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THE DRAW CLOSED.

THE NEW BRIDGE OVER THE THAMES, LONDON, RECENTLY AUTHORIZED BY PARLIAMENT.—THE DRAW OPEN.—[See page 261.]

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 512,

For the Week Ending October 24, 1885.

Price 10 cents. For sale by all newsdealers.

EFFECTS OF THE FLOOD ROCK EXPLOSION.

There is every reason to believe that the calculations of the engineers, in all their work on Flood Rock, were fully borne out, and their anticipations in every way met, by the results of the explosion of October 10. Over the whole of the area which had been mined, covering about nine acres, only a small proportion of which was above even low tide, the throwing up of water by the explosion showed that the dynamite everywhere had done its work, while the plans had been so judiciously made that the entire energy of the vast quantity of explosives employed was developed in the breaking and shattering of the rock. Many had looked for a much greater show of flying rocks and timbers, but this the engineers had guarded against by using much less dynamite around their entrance shaft, and under the rock exposed above water, than was placed in the parts where the water could act as a sufficient cushion. The official survey has not yet been completed, but sufficient has been determined, from the soundings and the inspection of divers, to show that the rock has been pretty thoroughly broken up. The rock has been sinking daily since the explosion, and on the north and south sides is so shattered that it can be dredged without difficulty. On the east and west sides the surface fragments are larger, and will probably require blasting, but the whole reef seems to be full of fissures, generally following the trend of the rock.

A NEW DYNAMITE GUN.

Many attempts have been made to substitute dynamite for the ordinary projectile thrown from the heavy gun. Its terribly destructive powers and the comparative safety with which it may now be handled make it peculiarly adaptable to offensive operations. It cannot be said that the experiments thus far made have been particularly gratifying; indeed, the contact of dynamite with an object representing the armored side of a ship, made in some experiments a year ago, was disappointing in its effect, doing nothing like the damage that had been promised and expected. Yet the experiments were but crude; and the fact that dynamite can safely be thrown from the mouth of a heavy gun by means of compressed air is of importance in itself, and hopes are entertained that a means will yet be found of utilizing the principle to advantage.

A very interesting experiment looking to the development of this principle was made last week at Fort Lafayette in New York Harbor, with a dynamite gun sixty feet long and an eight inch bore, poised on the redan of the fort, and resembling a great telescope. The object of the constructors of this gun is to throw dynamite against the sides or upon the decks or in the water and close to a hostile ship. They claim that they can do this with precision and dispatch within a radius of about two miles. It cannot be said that they demonstrated this in the experiments of last week, and yet these experiments were attended with enough success to impress the careful observer with the practicability of the project.

To show the power of the gun, a projectile weighing 200 pounds was thrown about a mile and a half, the air gauge showing one thousand pounds pressure, and the elevation of the piece being 30°. Then a projectile somewhat resembling a fish torpedo, having a core of five pounds of No. 1 dynamite surrounded with a quantity of explosive gelatine, was thrown to a distance of something over a mile, but failed to explode. There is reason to believe that this failure was owing more to the ordinary mishap attending public exhibitions of crude apparatus than to any defect in the principle.

Aware of the uncertainties of firing at a movable mark, the constructors of this dynamite gun have anticipated the failure of a shot to take effect by striking the water instead of the ship; and besides the percussion in the contact point of the projectile, there are two small dry batteries in its wooden tailpiece, which, when reached by the sea water, are expected to act upon a fulminate cap, and the detonation explodes the dynamite. The charge of a hundred pounds of dynamite that this gun is intended throw will, they say, if exploded in the water within several hundred feet of the modern iron war ship, kill those on board by shock. This is surely an extraordinary assertion, and there is reason to believe that they would find it impossible to sustain it.

But the experiments of last week show that dynamite can safely be thrown a short distance by compressed air, and this knowledge may be used with effect in advancing the science of harbor defense.

The air for firing is stored in six large reservoirs having walls capable of sustaining a pressure of 2,500 pounds to the square inch. The firing pressure of 1,000 pounds comes into the chamber behind the missile so slowly, and with an increasing pressure so gradual, that all danger of premature discharge of the dynamite by shock would seem to be avoided.

The expressed belief of the projectors that this gun will prove most effective placed *en barbette* in land works or in barbette towers aboard war ships seems to have little to sustain it, because its range—two miles—is so limited that it could not be worked while the marine guns carried by modern war ships were in play. At the distance of three, four, or five miles—a point-blank range for the great guns of to-day—a modern war ship could lie at ease out of its range, and tear it to pieces. If "it should be protected by heavy guns of modern construction," as suggested by one of its constructors, there would be scarcely any need of it at all, for it could take no part in a pounding match at what would be short range for modern guns.

But if it will fulfill the promises made for it, it would be invaluable in harbor defense when placed aboard of a quick moving torpedo boat. In order to make the ordinary torpedo effective, the torpedo boat must run up and take a position close aboard the enemy before discharging the projectile—always a dangerous and uncertain operation. But if this telescopic gun will throw its charge of one hundred pounds of dynamite only a mile with precision from the deck of a torpedo boat, it would possess advantages over the ordinary method which are readily apparent, and the most powerful war ship afloat, if beset by three such torpedo boats, each similarly armed, might belch forth her tons of iron and steel, and set all her pepper-boxes to work in vain.

It has not yet been proved, however, that the dynamite gun can do what is promised for it.

BENDING CAST IRON.

The quality of cast iron in softness—yielding to tool working—and in toughness has been greatly improved within the memory of many workers who are not old men. The crisp, brittle, hard character of cast iron has been changed to a material of a purer condition and therefore better nature.

One of the peculiarities of modern cast iron for machinery purposes is its flexibility, its capacity of being moved from its moulded position and retaining its new contour. In the older time it was necessary to peen a casting in order to permanently bend it; and this peening was rarely more than skin deep. The action of peening is simply to expand the surface of the casting by the quick, sharp blows of the peen end of the machinist's hammer—the unattached parts must, perforce, give to this persuasion. The consequence is that the hammered side is stretched, just as hammering will stretch lead, or silver, or copper, or any malleable metal. But the objection to the peening process is that the after-working by the file or the planing tool may destroy all the work done by the peen end of the hammer.

But it is possible to permanently bend cast iron without resort to such heroic methods as peening, and the ruder one of heating to redness in a forge fire, bending while soft, and plunging into cold water; the last so risky of breaking the casting that it is seldom tried except on cheap stuff like grate bars or similar traps. Good cast iron can be bent and keep its bend without the slow process of peening or the risky one of bending under intense heat and chilling in cold water with the chance of breaking. And this quality is sometimes handy.

In a cotton mill for spinning peculiar yarn, the leaders on a spooler require to have a decided curvature near their heads. For convenience in finishing and fitting, and for economy in production, castings were preferable to forgings. These castings were made flat; but after being finished they were heated over a blaze, and bent under a lever. The amount of bend was more than 30°.

A casting was made recently which required two turns or bends in its length, the casting weighing something over three hundred pounds. The superintendent determined to make the casting straight, plane and finish it, and afterward bend it to shape. This was successfully accomplished. The curved pattern would have been costly, the resultant casting might have been faulty, and the hand dressing and finishing of the double curved casting would have made the piece cost more than if forged. But a forged piece, of wrought iron, was just what was not wanted; it was a casting, and it was made.

Where the bends were to be made were stationed alcohol lamps, the piece being suspended between proper supports. After the under side being heated to a degree that would have drawn hardened steel to a straw color—as a supposable degree of heat—a pressure, by weighted lever, was introduced on the upper side of the casting. As the lamp was moved from point to point, it was surprising to see how the iron yielded to the pressure and the heat. A curve was made that could not have been finished by planing, and yet the bent casting retained its finish, only the discoloring by the lamps being necessary to be removed by emery cloth rubbing.

A crooked casting, withdrawn out of line by injudicious pattern making and lack of sensible moulding in the foundry, was about to be thrown on to the scrap heap at a loss of nearly a hundred dollars. It was straightened to usefulness simply by the careful use of two gas flames diffused by wire netting, and by the use of weight. It is quite possible to bend or to straighten cast iron to an appreciable extent by a quite low degree of heat, if the heat is judiciously applied; a gradual heating of the side to be elongated by a heat that can be controlled, and the simultaneous persuasion of weight, lever, or screw, will do wonders on such a material as the cast iron that is usually considered to be of too friable, untenacious, and brittle a nature to be much beyond stone in resistance to tension; but even stone will bend.

Purifying Air by Washing.

M. Windhausen has designed an apparatus for the purifying of air from dust, germs, and other impurities which is well spoken of by French technical writers. The principle of the appliance is to impart a rotatory movement to the air to be purified; the air being at the same time surrounded by a surface of water in movement. The idea is that in this way the solid impurities which may happen to be in the air will be thrown, by centrifugal force, against the water surface; and they will consequently be taken up and carried away by it. The actual apparatus consists of two horizontal concentric cylinders placed in connection with a fan. The fan and cylinders are fixed upon and turn with the same spindle, and the whole is inclosed in a casing. The cylinders are closed at the ends, except for a hole permitting the passage of air drawn by the fan. As the air passes through the concentric space between the drums, it is caused to rotate with them by the presence of feathers running longitudinally on the inside of the outer cylinder.

The spindle which carries the whole arrangement is hollow; and it thus serves to bring the water, which is allowed to escape therefrom inside the drum by means of fine holes, which project it in the form of fine rain against the inside of the inner cylinder. This cylinder is also perforated, and the water again escapes from it and is projected against the inside of the outer cylinder, over which it spreads as a thin coating. The motions of the air and water are as nearly as possible in opposite directions. The water after it has been sufficiently exposed to the air is allowed to escape, and is drawn off by means of a siphon. It is impossible for any air to pass through the apparatus without being washed, and its solid impurities removed by centrifugal action; and the proportion of water required may be varied as found necessary with reference to the condition of the air. The apparatus may be combined with any device for warming or cooling the air; or the same arrangement may be modified for treating smoke or gases.

MICROSCOPICAL EXAMINATION OF THE PHENOMENON OF COLORS OF THIN PLATES

BY GEO. M. HOPKINS.

As all works on light and on general physics treat on the phenomenon of the interference of light as exhibited in thin transparent plates or films, it will be unnecessary to go into an examination of this subject in detail; but it will doubtless prove both interesting and profitable to those interested in microscopy to take up the study of this subject with the aid of the microscope.

There is nothing more beautiful than Newton's rings, or a soap film, or extremely thin plates of mica when viewed in a microscope by properly directed light. Even the gorgeous colors of polarized light cannot be excluded in this comparison; but it is difficult with ordinary appliances to see these exquisite tints.

The writer, after some experiment, devised mounts for the ready exhibition of Newton's rings and interference phenomena, as shown by the soap film.

The device for the exhibition of Newton's rings is shown in Figs. 1, 2, and 3; Fig. 1 showing the position of the mount on the microscope stage; Fig. 2 being a perspective view of the slide; and Fig. 3 a diametrical section of the rubber cell, containing the plane and convex glasses. The plane glass is a disk cut from one of the finer kinds of glass slips, commonly used in mounting objects. The convex disk is cut from an ordinary 24 inch biconvex spectacle lens. The cell is screw-threaded internally, and provided with a screw-threaded ring, which clamps the two glasses together. The cell so formed has, in diametrically opposite sides, cavities for receiving the ends of the wire frame, and the wire frame is clamped to the face of the slide by a clip and two screws. The cell containing the glasses is in this way supported so that it can be raised or lowered, or tilted at any required angle.

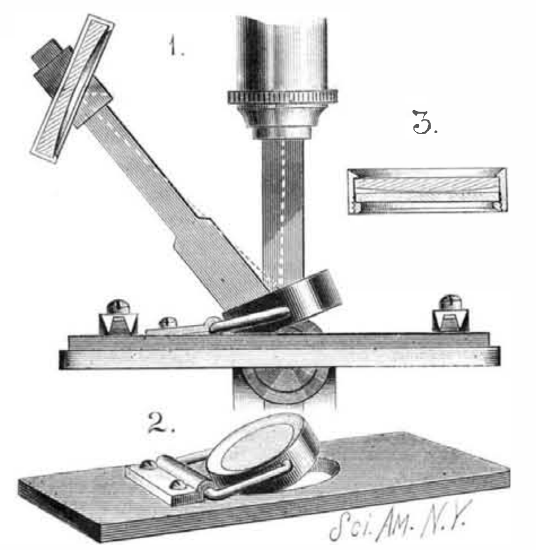
The position of the cell relative to the source of light is shown in Fig. 1. The cell and the source of light or the mirror should be arranged so that the image of the flame used for illumination or the broad light of the sky will be reflected up the tube. The objective (a 2 inch, with an A eyepiece) may now be focused, when the rings, which about fill the field, will appear with great brilliancy. The effect may be somewhat varied by turning the cell at different angles, and moving the source of light accordingly. The concave mirror is used to concentrate the light; but, of course, a condenser may be used instead, or, if the light is strong enough, the beam may be received directly on the glass of the cell, and thrown up the tube.

With the unaided eye the rings appear as a very small disk, with no very noticeable beauty; but in the microscope it is not only greatly magnified, but properly illuminated.

An interesting experiment, showing the difference between the effect of pure sunlight and artificial light, consists in adjusting the mirror so as to simultaneously receive light from the sky and from a lamp or gas light. The portion of the disk illuminated by the lamp light shows the predominance of yellow, a greenish hue taking the place of the blue; the red being also modified.

Monochromatic light, such as is secured by passing light through a deep red glass, for example, shows the rings as alternately red and black.

The device for exhibiting the soap film, which is

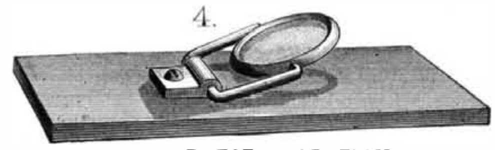


MOUNT OF NEWTON'S RINGS FOR THE MICROSCOPE.

shown in Fig. 4, will now need little explanation. A ring is pivoted in the same manner as the cell already described. By dipping the finger in soapy water, and passing it over the ring, a film will remain in the ring, which may be viewed in the same manner as Newton's rings. The bands of iridescent color are very brilliant, and the eddies and swirls of gorgeous colors are something beyond description.

Thin plates of mica exhibit the same phenomenon. By tearing a very thin plate of mica, so as to leave a ragged edge, many extremely thin points will remain projecting from the torn edges; these may be cut off, and cemented in a suitable position for observation. These little points are quite difficult to handle. Probably the easiest way to manage them is to cut the piece of mica down quite small, and then take the bright point in a pair of clean forceps, and cut the

4.



HOLDER FOR SOAP FILM.

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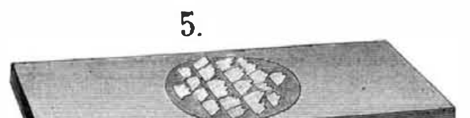


MOUNT OF MICA PLATES.

larger part off, then touch the edge of the bright piece to Canada balsam, and put it in position on the slide. These little plates of mica are viewed in the same manner as the Newton's rings.

It is perhaps hardly necessary to say that having prepared a good mount of the mica plates, it is advisable to inclose it under a cover, as soon as convenient, to exclude dust.

Removing Microbes from Water.

Professor Frankland has recently made a series of experiments on the relative efficiency of filtration, agitation with solid particles, and precipitation as a means of removing micro-organisms from water. His method was to determine the number of organisms present in a given volume of the water, before and after filtration. The filtering materials were greensand, silver sand, powdered glass, brick dust, coke, animal charcoal, and spongy iron. These materials were all used in the same state of division, being made to pass through a sieve of forty meshes to the inch. Columns 6 inches in height were used. It was found that only greensand, coke, animal charcoal, and spongy iron wholly removed the micro-organisms from the water filtered through them, and that this power was lost in every case after the filters had been in operation a month. With the exception of the animal charcoal, however, all these substances, even after being in operation for a month, continued to remove a very considerable proportion of the organisms present in the unfiltered water; and in this respect coke and spongy iron occupied the first place. Water containing micro-organisms was also agitated with various substances in the same state of division as above mentioned, and after subsidence of the suspended particles, the number of organisms remaining was determined. A gramme of substance was in general agitated with 50 c. c. of water for a period of about fifteen minutes. It was found that a great reduction in the number of organisms could be produced in this way; and the complete removal of all organisms by agitation with coke is especially to be remarked. Precipitation by "Clark's process" also showed that it affords a means of greatly reducing the number of these organisms in water. Dr. Frankland concludes from his experiments that, although the production in large quantities of sterilized potable water is a matter of great difficulty, involving the continual renewal of filtering materials, there are numerous and simple methods of treatment which secure a large reduction in the number of organisms present in water.—*Journal of the Society of Arts.*

Trying a Dynamite Gun.

The pneumatic dynamite gun, tested last week at Fort Lafayette, is the development on a large scale of the system of throwing high explosives from guns by means of compressed air. Experiments with this system have been in progress for several years past with small guns with from two to four inch bore, throwing from 10 to 20 pounds of explosive gelatine about a mile, using a pressure of 500 pounds to the square inch.

The system, in brief, consists in the use of a reservoir for compressed air connected to a gun-barrel by a suitable firing valve, this reservoir having a cubic capacity six times greater than the bore of the gun, measured from breech to muzzle. A shot loaded with explosive gelatine is placed in position through a breech-closing mechanism, when, by means of a firing lever, the valve is made to deliver a quantity of air from the reservoir into the barrel just sufficient to fill it, and shut off the supply just at the point when the shot passes out of the muzzle, thus subjecting the shot during its passage through the barrel to a pressure equal to an average of the initial and terminal pressures in the reservoir. A space is left between the base of the shot and the face of the firing valve, which acts as an air cushion, starting the shot without shock or jar, thus avoiding explosion. Each shot is fitted with fulminate primers, which explode the charge on impact.

In the small guns referred to above, full air pressure was never obtained on the base of the projectiles, on account of faulty valve action, and numerous minor points of construction were impracticable; but the absolute surety with which high explosives could be handled, proved by a large number of shots said to have been made under all sorts of conditions, favorable and unfavorable, if the private tests have not been exaggerated in their description, did much to prove the correctness of the principle involved.

The dynamite gun is large enough to carry 100 pounds of explosive gelatine two miles, and its projectors expect it to supersede all kinds of self-propelling torpedoes, except in special cases. It will, they think, if successful, introduce into warfare an aerial and explosive shell.

This gun was constructed from plans furnished by Mr. Nat. W. Pratt, a practical and ingenious mechanician. It has a bore of 7¾ inches with a barrel 60 feet long, hung on trunnions at the breech and in a pair of heavy cast supports, which in turn are bolted to a carriage running on a track for side training. The elevation is obtained by swinging the gun on its trunnions. Both motions are performed by the compressed air in the reservoirs, which rest on the carriage and turn with it.

The handling of the gun is controlled by the man who does the firing. The gun's crew consists of the gunner and two men to load. The valve which regulates the flow of the air into the barrel is eight inches in diameter, and works under a total load of over 75,000 lb. without shock or jar, and the amount of air to be discharged at any one shot can be regulated at will; the valve always giving a full opening, delivering the full pressure on the base of the shot, but remaining open a longer or a shorter time, according to the amount to be delivered.

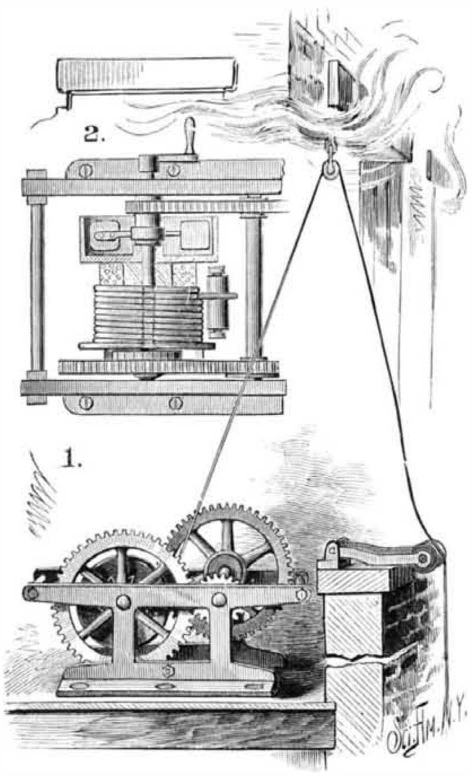
Unlike the smaller guns, there are no movable joints under pressure, and it is said no leaks are found when working under a full pressure of 1,000 lb. per square inch. On account of the greater pressure at which this gun is worked, and the certainty that full pressure is delivered on the base of the shot, the experiments of firing dynamite have been very carefully conducted.

At the exhibition last week a projectile weighing 200 lb., one hundred pounds of which was explosive gelatine, was fired with 1,000 lb. pressure at an elevation of barrel of 30°. At this writing the exact range has not been received from those operating the plane-tables at Fort Hamilton, but it was thought to be about a mile and a half.

Unfortunately, the electric battery which should explode the charge upon contact with the water did not do its work.

IMPROVED FIRE ESCAPE.

The frame consists of two side plates bolted together, and formed with flanges at their lower edges, through which the fire escape may be bolted to the floor near the window. Journaled in the frame are two shafts; on the crank shaft is a drum carrying the descending rope, and a loosely mounted large gear wheel. A properly arranged pawl and ratchet wheel turn the wheel when the drum is revolved by the drawing off of the rope. Upon the other end of the crank shaft is a



DITTRICK'S IMPROVED FIRE ESCAPE.

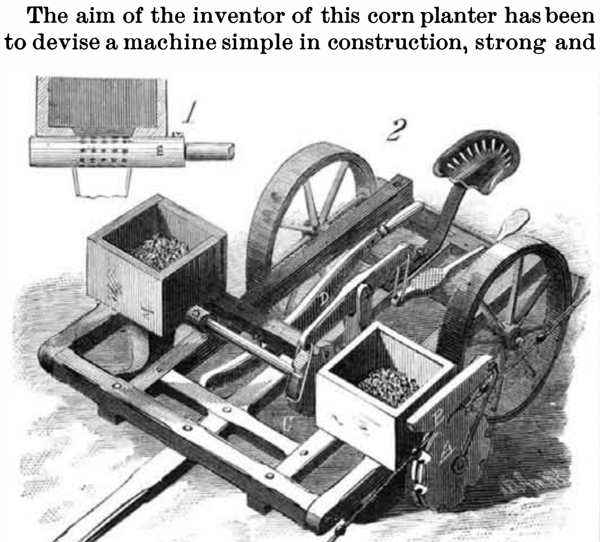
loosely placed fan inclosed in a circular casing fixed upon the shaft. The hub of the fan is formed with a small gear wheel meshing with a large wheel upon the end of the second shaft; upon the other end of this shaft is a pinion meshing with the large wheel on the crank shaft; when the latter wheel is revolved by the drawing off of the rope, the fan will be rapidly revolved, and will act as a governor to prevent the too rapid unwinding of the rope. The arrangement of the parts is clearly shown in the plan view. By turning the crank the rope may be wound upon the drum without turning any of the gearing. A simple device acts as a guide in winding up the rope, and also prevents any slacking of the rope when wound upon the drum.

The rope passes from the drum up over a pulley secured at the top of the window, so that in use a person to descend has simply to attach himself to the rope and swing out of the window, when his weight will draw the rope from the drum with a slow movement governed by the fan. The rewinding of the rope upon the drum can be quickly done. A hinged frame provided with a roller prevents the rope from chafing upon the window sill. The frame, being wider than the sill, the roller is held beyond the wall, and the rope is clear of the building.

This fire escape is the invention of Mr. John Dittrick; further particulars can be had from Mr. J. M. Millar, 12 Sherman St., Chicago, Ill.

IMPROVED CORN PLANTER.

The aim of the inventor of this corn planter has been to devise a machine simple in construction, strong and



AGEE'S IMPROVED CORN PLANTER.

durable in use, and reliable in operation. The main axle may revolve in bearings attached to the frame, or may be rigidly connected with the frame. The tongue is secured to the middle part of the frame. To the ends of the front cross bar are pivoted the forward ends of the top bars of the runners, the rear bars of the runners being made hollow to serve as spouts to conduct the seeds to the ground, and being attached at their upper ends to the bottoms of the seed boxes, which are connected by a cross bar. Beneath the openings in the seed boxes are placed cylinders, E, on a shaft revolving in bearings attached to the boxes. Each cylinder has eight, more or less, rows of holes; each row has five holes, of such size as to contain a single kernel of corn, and formed with sloping sides to prevent the grains hanging. As the cylinders are revolved, the holes receive corn from the boxes and drop it to the ground. The cylinders are secured upon the shaft by set screws, so that they can be adjusted to leave any number of holes beneath the openings in the bottoms, and thus regulate the amount of seed planted.

To the end of the shaft is secured a wheel, A, in the face of which are formed an annular groove to receive the check wire, and recesses at equal distances apart, and equal in number to the number of rows of holes in the cylinders. These recesses receive the balls on the check wire, so that the cylinders will be revolved through the space of one row of holes by the passage of each ball. The wheel is stopped at the proper point by a latch, B, which is grooved to permit the passage of the wire, and is formed with a projection to drop into each recess, and thus stop the wheel. Suitably arranged arms prevent the wire from becoming accidentally displaced. The catch can be thrown back, when the friction of the wire will run the wheel as a drill. On the middle of the shaft is a ratchet wheel, C, having as many teeth as there are holes in the cylinders. Engaging with these teeth is a link pawl hinged upon the forward end of a lever operated by a treadle pivoted to the rear part of the frame, as clearly shown in the cut. The seat can be moved forward or back, to cause the weight of the driver to properly balance the machine. By means of the lever, D, which is pivoted to the forward cross bar of the frame, the seed boxes and runners can be readily raised from the ground when desired. Scrapers secured to the ends of a shaft rocking in bearings on the rear part of the frame remove any soil that may adhere to the rims of the wheels; this shaft is operated by a foot lever.

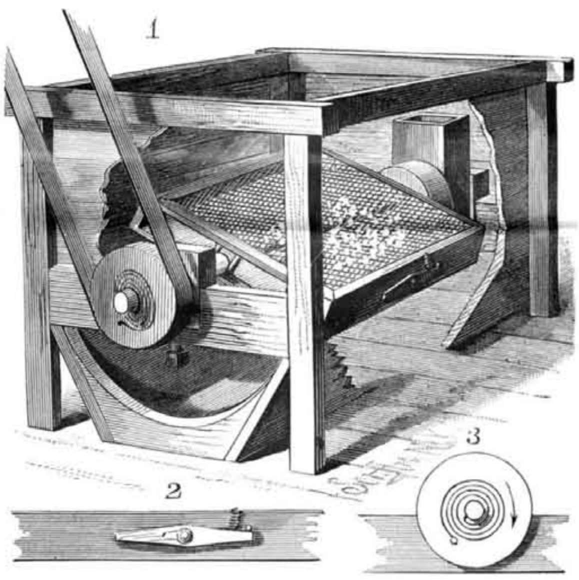
This invention has been patented by Mr. George S. Agee, of Louisville, Kan.

Canal Works.

Besides the works at Panama, we may mention the excavation of the canal through the Corinthian Isthmus, in Greece. Germany is completing improvements on the Main, by which Frankfort will be turned into an interior port town; it is intended also to connect Baltic and German seas by a canal 60 miles long, 30 feet deep, and 380 feet wide; this canal will pass from Brunsbuttel on the Elbe into Kiel Bay, and will be of a great commercial and strategic importance. In Spain a private company is occupied with realization of an old project of the King Charles III., namely, the connection of the Cinca and Ezera rivers by a system of canals, which will benefit the provinces of Huesca and Lerida. In England, Manchester will be turned into a port town by a lock canal to Runcorn and regulation of the river Mersey; and there is a talk of connecting the Clyde and Forth rivers by a canal 30 miles long. In Egypt it is proposed to improve the Suez Canal by doubling its width. Even from such a remote country as Ceylon we hear that by deepening the canal in the strait between the island and mainland they will permit the vessels to pass directly from the Gulf of Manaar into Bengal Bay without going around the island.

IMPROVED FLOUR BOLT.

The bolt is composed of two parallel bolt cloths held about two inches apart in a light rectangular frame secured to a shaft by bolts. The shaft is journaled in blocks, fitted in the bolt chest, placed upon screws by which they may be moved vertically for adjusting the pitch of the bolt. The meal is fed into the bolt through a spout, the lower end of which enters a receiving chamber formed at the head end of the frame of the bolt. The shaft is revolved by a belt passing over a loosely mounted pulley connected with the shaft by a coiled spring (Fig. 3), the inner end of which is secured to the shaft and the outer end to the pulley. To each edge of the bolt frame is pivoted a knocker, shown in Fig. 2. These are normally held against pins by spiral springs, and in the sides of the bolt chest are pins, against which the ends of the knockers strike as the bolt revolves; upon passing the pins in the chest, the springs react and bring the knockers suddenly against the pins in the bolt frame, thereby jarring the bolt cloths and clearing the meshes. The jarring takes place while the bolt cloths are in horizontal position, which jars the specks and impurities from the upper cloth into the interior of the bolt, and does not affect the lower cloth, as the whole body of meal in the bolt is resting upon it at the time the strokes are delivered. When the bolt stands in a vertical position, the weight of the meal within will be below the shaft, so that as the pulley revolves it will turn upon the shaft and wind up the spring; this will continue until the tension of the spring is sufficient to turn the unevenly loaded bolt. As the bolt passes a horizontal position, and the meal begins to shift to the other side, the strain on the spring will be lessened, and it will react on the shaft and bolt, and give them a sudden forward motion, which will throw the meal against the opposite cloth, down which it will slide. The meal is thrown from one side to the other twice during every revolution. The bolt may be run at about twenty revolutions a minute, which is one of its chief advantages, as, with this slow motion, sticks, nails, and dough balls will not break the cloths, while the bolting is quite as rapid as with rapid motion bolts.

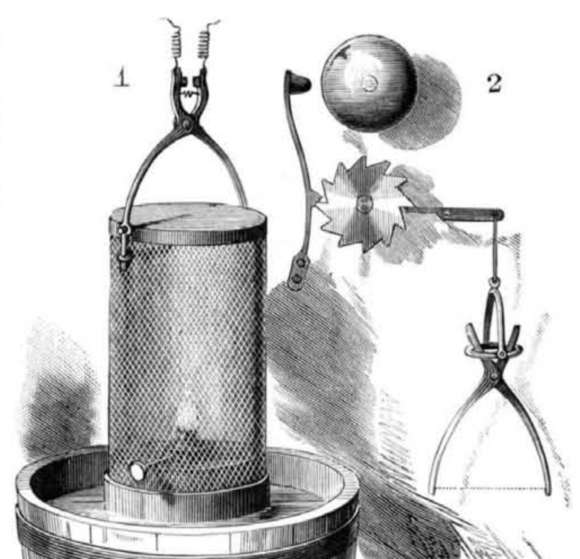


HALLIDAY'S IMPROVED FLOUR BOLT.

This invention has been patented by Mr. George Halliday, of Winnebago City, Minn.

GAS DETECTER FOR MINES.

This device is designed to automatically send an alarm when explosive gas, such as coal gas, natural gas, or fire damp, accumulates at the place where it is located. An oil lamp or gas burner is secured to the bottom of a wire netting cylinder, provided at its upper end with diametrically opposite pins, which project into eyes formed near the lower ends of pivoted angular levers. The upper ends of the levers carry electric contact points connected with wires leading to a battery, and are pulled toward each other by a spring; the lower ends of the levers are united by a cord or highly fusible wire. The cylinder is held above a vessel containing water. The gas, fire damp, etc., passes through the wire netting and is ignited, and burns the cord or melts the wire, thereby permitting the spring to pull the lower ends of the levers from each other, when the lamp drops into the water, and is extinguished. At the same time the contact points are brought together, the current is closed, and an electric bell in the circuit is sounded. The remaining gas does not explode, as only the gas in the cylinder is burned. In the modification shown in Fig. 2, the upper ends of the levers are held in a ring suspended by a stirrup hung on one end of a pivoted lever, the other end of which engages with a ratchet wheel provided with a drum on which a weighted cord is wound. A spring hammer, operated by the ratchet wheel, strikes a gong. The lower ends of the lever are kept from



LYON'S GAS DETECTER FOR MINES.

spreading by a wire or cord. When the cord is burned, the upper ends of the lever swing toward each other and drop through the ring. The lever, being relieved of its weight, releases the wheel, which operates the hammer.

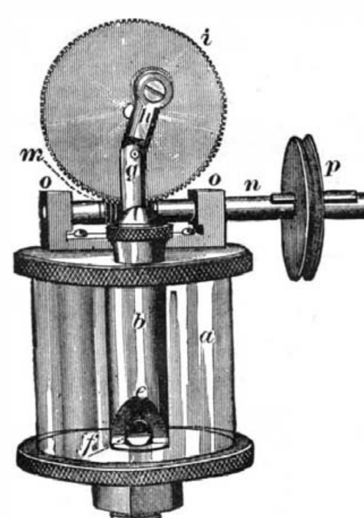
This invention has been patented by Mr. James A. Lyon, of Clarksville, Tenn.

A Portable Leclanche Pile.

Mr. C. M. Gavill has recently presented to the Physical Society, in the name of Mr. Guerin, a pile whose liquids have been rendered immovable, and which is as a consequence portable. This result has been obtained by substituting for water a solution of agar-agar, an alga that comes from the extreme East. The liquid upon cooling becomes a solid and elastic jelly. The proportion of agar-agar may vary from one to five per cent, and depends upon the substances that are to be mixed with liquid. The model that Mr. Guerin has studied is the agglomerate Leclanche pile. Its electromotive force is slightly less (0·03 to 0·04 volt) than that of the ordinary styles of the pile. The resistance of one of these elements of medium dimensions is about 0·9 ohm. The same process may be applied to any other pile.—*La Nature.*

OILER FOR ECCENTRICS, CRANKS, ETC.

This oiler may be applied to eccentrics, cranks, crossheads, dynamos, and all other stationary or moving bearings; the one shown in the cut is for a stationary bearing, and is operated by a band from the pulley to shaft. Its operation may be easily understood from the engraving, which clearly shows the construction. It works automatically, and when the machine stops it is impossible for the oil to run to waste. The feed is positive and regular, and the flow is increased or diminished by the speed of the machine. It can be easily attached, and when once in position and adjusted it requires no attention except to fill, and, having glass sides, the amount of oil in the cup can be seen. The parts are few, and not liable to get out of order.

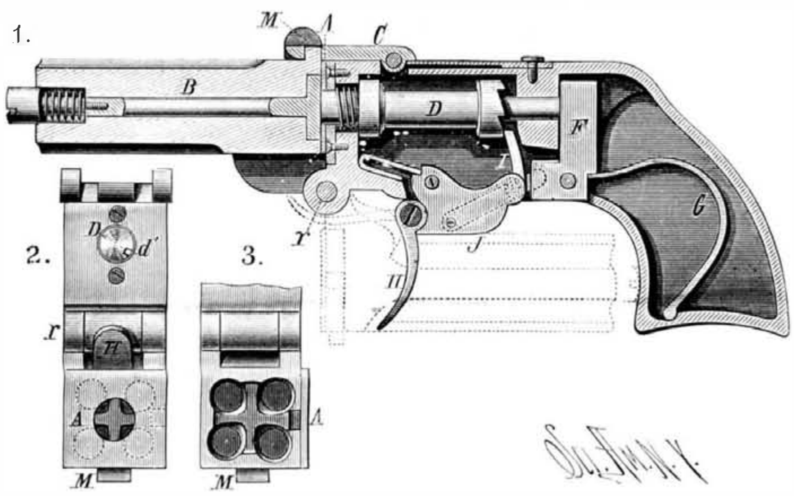


MERSHON'S IMPROVED OILER.

Further particulars can be had from Mr. S. D. Mershon, 95 Campbell Street, Rahway, N. J., or the Shelton Brass Hardware Company, of Birmingham, Conn.

REPEATING FIREARM.

The invention herewith illustrated relates to repeating firearms, and more particularly to pistols having several barrels. The pistol occupies very little space in the pocket, as the barrels may be folded underneath the stock, and by reason of the multiplicity of barrels it presents the same advantages as the revolver at present in use. The four barrels are formed of a single piece of metal having four bores; this piece is provided, near its point of articulation with the stock, with a hinged cover plate, A, which can be turned around upon the rear end of the piece, so as to prevent the cartridges falling out when the pistol is folded, as shown by the dotted lines in Fig. 1. In the center of the barrel piece is an extractor rod, B, provided at its outer end with a spiral spring, which tends to hold the star-shaped opposite end in a recess in the rear end of the barrel piece; the star is properly recessed to receive the rim of the cartridge. By pressing upon the extremity of the rod, the star can at will be removed from the recess. When the pistol is in use, the barrel is held to the stock by a lug, M, engaging with a slot formed in a catch, C, pivoted to the stock. A spring holds the catch horizontally in such a way that in order to break down the pistol it is necessary to lift the free end of the catch, to release it from the lug. In the stock is a movable firing pin, D, having a firing point or striker at its forward end. By pressing upon the trigger, H, a pivoted piece, J, acts upon the hammer, F, so as to draw it back, the firing pin being retracted by its own spiral spring. When this pressure upon the trigger is discontinued, the mainspring, G, which has been bent by the movement of the hammer, unbends, drives the hammer forward, when the firing point strikes a cartridge in one of the barrels. Each time the trigger is pulled it actuates a pawl, I, which revolves the firing pin a quarter of a turn, to bring the firing point opposite the barrel next to that in which the cartridge has been fired. When the pressure upon the trigger is relaxed, a compressed spring forces it back to its original position. Fig. 2 is a front end view of the pistol folded, and Fig. 3 is the same view with the covering plate open.



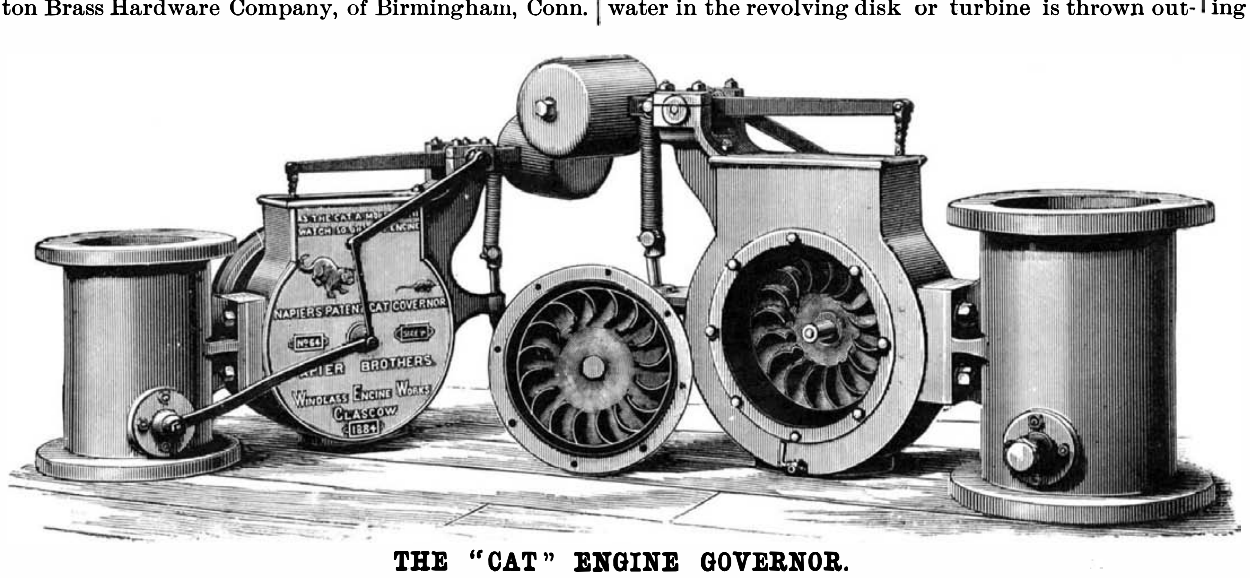
CHUCHU'S REPEATING FIREARM.

This invention has been patented by Mr. Athanase Chuchu, whose address is care of H. H. Swift & Co., P. O. box 3399, New York city.

IMPROVED ENGINE GOVERNOR.

The governor shown in the cut is remarkable for quickness of action on the slightest variation in the speed of the engine. Two saucer-shaped shells, or hollow disks, fitted with curved blades, work face to face in a casing filled with water; one of these turbines is driven by the engine, and the other oscillates and works the throttle valve. In the engraving, the right hand figure shows the casing attached to the part of the steam pipe containing the throttle valve, and the oscillating turbine in its working position; the middle figure shows the revolving turbine removed, along with the casing cover, through which its axle works; to the left hand is shown a face view of the governor. The water in the revolving disk or turbine is thrown outward, forward, and sideways into the oscillating disk. The blades in the latter deflect the currents from an outward and forward direction into an inward and backward direction, and send the water back into the revolving disk. The reversing of the motion of the water by the blades of the oscillating disk gives it a tendency to revolve in the same direction as the other disk; this tendency is resisted by a chain attached to a pulley on the disk until the strain on the chain is sufficient to lift a balance weight, which keeps the throttle valve open. When that strain is exceeded it shuts the throttle, and when it falls short the weight opens it. It is claimed that by this arrangement a comparatively small velocity of the disk is required to get up much greater power than with any centrifugal arrangement; a sudden increase in the velocity produces an almost instantaneous action on the throttle, so that the whole load may be suddenly taken off the engine without any danger of running away. The durability of the apparatus is assured, since almost the only wearing part is the spindle of the revolving disk, upon which there is no strain.

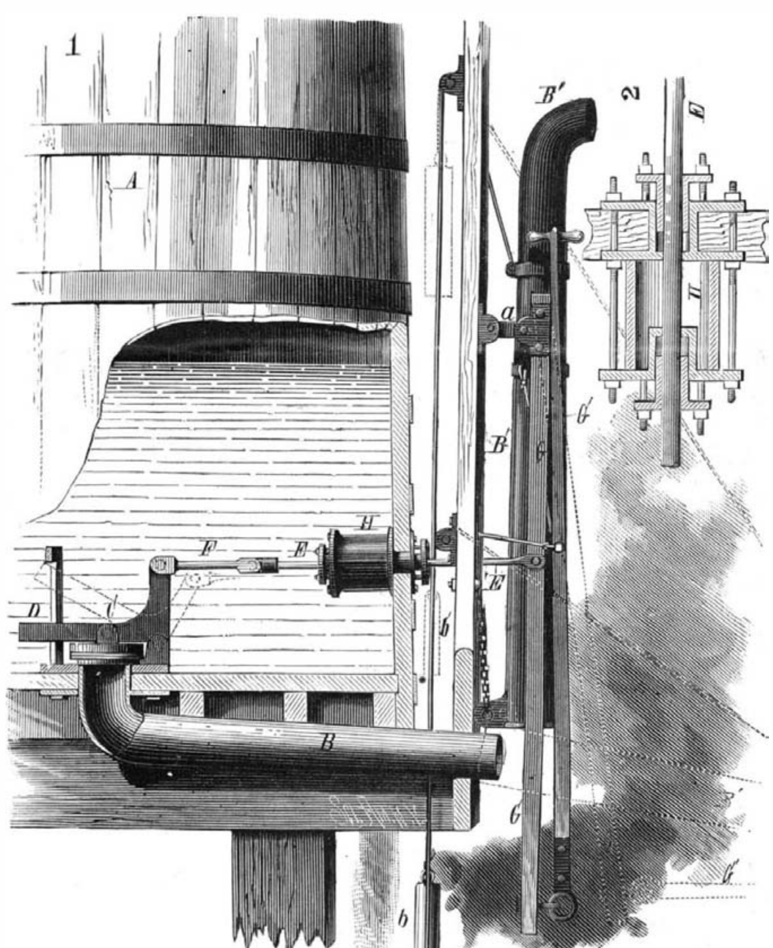
All further particulars concerning this governor, which has been most successfully used in Great Britain, can be obtained from Messrs. Napier Brothers, Windlass Engine Works, Glasgow, Scotland.



THE "CAT" ENGINE GOVERNOR.

RAILWAY WATER TANK.

In the Northwestern States much trouble has been caused during the past few years by the freezing of the railway water tanks--a tank half full of solid ice has been a by no means uncommon occurrence. The engraving represents a water tank, the invention of Mr. Albert Roberts, of Marion, Ia., Supt. Water Supply of the C., M. & St. P. Railway, designed especially to overcome this difficulty. The arrangement for opening the valve is simple, convenient to work, and not liable to freeze up; all the parts of the tank are out of the way of passing trains. In the bottom of the tank, which is not unlike those in common use, is fitted the outlet pipe, B, adapted to connect with the swing-ing pipe, B′, in the usual way. Over the inner opening of the pipe is a valve or gate, arranged to lift on a lateral pivot by means of the bell crank, D, to the horizontal arm of which the valve is attached. The rod, E, is connected with the vertical arm of the crank by the rod, F, and, passing through the side of the tank, may be moved back and forth by the pivoted lever, G. In order to bring this lever within reach of the operator from the tender, it is provided with a hinged bar, G′, adapted to swing up and down with the sway spout. The short connecting rod, *a*, permits the necessary variation in position as the valve is moved. The lower end of the lever is some distance below the outlet pipe, so that when the spout is lowered to the position indicated by the dotted lines it is about level with the end of the spout, and the handle bar is horizontal, rendering the operation of the lever and its connections easy. The spout and lever may be connected by a chain, as shown. When the spout is elevated, the chain is drawn taut, and the handle bar is thereby held



ROBERTS' RAILWAY WATER TANK.

in a vertical position; but when lowered, the chain is slack, allowing the handle to be drawn outward.

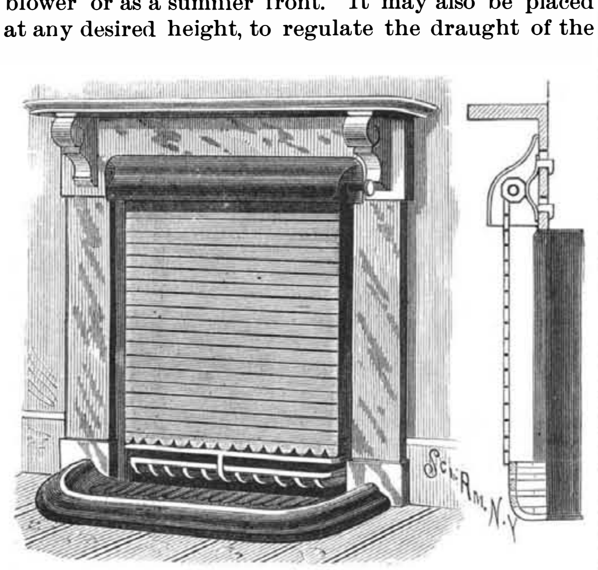
This construction, it will be seen, admits of the valve being forcibly closed as well as opened. To render the movement of the spout and handle bar as easy as possible, and to hold them at any desired angle, the counterweights, *b*, are provided. In some of the ordinary railway tanks, the chain which raises the valve is exposed to the liability of being frozen fast, and the tank rendered useless until the ice is cut away. This invention obviates the difficulty by passing the rod which actuates the valve through a chamber, H, provided with suitable stuffing boxes, and attached to the inside of the tank near the bottom. This chamber is made long enough to extend inward beyond the limits of frost, and is filled with common black oil, which serves to lubricate the valve rod, and thereby the better prevent any accumulation of ice on the parts extending beyond the stuffing boxes. The chamber is preferably made of wood, and is quite simple in construction, as will be seen from the drawing. The tank may be so arranged as to receive water directly on the valve, which may be further protected against frost by a sawdust box placed immediately beneath it.

Bad Effect of Cement on Iron.

A few days ago, says the *Sanitary News* of Chicago, a large water pipe on the fourth floor of the government building, this city, burst, flooding the floor and badly damaging the ceiling of the third floor. It is thought that it was caused by the cement hardening, together with the jars caused by the workmen while repairing other parts of the work. In relaying the tiles on the floor, it has been found necessary to replace much of the iron gas pipe with galvanized iron pipe, as the iron pipe has almost rusted away, while the galvanized pipe that was put in about nine years ago is almost as good as it was then, showing to advantage the lasting qualities of galvanized iron as compared with iron pipe when embedded in cement. As the cement is so injurious, the pipe is being either incased in boxes or laid in gravel.

FIREPLACE ATTACHMENT.

This attachment can be applied to the front of a fireplace, to serve as a blower to regulate the draught, and to answer the purpose of a summer front. Two brackets are held upon the mantel by hooks that enter slots made at each side of the fireplace. To a roller journaled in the brackets is secured the upper end of a screen formed of metal slats connected together by links, or hinged to each other. One end of the roller is prolonged and provided with a handle or knob, by which it may be turned, and between the handle and bracket is a polygonal wheel, which is pressed by a spring, as shown in the sectional view; the pressure of the spring keeps the roller in any position. A sheet metal cover, secured to the mantel, inclosed the brackets and roller. By turning the roller the screen may be raised so as to entirely open the fireplace, or it may be lowered so as to entirely close it, when it will act as a blower or as a summer front. It may also be placed at any desired height, to regulate the draught of the



DICKINSON'S FIREPLACE ATTACHMENT.

chimney and to prevent smoke entering the apartment.

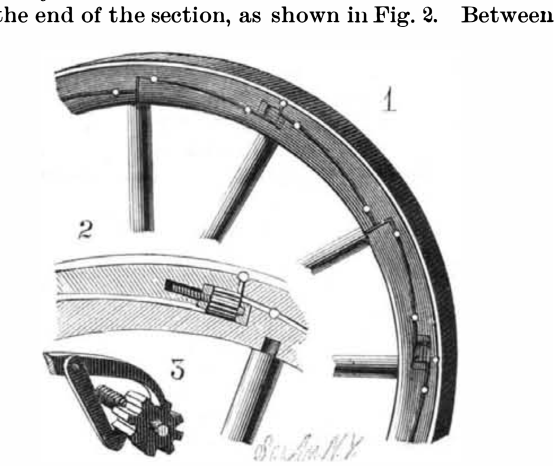
This invention has been patented by Mr. Thomas W. Dickinson, of Sharon, Pa.

Legislating against Thistles.

The recent Indiana Legislature enacted that any person knowingly allowing Canada thistles to grow and mature upon his land, or land under his charge, shall be fined not less than five nor more than twenty dollars; and for the second and each subsequent offense, double the amount of the first fine. Supervisors of the highways of the State who allow thistles to grow on any road in their districts are subject to like penalties; as are also road masters of railway lines who allow the pests to grow about stations or along the right of way under their supervision. This is a wise law, and worthy of enactment in other States.

TIRE TIGHTENER.

The rim of the wheel is formed of a series of two sets of felly sections, the sections of each set all being of the same shape and size. The outer edge of each outer section is curved on the radius of the wheel, and the inner edge has two concave curves forming a shoulder at the middle, as shown in Fig. 1. The inner edge of each inner section is formed to fit the corresponding edge of the outer section. The rim of the wheel is so made that the inner edges of both sections are in contact, and the sections are arranged so as to break joints. On the shoulder of each inner section is a metal plate, into which one end of a screw spindle passes, the other end passing through a nut in the adjacent end of the outer section and into a hole in the end of the section, as shown in Fig. 2. Between



POWERS' TIRE TIGHTENER.

the nut and plate the spindle is formed with a ribbed head. The tire is held in place by rivets placed between the sections and between the tire and rim of the wheel. By means of the tool, Fig. 3, the spindle may be turned to press the ends of the outer sections more or less from each other, thereby increasing the circumference of the wheel at the outer edges of the rim, and tightening the tire. This invention has been patented by Mr. Emory R. Powers, of Paradise, California.

Decay of the Obelisk at Central Park, New York.

Cleopatra's Needle, the Egyptian obelisk at Central Park, is found to be rapidly crumbling away under the influence of our American climate. For 4,000 years the needle suffered comparatively little change in the dry, warm air of Egypt, but though it has been in America only five years, there are already unmistakable signs of its serious decay. Fragments of stone are found scattered at the base of the needle, and flakes an inch or more in length can readily be picked off with the fingers. On the eastern side of the monolith there is a fissure three feet in length and sufficiently wide to admit the insertion of a knife blade for a distance of two or three inches. A finer crevice extends to a much greater depth. The vein containing the fissure can be traced to the south and west sides. Should this large fragment split off, the obelisk would undoubtedly fall.

These indications have led the Park Board to consider means for its artificial preservation. Prof. Doremus strongly recommends the use of paraffine, which is not affected by the atmosphere and has the advantage of being impervious to moisture. The stone would be warmed at its surface, in order that it should absorb the melted paraffine more readily. This treatment would make the stone somewhat darker, but brighter and nearer the color of the original syenite. It is thought that it would prevent further decay. Prof. Egleston, of Columbia College, favors the use of boiled linseed oil, as giving a better protection even than paraffine. The corresponding needle, erected on the Thames embankment, London, has undergone a similar deterioration, and artificial protection was found necessary. In this case a liquid was used composed of a solution of dammar resin in a volatile hydrocarbon, with a small quantity of wax and a still smaller quantity of corrosive sublimate added. Prof. Crookes, the great English chemist, is, however, quoted as preferring paraffine to dammar resin. Prof. Chandler, on the other hand, regards the proposed method of heating the obelisk by means of charcoal furnaces, so that it shall absorb a larger amount of paraffine, as one of unquestionable danger. The expansive action of heat is liable to cause cracks and fissures, which would leave the stone in a more injured condition than before the treatment. It is evident that much caution will be necessary, and that a preliminary trial should be made before the obelisk itself is subjected to any process. It was proposed some time ago to inclose the entire monolith in glass, and though that method would have given rather a clumsy result, it would have been far preferable to the loss, or deterioration of so interesting a relic. The decay of even our native building stones has shown our climate to be particularly trying to all exterior masonry, and has called the attention of architects and engineers to the necessity of some artificial preservative. There are many substances which have been tried for this purpose, and have been found more or less effective, but opinions differ considerably as to which is the best for general use, and which method of application gives the most satisfactory results.

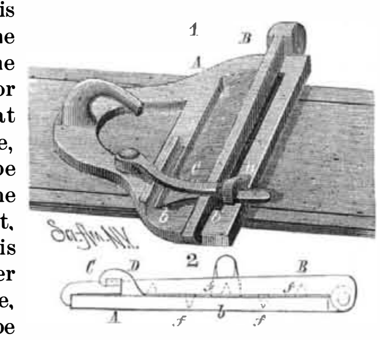
Many of our readers have doubtless given some attention to this subject, and have perhaps been able to collect information in regard to actual experiments which have come under their notice. We should be glad to hear from them, and to have them suggest a practical method for the preservation of the obelisk.

The Magnesium Light.

Magnesium, which has more than once been abandoned as a source of light, appears about to be employed again. A Mr. Graetzel has succeeded in producing pure magnesium by electrolysis, and at a price much less than that at which it has hitherto been sold. So there are serious thoughts of using it for lighting purposes. The Bremen aluminum and magnesium manufactory that is working the Graetzel process has just offered two prizes for magnesium lamps with clockwork movement. Five hundred and two hundred marks ($125 and $50) will be awarded to the constructor whose lamps shall be adjudged the best and most practical. The Bremen manufactory reserves to itself the right of working the two systems that are rewarded. —*La Nature*.

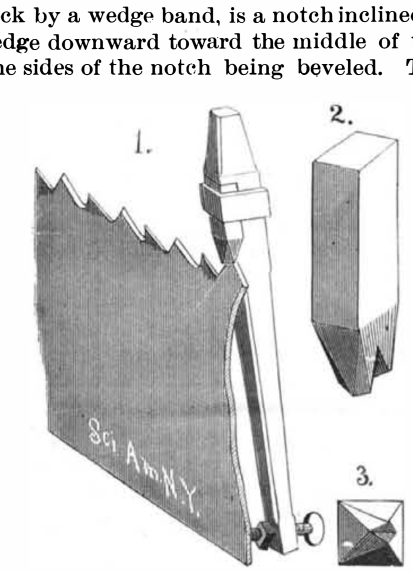
HOOK BUCKLE.

The frame, A, of the buckle is formed at one end with a hook, and at the other end is slotted to form cross bars. The central bar is formed with points, *f*, to retain the strap, C, which is passed through the slots, as shown in the engraving. A bar or lever, B, is hinged at one end to the frame, so that it may be closed over in line with the forward slot, and locked in this position by a lever pivoted to the frame, and adapted to be turned over the end of the bar and held by a hook, *b*, formed on the frame. The hinged bar is formed with teeth, *f*, to hold the strap, to which the buckle may be applied. A lug on the free end of the bar, B, enters a notch in the frame, thus preventing lateral movement of the bar. This buckle, the invention of Mr. Victor Berthelot, of Cannon Store, La., may be cheaply made, and can be easily shifted upon the strap.



IMPROVED SAW SET.

Fig. 1 shows the saw set applied to the blade of the saw, and Figs. 2 and 3 show the detachable die. The steel stock or bar is formed at one end with a slightly tapered head, below which is a notch in one edge. In the lower end of the die, which is held in the recess in the stock by a wedge band, is a notch inclined from the inner edge downward toward the middle of the lower end, the sides of the notch being beveled. The lower



MARSH'S IMPROVED SAW SET.

end of the recess for receiving the die is inclined outward. The saw to be set is held in a horizontal position in a vise; the saw set is placed on that side of the saw opposite the bevel of the tooth to be set, in such a manner that the point of the tooth passes into the notch in the end of the die, the point of the screw passing through the lower end of the stock resting against the blade. A blow is then delivered on the head of the stock, whereby the point of the tooth is pressed over by the die. By means of the screw, which is provided with a locking nut, the inclination of the stock to the saw can be governed, and the desired set given to the teeth; as the inclination of the stock to the saw increases, the set given to the teeth decreases. The device is convenient to handle, reliable, and not liable to get out of repair.

This invention has been patented by Mr. Gideon Marsh, of Mancelona, Mich.

THE NEW TOWER BRIDGE, LONDON.

Our illustrations give two views of the intended bridge across the Thames, immediately below the Tower of London, which the Corporation of the City of London are about to erect, having received the sanction of Parliament. The want of a bridge at this spot has long been recognized, for the relief of the congested traffic over London Bridge, as well as for the accommodation of the East End of London, and for the improvement of the communication between the north and south sides of the river, below London Bridge. Mr. Horace Jones, the city architect, past President of the Royal Institute of British Architects, had, by direction of the corporation, at various times since 1876, prepared a series of schemes and reports on this subject. A committee of the House of Commons had reported strongly on the propriety of improving the means of communication between the north and south sides of the river below London Bridge, and had suggested that the corporation should take upon itself the task of erecting a bridge, with mechanical openings, below the Tower. The corporation referred the question to the Bridge House Committee, of which Mr. Frank Green was then chairman, and the committee directed Mr. Horace Jones to prepare designs for this purpose. After mature deliberation the committee selected one on the bascule principle, and the Court of Common Council adopting this selection in October, 1884, referred it back to the Bridge House Committee, by whom, with Mr. Thomas Beard as chairman, the necessary steps were taken for obtaining an act of Parliament. This design is in effect that which has been approved by Parliament, and which received the royal assent on August 14, 1885. The plan of the constructive ironwork, and the machinery necessary to work the mechanical openings of the central span, had been indicated in the general design; but these features of it have received great consideration, and some important and valuable improvements have been added, by Mr. T. Wolfe Barry, the well known engineer, who was associated with Mr. Jones; and his skill and experience have signally contributed to successfully obtaining the act of Parliament.

Our illustrations show the bridge open and closed. As will be seen, the bridge portion is carried by two massive picturesque Gothic towers, in which provision is made for the necessary machinery for opening and closing the center span, so as to allow the largest shipping to pass through. Lifts are provided on either side, as well as an internal staircase, for the use of foot passengers; these lifts communicate immediately with the upper footway, so that the foot traffic will never be interrupted. The center leaves of the bridge, when open, will be flush with the pier, thus leaving a clear opening or freeway of 200 feet for the shipping to pass. When the bridge is closed, there will still be sufficient height, at high water, for the ordinary traffic of the river to pass under. The approach roads and footway will be 60 feet in width; the land spans of the bridge about 62 feet, and the center span will be 50 feet wide. The two land spans will be suspended, as shown in our illustration. The materials proposed to be used are, for the lower part of the piers, up to the parapet line of the bridge, gray granite; for the upper portion of the towers, a hard red brick, with Portland or other hard stone dressings. The style of architecture will be that of the sixteenth century, allowing scope for a picturesque treatment.

The opening, the passing of a vessel, and the closing of the bridge could be accomplished in four or five minutes; but if it took even double that time, once or twice in the course of a day, it would be no material interference with the road traffic.—*Illustrated London News.*

A Chemical Water Sounder.

In connection with the preliminary investigations for the introduction of the Improved Sewerage Scheme into Boston, Mass., an ingenious, if not novel, method was successfully tried for obtaining the height of water in small test pipes driven into the ground. The purpose of the experiment was to test the effect of pumping upon the height of the ground water, and as the method may be of use elsewhere, we give it as follows:

About twenty small pipes were driven into the ground below the surface of the soil water, and measurements taken twice a day of the height of water standing in these tubes. The elevation of the top of each pipe being accurately determined, the exact distance to the water surface in the pipe was obtained as follows: To the ring of an ordinary metallic tape a small lead plumb was attached by a wire hook; the top of this plumb was flat, and in a hole to one side of its center was forced a cork, and in this cork a needle was fixed upright, eye down, so that its point was just on a line with the bottom of the tape ring. A small bit of metallic potassium was put on the needle point, and the tape lowered into the pipe; the instant the potassium touched the water it ignited explosively, and the flash and sound both gave the exact moment for reading on the tape the required depth of the water line.

PHOTOGRAPHIC NOTES.

Photographing the Recent Flood Rock Explosion.—Owing to the advantages offered by the extreme sensitiveness of the modern dry plates for recording rapid motion, no better opportunity was afforded for their employment in this respect than the recent explosion of Flood Rock. Such a large area under water, of nine acres, had never been exploded at a single flash before; and, in view of its uncertain extent and the height to which it might rise, it presented difficulties which the average photographer was not familiar with. The Society of Amateur Photographers of this city, with the facilities of access offered by General Newton and the Commissioners of Public Charities and Correction, undertook to photograph the explosion simultaneously from five different points —from the foot of East 93d Street looking east; from 89th Street, looking northeast; from the south end of Ward's Island, from the north end of Blackwell's Island, and from Astoria, looking west, the nearest point. Groups of four or five cameras were stationed at each location, with a leader who gave the word when each man should snap the shutter, general instructions having been given that they should operate at different periods of time, for the purpose of recording the commencement, the full height, fall, and finish of the explosion. It is estimated between fifty and seventy-five cameras were directed toward it. The results obtained by the Amateur Society were extremely satisfactory, inasmuch as the pictures show a complete record of the event, how the island appeared a minute or so before the explosion, the beginning, its climax, its fall, and the appearance of the water immediately after.

In Astoria four points of view were selected—one included the flat roof of a two story wood dwelling, on which were located five cameras, and from which a broadside view of the explosion was obtained. When the earth shock struck the house, the vibration was of such amplitude as to throw down two of the five instruments, resulting in the loss of the pictures intended to have been secured by the same. The shock was also sufficient to set off the shutters of some of the others before it was intended they should go. Altogether, however, the photographic record of the explosion was eminently successful, and will doubtless prove to be a valuable memento for General Newton, as well as a matter of special interest to those who took part in making it.

Improved Method of Development.—Following the lines suggested by Mr. Andra, at a meeting of the Photographic Society of France, wherein he advised the separation of the pyro solution from the alkaline, and the immersion of the plate in each separately for developing, the *British Journal of Photography* has conducted a series of experiments which appear to confirm the advantages claimed by M. Andra.

The plate should first be soaked in water from one to four minutes, according as the film appears to be hard or soft; then it is immersed in the following solution for two minutes:

A.

Pyrogallol	30 grs.
Sodium sulphite	120 grs.
Water	10 oz.

The solution may be poured back into the measure, and saved for use on several succeeding plates.

Sufficient of the following is then poured on, and allowed to remain until the development is complete:

B.

Ammonia, 0·880	1 drachm.
Potassium bromide	30 grains.
Water	20 ounces.

If the exposure is known to have been short, the full strength may be used at once; but, under ordinary circumstances, it will be found better to dilute the above with half its volume with water, subsequently strengthening it from a concentrated solution. In place of ammonia, for ordinary exposures twenty minims of the following solution added to two ounces of water will be sufficient:

POTASH SOLUTION.

Water	4½ ounces.
Carbonate of potash (chem. pure), 437 grs. to oz.	3 "
Sulphite sodium (chem. pure) dissolved in 3 oz. water, 437 grs. to oz.	2 "

If the development then proceeds too slow, twenty minims should be added at a time until it is accelerated.

For instantaneous exposures, the following is equal if not superior to ammonia, there being 480 grains to each ounce of salt.

POTASH AND SODA SOLUTION.

Water	32 ounces.
Ferrocyanide potash	3 "
Carbonate potash	3 "
Carbonate soda	3 "

Of the above add ¼ ounce to 2 ounces of water, increasing the quantity up to ¾ of an ounce if the details do not appear sufficient in the shadows.

By this system of development the image appears rapidly yet very harmoniously, the high lights not gaining in strength out of proportion to the shadows, and only the amount of pyro necessarily absorbed by the film is consumed. The pyro solution can be poured back into its measure, and be repeatedly used until it is exhausted. A fresh alkaline solution should be employed on each plate. The fingers are not stained, and there is less waste of the pyro.

When pyro is not used, Dr. Liesegang finds excellent results may be obtained by the use of separate saturated solutions of sulphate of iron and oxalate of potash. An instantaneously exposed plate is placed first in a saturated solution of sulphate iron for two minutes, after having had a preliminary soaking in water for one and a half minutes. The iron solution was next washed off, and the plate immersed in a saturated oxalate of potash solution. The development proceeded very rapidly, the image remaining absolutely clear in the shadows and gradually acquiring full printing density. Over-exposed plates were easily developed by using dilute iron and oxalate solutions. In such cases the addition of a small quantity of potassium bromide is recommended.

Red and Purple Ribbons Suppressed.

In consequence of a letter written by Examiner Antisell, of the Patent Office, the Secretary of the Treasury has ordered the use of red and purple ribbons in the government type writers to be discontinued in preparing papers intended for permanent record.

In reply to queries of the Acting Secretary of the U. S. Treasury, the examiner says: There are ten different ribbons used, five being copying ribbons, and five record ribbons.

The word "permanent," which appears in the inquiries presented, should be understood as referring to the power of resisting obliteration by the action of light, of washing, of treatment with acids and alkalies, as ordinarily practiced by those operating to remove the ink. The color of the ink may be changed by such treatment (as from blue to black, black to green, and other similar changes of shade), but, whether change of color be produced or not, the ink is not effaced; it is legible, the letters not obliterated, and therefore such ink may be said to be permanent.

This is eminently true of the black record ribbons.

Another ink is furnished, called the black indelible copying ink, which has also the above-mentioned properties of permanence.

The ribbons of other colors than the foregoing are . . . found to be fugitive—red and purple particularly so. They, for this reason, should not be used for recording permanent records. These inks cannot be styled permanent. It may be stated here that the same ink has different results as it is applied on paper by the ordinary writing pen and as applied to similar paper by the type writer; in the latter instance, from its soaking more deeply by the impact of the machine, and being forced below the surface of the paper, it is more difficult to be removed or reached by chemical agents applied; therefore, an advantage accrues in the use of the type writer over the pen. "Are copies made on the type writer by the use of carbon paper permanent in their nature?" may be answered as follows: If these carbon paper copies do not require to be frequently referred to, they may be said to be permanent in their nature. Owing to the light pressure upon the paper, the ink is not deeply embedded, and may be easily removed by friction. This appears to be an objection to the use of carbon paper. In all cases where permanence is desired, the paper should be as thin as may be consistent with its cohesive strength, and bearing as little thickening material or size as possible.

The American Institute Fair.

The fifty-fourth annual exhibition of the American Institute, now being held in New York, presents a favorable comparison with any of its predecessors, and is attracting great numbers of visitors, as is almost invariably the case with any show of general interest in New York city. While there are no very striking novelties in the great array of articles this year presented, there is a sufficient variety of objects of interest, representing good specimens of many different manufactures, and of machinery in motion, to be highly interesting to most visitors, and afford valuable instruction to the majority. There is a good display of steam and gas engines and their appurtenances, of woodworking and agricultural machinery, and of stoves, ranges, and household furniture. The New York Trade Schools, the operation of which was fully described in the SCIENTIFIC AMERICAN in March last, have a fine exhibit, showing the work which young men are able to do after a few weeks' intelligent instruction in carpentering, wood carving, stone cutting, plumbing, and other departments of the building trades. Although the fair is always open for several weeks, intending visitors should not put off the matter too long, for it is but seldom that one is content with a single visit.

The McKeen Automatic Car Coupler.

In connection with our illustrations of car couplers in the SCIENTIFIC AMERICAN of Oct. 10, it was inadvertently stated that the McKeen device, when used with the old style couplers, necessitated coupling by hand. Mr. McKeen writes us that no hand coupling is required, as in his coupler the link can be guided from the side of the car to couple to any other device at present in use.

AILLOT'S BRICK MACHINE.

In the machine shown in the accompanying engraving, the apparatus for kneading and compressing the clay are united upon one and the same frame. This arrangement leads to a marked reduction in the first cost of the establishment, as well as in the cost of manual labor. Besides this, it affords every facility for setting up a plant within a very limited space.

The strength of the various parts of the machine is such as to permit it to work hard as well as soft material. When the latter has been properly prepared, it is introduced into the pug mill, which works it by means of cutters keyed to a vertical shaft. At the lower part of this apparatus there is a rectangular piston, which has a horizontal, backward, and forward motion, and which is so arranged as to force the clay alternately through each of the moulding boxes. The moulded clay is then received by a carriage provided with a steel wire frame that cuts it into bricks of the desired length.

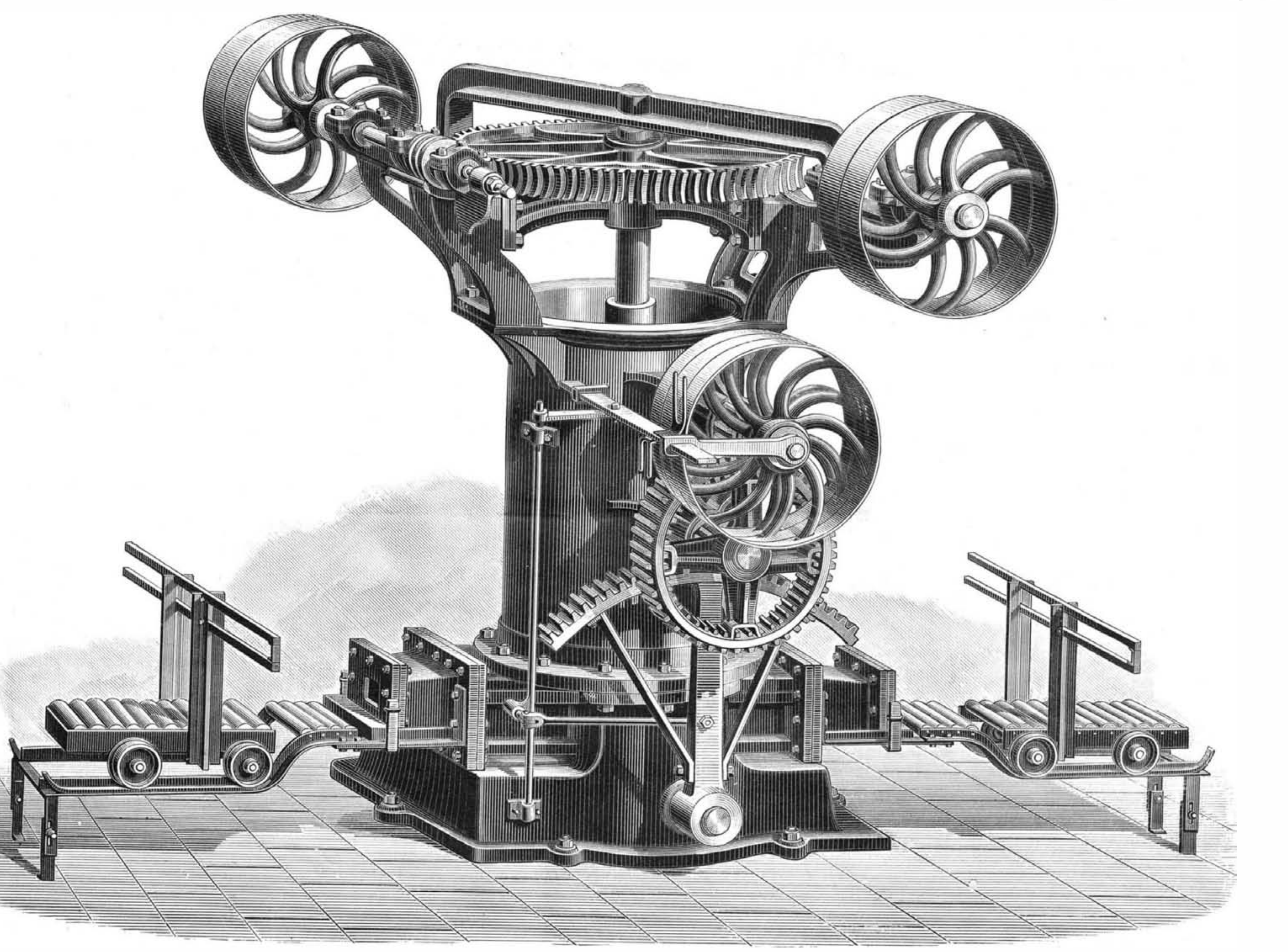
As the alternating motion of the piston is very slow, the head workman has time to cut up one length of clay while another is forming in the opposite moulding box.

It is especially in the mode of performing this work that Mr. Aillot's apparatus differs from all similar ones. In fact, the mechanism appears to us to have been simplified in a very ingenious manner.

In order to understand the transmission and the transformation of the rotary motion, it is necessary to suppose that the axis of the endless screw which drives the toothed wheel of the pug mill is turned on its supports in such a way that the pulleys appear in the foreground. A special transmission, carrying an independent ungearing movement, actuates the small intermediate shafts that are arranged to the right and left of the summit of the pug mill. These gearings are afterward connected with the shaft that carries the first pinion of the train of gearings. This shaft is provided with three pulleys, the central one of which is loose, while the other two are fast, revolve in opposite directions, and work in succession in such a way as to give the piston its alternating motion.

The machine is reversed automatically by a very simple combination of the levers of a double acting ungearing mechanism. When the toothed sector that controls the piston reaches the end of its travel, a horizontal rod, bolted to a spoke of the wheel, displaces, through the intermedium of a vertical shaft and lever, the double-forked shifting bar. It follows that one of the driving belts will then be upon the loose pulley, while the other will be actuating the piston.

Mr. Aillot's improved machine is already operating in several brick and tile works, where it is permitting of the manufacture of all sorts of products, such as tiles, floor slabs, hollow bricks, solid bricks of different shapes, drain pipe, etc. It is capable of turning out about from 8,000 to 10,000 pieces per day of ten hours. —*Revue Industrielle.*



AILLOT'S BRICK MACHINE.

Hints about Paper Negatives.

So far as the development of paper negatives is concerned, there is nothing special in which the manipulations vary from those in connection with glass plates. The exposed paper is first soaked thoroughly in water until flat, and then, lying film side uppermost, the water is poured off, leaving the paper adherent to the bottom of the dish. If the developer be now poured gently into the dish, the negative will retain its position during the whole operation, and there will then be less chance of air-bells forming, or of the paper becoming doubled, and causing unequal action. If it be necessary to examine the negative by transmitted light, it is better, after having done so, to pour the developer out of the dish, and carefully lay down the negative before repouring on the solution, as, if it be attempted to float or immerse the tissue in the limited space of the developing dish, the chances are strongly in favor of inequality of action.

So far as the solutions are concerned, the instructions of the manufacturers of the paper should be followed. We have used both ferrous-oxalate and pyro development, but strongly prefer the latter. With due care in washing there is not the slightest fear of staining the paper, and in this respect we think pyro has a distinct advantage over the iron salt. If from prolonged development there should be a slight stain, it is best removed by a short immersion, after careful washing, in a strong solution of bisulphite of soda; only in cases where it is absolutely necessary, in order to prevent softening of the film, do we recommend the employment of alum.

The next operation, and one of the utmost importance, is the drying, as, if this be not properly done, the negative will be perfectly useless, until it has been rewetted and again dried; if, indeed, as may easily happen, the first drying has not irretrievably spoilt it. If left to dry alone, the negatives will, of course, "cockle" and curl up into all sorts of shapes, from the difference in contractility of the paper and the gelatine film; the latter, too, will sometimes crack during the operation. If any attempt be made to straighten such a negative, the probability is that it will be torn or broken, or that creases will be formed which it is impossible to get rid of afterward; therefore our advice is to take a little care at first in drying properly.

One plan is to take a piece of glass very slightly larger than the damp negative, and tip its edges to the depth of three-sixteenths of an inch with strong glue or gelatine; then lay down the negative smoothly with the plain paper surface in contact with the glass. In drying, the edges will adhere, and the center portion will be stretched, smoothly and uniformly, literally as "tight as a drum." The point of a penknife passed round the edges will release the negative in a condition of the most perfect flatness.

But the best process of all, though perhaps a little more troublesome, is undoubtedly the following: A sheet of glass is cleaned, polished with talc, and collodionized; the damp negative is then cemented to the collodion surface with gelatine in the ordinary way by squeegeeing the two in contact, and allowed to dry. When dry, the negative and collodion film are stripped from the glass, the surface resembling an enameled print. The great advantage of the collodion surface lies in the fact that, should the negative accidentally get wet during printing, it will not adhere to the print, as would otherwise inevitably be the case.

The only remaining question is that of waxing, or rendering the paper translucent. We do not recommend it, as with many samples of paper it rather increases than diminishes the grain or texture. If it be resorted to, the best material, in our opinion, is solid paraffine or "paraffine wax," as this does not become yellow on exposure to light and air. The application is made in the usual way by laying the negative *face downward* on a hot plate and rubbing the back with a lump of the solid wax, the surplus being removed with a pad of flannel. It will be just as well to give the front or gelatine side of the negative a rub with the waxed pad, as, if it perform no other function, it will act as a slight protection against damp; but if applied to the face of the negative only, the wax will not penetrate through the gelatine film to the paper.—*British Journal.*

Some Curious Hail Stones.

A Minnesota correspondent writes us of a hail storm experienced over a narrow district in that State, on September 14, where the hail stones falling reached a size of 9 to 11½ inches in circumference. On being broken open, the interior was like frozen snow, but surrounded by different rings of clear ice, as though they had, in formation, been suspended some time in the upper air, and during this period had passed through clouds of greatly varying temperature.

The Coast Whale Fishery.

Whale fishing off the New England coast by small steamers is getting to be quite a business. During the past two months four steamers have been engaged in this work, viz., Fannie Sprague, Mabel Bird, Hurricane, and Josephine.

They cruise off the Maine and Massachusetts shores, as far south as Cape Cod. A bomb-lance, fired from a gun held at the shoulder, is used for killing the whales. Up to date about forty whales have been captured.

As the men become expert in the manner of capture, the whales become shy and keep more in deep water. After being killed they usually sink, and it is doubtful if the business, as at present conducted, will last if the whales are driven off from near shore, it being difficult to recover them in over 40 fathoms of water.

The whales captured the past few weeks average 60 feet long, and weigh about 25 tons each; they yield about 20 barrels of oil, 2 barrels of meat, 5 tons of dry chum, and 2 tons of bone, about $400 being realized from each whale, on the average.

Double Rails.

According to the Joliet (Ill.) *News*, the Joliet Steel Co. now roll steel rails in 2-rail lengths, thus saving two crop ends on every two rails, as well as securing a larger product than by the old method of rolling single rails. The company intend to roll 4-rail lengths after a while. The rails are passed through the rolls by machinery.

LOCKS OF THE MANCHESTER SHIP CANAL.

At Latchford, some 15 miles from the Manchester dock, it is intended to construct a dock for the accommodation of Warrington; and there are to be coal docks at Irlam and Barton. The canal locks at these places are of compound design; at Latchford there will be a group of three locks of different sizes, placed side by side. The largest will hold several ships at once, but they will have intermediate gates to allow a part of the lock to be used without waste of water. Hundreds of vessels may thus pass these locks in a day. The Irlam and Barton locks are to be similar in design, but without tidal gates. The gates and sluices will be worked by hydraulic power, but steam power will also be provided. In other respects, the locks on the Manchester Ship Canal will be constructed very similar to each other, so that in illustrating one of these locks from the engineers' designs, a very good representation of the various locks on the canal route is afforded to the reader, so that we need only add that in its course the canal will ascend five of these locks.—*Engineering Review.*

A NEW STEAMBOAT.

The annexed cut represents the model of a new steamboat constructed by Mr. Emil Adam, of Prague, Austria, and with which astonishing results were obtained.

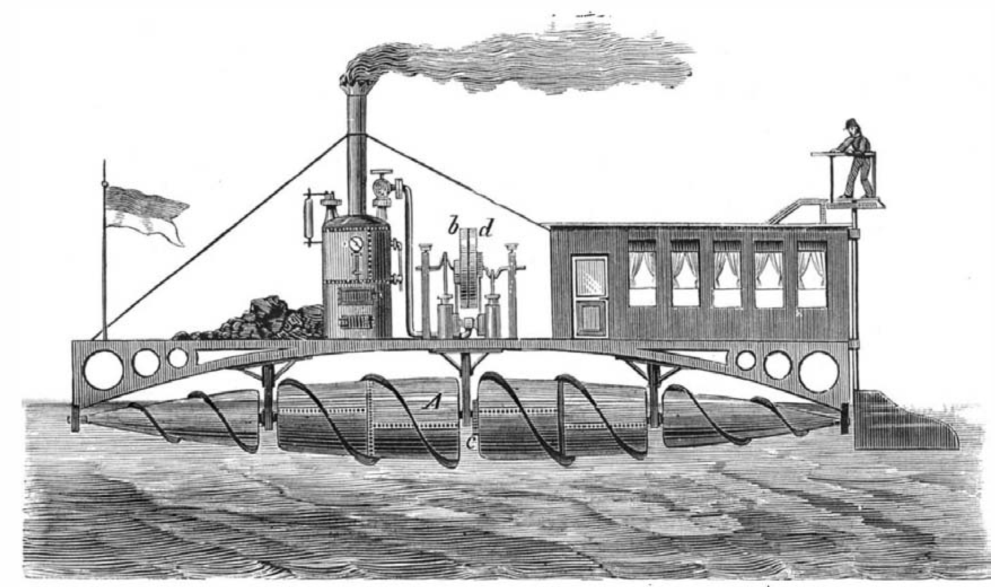


Fig. 1.—A NEW STEAMBOAT—SIDE VIEW.

According to the *Erfindungen und Erfahrungen*, from which we copy, the inventor set out to reduce the resistance of the water as much as possible, and for this purpose constructed the hull of his vessel of two hollow cylinders, which are tapered from the middle toward both ends, whereby a shape resembling that of a cigar was obtained.

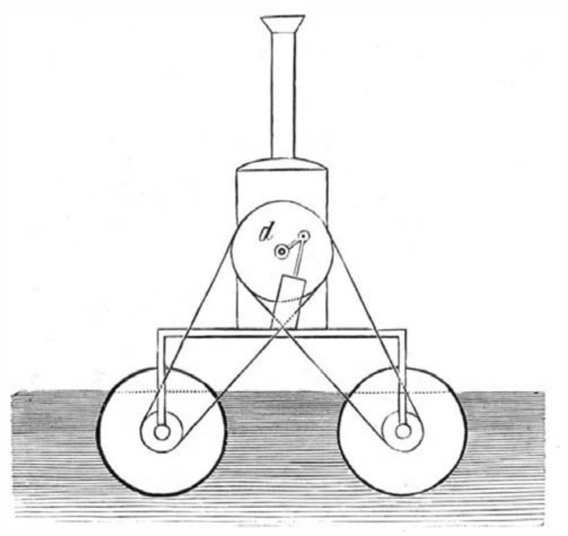


Fig. 2.—END VIEW.

Each cylinder is provided on its outer surface with a screw thread, formed of metal plates riveted on the cylinder, the line of inclination of the thread being about 45° to the longitudinal axis of the cylinder. Annular recesses or breaks are formed in the cylinders at suitable intervals for the bearings supporting the frame of the vessel. The cylinders are rotated by a suitable engine, of any desired construction, on the deck or platform of the vessel. The water in which the cylinders revolve acts as a nut for the screw threads, whereby a rapid motion in either direction is obtained; especially as the frame, decks, etc., are entirely above the surface of the water, and thus offer little or no resistance.

Fig. 1 is a side view of the vessel, and Fig. 2 is an end view of the same, the latter figure showing the belts for transmitting power to the screw cylinders. In the vessel shown, the two cylinders act the same as the two vessels forming a catamaran.

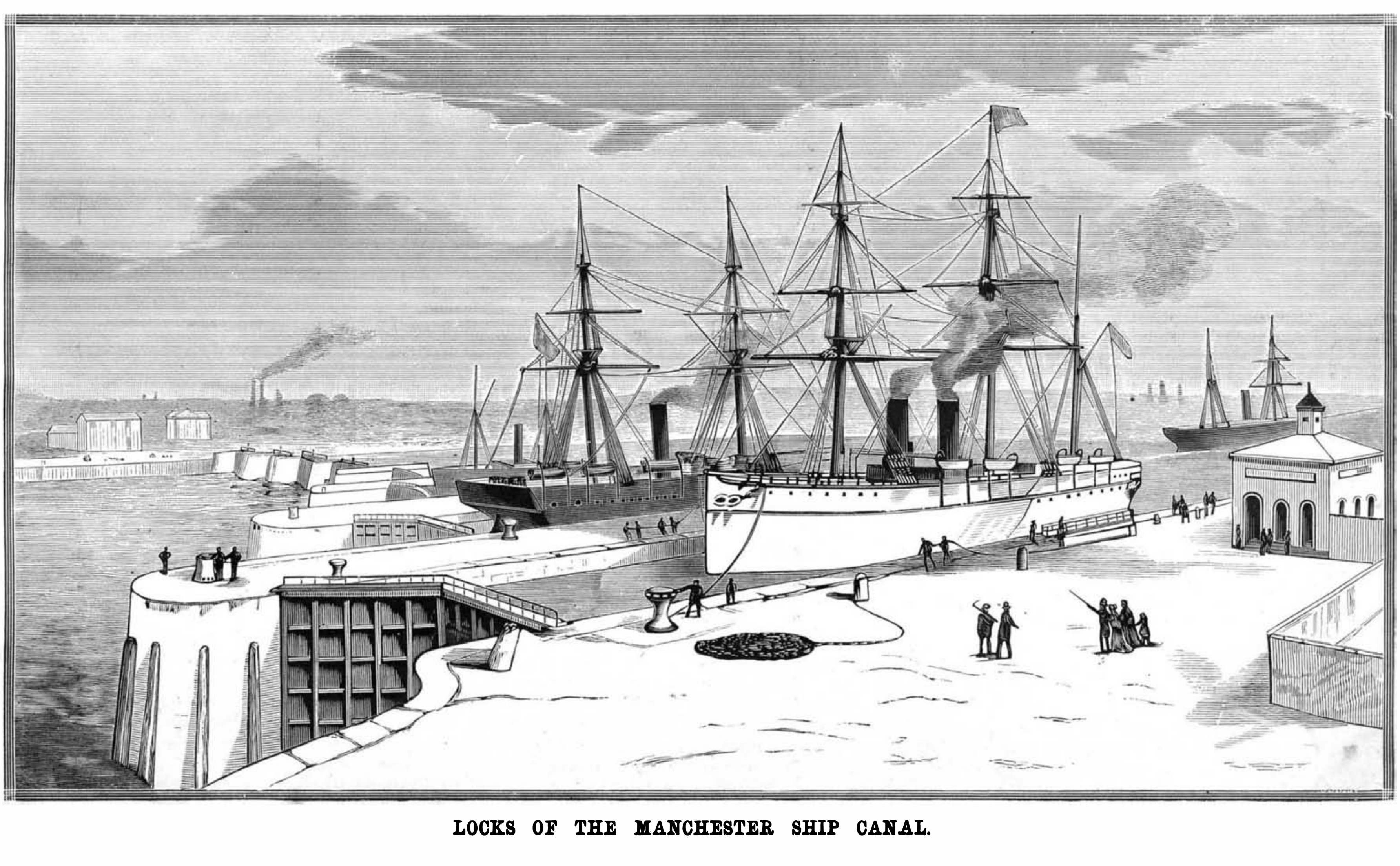
If desired, a third cylinder may be provided, or the number may be still further increased.

Walnut Hair Dye.

The juice of the walnut rind has been used from time immemorial as a hair dye. Bernschen and Semper have recently communicated to the Berlin Chemical Society a method of preserving it for use in the shape of a hydroglucoside, prepared as follows: The rinds of the ripe nut are digested in sulphuric ether until their coloring matter is extracted. A solution of chromic acid in water is added to the ether solution, and the mixture thoroughly agitated. The ether is then distilled off, and the residue purified by solution, first in hot ether, and afterward in a mixture of chloroform and petroleum ether, from which latter it is obtained in a crystalline form as hydrogen glucoside. This substance colors the hair and skin exactly as does the juice of the fresh rind.—*National Druggist.*

Car Coupler Company.

The Hilliard Car Coupling Co., says the Kansas City *Times*, has filed articles of association in the county recorder's office. The capital stock of the company is $600,000, divided into 6,000 shares of the par value of $100 each. The names of the incorporators and the number of shares held by each are as follows: Thomas J. Hilliard, 1,950 shares; Charles Schryver, 900 shares; William Peake, 1,125 shares; Charles A. Peake, 300 shares; T. K. Hanna, 300 shares; R. H. Drennon, 300 shares; W. C. Duvall, 375 shares; Waldo Suckow, 75 shares; F. C. Adams, 75 shares; H. M. Tilotson, 300 shares; O. L. Woodgate, 150 shares; and J. A. Scott, of Rich Hill, 150 shares. The object of the company is to exercise all rights and privileges under the letters patent granted to Thomas Hilliard in 1882 for improvement in car couplings. The corporation is to continue fifty years.



LOCKS OF THE MANCHESTER SHIP CANAL.

Correspondence.

Rackarock Blasting Powder.

To the Editor of the Scientific American:

In your issue of the 10th inst. you state the power of rackarock to be 95 per cent of No. 1 dynamite. As a matter of fact, the average of the tests made for the Government by Gen. Abbot himself *ran nine per cent above* No. 1 dynamite.

You have taken our guarantee instead of the actual results attained. As usual, "we promised less than we performed."

RENDROCK POWDER CO.,
A. C. RAND, *Treas.*

How to Engrave Egg Shells.

To the Editor of the Scientific American:

Trace the writing or design on the shell with thin varnish or melted wax, using a common pen; then immerse the egg for a few minutes in vinegar or dilute acetic acid. A few experiments will determine the proper time, depending on the strength of the acid employed. Then wash the egg in water, and remove the tracing. Wax will rub off, and varnish will come off with alcohol. The result will be a most beautiful and delicate relief of the desired pattern. If varnish be used, a colored background can be produced by dyeing the egg before applying the alcohol. Wash tne egg before dyeing it, as the acid would injure the color.

E. L. INGRAM.

Wilmington, Del., Oct. 3, 1885.

Measuring the Height of Trees.

To the Editor of the Scientific American:

Measure off a distance from the foot of the tree which the experimenter may think is a little less than the length of the tree, and stand facing the tree with a staff of such length that it may be stuck into the ground until the top is on a level with the eyes. Then lie down on the back with the feet against the foot of the staff, the head being in a straight line away from the tree. It will be understood at once that the line of vision, passing just over the top of the staff, will strike the tree exactly the same distance from the ground that the eyes are from the foot of the tree. Of course, it is presumed that the tree is straight and that the direction selected to form the bottom of the right angle is level. It is easier to obtain these conditions by this process than by computing from shadows, as any side of the tree may be chosen.

This plan has been followed for years by woodsmen to find out before cutting whether a tree would make a stick of timber of a desired length or not.

N. L. GANO.

Fernandina, Fla., Sept. 28, 1885.

Pneumonia and Ozone.

To the Editor of the Scientific American:

In the issue of October 3 of your most valuable paper, which has been to me a constant friend and valued teacher for thirty-five years, I find an article headed "Pneumonia and Ozone."

In the interest of suffering humanity, I wish to call the attention of scientific observers to some facts that have come under my observation.

A member of my family has been suffering for more than twenty-five years from neuralgia. During the year 1865 I first observed that the malady enabled her to detect the approach of storms. The attacks always commenced before a storm reached her place of residence, and ended as soon as it rained, or gradually diminished as the storm passed by.

For the last ten years I have carefully watched the effect of storms on the invalid, and, by the government reports of the paths and extent of the movements of storm centers over the country, I find that on the approach of a storm the suffering will commence, and cease as soon as the storm center is reached. When the edge of a storm center passes over the residence of the patient, she will suffer until the whole storm center has passed by.

In the year 1871, during the prevalence of the peculiar disease that so completely prostrated the horses in Boston, the "epizooty," as it was called, the invalid suffered continually. During that year I had peculiar opportunities of observing the large excess of ozone in the atmosphere. Since then I have repeatedly tested the condition of the atmosphere in front of the storm center, and along its skirts, and always discovered an excess of ozone.

I have frequently called the attention of the medical profession to my observations, but found that all with whom I came in contact were satisfied with giving relief by the use of morphine, narceine, or chloral, rather than investigate the cause. All observers must know the fact that we are very sensibly affected by the chemical condition of the atmosphere. I hope, therefore, that you will call attention to the above facts, and request physicians in all parts of the world to which your valuable paper is carried to make such observations in connection with pneumonia as will establish or disprove its connection with ozone. If in modern science we once find the cause, we can readily find the remedy.

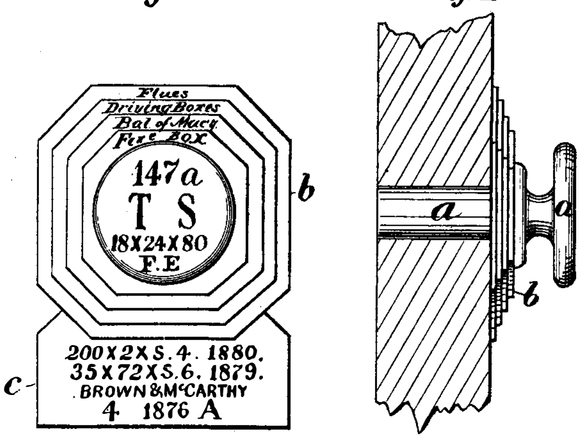
An old contributor,
JOSEPH A. MILLER, C.E.

KEEPING TRACK OF LOCOMOTIVES.

On a road of several divisions or of several engines, it is desirable frequently, and necessary, that the master mechanic, and sometimes the superintendent, have some means of determining at a glance the condition, size, etc., of the several engines, as well as their location and occupation. This is sometimes partially filled by a list, which, as it requires to be newly made each month, if anything like accuracy is desired, is, for the the reason of the bother of this, too frequently left undone, and the list generally is allowed to get several months and sometimes years old, when, of course, it is useless. I have seen a board arranged with clips to allow of the insertion of different colored slips of cardboard, which, having a certain feature exhibited by the color, gave the condition of the engine.

I have gotten up several boards based on this system, but which are simpler and, I think, much more complete. A board of the size to allow for the number of engines is arranged with feet, so that it may stand in any convenient position, or be hung on the wall. Where different divisions are to be represented, this is

Fig. 1. Fig. 2



easily done by giving to each division a distinctive color, and painting each portion of the board allotted to such division that color. The board is pierced with holes, about three inches apart each way, each hole for an engine. Squares of cardboard of different colors and shades are provided, with holes through which the pins can be slipped to retain them in place on the board. The plan is that each color represents a part of the engine, while the shade of the color the condition of that part. The cards are of increasing size, so that they may all be seen.

Suppose it is desired to divide the engine for record into four general parts, such as the flues, driving boxes, balance of machinery, and firebox; then it would be necessary that the first card next to the board be the larger, as shown by "flues" in Fig. 1, so that it might show over those following it, the rest decreasing in size as shown. It is, therefore, necessary to establish the order in which they go on to the pins, as, say, flues front, driving boxes second, etc.

The flues may be represented by blue, driving boxes by red, balance of machinery by green, and the firebox by yellow, etc. White represents a first class condition, black that the engine is in the shop for repairs. The condition of each portion is represented, therefore, by the shade of color, while the part is represented by the color and position of card on the pin. The condition is divided into first class, represented by white; fair or needs light repairs, by a light shade of the distinctive color; needing heavy repairs, by a darker shade of the same color; and in the shop, by black.

Suppose, in Fig. 1, that the flues are in bad order; then, as blue indicates the flues, and they need heavy repairs, the first card next to the board would be a dark blue. The driving boxes need light repairs, and therefore the next card would be a light red; the balance of machinery being as supposed in fair order, or needing light repairs, the next card should be a light green; and the firebox a light or dark yellow, as answered the condition of it. Suppose the engine to be in the shop for heavy repairs or a general overhauling. This would be indicated by the first or largest card being black, and each of the following cards of dark shades. If, however, she was in for a new set of flues, with nothing else to be done—an improbable case, but supposed simply to illustrate how this might be indicated—the proper arrangement would be: put a black card to indicate the engine was in the shop, and next a dark blue to represent heavy repairs to the flues; and as it is supposed that nothing is to be done to the balance of the engine, the balance of the cards would be white. But if light repairs were to be made on the balance of the engine, light shades of red, green, and yellow cards would follow, If new flues and a new firebox, and the balance light repairs, were the conditions, the black card would come first, to show the engine was in the shop, dark blue next to indicate heavy repairs to the flues, light red next to indicate light repairs to the driving boxes, light green to represent light repairs to the balance of machinery, and a dark yellow to show heavy repairs to the firebox. An engine just out of the shop would be represented by all of the cards being white, to show first class condition; and as her parts deteriorated by service, the conditions would be shown successively until she again went into the shop.

Each month each division master-mechanic makes out a report of each engine on his division on a printed slip or sheet, on which the words flues, driving boxes, balance of machinery, firebox, service, with or without air pump, engineer, and fireman, etc., are printed, opposite to which he records the proper words in answer. This sheet being forwarded to the general master-mechanic, in whose office the board is properly supposed to be, he furnishes the boy whose duty it is to look after the board the necessary information with which to change the board to the new conditions, thus supplying at a glance all of the information generally desired to be known in a hurry about each engine.

On the end of the pin, *a*, Fig. 1, is marked the number of the engine—147; next follows the initial letters of the stations she is running between, as T for Turtletown and S for Sheboygan. 18 x 24 x 60 shows the engine 147 has 18 x 24 cylinders and 60 inch drivers. The letter F that she is in freight service, and E that she is an eight wheel or American type. In place of E, M for mogul, T for ten-wheeler, and C for consolidated would be substituted to meet the case.

If it is desired to extend the information exhibited, a card, *c*, being the first card next to the board, and having a lower extension, as shown, may be used, on which may be recorded whatever may be desired, as 200 x 2 x S. 4, 1880 would stand for 200 two inch flues, S for steel flues, and 4, 1880, that the flues were put in the fourth month of the year 1880. 35 x 72 following would indicate the size of the firebox, S that it was steel, and 6, 1879, that it was put in the sixth month of the year 1879. Brown and McCarthy are the engineer and the fireman; 4, 1876, the date when the engine was last overhauled; and A that the engine has an air pump; and as much more information as may be desired, the *position* of each line showing what it refers to. A key, explaining this and the colors, etc., is convenient, although not necessary, as the simple planning out of such a board will suffice to make the whole clear, so that a glance is sufficient to answer many questions which are ordinarily only determined after hours of hunting through books, etc. FRANK C. SMITH.

Explosions Caused by Carbon Dust.

Mons. C. Engler has been making some experiments on the nature of explosions caused by various kinds of dust, more especially in connection with accidents which have occurred in the manufacture of lampblack. He finds that these explosions may be attributed to the inflammation of a mixture of combustible gases and air, of carbon in a finely divided state, or of a mixture of combustible gases and particles of lampblack in air. The problem which he set himself to solve was this: Is it possible for the inflammation of dust floating about in the air to take the form of an explosion, even when this dust is incapable of engendering a combustible gas under the influence of heat? It is scarcely necessary to follow the details of the experiments; but as the conditions of one series were those in which a combustible dust and an inflammable gas were brought in contact with each other—circumstances which have been found to give rise to spontaneous combustion of a more or less explosive kind—some particulars in regard to them may be given. The first materials selected were charcoal dust and ordinary illuminating gas; and it was found that air mixed with from 8 to 12·3 per cent of gas and dust exploded on ignition. When the mixture was from 3·5 to 7 volumes per cent, the whole mass rapidly took fire; but when there were only 2·4 volumes per cent, the mixture did not ignite. According to Herr Wagner, air charged with Munich gas to the extent of 6·7 volumes per cent will, on ignition, cause slight explosions; but air which contains only 6·25 per cent of gas is not susceptible of ignition. With Carlsruhe gas (with which the experiments were made), it was found to be impossible to cause the inflammation of mixtures of air containing less than 7·5 per cent of gas. It seems, therefore, that a mixture of air and lighting gas (where the latter exists in too small a quantity to allow of its inflammation) becomes capable, whenever it contains, in addition, particles of carbon in suspension, not only to quickly propagate flame, but to produce actual explosions. The experiments of M. Engler possess especial interest, inasmuch as they show that a carbon which does not develop combustible gases under the influence of a high temperature (as, for instance, charcoal) is nevertheless capable of rendering explosive a mixture of air and hydrocarbon gas when the proportion of the latter would, under any ordinary circumstances, be insufficient to engender flame,

THE GREAT "BOA" OF THE PARIS MUSEUM.

The boa family (*Boidæ*) comprises the boas, the tropidophides, the eunectes, etc. The reptile which has just been added to the menagerie of the Jardin des Plantes at Paris, and which is certainly one of the largest that has ever been seen in Europe, is not a "boa," as it has been erroneously styled, but a eunectes—*Eunectes murinus.* It is over twenty feet in length, and the size of its body is as large in proportion. This species of *Eunectes* is found in South America, especially in Guiana and Brazil. It was made known by Fermin, in his natural history of Surinam, and its habits have been since described by Prince Neuwied, in his *Beitrage zur Naturgeschichte von Brazilien* (vol. i.). The following are a few of the data that we owe to this accomplished traveler:

In Brazil this serpent is called *cucuriubu* or *cucuriu.* The Botocudos name it *ketameniop.* The Prince saw specimens that were twenty feet in length, and the inhabitants assur~~ed him that in wild and uninhabited~~ places the animal attained a much greater length. This serpent usually lives in the water, where it lies upon the bottom, with only its head protruding. Being a skillful diver, it is capable of going beneath the water and not appearing at the surface again till quite a long time afterward. Sometimes it swims rapidly through the water in all directions, after the manner of eel-like fishes, and sometimes, on the contrary, it abandons its stiff and immovable body to the rapid current of a creek or river. Sometimes it lies stretched out upon the sand or rocks of the shore, or else upon a fallen tree, patiently waiting for some thirsty mammal to approach near enough to be seized. The animals that it oftenest captures are agoutis, pacas, and capybaras. It is said that it also eats fishes.

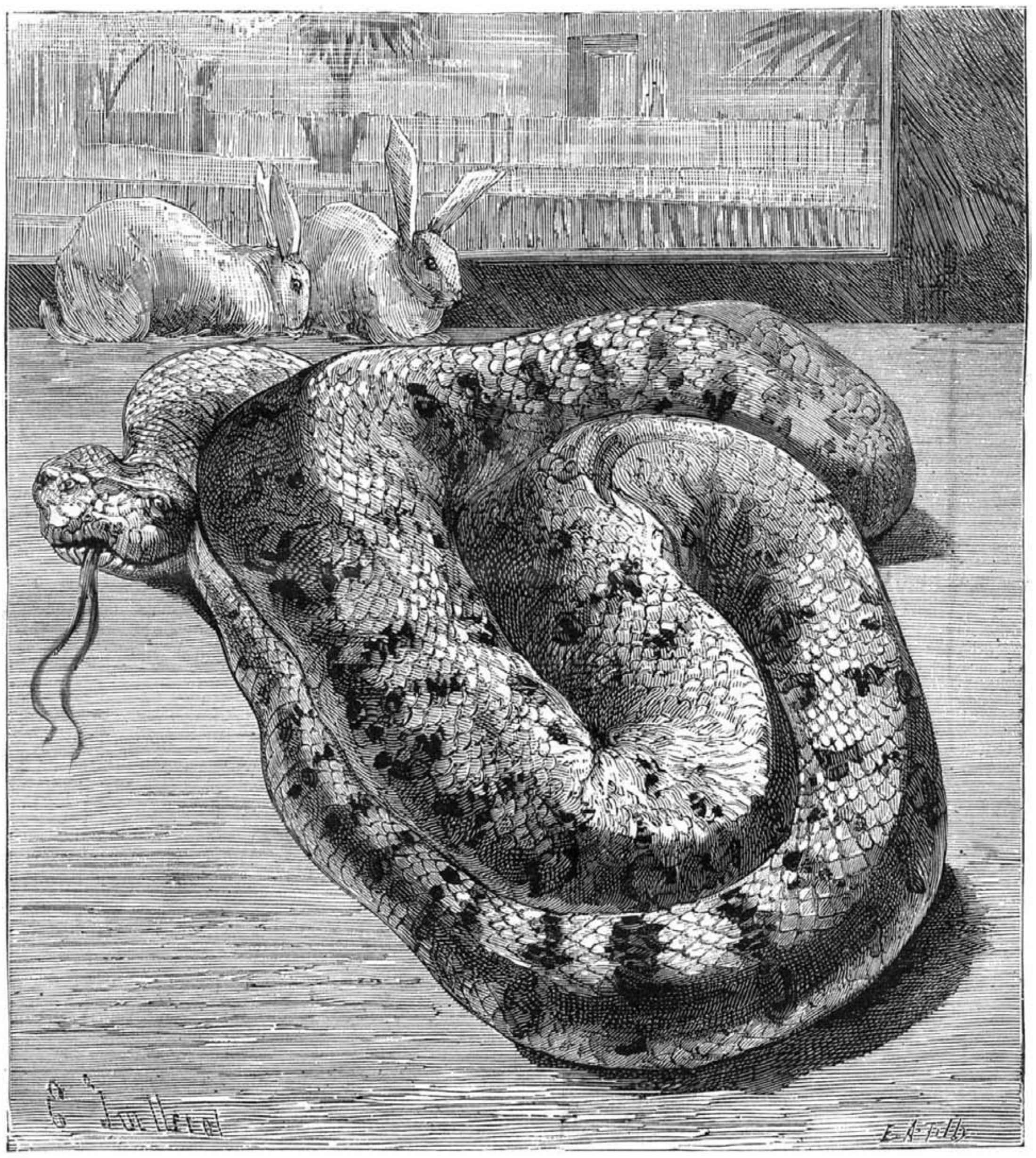
In Brazil the eunectes does not become torpid in winter. The bow and gun are the weapons that the natives use for killing it, except when it is upon land, where it moves but slowly. In this case they dispatch it with clubs. Its skin is used for making footgear and traveling bags. Its fat is employed for different purposes, and its flesh is eaten by the Botocudos.

The eunectes, like the species of the other genera belonging to the family Boidæ, is in no wise venomous.

There are already in the Museum of Paris several eunectes, either stuffed or in alcohol, two of which are of great size. One of these is not so long as the live specimen at the menagerie, but its body is thicker.

The new boid of the Jardin des Plantes reached the menagerie the 21st of last July. It came from South America, and was purchased from a dealer in animals at Liverpool. Food has been offered it, but it has so far refused to eat fishes, rabbits, or other victuals. There is nothing surprising in this, since these sorts of reptiles are capable of going several months without partaking of food.

The animal usually remains in a bathing tub full of water in its cage, its head protruding from the liquid. It comes out of the water for a few moments during the day, but it is almost constantly immovable, and assumes nearly the position shown in our engraving, which is from nature. The rabbits figured alongside of it will give some idea of the reptile's dimensions.—*La Nature.*



EUNECTES MURINUS.

A Mustard Sponge.

In referring to sponge as a carrier of poultices, Dr. Richardson considers that it makes the best of mustard carriers. Mix the mustard in a basin with water until the mass is smooth and of even consistency. Then take the soft mass all up with a clean sponge, lay the sponge in the center of a white handkerchief, tie up the corners neatly, and apply the smooth, convex surface to the skin. This mustard sponge, warmed again by the fire and slightly moistened, can be applied three or four times, is good for several hours, and saves the trouble of making a new poultice during the weariness of night watching. The sponge can afterward easily be washed clean in warm water.

How Long Will Oysters Live out of Water?

In the Bulletin of the U. S. Fish Commission, Prof. A. E. Verrill says: My attention was recently called by Capt. C. H. Townsend to a large cluster of oysters attached to an old boot which had been hanging in the front windows of the fish market of Charles Reed, in this city, for a long time. This cluster was taken from the water in the early part of December, 1884 (about the 10th, it is said), and when I examined it on February 25, several of the larger oysters were still alive. I am told that they continued to live for some days afterward. The larger ones, which were still alive, were of about the size ordinarily sold in the market. Most of the smaller ones were dead, and many of the larger ones, of which the edges had been broken or chipped, were dead and dried up when I saw them. Those that were alive had all been hung up with the *front edge of the shell down* and the hinge upward. They had been hanging in the show window, attached to a gas burner, during the whole time (over ten weeks), freely exposed to the air and light. The room was, of course, rather cool, as such shops usually are in winter, and the window space, although open freely to the shop, was doubtless still cooler, especially at night, but the air must have been dry and the temperature quite variable. The window faces to the west, and would have direct sunlight in the afternoon. The remarkable duration of the life of these oysters is undoubtedly due to two causes:

1. The perfect condition of the edges of the shells, which allowed them to close up very tightly.

2. The position, suspended as they were, with the front edge downward, is the most favorable position for the retention of water within the gill cavity, for in this position the edges of the mantle would closely pack against the inner edges of the shell, effectually closing any small leaks, and the retained water would also be in the most favorable position to moisten the gills, even after part had evaporated. It is also possible that when in this position the oyster instinctively keeps the shell tightly closed, to prevent the loss of water.

This incident may give a hint as to the best mode of transporting oysters and clams long distances. Perfect shells should be selected, and they should be packed with the front *edge downward*, and kept moderately cool, in a crate or some such receptacle which will allow a free circulation of air. Under such favorable conditions selected oysters can doubtless be kept from eight to twelve weeks out of water. Probably the quahaug, or round clam, which has a very tightly closing shell, when perfect can be kept equally long in the same way.

The Star Fish.

No animal is more common on the rocky coasts than the star fish, and for this reason visitors to the seashore are very apt to pass it by, and search for the more attractive and rare sea anemones. But in doing this they pass by one of the most interesting animals, and one which has very curious habits. Drop a star fish into a glass dish filled with sea water, and watch it for a few moments. If it happens to drop on its back, one of the five arms which seem so rigid when taken from the water will begin to bend, scores of small suckers will fasten themselves upon the bottom of the tank, and soon the star will be right side up.

He is a restless creature when in an aquarium, and will continually rove about in search of something to eat. He moves about with a slow, regular motion, which at first seems mysterious. There is no irregular motion, as in walking, but simply a slow propulsion along the bottom or up the sides of the tank, as if pushed on by some continual pressure from behind. In a moment he mounts the perpendicular side, and through the transparent glass we have an opportunity to see how he moves. In the center of each arm there is a depression, and in each depression there are several rows of pure white suckers extending from the base to the tip of the arm. These are his locomotive organs, and well do they serve the purpose. There are hundreds of them, elastic, yet muscular, all working at the same time to propel the creature along. One loosens its hold, stretches itself out, and takes another hold an eighth of inch further up. Others follow, and the creature moves. It is held firmly, yet at the same time is continually moving.

But see, it is approaching a mussel hanging by its finely woven byssus to the side of the tank. Can it have designs upon this shell fish? Straight toward it the star moves, it nears the mussel, the forward suckers touch the shell; the star hesitates a moment, then moves on faster than before. One arm has passed over the mussel, and the mouth of the star fish is just over the center of the shell. Surely it can do no harm to this well defended shell fish. Its mouth is so small that it cannot swallow the mussel, and surely it cannot bore into the hard shell.

The star fish has stopped, the five arms are curled around the mussel, and it is held in a strong embrace. We watch the star fish with renewed interest, but all we see is the same motionless attitude, no change in position, nothing to indicate change. The star seems satisfied to remain as it is, as if at rest. Soon a thin membrane encircles the mussel, but nothing further is seen. We revisit the aquarium at the end of an hour, and the star is in the same position; at the end of two hours there is no change; but in three hours we return to see the star fish nestled in the darkest corner of the aquarium, while the unfortunate mussel hangs in its old position quite dead, the shell gaping open, and numerous little shrimp feeding on the half digested parts left by the destructive star fish.

What has been done? Simply this—the star fish, unable to take the shell into its stomach, has accommodated itself to circumstances, and extended its stomach out of its mouth, and digested the shell fish with its stomach entirely outside of its body. In this silent manner hordes of star fish invade the oyster beds, and in a single night destroy thousands. The oystermen, recognizing their destructive power, formerly had the stupid habit of cutting every star fish that they caught into three or four pieces and returning them to the water, not knowing that each piece had the power of reproducing itself, and that for each star thus torn into three or four pieces, two or three new individuals were formed. R. S. T.

Gloucester, Mass.

PAPIER maché has come of late to be largely used in the manufacture of theatrical properties, and nearly all the magnificent vases, the handsome plaques, the graceful statues, and the superb gold and silver plate seen to-day on the stage are made of that material.

AGRICULTURAL INVENTIONS.

A harrow has been patented by Mr. Philip Nelson, of Las Vegas, New Mexico Ter. This invention covers improvements on a former patented invention of the same inventor for the support and adjustment of a plate through which the harrow teeth pass, the plate serving as a gauge to regulate the depth of the teeth in the ground, or as a smoothing plate for pressing the surface of the ground.

A combined cultivator and weed cutter has been patented by Mr. Lundy B. Hogue, of Carpenteria, Cal. It has a beam with standards and teeth connected with the axle by hinged drawbars, with a long cutting plate secured to the standards, with other novel features, whereby weeds can be destroyed without loosening the soil, and to facilitate the cultivation of fruit trees and plants.

A cane scraper has been patented by Messrs. Alfred R. Gourrier and Joseph M. Thompson, of Dorcyville, La. Combined with a frame having runners and a double winged scraper is a bar attached to the scraper frame, and operated by a lever, so the forward end of the plow bar and scraper can be raised or lowered as desired, to remove the soil to any desired depth and leave the tops of the ridges smooth.

MISCELLANEOUS INVENTIONS.

A reservoir stove has been patented by Mr. George H. Matthews, of Leavenworth, Kan. This invention consists in a novel arrangement of flues in connection with the ordinary three flue stove, to heat water in the reservoir more rapidly and to a higher temperature than heretofore possible.

A horse blindfold has been patented by Mr. James Brick, of Clifton, N. J. The device consists in a strap having muzzle and blinders attached to it, in combination with a strap connecting the blinders and strap supporting them, for convenience in blindfolding a horse in case of fire.

A grading and ditching machine has been patented by Mr. Benjamin Tobias, of of Washington, Ill. It consists essentially of a cart with a tilting bottom, a plain wheel and a bucket wheel, a plow being arranged to fill the bucket wheel, and a lever mechanism for raising and lowering it.

A flexible match lighting device has been patented by Mr. Daniel E. Carroll, of New Orleans, La. It is a simply made box for a fulminating tape, so made that in case of breaking the box the sectionally formed tape match may be used separately on any suitable igniting surface as a series of independent matches.

A vehicle shaft support has been patented by Messrs. Dewitt Ellsworth and Morris Rogers, of Riverdale, Mich. This invention covers improvements in shaft supporters where a spring catch on the shaft engages a lug or roller on the axle clip, for holding the shafts erect when not in use.

A washboard holder has been patented by Mr. Henry M. Wines, of Center Moriches, N. Y. It is a combination of socket lugs and locking hooks with the washtub and washboard, by which the latter may be held securely in place while being used, and prevented from jumping up in the tub.

A carpet stretcher has been patented by Mr. John M. Hurst, of Coalville, Utah Ter. Combined with a hinged bar having pins is a hasp, staple, hook latch, bands, frames, and pulleys, for conveniently stretching a carpet as desired, while the device may be folded compactly when not in use.

A barbed fence has been patented by Mr. George M. Beerbower, of Cherry Vale, Kan. It has a flat central portion and two pointed ends standing nearly at right angles to the plane of the flat portion, the design being to make a fence that will not mutilate or injure animals and that can be cheaply made.

A cartridge pouch has been patented by Mr. Charles McClure, of Champaign, Ill. Combined with a pouch provided with tubes are mouth pieces on the ends of the tubes, having their lower ends beveled, with springs in the mouth pieces for preventing the cartridges from sliding out of the tubes.

A wire fence post has been patented by Mr. John Schafer, of Marine, Ill. This invention covers a special construction and combination of parts, including a novel form of corner and intermediate posts and diagonal supports, together with a convenient arrangement for readily tightening or making slack the wires.

A gate latch has been patented by Mr. Felix A. Harvey, of McLeansborough, Ill. The frame has corrugated parts, with a slide having corrugated flanges, a prong projecting from the slide, and a screw locking the slide in place, making a latch which can be readily adjusted to operate when the gate sags or shrinks.

A portable desk has been patented by Mr. Charles Newbourg, of Brooklyn, N. Y. This invention covers a novel construction of desk which may be readily folded flat, and if small be carried in the pocket, and which may be readily adjusted to the back of a chair or pew, with its upper surface at a proper inclination for writing or reading.

A corset has been patented by Mr. Sherwood B. Ferris, of Lakewood, N. J. This invention covers the use of plaited sections in the body of the corset, with the plaits confined at suitable points by stitching, so the sections are adapted to receive padding, and the corsets are suitably expansible to fit the bust.

The manufacture of flat brushes forms the subject of a patent issued to Mr. Henry Rosenthal, of New York city. The method consists in placing the bristles around a core, passing a metal band or ferrule around the upper end of the bristles, which are cemented together, and then forcing out the core by introducing the handle.

A calculating device has been patented by Mr. Charles M. Bradt, of Newton, Kan. It is made with a plate having flanges with a series of pivoted rollers and cross strips, the strips and rollers having tables prepared for instantly finding the number of bushels in a given number of pounds, and thus quickly measuring grain.

A stanchion has been patented by Mr. Jackson A. Barber, of North Adams, Mich. It is for securing cattle in stables, and is designed to secure them quickly and so they may turn their necks freely while standing or lying down, the construction being such that a boy can readily secure or release the stanchions.

A fire escape has been patented by Mr. Theodore B. Woodward, of Norway, Pa. This invention provides means whereby a car may be hung upon a house to descend in front of the windows, and so it may be raised and its descent controlled either by its occupants or by persons on the ground or on any floor of the house.

A joint for umbrellas has been patented by Mr. Samuel W. Staats, of Grand Bay, Ala. Combined with an umbrella ring or runner having its top bent over to form a hollow bead with apertures, are ribs or braces passed through the apertures, with cross pieces held within the bead and a sleeve surrounding the slide for holding the bent folded parts in place.

A sash holder has been patented by Mr. George W. Naylor, of Jersey City, N. J. It is a spring holder, with a U-shaped bend in its outer part, holes in the corners of its short arm to receive fastening screws, and recesses over the screw holes to give access to the screws, the design being to prevent the rattling of sashes of cars, stages, etc.

An oil can has been patented by Mr. Henry E. Wolcott, of Syracuse, N. Y. Its construction is such that the body may be filled, and the height of the contents readily ascertained without removing the top, or the top may be removed conveniently to cleanse the can or permit the contents to be more rapidly discharged than by the pump.

A bee hive has been patented by Mr. Joseph J. Pearson, of Batesville, Miss. The walls of the hive carry bars, with recesses in their upper ends to receive pins attached to the upper corners of the comb frames, affording a free passage way for the bees over all parts of the inner surface of the hive, while furnishing a firm support for the comb frames.

An adjustable bedstead has been patented by Mr. Conrad H. Matthiessen, of Odell, Ill. It has a supporting frame, provided at the foot with toothed plates for holding a rod that supports the foot end of the beadstead, so the foot end can be adjusted higher or lower, and any desired inclination can be given to the bedstead from the head to the foot.

A nut lock has been patented by Mr. Lewis J. Williamson, of East Fairfield, Ohio. The nut has a recess in its face in which is pivoted a latch, one end projecting a short distance into the central aperture, and the inner end adapted to engage the threads on the bolt, a spring held on the nut acting on the latch to press the free end into the central opening.

A steam trap has been patented by Mr. Isaac Cumberbatch, of Newark, N. J. Combined with an expansion chamber and the head of its inclosing case is a rounded nut with concaved seat, whereby a perforation in the head will be opened and closed by the expansion and contraction of the chamber for automatically withdrawing the water of condensation from the pipes of steam heaters and other steam pipes.

A range boiler has been patented by Mr. Nicholas Styne, of Brooklyn, N. Y. This invention relates to a specially constructed valve, whereby the circulation pipe can be connected with the boiler or the waste pipe, to facilitate the washing out of range water backs, and to promote convenience in testing the circulation, to see if the pipes or water back are frozen or otherwise obstructed.

A combined adjustable chair, invalid bed rest, and stretcher has been patented by Mr. Frederick T. Dodge, of Carleton, New Brunswick, Canada. The back rest is hinged to the rear end of the seat frame and a leg rest to the front end, and combined with the back rest is a transverse shaft held removably thereon, which can be locked in place, with various other novel features.

A terry loom has been patented by Messrs. Thomas Holt, Jr., of Midland Park, and James Mellor, of Paterson, N. J. Combined with a loom frame and lay are projections on the breast beam, a swinging reel having projections and means for raising and lowering them to bring them into or out of line with the projections on the breast beam, with other novel features.

A boat propelling device has been patented by Messrs. Newton C. Corckran and Robert J. Thompson, of Doniphan, Mo. Combined with a stern wheel are crank arms on the ends of its shaft, with sliding racks in front connected therewith by pitmen, levers with segmental gear teeth, with other novel features, in a boat to be operated by turning a crank in the boat.

A bracket has been patented by Mr. James A. Van Kirk, of New Brunswick, N. J. The bracket has spurs to facilitate securing it in place, and has a slot through which the screw passes for holding it, so that by loosening the screw the bracket can be adjusted without entirely removing the screw, the device being more especially designed for holding window shade rollers.

A churn has been patented by Mr. Abraham C. Gandee, of Syracuse, Ohio. The cream receptacle and its cover form a cylindrical vessel placed upright on a base, a shaft being journaled in one side of the box and in a neck of the other, the shaft operated by a crank, and carrying wings or blades, each of which has an aperture, there being also a drip pan for buttermilk, and other novel features.

A grain measure, register, and sacker has been patented by Mr. John F. Porter, of Mount Washington, Ky. It has a casing with open front and a discharge opening in its bottom, within which is pivoted a wheel divided into compartments by radial partitions, the wheel receiving grain through a feed hopper at the top, so the grain can be measured and discharged from the machine by turning the wheel.

A time signal has been patented by Messrs. Stephen J. Swayze and John C. Lane, of Sag Harbor, N. Y. It consists of an independently acting signal board, which when set will remain wholly displayed the required length of time and then drop suddenly into the signal inclosure, the invention covering an improvement on a former patented invention of the same inventor.

The manufacture of paint from metallic lead forms the subject of a patent issued to Mr. William E. Harris, of New York city. This invention consists in burning the metallic lead with coal, coke, or charcoal, at a temperature of about 2,700° F., whereby the fumes are united and the vapors condensed, the product being in a finely divided condition, ready to be mixed with oil without grinding.

A station indicator has been patented by Mr. Wiley Jones, of Norfolk, Va. This invention consists mainly in the peculiar construction and arrangement of the friction brake, whereby thrust on the bearings of the rollers and unequal wear are avoided, while the mechanism can be readily taken out of the case, the device being also applicable as a revolving calendar or for bulletins.

A stop motion has been patented by Mr. Chester E. King, of Phenix, R. I. Combined with the draught rolls and a belt shifting spring-actuated lever is a pivoted lever having a plate or arm, with other novel features, for stopping a railway head or drawing roll when the sliver breaks, and preventing the broken sliver from winding on the draught rolls and injuring their covering.

A metal splice for uniting the ends of cane strips for chair seatings has been patented by Mr. Francis A. Sinclair, of Mottville, N. Y. It consists of a plate having side flanges and transverse slots, to be used by two cane strips having their ends passed over the plate and through the middle slot, then under the plate and through the end slots from the bottom upward, by which the ends are firmly held.

A mechanical movement has been patented by Mr. Mark B. True, of Newburyport, Mass. Combined with a rotatable disk, and spindles or axles carried by it, is a circular rod or ring arranged to occupy an eccentric position in relation with the disk, cranks connecting the rim and disk, the invention being applicable for giving a parallel and straight motion from a revolving disk in a reduced space.

A saw setting machine has been patented by Mr. John H. C. Winston, of Lynchburg, Va. It has a driving shaft carrying opposite cam disks to lift oppositely arranged pivoted hammers driven by an elastic band against punches, for setting a pair of adjacent teeth at once in reverse ways, against anvils or set blocks held in the jaws of the vise in which the saw blade is clamped, while the punches act on the teeth, with other novel features.

A type writing machine has been patented by Mr. Andrew P. Hansen, of London, Eng. This invention covers a character bar or device adapted to travel across the table to space apart the letters, with mechanism for moving the paper, or in lieu of the oscillating index lever the type rack may be made to act as the index lever, the invention admitting of various modifications in the construction of an effective type writer. (Address Theo. Bourne, 100 William St., New York city, concerning this patent.)

NEW BOOKS AND PUBLICATIONS.

MINERALOGY SIMPLIFIED. Easy methods of identifying minerals, including ores. By Henri Erni, A.M., M.D. Philadelphia: Henry C. Baird & Co., 1885.

In this second edition of Dr. Erni's Elementary Mineralogy, the work has been revised and considerably enlarged. It is divided into two parts, treating of modern chemistry and of determinative mineralogy. In the introduction to the mineral tables is given a glance at chemical philosophy; a description of the apparatus and manipulations of the laboratory; the preparation of the common reagents; blowpipe analysis and apparatus; the reactions of the oxides with general reagents; flame reactions; special methods for the detection of certain elements; and finally the operations of fusing and fluxing. The descriptions are for the most part clear and intelligible, though the desire to abbreviate has occasionally produced a little obscurity. The part treating of determinative mineralogy is based upon Professor von Kobell's well known tables, and shows no particular originality of arrangement. It is not so compact as Dr. Frazer's translation of the same authority, nor so clear and easy of reference as the tables compiled by Professor Brush. The characteristic behavior of the most important ores before the blowpipe and with solvents is also given, together with some information regarding the coals and natural hydrocarbons. The work is well printed and illustrated. It is intended chiefly for practical people and amateurs, whose presumed knowledge of chemistry is somewhat limited, and, in spite of some faults, is nevertheless worthy of their attention.

LECTURES ON THE PRINCIPLES OF HOUSE DRAINAGE. By J. Pickering Putnam, Architect. Boston: Ticknor & Co., 1886.

Mr. Putnam's brief summary of the essential features of good house drainage comes to us very well recommended by Colonel Waring and other authorities in sanitary engineering. It consists of lectures delivered before the Suffolk District Medical Society and the Boston Society of Architects. The book is divided into three parts, treating respectively of traps, of lavatories, baths, etc., and of soil and drain pipes. Under these headings the main features of house plumbing are carefully discussed, and a number of sensible suggestions are offered. The merits of the author's patent "Sanitas" apparatus claim, however, almost too much attention in a work which is presumably not an advertisement. The publishers have anticipated the year of grace 1886, but have omitted to supply a table of contents or an index. The work is well illustrated by seventy woodcuts.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

Minerals sent for examination should be distinctly marked or labeled.

(1) P. L. asks (1) the best way to kill reptiles, without disfiguring them. A. Use chloroform. 2. The proper strength of the alcohol to preserve the same in? A. A diluted alcohol, about 40 per cent, is used at first, and in time the strength can be increased to 80 or 90, as may be deemed necessary.

(2) E. P. M.—Silver or any metal should not be hammered to the extent to show cracks without annealing. Heat to a low red, allow to cool until it loses the heat color, and plunge in water. To remove solder coloring, you must refinish. You should use an alcohol flame with your blowpipe.

(3) H. W. F. asks: 1. What can I use to prevent Russian stove pipe from rusting? A. Such pipe with ordinary care should not rust; perhaps a little application of plumbago would be good. 2. What kind of blacking or polish can I use to make it look like new? A. Take of:

Asphaltum	2 pounds.
Boiled linseed oil	1 pint.
Oil of turpentine	2 quarts.

Fuse the asphaltum in an iron pot, boil the linseed oil, and add while hot. Stir well, and remove from the fire. When partially cooled, add the oil of turpentine. Some makers add driers. 3. What will take the rust off the pipe? A. Dip the pipe in a solution of one part sulphuric acid and ten of water, and then immerse in a bath of hot lime water; finally rub with dry sawdust.

(4) E. M. N. desires (1) a recipe for making shaving cream that can be used without water. A. Melt 20 pounds of lard in a steam bath at a temperature of 212°, and then letting 5 pounds of caustic potash lye of 36° Baume run in very slowly during constant stirring with a wooden paddle; when the paste becomes thick, 5 pounds more of lye are added in the same manner. After several hours' stirring, the mixture becomes firm, and is finished. It is then transferred to a mortar, and triturated until the soap becomes perfectly even throughout, and assumes a pearly appearance. Attar of almonds is the perfume for almond cream, and attar of rose for rose cream. They are dissolved in a little alcohol, and added during trituration. 2. A recipe for making a shampoo mixture? A. Salts of tartar 4 ounces, pulverized borax 4 ounces, soft water 1 gallon; mix and bottle. 3. Something to make the hair grow on the face? A. Cologne 2 ounces, liquid hartshorn 1 drachm, tincture of cantharides 2 drachms, oil rosemary 12 drops, lavendar 12 drops. Apply to the face daily, and await results.

(5) W. E. H. writes: I want to use the exhaust steam from a twenty horse engine for heating, or to aid in heating, a factory. What are the best methods now in use for that purpose? A. You may heat your factory with great economy by means of the exhaust steam flowing directly into coils of 1 inch or 1¼ inch iron pipe placed along the walls or overhead. As a rule, make the inlet or connecting pipe nearly as large in area as the areas of all the pipes in the coil. Have the coils so laid that they will drain the water of condensation in the same direction that the steam moves, Also vent the coils with a pipe equal in size to one of the coil pipe. Vent may go directly to roof, or you may join all the coils in a common vent. By making the entire system equal to or larger than the area of the exhaust pipe, you may close the exhaust with a valve and carry the whole exhaust through the heating pipes. Or by using a back pressure valve on the exhaust pipe, you may control the steam in the coils.

(6) R. S. M. writes: Thirty-six rods, with 7 foot fall, brings water to my house from a fountain 20 feet diameter, 5 feet deep, surface of water 2½ feet over strainer. In winter it runs continuously, but in warm weather stops every few days, from the accumulation of air in the pipe. Can you explain the cause? The bottom of the fountain is porous clay, and quite often bubbles of air may be seen to rise. Does air accumulate in the water by this means, and thus enter the pipe? A. If your pipe is a siphon, and exposed to a warmer temperature at its apex than at the fountain, air will have a tendency to become liberated under the decreased pressure, and accumulate in sufficient quantity to stop the flow; while in winter the exposure of the siphon to lower temperature will retain the air combined with the water, and make the flow permanent. The bubbles that you speak of are probably marsh gas, or sulphureted hydrogen, arising from decomposition at the bottom of the fountain. These gases may be partially or fully the cause of stoppage in the siphon flow.

(7) A. O. asks if it is any benefit to a yacht's coil boiler to fill it with crude petroleum while she is hauled up for the winter; what effect will it have on the iron? A. It will have a preserving effect upon the iron, and is probably the best way to keep such a boiler over winter; we are informed the Stiletto's boiler is to be thus treated when she is laid up for the winter.

(8) C. J. C. asks how to construct a brick wall partition (tenement houses) so as to prevent noise from one house being heard in the other. Will a hollow wall do it? A. You may deaden sound between houses or apartments by hollow walls or furring off, and lath and plaster on both sides of a solid wall. Solid walls plastered directly on the brick are good conductors of sound.

(9) F. B. S. writes: I have a forge with large bellows with straight blast (horizontal). Can I not fix some kind of small cupola over the tuyere so as to melt cast iron to make small castings, say 12 or 15 pounds weight? A. It is considered impracticable and unprofitable to make iron castings by the use of a forge fire or bellows; 10 or 15 pounds of cast iron may be melted in a crucible by making a small brick stack over a forge fire. A small cupola should be fashioned in proportion to those in use in foundries, which we advise you to visit.

(10) C. H. P. asks: What substance other than tin and lead ashes can be melted with old glass to give it a white, opaque appearance? A. The white opacity of glass is due to the use of either arsenic trioxide, tin dioxide, lime phosphate, powdered talc, or cryolite. There are no recent books on glass manufacture in the English language. The article on glass in "Spons' Encyclopedia of the Useful Arts" is one of the best authorities that we can recommend. We can send the number containing it for 75 cents.

(11) E. B. O. writes: In SCIENTIFIC AMERICAN, No. 11, page 170, you give a mixture for gilt-coating metals. Will you please state: 1. If the mixture is thickened to a paste, or thicker, with the chalk and cream of tartar? A. It is made into a paste. 2. Can the coat be increased in thickness by continued rubbing? A. Not to any extent. 3. Will it crack or peel off if too thick? A. The peeling off depends upon the cleanliness of the article to which the paste is applied. 4. Will it wear off quickly if handled or carried in the pocket? Will it tarnish quickly, and if so can it be brightened except by rubbing with the mixture? A. The wearing off and tarnishing of the coat is entirely a matter of usage. Under any circumstances this process cannot at all be favorably compared with the electro-gilding by means of the battery. 5. Is it expensive? I am handling cutlery—plain steel and silver, and nickel plated. A. The expense is slight. The chloride of gold is the only expensive ingredient of the mixture. 6. How can I best keep it from rusting and tarnishing? A. Coat with paraffine.

(12) L. E. T.—A well constructed ice boat, on good ice, will sail much faster than the wind. Probably a wind velocity at rate of thirty miles per hour would give the boat a speed of two miles per minute, the boat and ice being in best condition.

(13) L. K. asks: 1. What is the composition of Babbitt metal? A. Add to 4 pounds of melted copper 12 pounds of Banca tin. Introduce it gradually, then add 8 pounds of regulus of antimony and 48 pounds more of tin. 2. How is phosphor-bronze prepared? A. A small quantity of phosphorus is added to an alloy of copper and tin. The phosphorus is pushed down into the melted alloy by means of an iron tube. Great care must be exercised in this operation, as well as in handling phosphorus generally.

(14) R. H. M. asks as to how porous cells are made. A. claims that they are made the same as flower pots. B claims they are made with two kinds of clay. I claim they are made by mixing sawdust with the clay, leaving it porous when burnt. A. They are simply unglazed pottery.

(15) N. D. W. asks how new rubber rolls are put on clothes wringers. What is used for cement, and what material is used for filling old rolls? A. The unvulcanized rubber in sheets is rolled tightly around the iron cores. The material being soft or tacky, sticks together. The roller is then put into an iron mould and pressed tightly, so that the iron core or spindle will be forced to the center. The whole is then put in the steam oven and vulcanized. Rubber cement is used for mending old work. It may be had from the rubber dealers.

(16) W. P. F. asks: What are the metals on which ammonium hydrate has no chemical action? A. It has practically no chemical effect upon any of the common metals.

(17) F. V. W. asks: What is good for sore and painful bunions? Is there any permanent cure for them? A. Bunions result from pressure and irritation by friction. This frequently causes a permanent enlargement of the joint, which it is difficult if not impossible to remove. The treatment for corns applies also to bunions, for removing the soreness; but in consequence of the greater extension of the disease, the cure is more tedious. When a bunion is forming, it may be stopped by poulticing and carefully opening it with a lancet. Gezow's corn cure consists of:

Salicylic acid	30 grains.
Ext. Cannabis indica	10 "
Collodion	½ ounce.
Mix.	

(18) R. A. D. asks how to clean kid gloves, so as not to injure them? A. Stains may be removed even from the most delicately colored kid gloves by suspending them for a day in an atmosphere of ammonia. Provide a tall glass cylinder, in the bottom of which place strong aqua ammonia. Be careful to remove from the sides of the jars any ammonia that may be spattered upon them. Suspend the gloves to the stopper in the jar. They must not come in contact with the liquid.

(19) O. H. asks: Can the rear pair of driving wheels of a locomotive railroad engine be turned end for end, and rods connected when in perfect quarter, and, when so changed, will the engine operate with former perfection? A. There will be no difference in the action of the engine, provided all the bearings fit, as you will find by marking a spool at the crank pin point, and turning it over and around to bring the pins to the same position.

(20) F. J. C. desires the formula for a cleaning and scouring compound which, when prepared, has the appearance of a large white ball. A. The following is the composition of a scouring ball which is useful for many purposes: Dissolve some good white soap in alcohol, and mix with it the yolks of four or five eggs; add gradually a little spirits of turpentine and sufficient fuller's earth to make the mixture into balls. To remove a stain, wet the spot with soft water, rub it with a ball of the above composition, then rub the cloth and wash out.

(21) E. C.—The only means of determining the strength of tobacco as a cure for scab in sheep would be by chemical analysis. Such a process would be too complicated for you to use.

(22) B. G. P. asks: What power in pounds can the average locomotive freight engine exert on its drawbar on a favorable track? Do both engines give a power there together, or is only the power of one side of the locomotive applied at a time? A. For the locomotive, about 5,000 pounds, average of both engines. Both engines add their individual power to the locomotive.

(23) W. R. T. asks: Which is the best receipt for cleaning smoke off of tile? A. If the smoke cannot be washed off with a proper soap and water, it is probable that the heat has been sufficiently high to incorporate the carbon with the glaze, whence it could not be removed without destroying the surface.

(24) J. L. asks: What material is used at the manufactories for dressing ladies' white dress goods, especially jaconet and Swiss muslin, also how the dressing is applied? A. Take 1 part crystallized carbonate of soda; 4 to 6 parts each white wax, stearine, and pure white soap; 20 parts carbonate of magnesia or fine Paris white; 40 parts potato starch; and 160 parts pure wheat starch. Boil these together with sufficient water to make 1,600 parts altogether. A little ultramarine may be added to counteract the yellow tint of linen which is starched with this preparation, passed between rollers, and dried.

(25) J. G. H.—To remove old paint and varnish from wood and iron: Mix one part by weight of American pearlash with three parts quick stone lime, by slaking the lime in water and then adding the pearlash, making the mixture about the consistence of paint. Lay the above over the whole of the work required to be cleaned, with an old brush; let it remain 14 or 16 hours, when the paint can easily be scraped off.

(26) J. E. S.—We recommend you to read "Other Worlds than Ours," by R. A. Proctor, which we can mail you for $2.50.

(27) N. W. writes: Manufacturers of house heaters (furnaces) claim that it is perfectly safe to put the hot air pipes leading from heaters in direct contact with joists 3 feet away. They say the wood never chars as it does from highly heated steam pipes. Are they right? A. It is considered by the Board of Underwriters of New York not safe at any distance. They require also insulation at registers.

(28) T. B. W. asks: How is weiss beer made? Is it a malt beer, brewed as other beers? A. Weiss beer is brewed from wheat, and in Berlin it is made from one part of barley malt and five parts of wheat malt. The process of manufacture is similar to that of ordinary beer.

(29) G. W. B. asks: What is a perforation? Webster defines it: "A hole or aperture passing through anything." Worcester: "A hole, an orifice." Stormonth: "A hole or aperture passing through." Now, is "a hole passing through anything," however made, a perforation, *e. g.*, a metal plate is cast in a mould in which there are pins (or cores). These pins form a hole through the plate during the casting, but do not perforate it. Can such a hole properly be called a perforation? A. We should say not, although every perforation is a hole or aperture. As the verb "perforate" comes directly from Latin words meaning to "bore through," we think a nice distinction in the use of language would call for some other word to cover such apertures as you mention.

(30) C. P. K. asks: 1. What is the best glue for sizing pictures, also best varnish for pictures? A. Cover with a thin coating of gelatine, and then use a thin spirit varnish of either balsam of fir or dammar. 2. What material is best to cut on, as in cutting paper with a punch? A. Any hard, close-grained wood, such as maple or hickory.

(31) S. T. asks: What can I mix with ink to make it dry better? A. Gum, sugar, and glycerine are added to the usual ingredients with which ink is made, in order to give it the property of copying. Lessening the amount of these substances will be found desirable. See also the article on "Inks" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157.

(32) F. W. S. asks: 1. How can I keep a bouquet of flowers? A. Dip the flowers in melted paraffine, withdrawing them quickly. The liquid should only be just hot enough to maintain its fluidity, and the flowers should be dipped one at a time, held by the stalks, and moved about for an instant to get rid of air bubbles. 2. How to dissolve paraffine? A. Paraffine is soluble in hot alcohol, ether, and oils. 3. How can I paint tin covers so that they will not rust? Ordinary paint often comes off. A. You will find japan more satisfactory than paint for tin. 4. How can I coat old trays or waiters where the japan has come off? A. They must be rejapanned. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 160 and 166.

(33) W. J. P. writes: I want to make a salve consisting of sal soda and soap, but do not know how to mix it. A. Heat the soap sufficiently to so melt it that the sal soda can be thoroughly incorporated or mixed while the soap is in liquid condition.

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

A. P. W.—Your specimen is pyrite, iron sulphide—of no value.

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October 6, 1885,

AND EACH BEARING THAT DATE.

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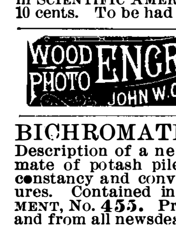

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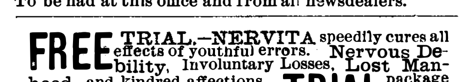

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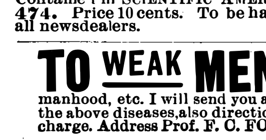

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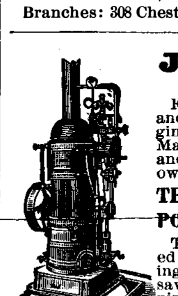

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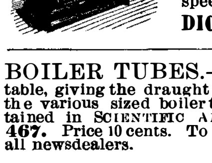

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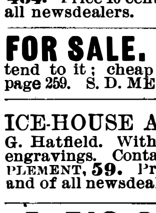

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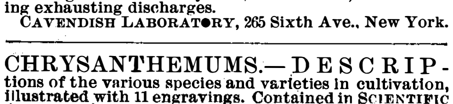

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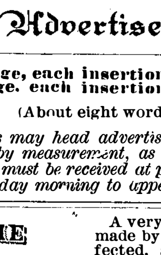

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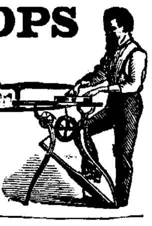

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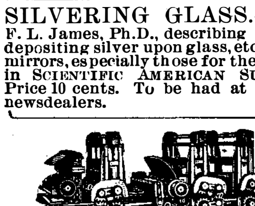

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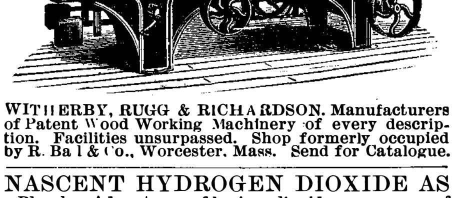

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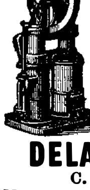

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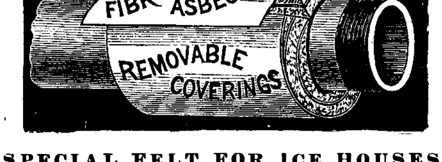

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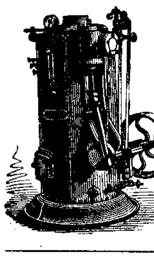

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