool or basin placed at the mouth of the pit, and from which a short runner conveys the molten iron to the mould.

The pit is 40 ft. deep by 13 ft. in diameter, and its brick walls are 1 ft. thick. In the center of the pit stands the gun flask, which rests on dry sand supported upon a firm foundation of masonry and concrete. Every precaution is taken to prevent the entrance of water within the pit, since even an extremely small quantity would ruin the work. The flasks are flanged sections of iron, which, when placed in position in the pit, form a shell for supporting the mould. The flasks are rammed, washed, and dried before being lowered into the pit, and are not touched after being placed in position.

These flasks, being called upon to sustain a quantity of melted iron weighing from 125 to 150 tons, and to resist a pressure due to nearly 40 feet, are necessarily made of great strength. When casting on July 9, 1884, the flasks broke and the iron flowed into and filled the bottom of the pit. The "cheese" thus formed was 7½ ft. high, 11 ft. in diameter, and weighed 137 tons. It was three months' work to remove this from the pit, and it was wedged so firmly that it required a force of 736 tons to start it from the bottom. The print of the brick lining of the pit is shown so plainly on its outer face as to appear, to an inexperienced observer, like a section of a brick tower.

The upper end of the core arbor is supported by a cast iron tripod or spider, resting upon the upper edge of the top flask. The lower end of the core arbor is steadied by a chaplet which is on the muzzle of the gun casting and beyond the end of the finished gun. Through the center of the arbor passes a pipe, which terminates near the lower end of the arbor. Water flows through this pipe and up the arbor to an outlet pipe at the top. The water is kept running at the rate of forty gallons per minute, both before and during the casting and for two days after, thereby gradually cooling the interior of the casting; the layer of metal next the core is first cooled and solidified, next the succeeding layer in cooling shrinks and binds upon the first, and so on throughout the mass, the exterior being the last to acquire a set.

There are three heavy cranes in this foundry, having each a lifting power of 30 tons. They are used principally for lowering the gun flasks into the pit and removing them after the gun has been cast. The gun is hoisted from the pit by hydraulic power or by a system of lifting screw jacks, both contrivances having been used. After the gun has been lifted from the pit, it is moved into the ordnance machine shops on rolls, much after the manner of moving a house.

Engraving No. 2 is an interior view of the ordnance machine shop, showing one of the 54 ton rifles in the process of being bored in one of the 100 ton lathes. This gun is to have a short steel tube, four inches thick, inserted from the breech and extending a little forward of the trunnions. This tube is shrunk into the bore of the gun, the latter being heated. The longitudinal sectional views, Fig. 5, show this tube and its length and relative thickness. The diameter of the bore of this gun is 12 inches and its total length 30 feet. It will be fired with a powder charge of 265 lb. of brown cocoa powder, and will throw an 800 lb. shot 10 miles.

The third engraving shows another 100 ton lathe in the machine shop, with a 53 ton rifle in the stage of being turned. This gun has a cast iron body weighing about 31 tons. A steel tube, 4 inches thick and of six tons weight (made by Sir Joseph Whitworth, of England), is shrunk into the bore from the rear, and extends into the gun for 168 inches. Two layers of steel hoops of an average width of eleven inches and a thickness of four inches, 26 in number, and about 40 inches in diameter, are shrunk on to the outside of the cast iron body. The hoops (shown in the upper view, Fig. 5) are bored four hundredths of an inch smaller than the outside diameter of the cast iron body, and are expanded by gas burners until they are two hundredths of an inch larger than the body, and are then pushed up to place. Then a stream of water is played on to the hot ring until it cools. The ring then hugs the cast iron, and strengthens it. While the ring is "setting," a hundred ton jack keeps it in position and close up to the preceding ring, so that there shall not be any space at the joint between any two rings exceeding three thousandths of an inch. The diameter of the body of this gun, when ready for the shrinking on of the hoops, showed no variation over two thousandths of an inch, and the ordnance officers consider it the finest and most accurate shrinking ever done in this country or abroad.

This gun will fire the same charges as the 54 ton rifle. The diameter of the bore is the same (12 inches), but it is two feet shorter. The gun, when finished, is about five feet in diameter.

The 12 inch B. L. rifle is shown in the fourth engraving. This is all gun iron, that is, it has no steel tubes or hoops, is rifled with twist one turn in 135 calibers at origin to one turn in 40 calibers at muzzle, and is mounted on a Powlett pneumatic siege carriage at the U. S. ordnance proving grounds at Sandy Hook, N. J. This rifle was mounted in June, 1885, and has been fired 137 rounds with charges of 265 pounds of powder and an 800 pound projectile. This is the best record known in this or foreign countries for a 12 inch rifle, with this weight of powder and projectile. A 12 inch B. L. steel rifle, made by Herr Krupp, has been fired 120 rounds. The muzzle velocity of the 12 inch gun iron rifle is 1,862 feet per second; penetration at 1,000 yards, 23 inches of armor; and range, 10 miles.

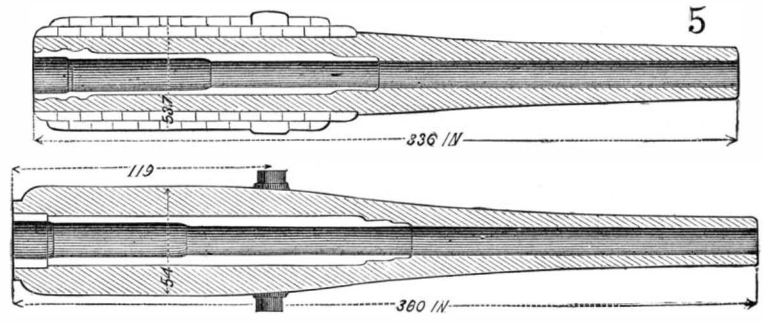


Fig. 5.—SECTIONS SHOWING STEEL TUBE AND HOOPS OF GUN.

The Powlett carriage, on which this gun is mounted, was made at the South Boston Iron Works last autumn, and is worked entirely by compressed air. This system is owned by the Pneumatic Gun Carriage Company, of Washington, D. C. The recoil from this gun, equivalent to starting 800 pounds of iron with a velocity of 1,862 feet per second, is taken up entirely by the compressed air system, and instead of straining and banging the carriage and having the pressure in the cylinders run up from 3,000 to 4,000 pounds per square inch, as is the case with all the hydraulic carriages now in use, the greatest pressure in these air cylinders is 450 pounds per square inch, as shown by a pressure gauge recently attached to the carriage at the Hook. The elevating and depressing of the gun is entirely under the control of one man, and the gun can be sighted to a line in ten seconds. The traversing of the carriage is also controlled by one man, and, instead of taking 12 men 20 minutes to make the traverse, as is the case with the usual type of 12 inch siege carriages, one man can traverse it in 2¼ minutes. This carriage was built for the Ordnance Dept., U. S. Army, and its tests have been so satisfactory that Secretary of the Navy Whitney ordered a board of navy officers, consisting of Captain J. A. Howell, Commander George F. F. Wilde, and Lieutenant Bradbury, to visit the Hook and witness the firing with this carriage. The board were very much pleased with its working, and have made their report. They recommend an 8 inch navy carriage be built, to try this pneumatic system applied to the naval service. They are of the opinion that compressed air for gun carriages, and especially for the stoppage of recoil, possesses decided advantages over all other methods. The South Boston Iron Works have built and erected at Sandy Hook a pneumatic gun loader and tramway for 12 inch carriage, which will convey the powder and shot from the magazine to the gun and load the gun, and, after firing, clean out the bore. This will do away with at least 12 men, and will facilitate the loading and firing twentyfold.

On Thursday, Sept. 2, 1886, the Japanese Commission of military and naval officers which has been visiting the United States and inspecting our ordnance resources went to Sandy Hook to see the 54 ton gun-iron rifle and the Powlett 12 inch siege carriage. The operation of this carriage was shown in all its detail, the gun being run in and out of battery, elevated and depressed, and the carriage traversed backward and forward. The gun loader worked perfectly. With it an 800 lb. projectile was carried 100 feet, elevated, and rammed home into the chamber of the gun in 40 seconds, with the aid of but one man; with the old hand gear system, it takes 8 men 20 minutes to accomplish the loading of a shot. This pneumatic carriage is apparently the type of the future equipment of heavy guns.

For and Against Alcohol.

The total abstinence section of the British Medical Association never fail to testify at the annual meeting. About 160 members of the Association were present at the breakfast at Brighton recently given by the National Temperance League. We need not say that the speakers at this meeting were not of the opinion of a recent writer in the *Revue Scientifique*—M. Fournier de Flaix. M. De Flaix maintains that the outcry against alcohol is utterly unmerited, and that all vital statistics are more favorable in nations in proportion to the use of alcohol. In France, he says, the birth rate is lower and the death rate higher, where the consumption of alcohol is smaller. In England, again, more alcohol is consumed than in France, and yet in France the birth rate, the death rate, and the statistics of crime and suicide are less favorable than in England. Comparing other nations, he reaches the same conclusions, and maintains that alcohol is an alimentary element whose consumption should depend directly on climate. Very different were the teachings of the medical abstainers at Brighton, viz., Dr. Norman Kerr, Dr. Nathan S. Davis, Professor Geikie of Toronto Medical College, Dr. Simon Fitch of Nova Scotia, Dr. Bernard O'Connor, and Dr. Ridge, Secretary to the Medical Temperance Association. Dr. O'Connor said that during his fourteen years of practice he had never prescribed alcohol for any patient. Speaking as a physician to a consumption hospital, he maintained that phthisical patients did much better without alcohol—the night perspirations and the cough were less, and the morning exhaustion was less. But the principal speaker, of course, was Dr. Nathan S. Davis—the president-elect of the approaching International Congress. Dr. Davis' disparagement and denunciation of alcohol were absolute and unconditional. It does not nourish, it does not sustain heat, it does not assist convalescence, it does not improve the pulse in fever, and it is of no virtue in nursing. It is purely evil in its effects. So far from strengthening the heart's action, it depresses it—it paralyzes it. In saying so, he relied not only on his own observations, but on those of Anstie and Parkes. He maintains that alcohol is simply anæsthetic; that it does not remove evils, but makes one insensible to them; and that it arrests and retards all healthy action of the tissues, and tends to the retention and accumulation of effete materials. It is a pity that M. Fournier de Flaix and Dr. Davis did not meet at the Brighton breakfast. There is perhaps a little extremeness on either side, but of the two sides we decidedly lean to that of Dr. Davis. We entirely agree with him and other speakers in thinking that the medical prescription of alcohol should be undertaken only on the strictest grounds. M. De Flaix must remember that France now is not far, if at all, behind England in the consumption of alcohol, and that, besides, she indulges in absinthe, and he will have to explain the fact that in the temperance section of life insurance offices in England the value of life is apparently much greater than in the ordinary section—so much so that in some offices teetotal lives are taken for less premiums or receive larger bonuses. When we read the indictment of Dr. Davis against alcohol, we are tempted to ask if it is the whole truth—if alcohol has no redeeming quality. Admitting that it does infinite harm, does it do no good?—does it prevent no evil? Can the able physicians who recognize its virtues be all mistaken? The question is one for scientific and thoughtful men to discuss gravely, and medicine will not be without much authority and, let us repeat, responsibility in its settlement.

Corn Silk—Stigmata Maydis.

Corn silk has been examined by Messrs. Rademaker and Fischer, who report their results (*Amer. Jour. Pharm.*). Among the more important constituents found were fixed oil 5·25 per cent, light yellow in color, saponifiable, solidifying at 50° Fah., and insoluble in alcohol. Resins and coloring matter (chlorophyl) existed to the extent of 2 per cent, and dissolved along with them by alcohol and ether was 1·25 per cent of maizenic acid, which was first discovered by Dr. Vautier. This acid is freely soluble in water, ether, and alcohol, but insoluble in petroleum spirit. It decomposes the alkaline carbonates, and its salts are crystallizable, the potash salt forming rhomboidal prisms.

NEW GERMAN-BUILT STEAMERS.

The opening of the new line of mail steamers by the North German Lloyds, of Berlin, has attracted much attention throughout Germany, but special interest has been felt in the six mail steamers which the company, contrary to its established custom of having its vessels built in England, has ordered of the Stettin Machine Building Corporation "Vulcan" at Bredow, near Stettin. It amounts to a competition between England and Germany in a branch of industry where England has always held undisputed sway. The powerful war ships built by the "Vulcan" for the German and other navies have already made for it an honorable reputation, which extends far beyond the limits of the German empire; and many vessels for the German merchant marine have come from these works. The company undertook to built six steamers for this new subsidized line, the three smaller ones of which—the Stettin, the Lubeck, and the Danzig—have been completed.

The first of the three larger vessels (shown in our engraving) was launched with much ceremony on July 10, and was christened Preussen by the wife of the Ober-president of Pomerania, the Countess Behr-Negendank. The other vessels, on which much work has already been done, will be named Sachsen and Baiern. These ships, the cost of which will be about $500,000, will ply between Bremerhafen, Antwerp, Port Said, Aden, Colombo, Singapore, Hong Kong, and Shanghai, and will make the round trip in 110 days.

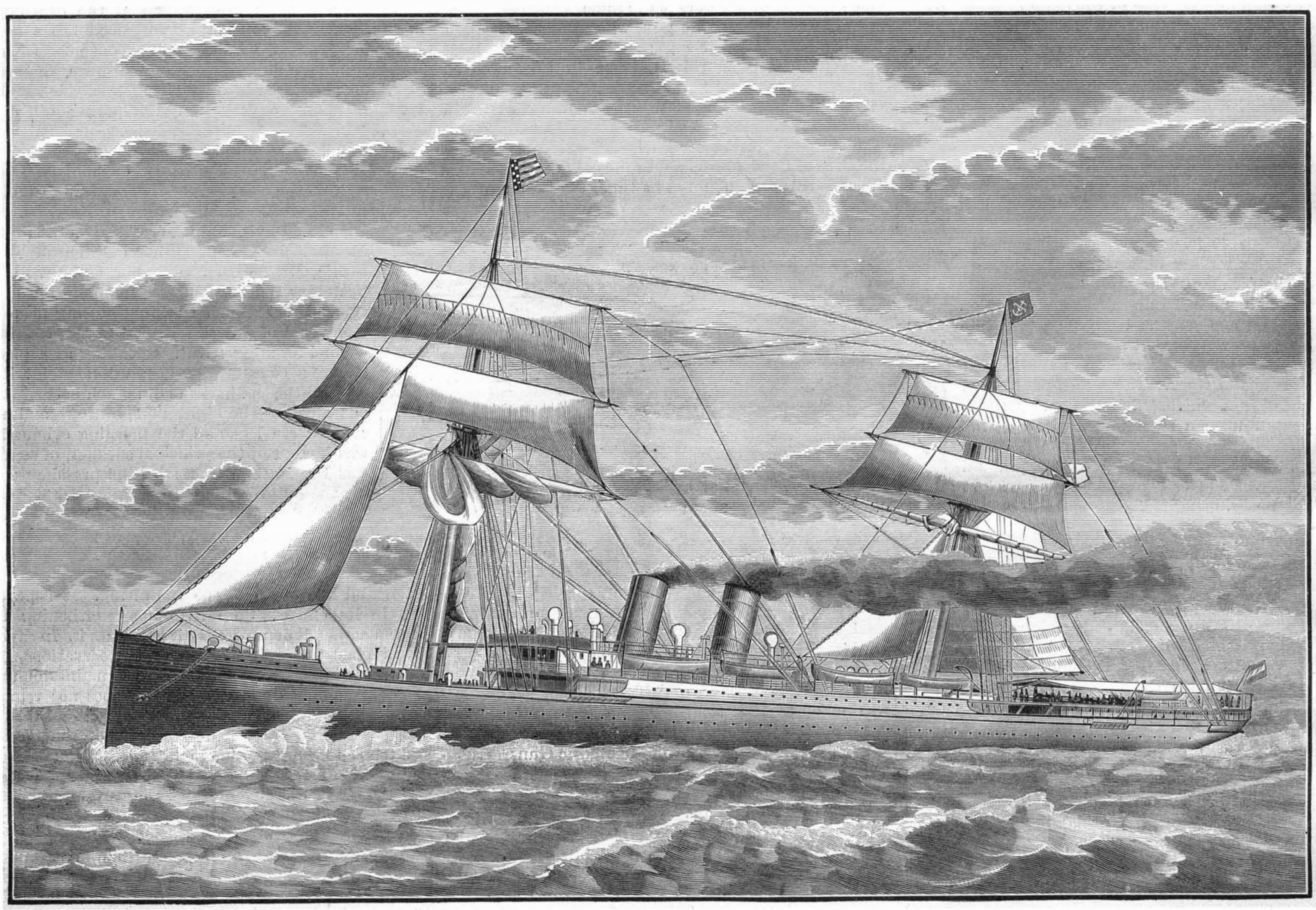
The principal dimensions of the Preussen are as follows: Length at the water line, about 388 ft.; beam, 44 ft.; and depth from keel to the side of the upper deck, about 33 ft.; cubic contents, 4,000 tons; draught, 20 ft.; and speed, 14 knots, or 16 miles, an hour. The engine is a three-cylinder expansion engine of 3,500 horse power. Steam is generated in four double boilers, for each two of which there is a common funnel, which is provided with double walls, so as to serve also as a ventilator for the fire room. The coal bunkers have a capacity of 900 tons. Besides the large boilers, there are two auxiliary boilers, which provide steam for the auxiliary engines.

The hull of the vessel is made of Martin steel. Three decks extend from stem to stern, and besides there is a fourth, the so-called orlop deck, which extends only over the forward part. In the center of the upper deck the bridge is built, while the forecastle is forward and the poop is aft on this deck. The bridge and the poop are connected by a removable platform. There are eight watertight compartments formed by nine bulkheads, six of which extend to the upper deck. Each compartment is provided with the necessary hand and steam pumps. The cargo will be stored in four separate spaces, and for loading and unloading four large steam cranes—each of which can lift three tons—are provided. Besides these, each mast is provided with a hydraulic hoisting device (Brown's patent). Numerous boats and life-preservers are provided for the safety of the passengers. There are six life-boats, two copper-fastened cutters, and a jolly boat. Four large anchors lie on the forecastle, and there is a steam windlass on the upper deck and a capstan on the forecastle. On both sides there are light towers for the side lights. The vessel is steered by teak-wood wheels on the poop, besides which there is a Muir & Caldwell steam steering apparatus in the pilot house on the bridge. On the upper deck, between the forecastle and the bridge, are the stalls for the cattle. There are numerous ventilated store rooms stocked with all the comforts considered necessary for a first-class passenger steamer, and an ice cellar is also provided.

The vessel is arranged for the accommodation of 116 first-class passengers. In the "between decks" and on part of the main deck there are 200 iron berths for steerage passengers.

The ship is furnished with patent ventilating apparatus and with 340 electric lamps. The first and second class saloons are on the main deck, and under the poop are a ladies' saloon and a smoking room.

The vessel is brig-rigged, and, in case of accident to the engines, can proceed under sail. All the newest and best methods have been applied in the construction of these ships, and it is hoped that they will promote German shipbuilding.—*Illustrirte Zeitung.*



THE IRON SHIPBUILDING INDUSTRY IN GERMANY.—THE NEW STEAMER PREUSSEN.

The Breaking of Grindstones.

The last report of the English Chief Inspector of Factories contains the following interesting suggestions with reference to the breaking of grindstones in the cutlery trade. Mr. Redgrave, Chief Inspector, says:

"Mr. Bartlett, Redditch, referring to a paragraph of my report for 1884, in which I had expressed a doubt whether it were possible to prevent the breaking of grindstones used in the cutlery trade, has sent me a recommendation, which I am glad to mention for the information of users of emery wheels, especially grindstones. Mr. Bartlett says: '1. Lay in the stock of grindstones not later than the middle of July, in order that they may have ample time to dry in the sun and air. To do this they must be placed where both sun and air can get to them, and they must be put on their edges on pieces of boards, not on the earth, so as to avoid the absorption of any moisture. 2. As soon as dried thoroughly they should be alone placed in the rooms in which they are intended to be used, or in a dry storeroom, and not be allowed to come into contact with soil or get damp again. 3. Before being used, each stone should be tested in a strong wrought iron testing box, and driven at a greater speed than when in work. 4. The stones above 9 inches in diameter should be hung with side chains or plates instead of being led on to their spindles. By the adoption of this system we have had no accidents in 20 years.'"

The Power of the Sea.

When visiting an outlying island of the Shetland group, I was much struck by the evidences of the enormous force of the sea in throwing up large bowlders. The island, which is composed of a pale red granite, is fully exposed to the Atlantic, and has seventeen fathoms of water at the edge of the rocks. The most violent storms occur from the northwest and southwest. Near the top of a gully facing the southwest, and about 25 feet above the sea level, was a block of granite nearly spherical in form, having had its angles chipped off by the action of the sea. Its measurement gave a weight of 22¼ tons. A little farther up, and about 35 feet from sea level, was a rectangular block 8 feet high, and 5 feet by 5 feet base, weight about 14½ tons. This was the smallest of three which were lying close to one another. They had evidently been recently thrown up, and the three pieces had the appearance of having formed one block, which had been broken where it was lying. I examined the cliff at the water's edge, and could see the mark where a large piece had been recently broken out. I should think it is highly probable that this block, which must have weighed at least 50 tons, had been broken off this rock, cast up 130 yards inland and 35 feet above sea level, and broken in three pieces. There were many slab-shaped blocks lying about; one was wedge-shaped, of 12 tons, another rectangular one 2 feet thick, of 11 tons. The largest block I measured in this gully was 14 feet high and 26 feet in girth.

In a funnel-shaped cleft facing the northwest lies a bowlder quite smooth, a flattened ellipsoid in shape, like a common beach pebble. I estimate its weight to be 17 tons. It is 30 feet above the sea level, and is resting in a V-shaped nick; a cliff behind prevents its being washed inland. This has evidently been polished smooth by being turned round in the cleft during storms from the northwest.

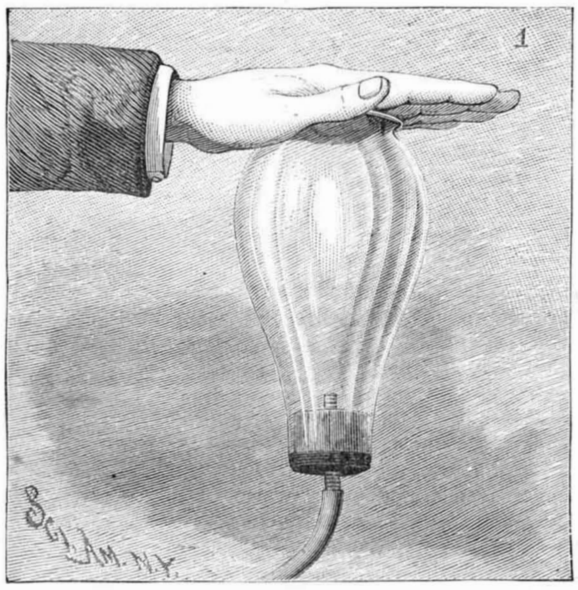
In another island there is a beach facing the southeast. The average size of the pebbles of which it is composed is 8 feet round the minor axis. During the lull in a great storm, the rattling of these bowlders can be heard several miles. EDWARD M. NELSON.

Shetland, August 2.

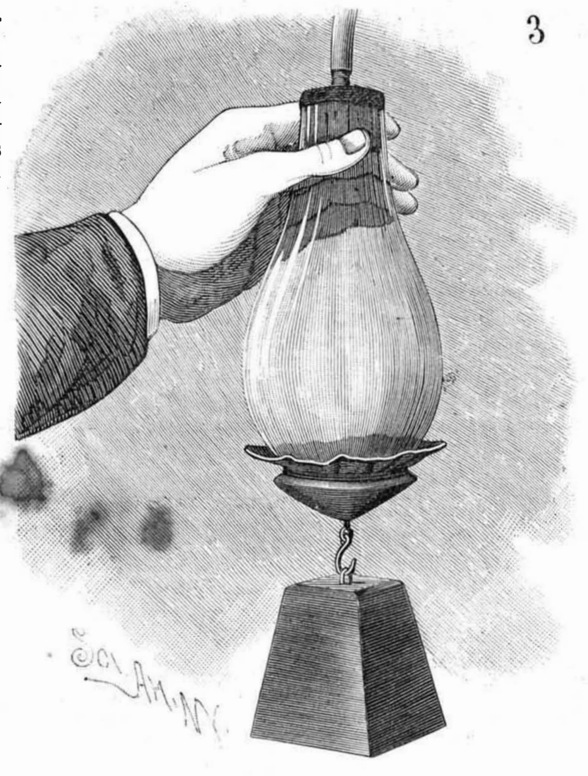
A FEW EXPERIMENTS WITH THE SIMPLE AIR PUMP.

BY GEO. M. HOPKINS.

A great deal of experimental and practical work may be done with the simple air pump recently described in these columns. The apparatus required for the vacuum experiments cost less than the pump. It consists of a fish globe 6 in. in diameter, a disk of thick, soft rub-



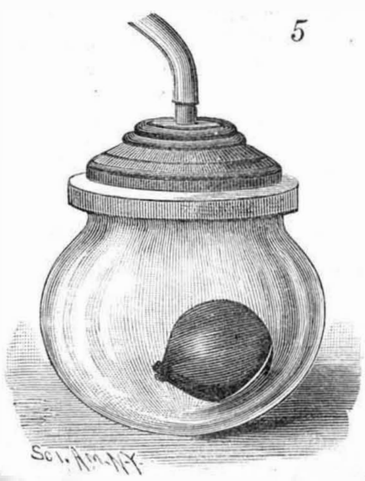
HAND GLASS.



WEIGHT LIFTED BY AIR PRESSURE.

RUBBER FORCED INWARD BY AIR PRESSURE.

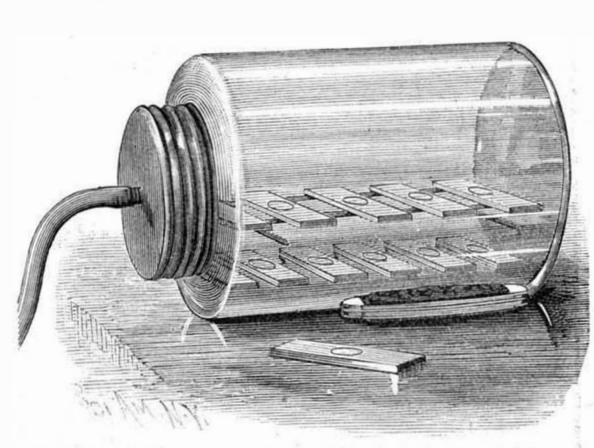
DISRUPTIVE FORCE OF AIR.



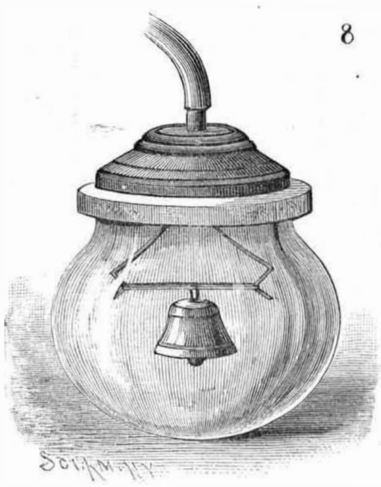
DILATION OF BALLOON IN A VACUUM.

DESTRUCTION OF LIFE BY REMOVAL OF AIR.

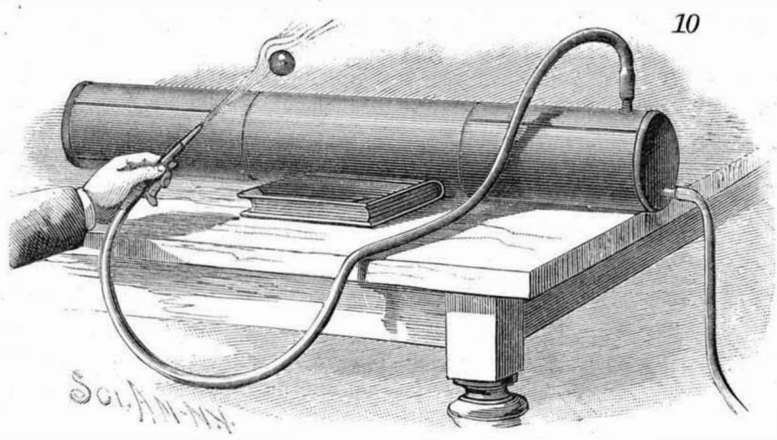
WATER BOILING IN VACUO.



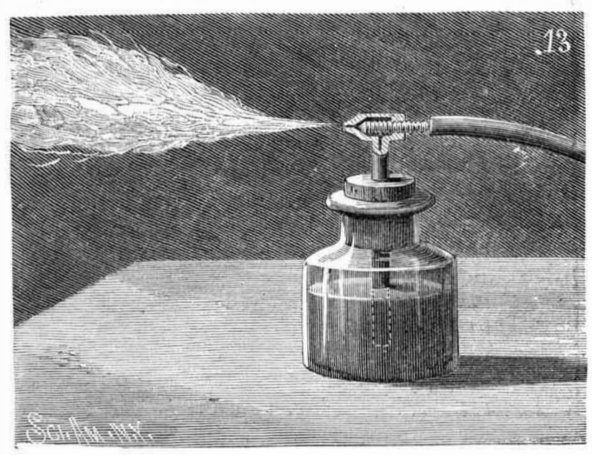
WITHDRAWING AIR FROM MICROSCOPE SLIDES.



BELL IN VACUO.



COMPRESSED AIR RESERVOIR AND BALL EXPERIMENT.



ATOMIZING PETROLEUM BURNER.

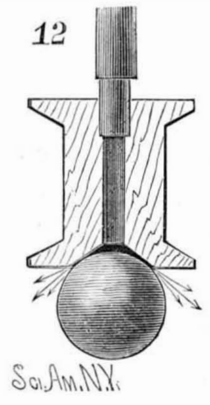
ber large enough to cover the fish globe, a plain disk of wood as large as the rubber, two 3 in. pieces of five-sixteenth inch brass tubing, a lamp chimney with a flange on the lower end, a cork fitting the small end of the chimney, a thin piece of bladder, a thin piece of very elastic rubber, a small bell, a tumbler, a small rubber balloon, some sealing wax, some stout thread, and a piece of small wire.

The lamp chimney needs no other preparation for use than the insertion of one of the five-sixteenth inch tubes in the center of the cork and the thorough sealing of the cork with its tube in the smaller end of the chimney.

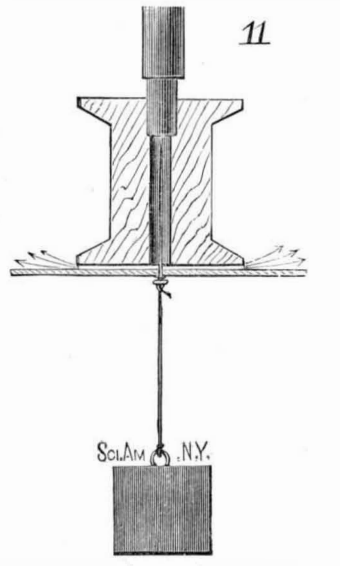
A very striking and instructive experiment consists in exhausting the air from the chimney by applying the suction tube of the pump to the tube at the closed end of the chimney, while the palm of the hand is applied to the large open end of the chimney. As the air is exhausted from beneath the hand, the pressure of the atmosphere exerted on the hand drives the palm down into the chimney, as shown in Fig. 1, and as the exhaustion proceeds, the pressure becomes painful and difficult to endure.

It is easy under such circumstances to realize that the atmosphere has a very appreciable weight.

The same fact may be illustrated by tying over the open end of the chimney a thin piece of elastic rubber, then exhausting the air from the chimney, allowing the external air to press the rubber down into the chimney, as shown in Fig. 2.



BALL PARADOX.



CARD EXPERIMENT.

In Fig. 3 is illustrated a similar experiment, in which the inwardly pressed diaphragm is made to raise a weight. A piece of rubber cloth is tied over the open end of the chimney and a hook is fastened to its center by sewing. The cloth is heavily coated with rubber cement around the sewing of the hook. A weight is placed on the hook, and the air is exhausted as before. The upward pressure of the atmosphere raises the weight. This experiment illustrates the action of a form of vacuum brake now extensively in use; the weight representing the brake.

The disruptive power of atmospheric pressure is illustrated by the rupturing of a thin piece of bladder tied over the open end of the chimney, as shown in Fig. 4. When the air is exhausted from the chimney, the bladder, if thin enough, will burst with a loud report. If the bladder will not readily burst, the rupture may be started by puncturing it with the point of a knife.

The fish globe forms the receiver of the air pump. It is closed by the soft rubber disk, which is supported by the wooden disk, the rubber being secured to the wood by four common screws passing through the rubber into the wood, about midway between the center and circumference of the rubber. Both the board and the rubber are apertured to receive a five-sixteenth tube, which is provided with a fixed collar at the top of the wood, and with a screw collar at the outer face of the rubber disk. The screw collar is turned down upon the rubber, clamping it to the wood, and at the same time making an air-tight joint around the tube.

The suction tube of the pump is applied to the small brass tube, and the soft rubber disk is pressed down upon the mouth of the globe, when the operation of producing a vacuum is begun. After a few strokes of the pump, the cover will be retained on the globe by atmospheric pressure, and will need no further holding by the hand.

The expansibility of air is shown by inclosing a small quantity of it at atmospheric pressure in an elastic rubber balloon,* and placing the balloon in the

*The small inflatable balloons applied to the toy squawkers, and which may be bought in any toy store for three cents, answer perfectly for this experiment.

receiver, then removing the atmospheric pressure from the exterior of the balloon by exhausting the receiver. The air in the balloon will expand, distending it as shown in Fig. 5.

The inability of rarefied air to support life is shown by the experiment illustrated by Fig. 6. A mouse in the receiver soon dies when the air is exhausted.

The fact that water boils at a temperature below 212° when the atmospheric pressure is removed, is exhibited by placing a tumbler of hot, but not boiling, water in the receiver, as shown in Fig. 7, then exhausting the air from the receiver.

The bell suspended in the receiver by a light elastic rubber band stretched across a wire fork, whose shank is inserted in the tube of the receiver cover (as shown in Fig. 8), may be distinctly heard when rung in the receiver before exhaustion, but after exhausting the receiver, the bell will be heard feebly, if at all, thus showing that the air when rarefied is a poor sound conductor.

A device for use in connection with the simple air pump for desiccating and for removing air from microscope mounts is shown in Fig. 9. It consists of an ordinary fruit jar having a short tube soldered in its cover, which is adapted to receive the suction tube of the air pump. The objects to be treated are placed in the jar, the cover put on and made tight, and the suction pipe of the pump is applied.

These are mostly well-known vacuum experiments, adapted to the simplified apparatus. There are, of course, many others that may be performed with equal facility by means of this air pump.

With the pump arranged for compression, a large number of experiments of a different character may be performed. A reservoir will be needed, like that shown in Fig. 10. It consists of a piece of ordinary leader, such as may be procured from any tinman. It should be 3 or 4 in. in diameter and 3 or 4 ft. long. Heads are soldered on the ends, and all the seams are made air tight by soldering. A five-sixteenth in. tube is inserted in one end, and another in the side. The discharge end of the pump is connected with one of the tubes of the reservoir, and a rubber tube, having at one end a one-sixteenth inch nozzle of metal or glass, is connected with the other tube of the reservoir. The air may be confined in the reservoir by doubling the discharge tube or applying to it an ordinary pinch cock. When sufficient pressure has been generated in the reservoir by operating the pump, the air may be allowed to issue from the nozzle. A light ball of cork may be supported in the air jet while the nozzle is held in an inclined position, as shown in Fig. 10.

By connecting the discharge pipe of the reservoir with a spool, in the manner shown in Fig. 11, the familiar experiment of sustaining a card, together with an attached weight, by blowing down on the card may be performed. A pin passing through the card into the central aperture of the spool prevents the card from slipping.

Fig. 12 shows a simple way of exhibiting the ball paradox. A spool, concaved at one end around the central hole, is connected at the opposite end with the air reservoir. The ball is held in the concavity of the spool by blowing forcibly outward against the ball.*

In Fig. 13 is shown an atomizer, which may be used in connection with the reservoir and air compressor for atomizing liquids for various purposes. In the present case it is represented as an atomizing petroleum burner. A burner of this kind yields a very intense heat, and produces a flame 2 or 3 ft. long. The oil is drawn up the vertical tube by the vacuum formed in the outer tube of the atomizer by the passage of the air from the inner nozzle through the outer nozzle. The outer end of the inner nozzle is connected with the compressed air reservoir.

A Ministry of Health.

The London *Lancet* contends that there ought to be a department of health in the Government of Great Britain, and that a Minister of Health should have a seat in the Cabinet. Public medicine is preventive, and as such it can only be effective when it forms an integral part of state policy. Surely, health is not secondary to wealth; and if trade needs to be specially controlled in the interests of the state, health promotion has a not less urgent claim to be considered a constituent part of policy. The question has been reopened, and is being agitated by Mr. Hamer, a practical worker in the field of health promotion. There are urgent matters of sanitary enterprise which call loudly for help from the government, and which it is not only inexpedient, but a cause of weakness to neglect. The Prime Minister who shall perceive the need, and take measures to satisfy it, will deserve well of his generation and serve his country.

* The ball paradox is explained in SUPPLEMENTS Nos. 37, 47, 51.

THE MINK.

BY C. FEW SEISS.

I have never met a person who spoke favorably of the mink. The only good I ever found to place to his credit was that he, when other more palatable food was not to be had, would capture and devour meat, mice, rats, and other like vermin. The farmer detests him, and with good reason, for the mink has a marked fondness for chickens and ducks, and makes it his business to pay nightly visits to the poultry house, and, if he gains admission, to carry off at his departure a strangled duck or chicken.

The mink, I believe, rarely kills more than one fowl at a time, of which he devours the greater part; and in this respect he is far less destructive and wanton than his near relation, the weasel. I know of a case where sixty chickens were killed in one night by a weasel, and yet not one of them was eaten.

THE MINK.

This species is aquatic in habits, being always found along water courses, or at no great distance from water. He is an expert swimmer, as would naturally be supposed by his partly webbed feet, and has been seen to dive at the flash of a gun. Anglers meet him frequently while wading through the mountain brooks in search of trout; and he himself is a good fisher, and has been seen in the act of chasing a large trout, which he forced to take refuge among overhanging roots, where it was seized, dragged upon the bank, and devoured by the mink.

Along the salt marshes of the coast, especially further south, the mink is quite as much at home as in the spring brooks of the mountains of the interior. Here he feeds upon marsh hens and other maritime birds, and occasionally upon such marine fishes as venture up into the shallow water of the inlets and coves.

This species is said to be able to follow its prey by scent, like the dog. Dr. Bachman says a friend informed him that once, while standing on the border of a swamp near the Ashley River, he perceived a marsh hare dashing by him. A moment after came a mink, with its nose near the ground, following the frightened hare, apparently by the scent.

In the Middle States the mating season of the mink takes place about the first of March, but in the Southern States earlier. At this season the males are observed restlessly wandering about in search of the females, as at this period the latter generally remain in their burrows. The young, five or six in number, are brought forth toward the first of May, in a burrow, under a stone pile, or in a hollow log.

Like most of the species of this family, the mink is provided with glands which at times emit an exceedingly rank and disagreeable odor. It cannot, however, eject the offensive fluid any distance, as is the case with the skunk, nor does it seem to use its odor battery unless frightened, wounded, or enraged, or when having a fierce struggle with its prey. It is highly unpleasant to remove the skin from a mink when its fur has become strongly impregnated with this odor, especially in warm weather.

Many zoologists consider the American mink a distinct species, while others say it is identical with the species inhabiting the Old World. While they agree in some points, they differ in others, yet hardly enough to separate them entirely; hence I should consider *Putorius lutreolus* variety *vison* as the correct scientific name for our species.

The American mink measures from 14 to 20 inches from the nose to the root of the tail; the tail, from 7 to 8 inches. The color is uniform dark brown, somewhat lighter beneath. Lower jaw sometimes white; often a white patch on the throat, and a narrow stripe of white on the breast, between the forelegs. Some specimens are entirely of a rich, deep brown color, darker along the dorsal region, with the tail black. It is found throughout the greater part of North America.

History of an Ancient Cyclone.

Mr. John J. Campbell, of Rockville, Ind., has succeeded in the very original work of tracing the course of a cyclone which must have passed over that portion of the country more than 300 years ago. The course of the storm was traced by means of what he calls "tree graves"—that is, the little mounds which a tree makes when it is uprooted and allowed to decay upon the spot upon which it fell. The earth thus turned up by the roots, with the decayed root itself, will generally form quite a large mound, which is often taken for an Indian grave, hence "tree graves." The date of the storm in question, as communicated by Mr. Campbell to the *American Naturalist*, was marked by noting the age of an oak which had grown on the top of one of the "tree graves."

Its course was found by inquiring where other "tree graves" had existed or had been observed in the past, and was traced in a belt about 1,000 feet wide for 15 miles. Where the "tree graves" are numerous, as in the path of Mr. Campbell's cyclone, they are supposed to mark the place where a fierce battle has occurred. In the wild forest these marks are, though more than 300 years old, as well preserved and as distinct in outline as many made by trees that have fallen recently. But if the land is cleared and cultivated, they disappear in a very few years under the action of the plow and of exposure to frost and rains.

The preservation of the little mounds in the woods, which under the continuance of the conditions might last for 5,000 or even 10,000 years, is due to the thin coating of forest leaves that lie upon them. Says Mr. Campbell: "The leaves act as shingles in shedding the rains, so that they are not washed or worn down by the falling rain or melting snow. The frost does not penetrate through a good coating of leaves, and therefore they are not expanded and spread out by freezing and thawing. I can see a great difference between the mounds in the wild forest and those on land that has been set to grass and pastured a few years. The tramping of stock, and the frequent expansions from freezing, which the grass does not prevent, flatten them perceptibly. The grass, however, does preserve them against rain washings."

To Transfer Newspaper Prints to Glass.

First coat the glass with dammar varnish or else with Canada balsam mixed with an equal volume of oil of turpentine, and let it dry until it is very sticky, which takes half a day or more. The printed paper to be transferred should be well soaked in soft water and carefully laid upon the prepared glass, after removing surplus water with blotting paper, and pressed upon it, so that no air bubbles or drops of water are seen underneath. This should dry a whole day before it is touched; then with wetted fingers begin to rub off the paper at the back. If this be skillfully done, almost the whole of the paper can be removed, leaving simply the ink upon the varnish. When the paper has been removed, another coat of varnish will serve to make the whole more transparent. This recipe is sold at from $3 to $5 by itinerants."—*Nat. Druggist.*

Correspondence.

Aerial Navigation.

To the Editor of the Scientific American:

I noticed in your issue of Sept. 4, page 154, a paper read before the American Association for the Advancement of Science, at Buffalo, N. Y., August, 1886, by Mr. Lancaster, of Chicago, upon the flight of birds. Mr. Lancaster had a number of diagrams to illustrate his paper, after which it was understood that he was to exhibit his model and let it soar; but as said model was not forthcoming, disappointment grew to indignation, and members offered one thousand dollars for a model that would work. Now, if these gentlemen mean what they say, and will place one thousand dollars in the custody of the SCIENTIFIC AMERICAN, I will produce a model which will rise without the aid of balloon power, and will continue its aerial motion or flight as long as the spring or mechanical power will last. I propose to use the one thousand dollars for the construction of a new motor which will dispense with all the difficulties of an aerial ship, and I will give that gentleman a sail to California and back again free.

J. R. CAMERON.

No. 90 Fourth Avenue, Pittsburg, Pa.

Oil of Cedar.

A subscriber says: "You will greatly oblige me by giving information as to the best and cheapest mode of manufacturing oil of cedar; also as to the parts used."

The original "cedar" is the well known Biblical cedar of Lebanon (*Cedrus libani* Barr.), which is a native of Syria. The wood of this tree has been renowned as a perfume from the most remote times. On distillation it yields an essential oil "which is very fragrant" (Piesse), and which is (or has been) used extensively for scenting "cold cream soap." Piesse states that this oil, the so-called otto of cedar wood, has become very scarce. Yet we find it quoted in wholesale price lists of the foremost manufacturers and dealers in essential oils at about $1.25 per pound in wholesale packages. That this oil is no longer derived from Lebanon cedar wood is made evident by various circumstances, among others by testimony of a very competent authority, namely, G. W. S. Piesse, in his "Art of Perfumery," where he says:

"Since the publication of the first edition of this work, otto of cedar wood, *which was very scarce*, has been sent extensively into the market. Messrs. Piesse & Lubin have procured an average of 28 ounces from 112 pounds of shavings, being the refuse of the *pencil makers*. The pencil cedar is the Virginian or American cedar, *Juniperus virginiana*, L. The true cedar, *Cedrus libani*, and from which the handkerchief perfume is '*named*,' yields a very indifferent otto and odor to the American plant. The 'Cedars of Lebanon' are so familiar, however, that perfumers could not afford to change the title of the scent they make for [from ?] the red wood of the West, though the latter is superior to the former in fragrance."

There is a contradiction regarding the fragrance of oil of Lebanon cedar between this passage and that quoted before from Piesse's work. The fact is, the two oils resemble each other very much, and any difference or preference of one over the other is probably due to care in distillation, as well as to proper selection of the most suitable portions of the wood. Hirzel (in *Toilet-ten-Chemie*) says:

"Ethereal oil of cedar was formerly very scarce; now it may be obtained in large quantities. The wood of the American or Virginian cedar, also called 'lead pencil cedar,' which is used largely by lead pencil makers, is very rich in essential oil, 1,000 kilos. (1 ton) yielding on distillation 1,700 gm. (about 3¾ lb.) of essential oil. The oil of the Virginian cedar does not differ much in odor from that of the Lebanon cedar; but all perfumes which bear the name 'Cedar of Lebanon' contain the oil of the American cedar, since the perfumers do not wish to alter the former name. The ethereal oil is prepared from the shavings and refuse of the lead pencil works by distillation."

Considerable quantities of it are also obtained, as we learn from other sources, during the drying of the wood, and are collected by condensing the vapors escaping from the drying rooms.

On the price lists of wholesale dealers we also find "Oil of Florida Cedar," at about 90 cents per lb. wholesale, and "Oil of American Cedar," at about 60 cents per lb. The latter is said to be scarce, and often adulterated or substituted by common oil of turpentine. In just what way these two grades differ, whether they are obtained in a different manner, or whether one is a residue of the other, we are at present unable to say. At all events, our correspondent will have no difficulty in obtaining cedar wood, either from lead pencil works or from cigar box manufacturers. The distillation, of course, is carried on as usual by distilling the wood with water, or passing steam through it.

It has also been reported that the essential oil obtained from the white cedar (*Cupressus thyoides* L.) has been sold as oil of cedar.—*Amer. Druggist.*

The Roosen System of Preserving Food.

A new system of preserving fresh food has been under trial for the past year or so, and, having satisfactorily survived numerous severe practical tests, is now being publicly introduced in this country. This process is the invention of Mr. August R. Roosen, of Hamburg, and its novelty consists in the fact that it is carried out without reference to temperature, while its importance is due to its economical character and its proved success. It partakes of the chemical and the mechanical nature, and consists in placing the food to be preserved in an innocuous antiseptic solution, and submitting it to continued pressure until required for use. So far the main experience has been obtained from the preservation of fresh fish, and with fish, therefore, we will deal, our own observations, too, having been made with this class of food. In practice, large steel barrels are provided, having lids which can be hermetically closed. The fish as captured are placed in a barrel, which is nearly filled with a solution consisting of 97 per cent of fresh water and 3 per cent of boracic acid, tartaric acid, and salt in certain proportions. The lid is then fixed on, and by means of a small hydraulic hand pump, water is pumped in until the cask is full and the air expelled. This condition is ascertained by a fine stream of water spurting through a hole in a screw nut, which is then screwed down and the orifice thus closed. The hydraulic pump is then worked until the pressure reaches about 80 lb. per square inch, when the pump is detached, a small valve in the cask lid being closed by back pressure from within. The process is now complete, and by it fish is preserved for lengthened periods.

It will thus be seen that the process is simple, and can be easily carried out by any ordinary laborer or fisherman. In the case of fish, smacks or steamers would be provided with the steel barrels, in which the fish would be placed, either gutted or ungutted, and treated as we have just described, the operation of filling the barrel, exhausting the air, and putting on the pressure occupying only a few minutes. On being discharged from the vessels, the casks can be forwarded to the inland centers of consumption, or they may be emptied and their contents forwarded by rail, as the fish will keep in a perfectly fresh condition for a number of days after being taken from the casks. As within a few weeks, more or less, the efficiency of the process is not affected by the length of time the casks remain unopened, the center of population to which there is access by water will reap all the benefit of the economy of water carriage over carriage by rail. The advantage of this in dealing with the cheaper kinds of fish will be readily appreciated by a comparison of the cost of the two modes of conveyance of the steel casks in question, full of fish, from Leith to London, which is from 2s. to 2s. 6d. by water, and 17s. 6d. by rail. These casks will hold about 300 lb. of fish, and it is intended to let them out at a charge, which will, it is stated, with the cost of the solution, and assuming that they are only filled twenty times in the course of the year, cause the total expense not to exceed one-fifth of a penny per pound of fish.

The Roosen process appears destined to become very important in connection with the food supply of this and other thickly populated countries. It will effectually prevent the enormous waste which, in the fish trade particularly, has been hitherto unavoidable, but it is stated to be equally applicable to meat and any other kind of food. Large quantities of perfectly fresh fish can be forwarded from the fishing stations to the large cities and towns, and placed on the market for immediate sale or kept until there is a demand for them. Numerous practical tests have been made to demonstrate the commercial value of the process. Fish have been sent from Norway to London and Paris, and from Shetland to different parts of Scotland, and recently the process has been shown in Edinburgh, Leith, Hamburg, and Berlin, and has been pronounced by the highest authorities in the fish trade to be a complete commercial success. On July 1 a steel cask in which a quantity of beef had been placed under pressure on February 5, or about five months previously, was opened at Copenhagen, and on part being boiled and part roasted, both were eaten, and were stated to be of perfectly good flavor. Lobsters have also been kept for fourteen days and then eaten, and found to be quite fresh.

The latest demonstration of the efficiency of the process was given on July 29, at the Criterion Restaurant, by Messrs. Dufresne & Luders, of 63 Cornhill, London, who are the agents of Mr. Roosen. There were present upon the occasion a large number of gentlemen interested in the question of the conservation of our food supplies, both at home and in the colonies, and the company included Sir W. Guyer Hunter, Sir Joseph Fayrer, Sir J. W. Reid, Sir James D. Mackenzie, Col. Sir Francis Bolton, Col. Edmund Palmer, Captain Douglas Galton, Dr. Day, Dr. A. Vintras, Mr. J. Dixon Gibbs, Mr. F. Gaulard, and Mr. Luders. The demonstration was conducted by Mr. Zwierzchowski, to whom is due the credit of perfecting the mechanical details of the invention. Having explained the method of preservation by the aid of one of the steel barrels and the handy little force pump, he opened a barrel in which a number of fine salmon were packed at Montrose on July 12, and which had therefore been in the solution under pressure for seventeen days. On one of the fish being cut in two, the blood followed the knife, and the flesh was found to be perfectly firm and of a fine fresh color. In fact, the preservation was perfect. The further test of this fish was the eating, which test was applied at a luncheon which followed the demonstration. There the visitors partook of the fish, both grilled and boiled, and among the connoisseurs present not one dissented from the decision that the flavor was in both cases full, and the flesh of the fish perfectly natural, a unanimous verdict of thorough success being given. That the very fish taken from the barrel was being partaken of was vouched for by one of the visitors, who had followed the fish from the barrel to the grill and back to the luncheon.

It is claimed for the Roosen process that it absolutely arrests putrefaction, and kills or destroys the germs of any putrefactive or other bacteria which may have been present in the blood, body, or viscera of the fish or meat submitted to its action. It is said to preserve for an indefinite period the muscular tissues of fish and animals in the first stage of the changes which follow death, and which, under ordinary circumstances, in summer does not last more than twenty-four hours. These important results are achieved by the pressure on the antiseptic solution in which the fish or meat are immersed, which pressure causes a direct inhibitory action upon the vital processes forming part of the development of putrefactive and fermentative bacteria. The antiseptic solution used, of which, as we have stated, boracic acid is the base, does not impart any taste whatever to the food treated, and is absolutely innocuous to human life and health, although destructive to the lower organisms which cause decomposition. We congratulate Mr. Roosen on the success of his simple, inexpensive, and ingenious process, which appears destined to cheapen our fish supplies by preventing the destruction of food, of which our fish markets are so frequently the scene.—*Iron.*

Gold is King.

The town of Grass Valley has an enduring foundation. It is as the house "founded on a rock," and the rock of our foundation is good gold-bearing quartz. In all our vales and on every hillside are the sure evidences of the wealth deposited beneath our feet. Deep down in Mother Earth the hardy miner has forced his way almost 2,000 feet below daylight; he has followed the golden veins through solid rock, and picked and blasted many miles of galleries; he is still going downward, and finds still richer reward for his increased labor. Locked fast in their rocky safes, these rich deposits in our eternal hills are not to be wrested away and scattered in a day; they are safe from drought and flood, and frost and blight and insect pests; no custodian of our deposits can take the treasure box to Canada between two days: But, unchangeable and indestructible, the precious metal beneath our feet waits to be brought forth by the intelligence and industry of man. The gold field in the midst of which Grass Valley sits is of some miles in surface area, is thickly veined with gold-bearing ledges, and the depth is unknown, but it is known that with depth the richness of the mines increases. There is no reasonable doubt that for generations, and very likely for centuries, gold will be mined in Grass Valley. When the last fish shall have been caught from the sea, the last gold may be mined from the earth.

And above this treasure box of ours smiles a genial sky, and the earth yields many of its fairest fruits and flowers in abundance.

But the grand fact which gives assurance of enduring prosperity and prominence to the place that can produce gold is to be found in human nature. Everybody loves gold, always has, and always will love it—unless the Creator should become tired of the sort of beings that now inhabit the earth, and should people it anew with an entirely different kind of man. Gold is the only thing that all mankind delight in honoring and unite in loving—even its bright sister, silver, is slightingly spoken of by some. The gold miner need never fear that the ware he gives to the world will ever cease to be in demand. Gold will always be in fashion. The miner, too, can proudly reflect upon the enduring nature of his contribution to the world's wealth. The "golden grain" of the farmer is eaten, and its mission ends. The golden metal of the miner is coined, and goes ever on and on, giving pleasure, if not blessing, to him who spends it and to him who receives it. In gold coin, labor is concentrated and wealth represented in a form such that the laborer and the capitalist can conveniently preserve or exchange their gains. The gold miner is often a hero, though his deeds of heroism are not so loudly sounded as the hero who wins a battle; and yet the hero miner found and dug the gold which the hero warrior's king or country had to have in order to place its armies and its hero on the battlefield. Truly, gold is king, and the miner holds up his throne.—*Grass Valley Tidings.*

The Elements of a Man.

It depends, of course, on how one looks at a man. That was the reflection of a Washington *Star* reporter, as he stood before a case forming a part of the exhibits in the section of foods at the National Museum. The contents of the case showed one what a 154 pound man appears like from the chemist's point of view. In other words, a supposititious man 5 ft. 8 in. high, weighing 154 pounds, had been passed through the chemist's laboratory, and divided and subdivided into his ultimate elements. There stood all these elements and chemical compounds in glass jars, properly labeled. All of the man was there, except the subtile breath of life, which in some way escapes before the chemist can get it corked up in a jar and labeled. Hence, as this important element is lacking, it would be difficult to make a man that would amount to anything out of the contents of these jars. The case of exhibits forms a part of a series being prepared under the direction of Mr. Romyn Hitchcock, curator of the section, and which, when complete, will illustrate not only the chemical composition of the human body, but the daily income and expenditure of the body, based upon the results of analyses made by Prof. W. O. Atwater.

The story or meaning of the exhibits is told so plainly by the different sizes of the jars and the graphic and explicit statements of the labels, that it can be easily understood even by one who knows little or nothing of chemistry. The first series of exhibits represent the thirteen elements which a large label informs you enter into the chemical compounds of which our bodies are made. Five of these are gases and eight solid substances. The oxygen is shown in a jar with a label which states that the weight of oxygen in a man weighing 154 pounds is 97 pounds. This jar, which would hold about a gallon, represents only one ten-thousandth part of the oxygen of a man of that weight. If the 97 pou ds of oxygen were set free from the body, it would fill a space of 1,090 cubic feet. The oxygen is the great supporter of combustion in the system.

The next jar represents the 15 pounds of hydrogen going to make up the 154 pound man. This amount of hydrogen set free would fill 2,750 cubic feet, and the jar represents only one ten-thousandth of the whole amount. Another jar or bottle, having a capacity of a little over a quart, represents the 3 pounds and 13 ounces of nitrogen found in the imaginary man. This nitrogen, if free, would fill 48·3 cubic feet. Another small bottle contains, combined with calcium, the 3·5 ounces of fluorine, and another jar contains one-tenth of the 4 ounces of chlorine to be found in the man. Chlorine is one of the constituents of bleaching powder. After the jar of chlorine was put in the case the stopper was blown out, and the gas bleached all the tinted labels in the case.

Thus the elements of the human body are shown to comprise five gases, existing in such quantities, as if they were set free, would fill a space of about four thousand cubic feet, which, if paid for at the rate of $1.75 a thousand at the usual discount for promptness, would amount to $6. If the gases of a 154 pound man began to expand, and expanded to their utmost, the man would fill a large room or hall. The Hall of Representatives, commodious as it is, could hold only a few men in the gaseous state.

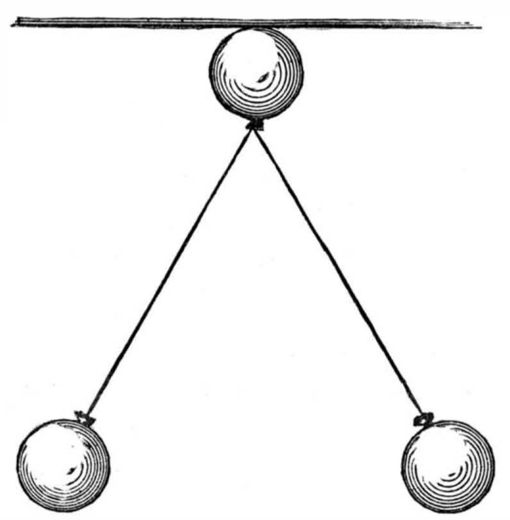
The next series of jars or exhibits represent the solids of the body. First, there is the carbon, represented by a solid cube of charcoal weighing 31 pounds. If a man had to take his carbon out and carry it around with him in a basket all day, he would be pretty tired at night. Yet every man, millionaire or tramp, is weighted down with a load of carbon which, if coined into diamonds, would enable him to rival the splendors of Monte Cristo. Then the 154 pound man yielded 1 pound and 12 ounces of phosphorus, and 3·5 ounces of sulphur. After the gases, the carbon, the phosphorus, and sulphur have been extracted from the man, there is nothing left of him but metals. It is doubtful whether metal exists in the human body in such paying quantities as to offer inducements to mining companies, still one would be surprised to look into this case and see how much a man is weighted down with various metallic substances.

First, there is iron, of which the average man described carries one-tenth of an ounce in his system. This quantity is shown in the exhibit in the form of iron wire. The metal with which the body is most abundantly provided is calcium, the basis of lime, of which the man, supposed to have been resolved into his chemical constituents, yielded 3 pounds and 13 ounces. This is a yellowish metal, and the amount obtained is shown in a cube about 3 inches high. A little block of magnesium, a silver-hued metal, weighing 1·8 ounces, and then 2·8 ounces of potassium were taken from the man, and all that remained was a little quantity of sodium, weighing 2·6 ounces. The weights of the chemical elements in the body of a man weighing 154 pounds are summarized on one of the labels as follows: Oxygen, 97·20 pounds; carbon, 31·10; hydrogen, 15·20; nitrogen, 3·80; calcium, 3·80; phosphorus, 1·75; chlorine, 0·25; fluorine, 0·22; sulphur, 0·22; potassium, 0·18; sodium, 0·16; magnesium, 0·11; iron, 0·01. Total, 154 pounds.

This, however, is only one way that the chemist has of looking at a man. These elements are chemically combined with each other, forming numerous compounds, and another series in the same case represent the result obtained by resolving another 154 pound man into his principal chemical compounds. First, there are two large jars of water, containing together 96 pounds or 46 quarts. Then another large jar represents the proteine compounds, of which the man yielded 24 pounds. The next in order of quantity are the fats, weighing 23 pounds; the mineral salts, weighing 10 pounds 13 ounces; and the carbohydrates, starch and sugar, weighing 3 ounces. Among the proteine compounds appears hemoglobin, the red coloring matter of the blood, and which serves to carry and distribute the oxygen from the lungs to the different parts of the body. Two little vials contain protagon and lecithin, substances found in the brain, spinal cord, and nerves. Then there is a pound of carbonate of lime, 8¼ pounds of phosphate of lime, 7 ounces of fluoride of calcium, 6 ounces of phosphate of magnesia, 6 ounces of chloride of sodium, 5 ounces of chloride of potassium, that exhausted the man with which the chemist started.

A NEW EXPERIMENT IN STATIC ELECTRICITY.

In devising some electrical experiments suitable for exhibition to a small audience, I sought for a simple and novel way of showing the fundamental phenomena of electrical attraction and repulsion; and reflecting on the strong electrical properties of rubber, it occurred to me to test the possibilities of the common toy rubber balloons, as they seemed to offer the advantages of large exciting surface and small weight, both of which are important desiderata in experiments of



A NEW EXPERIMENT IN STATIC ELECTRICITY.

this kind. A trial proved them particularly adapted to striking and interesting demonstration. My first experiments were made with the ordinary grade of toy balloons, which have a red-stained wooden mouthpiece containing a "squawker," well known to small boys and adults who have been harassed by their intermittent squawking. These common balloons may be procured at almost any toy store for a few cents each.

They are inflated with the breath and tied at the end with silk or thread, when they may be pushed off the tube. If one of these inflated balloons be thoroughly stroked with a cat skin, it becomes strongly electrical, and will fly to the body or adhere to the hand if held over it, or it may be rapped up to the ceiling with a small stick.

Its adherence to the ceiling is remarkably persistent. I have repeatedly had balloons remain in such positions for more than four consecutive hours. Numerous instructive experiments may be made with them singly or in combination, and the few here described will suggest others. Their strong attractive force implies, of course, strong repellent force. If two are suspended by threads of the same length, and excited with the catskin, they will be pushed apart two or more feet, the distance depending to a great extent on the length of the suspending threads. If the hand be now brought between them, they will be attracted to it, and if it be suddenly withdrawn before the balloons have touched it, they will bound away from each other almost as if they had struck a wall.

A very pretty experiment is illustrated by the engraving. Two of the balloons are hung with equal threads to a third, the threads being of such length that when the third balloon is against the ceiling the others may be conveniently reached. The third balloon is now excited, and put against the ceiling by means of a long stick. If properly done, the attraction is amply sufficient to support the two other balloons. These latter are now excited, care being taken not to pull the supporting one away from the ceiling; and as their mutual repulsion forces them apart and they float airily around each other, the whole group affords a demonstration of both the attractive and repellent forces of electricity so striking that it can hardly be appreciated until it is seen. If a strip of hard rubber be electrified with the cat skin and put between the suspended balloons, they fly still further apart, and one of them may be chased around, or made to rise vertically by a little dexterity with the rubber strip. By arranging say half a dozen balloons in the form of a hexagon horizontally on threads strung across a room or on a suitable light frame, it is quite possible that another balloon could be suspended in mid-air by the combined repulsion of the group when in a good state of electrical excitement. This would be a very effective experiment, although it has not yet been tried.

There is a choice among the balloons of different grades for these experiments. The cheaper kind I have found almost unexceptionally satisfactory, but it seems impossible to electrify the better ones, which are heavier and more highly colored. Probably the coloring matter gives them more or less conductivity, so that the charge excited on them easily flows off. It may be, however, that by thoroughly extracting the coloring matter with alcohol or otherwise, they may be made available for electrical purposes, in which case their larger size might make them specially desirable in some experiments. It should be added that, like most experiments with statical electricity, these succeed only in cold weather. H. A. DOTY.

Bloomfield, N. J.

Chrysamin.*

This coloring matter, which I have already had occasion to refer to when it was first brought into the market, possesses, besides the remarkable property of dyeing cotton a bright yellow without the intervention of a mordant, one or two peculiarities which may be of some interest to dyers and painters. A short time after I had received the first sample of the dye, I was informed by a member of the firm that manufactured it that cotton dyed with chrysamin in the ordinary way possessed an affinity for anilin green, and that by topping it with the latter a series of compound colors could be produced. I have lately conducted a few experiments with a view of verifying this statement, and find that it not only applies to anilin green, but also to several other basic coal tar colors. Cotton dyed with chrysamin and then in a solution of malachite green assumes a full shade of green, which is characterized by its great brilliancy. A similar shade is obtained by using methylene blue in place of malachite green. When topped with safranine, a scarlet is obtained which is quite equal in brilliancy to Turkey red (yellow shade) or crocein scarlet. Magenta yields an equally brilliant shade of crimson.

It is interesting to note the effect of temperature in dyeing these mixtures. If the solution of the basic coloring matter is used cold, the above brilliant effects are produced; while if the solution is heated, the color gradually loses its brilliancy, and a dull, worthless shade is the result. This property applies alike to all the basic dyes cited above.

These results led me to infer that the combination which takes place on the fiber is not of a mechanical, but of a chemical, nature. Solutions of malachite green, methylene blue, safranine, and magenta all yield characteristic precipitates when mixed with a solution of chrysamin; and by adding the latter cautiously, the liquid can be completely decolorized. Reactions of this kind usually point to a chemical combination. Experiments are at present being carried out with a view of ascertaining the composition of these precipitates, and, if possible, to explain the effect of heat on the colors obtained in the cold, on which, as well as on the fastness of the compound colors, I hope to be able to report shortly.

By passing cotton dyed with chrysamin through baths of metallic salts, various shades can be obtained. Bichromate, copper sulphate, and ferrous sulphate all sadden the original yellow, ferrous sulphate yielding a light brown somewhat similar to a catechu brown. Lime water yields an orange.—*E. Knecht.*

The Pecan Tree.

The pecan tree is found in a wild state in the woods of the various sections of the South and West. It grows to a very large size, and bears yearly many bushels of fine flavored nuts. Though little or no attention has been paid to these valuable trees, cultivation greatly improves them, the nut growing much larger and improving in flavor. The pecan tree lives to a great age, and continues long in bearing. There is no good reason why it should not be grown extensively in all parts of the United States. It is well adapted to almost any kind of soil, doing well even on rocky hills and waste land. There is no nut or fruit tree more valuable and requiring so little attention. Every farmer, in my opinion, should have his nut orchard, and cultivate especially the pecan for home use or sale. The nuts always find ready sale at fancy prices. In planting the trees, the only object is to obtain good fresh nuts, and of a good early variety, of large size, from which to grow the trees. If it is preferred to set out the plants, get healthy trees of a good variety one to two years old.

* Communicated from Edmund Knecht, Ph.D., to the *Journal* of the Society of Dyers and Colorists.

ENGINEERING INVENTIONS.

A rail joint has been patented by Mr. Edward A. Temple, of Chariton, Iowa. This invention covers a novel construction, designed to prevent the battering of the end of the rail, and to do away with the ordinary form of bolt and nut, using instead a key or wedge of wood or metal, or a combination of both.

A smoke consuming furnace has been patented by Mr. John L. Peslin, of Appleton, Wis. Its construction is such that the main fires, having been once started, are fed by partially coked coal, the smoke and gas generated during the process of partial coking being delivered beneath and forced to pass through the main fire of the furnace.

A car coupling has been patented by Mr. Joseph T. Hammick, of Rhinebeck, N. Y. The mouth of the drawhead is made very flaring, and has a rib just in front of the pin hole to guide the end of an entering link, with other novel features, intended to facilitate the automatic coupling of cars, the invention being an improvement on a former patented invention.

A stop block has been patented by Messrs. John P. and Joseph Goodman, of Plymouth, Pa. It is so made that the forward wheels of the car will be checked, without rocking or twisting of the axle, and so the stop blocks proper may be turned down to a position to constitute a portion or section of the tread of the rail in connection with which they are arranged.

AGRICULTURAL INVENTIONS.

A cultivator attachment has been patented by Mr. George W. Campbell, of Alamo, Ind. This invention relates to a construction wherein the shovels are adjustably connected to a leveler, and may be adjusted to any angle desired, to throw the earth to or from the crop being cultivated, and to make a deep or shallow furrow.

A corn harvester has been patented by Mr. Sylvester E. Ferguson, of Eureka Springs, Ark. Combined with a frame and platform is an elevator and its driving mechanism, with receiving box, all so constructed as to remove the ears of corn from the stalks and deposit them in the receiving box as the machine is drawn along the rows of corn, the stalks being left in the field.

MISCELLANEOUS INVENTIONS.

A harness pad machine has been patented by Mr. John W. Jones, of Glasco, Kan. It is a press intended to take the stretch entirely out of the leather before stuffing, to make a perfect shaped pad, without wrinkles, while being readily adjustable for different styles and sizes of pads.

A music leaf turner has been patented by Mr. Thomas H. Garland, of Chicago, Ill. Combined with a rack, spindle, and series of swinging arms is a spring, and various other novel features, whereby the leaves of sheet music may be conveniently turned by a performer, or turned backward, as desired.

A velocipede has been patented by Mr. Charles W. Hamshaw, of Blue Springs, Mo. This invention covers a construction applicable to hand or foot power vehicles or to small boats, and combines with hand propelling mechanism means whereby the steering device may be controlled without the rider releasing his grasp upon the handles of the propelling mechanism.

An adjustable scaffold has been patented by Mr. Samuel Tucker, of Pleasanton, Kan. It is a construction for the use of carpenters, masons, etc., so designed as to be easily adjustable as to height as the work progresses, by means of a windlass located upon the scaffold within reach of the mechanic, while the device is durable and not expensive.

A handle for cutlery and other articles has been patented by Mr. Joseph H. La Fave, of Miller's Falls, Mass. It is composed of a hollow metal shell and an outside covering of porcelain, the shell having a reduced inner end to receive a bolster over it, and one or more exterior flanges for support of the porcelain and engagement of it with the shell.

A mechanical telephone has been patented by Mr. Bloomfield L. Kenyon, of Lee Center, N. Y. Combined with a box holding rods, bars being secured to the rods and a diaphragm held by the bars, a wire is passed through an aperture in the diaphragm, and through a loop formed on the end of the wire a piece of wood is passed, which is held against the front of the diaphragm.

A floor cleaning machine has been patented by Mr. John F. Cameron, of New York city. It is adapted to be rolled along the floor, carrying water and operating scrubbing brushes, and so constructed that both the scrubbing brushes and a series of wipers will adjust themselves automatically to the floor, whether it be even or not, and an easy reciprocating motion is communicated from the drive wheel to the brushes.

A gate has been patented by Mr. Nelson D. Combs, of Hawthorne, Iowa. It is a combined sliding and swinging gate, with vertical ends, horizontal rods, central bar, and strands of barbed wire, antifriction rollers being journaled in transverse apertures in the uprights, with other novel features, making a gate not liable get out of order, and one that is light and easily handled.

A shot cartridge has been patented by Mr. William E. Boyd, of Selma, Ala. In this cartridge the individual shot are connected together by wire, twine, a chain, or other suitable means, to limit the spread of shot or bullets after they leave the gun, the wire or twine, etc., being wound around the body of any light substance, such as as cork, pith, or paper, that will allow of easy detachment.

A buckle has been patented by Mr. Samuel J. Scovil, of Jamaica, N. Y. It is designed for a cheap, practical, and convenient buckle, which can be put in place without stitching, and consists of a hollow frame and two right angled jaws or levers oppositely pivoted therein, the inner portions of the jaws being adapted to grasp the straps entered, one at each end of the frame.

A fence wire stretcher has been patented by Messrs. Clifton R. and Marshal E. Summers, of Stanberry, Mo. It is a simple and easily handled device, which can be conveniently attached to a fence post of any shape, to powerfully clamp and stretch barbed or plain wires or ribbons, and hold it tightly up to the faces of the posts until permanently fixed by staples or otherwise.

A candle burner has been patented by Mr. Hubert Bovê, of New York city. It is preferably made of sheet metal, of a hollow conical shape, so made as to rest as a shield upon the top of the candle, and prevent the sweating or running of the melted wax, sperm, or grease down the side of the candle, the shield itself descending by gravity with the burning of the candle.

A cutter head has been patented by Mr. William A. Woodroffe, of Mechum's River, Va. The cutter head has combined with it one or more oscillating or shifting cutters, intended to give better clearance for wood shapers having a rotary motion and capable of cutting in opposite directions of rotation, including solid friezing and edging cutters and those for making mouldings and other ornamental work.

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) A. W. asks: By what means may I remove the paint that have accumulated on the floor of a room that was used as a sales room of paints for several years? A. The best method is to lay on a thick coating or plaster of fresh slaked lime mixed with soda; next day, wash it off with water.

(2) E. B. writes: I have a fine banjo, but the neck of it, which is black walnut, is not polished, Will you please tell me how to polish the same, also how to stain the face of it to imitate ebony? A. Use the following to stain the wood: Dissolve 4 ounces of shellac with 2 ounces borax in ½ gallon of water. Boil until a perfect solution is obtained. Then add ½ ounce of glycerine, after which add sufficient aniline black soluble in water and apply. To polish: Dissolve by heat so much beeswax in spirits of turpentine that the mixture, when cold, shall be about as thick as honey. Apply with a clean flannel cloth.

(3) F. H. P. writes: 1. New wine was accidentally put in a very old barrel and tastes of decayed wood. How can said taste be removed? A. A little coarsely powdered charcoal or boneblack, in either case with dust sifted out, shaken up with the wine will remove any disagreeable odor. 2. How to detect imitation from genuine meerschaum? A. We know of no means, except its general appearance, by which the imitation can be detected.

(4) B. F. H. asks: 1. What are the constituents of and proportions used in nitroglycerine? A. See "Manufacture of Nitroglycerine," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 243. 2. What is the method pursued in making gun cotton? A. See "Manufacture of Gun Cotton," SCIENTIFIC AMERICAN SUPPLEMENT, No. 390. 3. Is nitrate of silver procured by dissolving silver in nitric acid, precipitating with sodium chloride and evaporating or drying the precipitate? A. No; this will produce chloride of silver. The proper method is by dissolving silver in nitric acid, evaporating to crystallization, and dissolving the crystals thus obtained in water. 4. How to make a silver plating solution to plate brass, copper, or replate old silver plated articles? A. See "Electro-Metallurgy," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310.

(5) Z. R. B. desires a few hints on permanently staining in different colors a polished white marble mantel piece. A. Marble may be stained or dyed of various colors by applying the solutions mentioned below to the stone, made sufficiently hot so that the liquid will just simmer on the surface. Blue, tincture of litmus; brown, tincture of logwood; crimson, a solution of alkanet root in oil of turpentine; green, tincture of sap green; red, tincture of dragon's blood or cochineal; yellow, tincture of gamboge or turmeric. Success in the application of the colors requires considerable experience.

(6) F. McF. asks: 1. Of what is the fluid in storm glasses composed? A. The ordinary barometric solution consists of: Camphor 2½ drachms, alcohol 11 drachms, water 9 drachms, saltpeter 38 grains, sal ammoniac 38 grains. Dissolve the camphor in the the alcohol, the salts in the water, and mix the solutions together. 2. What is a planchette, how is it made, and what is its use? A. It is an instrument made of wood, in the form of a heart, resting on slight supports, one terminating in a pencil point. Under certain favorable conditions, it was claimed that when this was placed on a sheet of writing paper, and the finger tips rested upon it, messages from the spirit world were conveyed by writing on the paper. 3. What is the cause of different colors of slate rock? A. These are caused by different colored mineral oxides, chiefly of iron.

(7) W. A. F. asks: 1. What added ingredient will render ruling inks copyable? A. Add sugar or glycerine. 2. What will remove stains of ruling inks from the skin and clothes without injury to either? A. See the list of ink erasers in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157; also for Removing Stains, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(8) J. E. J. W. writes: I made a "Norremberg doubler, according to directions given in SCIENTIFIC AMERICAN of July 17, page 38, except that I used 10 plates of common glass instead of the microscope cover glasses. The double proved to be a failure. What is the cause? A. The obvious trouble is that you substituted 10 pieces of window glass for 20 of cover glass. The doubler has been made in accordance with the description and has worked perfectly. You must not attempt to vary the construction without anticipating varying results. 2. How should a swimmer catch a drowning person, in order to swim to the best advantage? A. He may take the drowning person on his back with his head over his shoulder. 3. How should a drowning person catch a swimmer, in order to allow him (the swimmer) the free use of his limbs? A. The approved method is for the drowning person to keep behind the swimmer, with a hand on each hip of the latter.

(9) F. I. P. asks: If a party has a dynamo for electroplating purposes, can the same dynamo be used for electric lamps, without injury to the plating? A. It might be done, but would never give satisfaction, as one work would interfere with the other.

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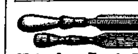

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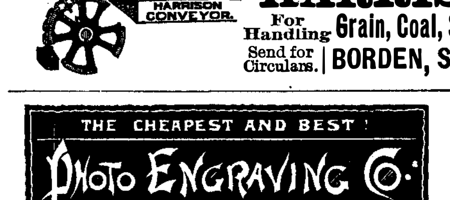

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Sealed bids for the construction, in the City of Cheyenne, Wyoming Territory, of a system or process of filtration adapted to the purification of the water supply of the city, will be received at the office of the City Clerk of said city until 7 o'clock P. M. of Friday, October 8, 1886. Bids should be for a plant supplying 1,000,000 gallons and also for a plant supplying 1,500,000 gallons in twenty-four hours. A guarantee for the perfect working of the system will be required. The system or process is to be constructed and operated to the satisfaction of the Council Committee on Waterworks. Bids should be indorsed: "Proposals for the Construction of a System of Filtration for the City of Cheyenne, Wyoming." Bids will be opened at the City Hall in the evening of above date.

The City Council reserves the right to reject any or all bids.

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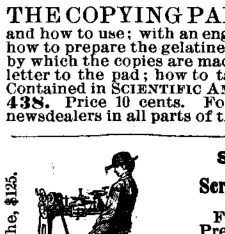

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TO THE STEEL MANUFACTURERS OF THE UNITED STATES OF AMERICA.

UNITED STATES NAVY DEPARTMENT, WASHINGTON, D. C., Aug. 21, 1886.

The attention of all steel manufacturers of the United States is hereby invited to the requirements of the Navy Department in the way of armor-plates and heavy gun forgings, for the prosecution of work already authorized by Congress.

This advertisement invites all domestic manufacturers of steel to specify, in competition with each other, upon what terms they will engage to prepare for the production of and produce the forgings and armor-plate required for modern ordnance and armored ships: and no bids will be considered except such as engage to produce within the United States ...ther all the gun-steel or all the armor-plate (or both) specified in this advertisement; nor will any bid be accepted unless accompanied by evidence satisfactory to the Department that the bidder is in possession of, or has made actual provision for, a plant adequate for its fulfillment.

Bids are hereby invited for supplying this Department with the under-mentioned material:

About 1,310 tons of steel gun-forgings, of which about 328 tons will be for guns of six inches caliber, 70 tons for guns of eight inches caliber, and 912 tons for calibers between ten inches and twelve inches (both inclusive).

These forgings are to be delivered rough bored and turned, and when in that state the heaviest forging which enters into the construction of a gun of each of the desired calibers will be about as follows:

6-inch . . . . 3¾ tons.
8 " . . . . 5 "
10 " . . . . 9½ "
10½ " . . . . 9¾ "
12 " . . . . 12½ "

All these forgings must be delivered within the following times from the closing of a contract, viz.:

For 6 inch guns, 28 within one year, and the remainder within 18 months.
For 8 inch guns, within two years.
For 10 inch and larger guns, within 2½ years.
Preference will be given for earlier deliveries.

Also, about 4,500 tons of steel armor-plates, to be of the best material and manufacture, shaped accurately after patterns to fit the form of each vessel for which intended, and of such sizes as may be required, varying somewhat as follows:

20 feet by 8 feet by 12 inches thick.
17½ feet by 6 feet by 17 inches thick.
11½ feet by 4½ feet by 6 inches thick.

There will also be thinner plates.

For information concerning shapes and weights of the gun forgings and armor-plates, what parts must be manufactured in sets, time of delivery of each set, the chemical, physical, and ballistic tests, which the metal must sustain in each case, and for all other particulars, apply to the Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Each bid upon armor-plate must specify the time within which the bidder will engage to make delivery; and preference will be given to earliest proposed deliveries.

Proposals must be in duplicate, sealed and addressed to the Secretary of the Navy, Navy Department, Washington, D. C., the envelopes indorsed "Proposal for steel gun-forgings and armor."

They will be received at the Navy Department until 12 o'clock M. on the 10th day of December, 1886, at which hour the opening of the bids will take place.

The right is reserved to waive defects in the form of, and to reject any or all bids.

Ten per cent. of the contract price will be retained from the payment for each article delivered, until the contract, as far as relates to articles of that class, shall have been completed.

Separate bids may be submitted for the gun steel and for the armor, if any manufacturer so desires; but bids covering both will receive preference, other things being equal.

Bids will be compared in two classes.
First. Gun Forgings.
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And the total sum for which, and the time within which the whole of the material covered by each class will be produced and delivered will be alone considered.

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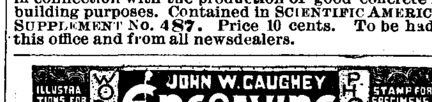

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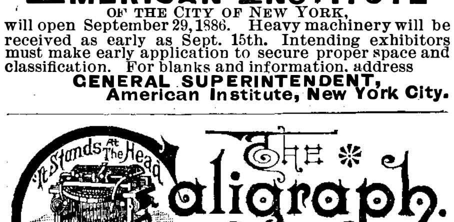

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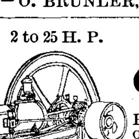

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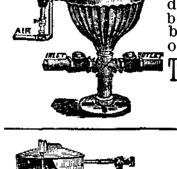

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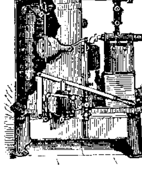

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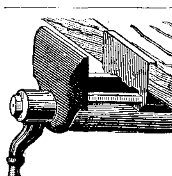

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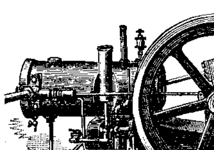

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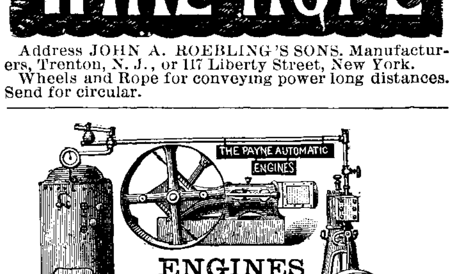

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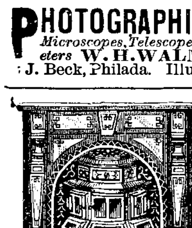

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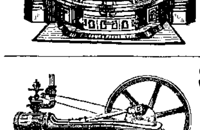

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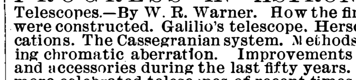

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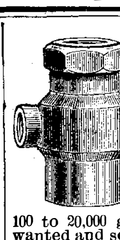

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