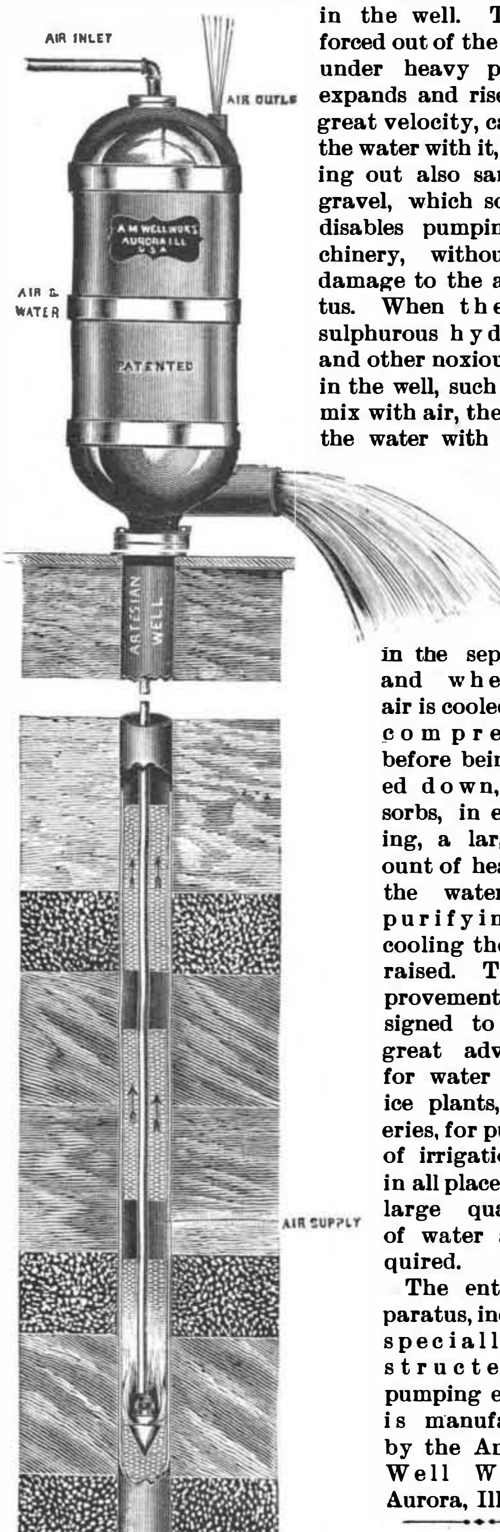
## AN AIR-LIFTING PROCESS FOR WELLS.

The illustration represents the practical application of a novel process of causing non-flowing wells to flow without pumping, which is said to have proved eminently successful, and to be more economical than any other means at present employed for raising large quantities of water. The improvement consists in placing centrally in the well an air-pipe, as shown in the engraving, the pipe being connected with an air compressor and a separator at the top, and having at its lower end a peculiarly constructed ejector, the lower end of the pipe being carried down to a predetermined distance below the natural level of the water in the well. The air forced out of the ejector under heavy pressure expands and rises with great velocity, carrying the water with it, throwing out also sand and gravel, which so often disables pumping machinery, without any damage to the apparatus. When there are sulphurous hydrogen and other noxious gases in the well, such as will mix with air, they leave the water with the air in the separator, and when the air is cooled at the compressor, before being forced down, it absorbs, in expanding, a large amount of heat from the water, thus purifying and cooling the water raised. The improvement is designed to be of great advantage for water works, ice plants, breweries, for purposes of irrigation, and in all places where large quantities of water are required.




CHAPMAN'S AIR-LIFT WELL.

The entire apparatus, including specially constructed air-pumping engines, is manufactured by the American Well Works, Aurora, Ill.

### Weighing.

The operation of weighing is so familiar to all that many are apt to forget what is actually done when anything is weighed. The method of weighing is adopted as a ready and easy means of finding the mass of a body—that is, the quantity of matter in it. This is done by comparing the attraction of the earth on the body in question with its attraction on another piece of matter whose mass is known. When the masses in the two scale pans of a balance are equal, the mass of the earth attracts them equally, and the beam of the balance stands horizontally; the balance is in equilibrium, and the substances in the two pans are said to be of equal weight. But the attraction of the earth on a mass near its surface depends on the distance of that mass from the center of the earth, so that a pound has less weight at the top of a mountain than in the valley below. The weights of bodies vary according to their position on the earth's surface, and the same mass has a greater weight at the poles than at the equator, because in the former place it is nearer to the center of the earth, and the earth's attraction for bodies outside it is the same as if the whole mass of the earth were concentrated at its center.

Again, at the equator, the motion of the earth about its axis tends to cause a body to fly away from the axis and to decrease the weight of the body. Thus the weight of a body, far from being a constant quantity, varies as the body is moved from place to place. Nevertheless, the method of weighing is an accurate way of determining the amount of matter in a given body, because by this operation we simply compare two attractions, and the forces of attraction on the body and on the standard weights with which it is compared vary equally as the balance is moved from one position to another; thus, although a body is lighter at the equator, so also is the standard pound against which we compare it.

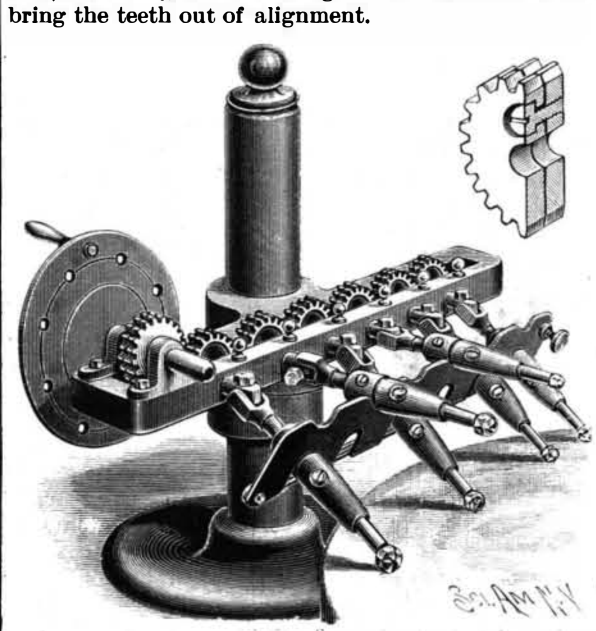
The comparison of weights is simple and familiar enough, but can we weigh the earth itself or find its mass? What can we compare it with? Here, again, what is to be done is to compare two attractions. If we can find the attraction of some mass—a part of the earth—on another mass, and then compare this attraction with that of the earth on the same mass—that is, with its weight—the problem is solved.—*Knowledge.*

### Patents and Population.

The following facts are significant: Mississippi takes one patent for every 20,469 of her population; Connecticut, one for every 1,018 of hers; South Carolina, one for every 23,490; Massachusetts, one for 1,055; North Carolina, one for every 21,288; Rhode Island, one for 1,191; Georgia takes one for every 14,817, and New York one for 1,635. Alabama takes one for every 18,457, Illinois one for 1,944.—*University Quarterly.*

## A WORK HOLDER FOR GRINDING MACHINES.

This is a device for holding precious stones on the abrading face of the lap or other grinding wheel, facilitating the grinding of a number of stones of various sizes at the same time. The improvement has been patented by Mr. William Linden, of Helena, Montana. Upon a post having a suitable base to give steadiness a collar is adjustably held at the desired height by means of a set screw, and on top of the collar loosely rests a hub forming part of a horizontally extending frame forming bearings for a series of short shafts. The outer ends of the shafts are connected by universal joints with drops adapted to support the work at their outer lower ends. Each drop has at its outer end a short rod, on the extremity of which is cemented or otherwise fastened the stone to be ground, the rod being adjustably held by a set screw in a sleeve, while the other end of the sleeve is adjustably held on a rod carrying part of the universal joint connecting the drop with one of the short shafts, whereby the holder can be lengthened or shortened according to the size of the stone. On the inner ends of the short shafts are segmental gear wheels, as shown in the small figure, in mesh with one another, an end wheel being in mesh with a driving gear wheel turned by a handle, and adapted to be locked in place by a pin passing through one of several apertures in an indicator wheel and into an aperture in the frame. As shown, there are eight apertures in the indicator wheel, and when one facet is ground by the revolving of the lap, the moving of the indicator wheel to the next registering aperture causes a corresponding rotation of the short shafts through the gear wheels, giving all the drops a like turn, so that a new surface is presented to the abrading surface of the lap. The several drops are engaged by a guide, preferably made of light sheet metal, having on one side recesses engaging annular grooves in the sleeves, and a pivoted locking arm extending over the entrance openings of the recesses. While grinding the facets the operator, by moving the guide, brings the work continuously on different places on the abrading face of the lap, insuring uniform grinding, and in case one facet is finished before the others, the locking arm is opened and the drop holding this facet is swung upward, carrying the work out of engagement with the lap. The segmental gear wheels on the short shafts are each made in two parts, as shown, to take up lost motion caused by wear or other reasons, the parts being connected by a set screw whose head and part of the shank passes loosely through a slot in one section, admitting of the setting of the two sections to bring the teeth out of alignment.



LINDEN'S WORK HOLDER FOR GRINDING MACHINES.

## SOME ANCIENT REACTION ENGINES.

BY W. F. DURFEE.

There seem to have been several recent attempts, said to have been fairly successful, to apply modern science to the perfecting of the oldest known form of steam engine, that described in the "Spiritalia" of Hero of Alexandria, which was written about B. C. 150. Of the real antiquity of the machinery described in this work we have no certain knowledge, for Hero in his

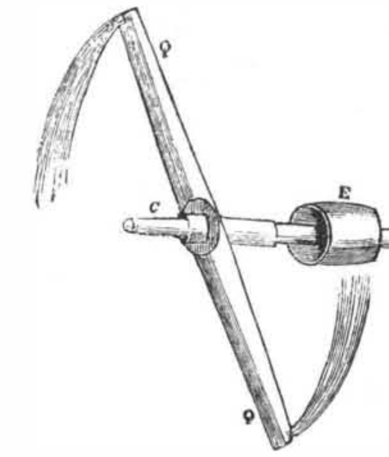



Fig. 2.—AVERY'S ROTARY ENGINE.

preface says he has "thought proper to arrange in order what has been handed down by former writers, and to add thereto our own discoveries;" but unfortunately he nowhere designates either his own or the more ancient inventions; hence the reaction engine may be among the mechanisms that were old even in Hero's time.

The reaction engine is the simplest form of mechanism yet suggested for utilizing the power of heat in the

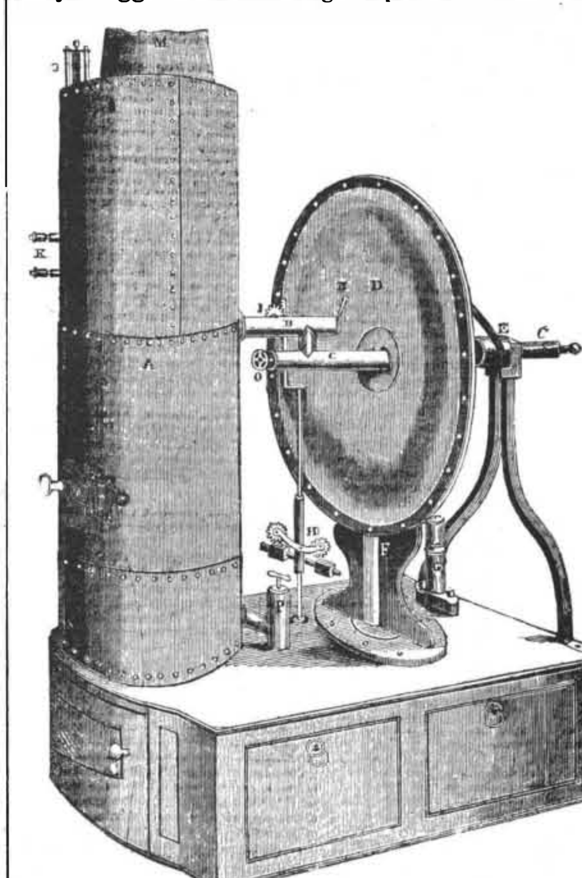



Fig. 1.—AVERY'S ROTARY ENGINE.

form of steam, and it will be a remarkable reversion if, after a couple of centuries of heterogeneous and ponderous complexity of design in steam machinery, we should return to the simple ideas of 2,000 years ago.

Since steam began to be employed as a motive power for manufacturing purposes, there have been several efforts to introduce engines for its use more or less like that described by Hero, and in view of the present tendency toward a careful study of the utilization of steam in reaction engines, it may not be untimely to recall some of the particulars of a reaction engine which was manufactured and used to some extent in this country sixty years ago.

The illustrations and description are taken from Vol. 24 (No. 637, October 24, 1835) of the *Mechanic's Magazine* (English). Its editor says:

AVERY'S ROTARY ENGINE.

"We have quoted at different times from the American journals some very favorable notices of a rotary steam engine invented by a Mr. Avery, which had been introduced into two or three manufactories, where it had given great satisfaction, and been applied in one instance with success to a railway carriage. Mr. Minor, of Wall Street, New York, has had a small engine on this principle built for his printing office, and in a recent number of his excellent *Railroad Journal* there is the following account of its construction and performances." Ed. *M. M.*

In No. 12, Vol. 4, of the *Railroad Journal* is published an account of the performance of one of Mr. Avery's engines used by the proprietors, Messrs. Lynds & Son, in their shop at Syracuse, New York, which has now been in use more than two years, and we cannot do better than republish a part of that article. The following extract refers to an engine with 18 inch arms of 6 horse power, but the engraving given herewith represents one with 12 inch arms, or about 2 horse power. There is one now in operation in this city for sawing mahogany, with 2½ feet arms, which will do the work of a 12 or 15 horse power engine, and performs to the entire satisfaction of those who use it.

The engine, that is the shaft and arms, weigh, as I learn, only 15 pounds; the arms, from center of shaft to their ends, are 18 inches, and in their revolutions describe a circle of 9 feet 5 inches in circumference; the two apertures at the end of the arms are equal to the eighth part of a superficial inch, and under a pressure of 80 pounds to the square inch will balance a weight of 10 pounds. From some experiments made it is estimated to carry a load of 8 pounds through a space of 37,660 feet per minute. The boiler has 66 feet surface exposed to the fire, and consumes daily half a load of soft dry wood. There are in the establishment the following machines in operation, namely: two large engine lathes, one boring mill for boring cylinders, two drilling lathes, one grindstone, one mill for grinding coal, two bellows of 40 double strokes each per minute, which will force, under a pressure of 1½ pounds per square inch, 580 cubic feet of air per minute, and requires 4 to 5 horse power to perform its operation of melting 1,500 pounds of iron per hour.

The following explanation will give an idea of the engine put up at our office:

The prefixed engraving (Fig. 1) is an elevation of a two horse power engine, built to drive a printing machine, which prints both sides of the sheet before it leaves the press. This engine, together with the boiler, force pump, and governor, and, in short, everything necessary for communicating motion to steam, and to the machinery to be operated upon, occupies a very small space, it being only 4 feet 8 inches by 2 feet 10 inches.

A is the boiler, 17 inches in diameter and 78 inches high, standing in a cast iron frame, with a grate inside.

B is the steam pipe, which conducts the steam to the end of the shaft, C C, one end of which is inclosed in a (superfluous) cast iron tube. The steam is ordinarily conducted from the boiler to the end of the shaft in a simple steam pipe, which may be 6 inches or 6 or 12 feet in length, to accommodate the engine to the machinery, without regard to the position of the boiler.

C C, the shaft, passing through the case, D, and the arms, Q Q (Fig. 2), which are inclosed and revolve in the case, D. On this shaft, as will be seen in Fig. 2, is the pulley, E, from which the band passes to the machinery.

D is a circular cast iron case, in two parts, fitted and put together with bolts and made steam tight. This case has in some instances been made of sheet iron; cast iron, however, is deemed best. The case, although the engine or revolving arm is only three-eighths of an inch in the thickest part, is at least 5 inches through in the center where the shaft passes, having the two concave surfaces turned; and it is considerably larger, or of greater diameter, than the length of the arms, that there may be space, which is enlarged by giving to the casting, near the outer edge, a half circle in each part of about 3 inches in diameter, which forms a circular channel or groove for the steam beyond the end of the arm, and by which it finds the outlet, F, through the bottom, and connected with a pipe which conducts it off outside of the building.

G, the supply pump, operated in this engine by cogwheels, but ordinarily by a band. The wheels, however, are not represented in the engraving, being desirous to show the engine as in general use and in its simplest form.

H I, the governor, or apparatus for regulating the supply of steam to the engine. This regulator is constructed upon a new plan, and works with cogwheels.

K, gauge backs.

L, safety valve, is set at 100 lb. to the square inch.

M, smoke pipe—a six inch stove pipe.

N, apparatus for stopping the steam or letting it on to the engine.

O serves to regulate the packing around the shaft.

P, the supply water pipe.

Fig. 2, C C is the shaft; E, pulley for the band; *r*, the orifice in the end of the shaft where the steam enters; Q Q, the arms at right angles to the shaft, and through which it passes.

There being a free communication (except when obstructed by the throttle valve, G, which may be in part or entirely cut off, as may be desired, thereby increasing or diminishing the velocity) from the boiler to the shaft and arms, there is necessarily an equal pressure upon the square inch of the arms as upon the boiler; and hence the *reaction*, in consequence of the pressure in every part, except where the steam escapes, and not from the action of the steam against the atmosphere, as is generally supposed.

The principal advantages of this engine, as we conceive, consist in its compactness, the ease with which it is managed by any person who can tend the fire, the trifling cost of fuel as well as the small outlay for the engine. The most important advantage, however, for many purposes, and especially for driving printing machines, will be found in its perfectly uniform motion. It is indeed so perfect, and the velocity so great, being about 5,000 revolutions of the arm shaft, and of course pulley or wheel, the band runs per minute, that but for other than the ordinary machinery attached to the engine a casual observer would scarcely know that a steam engine was in operation.

This engine, we are yet full in the faith to believe, will be found an important improvement for railroad purposes. The only locomotive of the kind ever used ran for a short time last spring on the Newark Railroad; and after various experiments which were made to test its qualities and power, a car was loaded with four tons of iron, and attached to the engine, which took it with great ease over the Bergen ridge, where there is an elevation of 152 feet to the mile, and in one place for a *short* distance, when leaving the direct track for that built temporarily on the bank, of 6 feet in 100, or 312 feet to the mile.

Another account states that the engine ran "4½ to 5 miles in eleven minutes."

Whatever the merits of this engine may have been, we do not think the writer in the *Railroad Journal* of threescore years ago is deserving of much commendation for perspicuity in his description of them. However, machinery was not very common at that time, and facility in describing it was not to be expected. At the beginning of the century there were but three steam engines in the United States; one an imported engine put up in 1763 (by a son of the Hornblower who had the legal contest with Bolton and Watt) at the Schuyler copper mine, in New Jersey; one at a sawmill in New York City, and a third in Philadelphia, used by Oliver Evans for grinding plaster.

The enormous increase of steam power since the beginning of the century is at the same time a measure of, and a most prominent reason for, the wonderful development of the United States during the past hundred years. In the belief that a knowledge of the total horse power of the engines now in use in this country would be of interest, and that the statistics of the increase for each decade would be startling in their immensity, I applied to the Census Bureau for information relative thereto, but was very much surprised to learn that the statistics of steam power had not been collected.

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[From the New York Sun.]

### Photography and its Rights.

A lawsuit of some significance has been begun by the Chicago Fair people against two St. Louis firms for publishing photographs and process reproductions from photographs which are the property of the first named. Of course no one can maintain exclusive property in a view, but equally one can maintain property in any individual photographic negative. One can possess such property in a view from a dwelling site as to recover damages for its obstruction in certain cases. But different photographs of any given view, as well as prints made from those photographs, may be very good or very bad. Products of the operator's skill in getting good views are obviously as much a subject of property right as any other product of skill.

The photographic camera is fast coming to be considered part of the equipment of the geologist. It is already an essential in the preparation of medical treatises. It is of habitual use in the preparation of trade catalogues. It would be difficult to name the science or the art that now makes no use of photography. It is a powerful nstrument in the hands of criminal justice. It is a part of the platform lecturer's equipment. While science and mechanic art recognize photography at its professional value, fine art adopts it as a handmaid and law enlists its service. It has thus come to acquire a status whose recognition is requiring an increased precision of definition.

The processes of photo-mechanical printing in colors broaden the base on which the principles of such definition must repose. There is no question here of patented process, but of the results of process without any reference to specifications of that order. There have recently been produced fine specimens of chromocollographic printing representing the covers of old books in the British Museum. The general results are described as being so rich and truthful as to convey no idea that they are produced in so simple a manner. Where the cover of a book is torn or frayed, for example, the reproduction is remarkably natural. Now, while those books can be copied by others under the general regulations of the Museum, which do not respect persons, it is not deniable that the particular reproductions here described are and of right ought to be a property vested in the skillful operators who produced them.

Some landscape photographs taken by the same process are described in the same number of the *Camera Club Journal* and pronounced exceedingly fine. A notable feature in these is the sky. Now, really good sky and cloud photographs are hard to get, and may be especially valuable, as say in the study of clouds. While no man may own the sky, is it not obvious that the value subsisting in these products of a special skill is the rightful property in the individual displaying it? And, again, practical photographers know how large a part is played by luck in hitting the supreme conditions of light and shade for a given view, as well as in fixing them when hit. There is the same propriety in securing to the operator this fortuitous value as in allowing a property in the finder of a precious stone.

A decision was rendered at Paris recently awarding damages against two American white metal companies for pirating certain statuettes, the original models of which were owned by the plaintiffs. There is a difference in principle between pirating the fruits of a man's skill in one line of art and of his skill in another line. For in photography the matter dealt with is not intangible; it is not an idea—it is a concrete product. When appropriated by another it is appropriated for gain, as any other article of production is stolen by any other thief. The character of the act is not changed by statutory definitions, though the penalty or the remedy for injury may be. In either case the failure to punish or to compensate is a failure either of public or private justice.

Fortunately for the chances of procuring the rule of right in cases of photography to become also the rule of law, the photograph is a concrete thing which is not the product of imagination. It is produced from start to finish by the use of mechanical apparatus, operated upon external material substance in the same sense that a saw blade is produced. The negative is not like the die of a medal, into whose execution the creative quality of design has entered. Nature created the photograph's design. The operator has done no more than apply human skill, of a kind not different in kind from that which tempers and sets the saw blade, to produce an individual reproduction of that design. This reproduction is identifiable from all others. Its utility inheres in the copies made from it, which can proceed from no source other than this particular negative. And whithersoever the individual picture, itself a mechanical product, can be identified, there its original producer ought to be able to follow the property he created and to enjoy its beneficial use.

The essence of property right is the beneficial use of its subject matter. To protect the property right in a photographic negative is, then, to protect the right of making copies. To steal the negative itself is an act of allowed larceny. But, apart from making copies, no other kind of value attaches to the blurred sheet of glass. Apart from this right, it is a messy window pane. Has the negative, then, no quality of value but as a window pane? Its film is a part of itself, and as such is allowed property. This film has had a particular quality impressed upon it by the operator's skill, which quality is individual. It has become something more than the material of a film, and something different from all other films. By no process of sound reason, by no analogy from other things, can the photographer's rightful property in his own work be grounded on statutes of patent or copyright. The first may apply to his process as an inventor. The second can never, but by confusion of thought, be deemed essential to his title to the work of his hands.

Allowing this, the protection of that title cannot rightfully be abridged through any defect of statutory enactments on which it cannot rightfully be held to depend. It is the natural title inhering in the laborer to the work of his hands, which statute might conceivably take away by expropriation for the public use or a principle similar to that which has led governments to buy works of art or valuable discoveries or inventions for common benefit. No other mode of depriving this particular workman, the photographer, of the fruit of his labor can be distinguished in principle from robbery, taking the word in its literal intent.

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### At Sea on an Ice Floe.

Recently the lifeboat society at Cronstadt received news that toward the south shore of the Gulf of Finland, about 30 miles from Cronstadt, some 200 fishermen and peasants, with their horses and sleighs, had been suddenly carried out to sea on a large ice floe, which had been detached apparently by a recent storm. The ice-cutting boats at Cronstadt were laid up for the winter, and could not be used. Twenty sailors, however, with two officers and assistant surgeons, were dispatched over the ice with two lifeboats on runners, and a similar party started to the rescue from Oranienbaum, on the other side of the mouth of the Neva. The latest telegrams from Cronstadt state that the fishermen and others have been found and all rescued by means of a bridge made of poles and planks, which was thrown out from the firm ice. They had been cut off from the mainland for at least 48 hours, during the latter part of which provisions were passed over to them by the inhabitants of the nearest shore.

### Action of the Electric Arc on the Diamond.

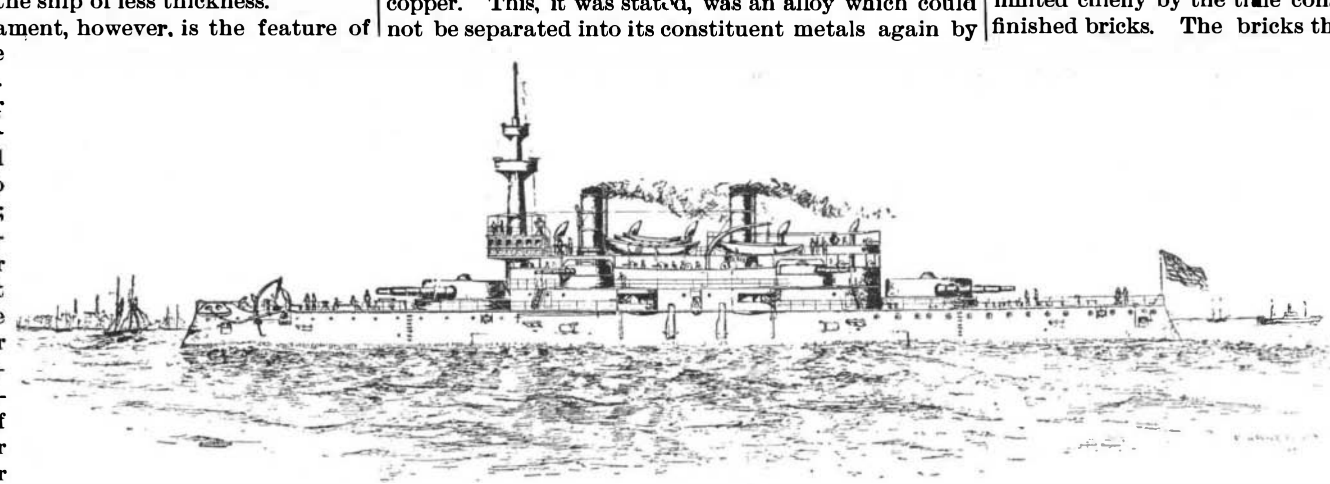
M. H. Moissan, in the *Compt. Rend.*, deals with the action of the electric arc on the diamond, amorphous boron, and crystallized silicon. In the electric arc, at a somewhat high temperature, the diamond becomes incandescent, swells up without melting, and becomes covered with black masses consisting entirely of hexagonal lamellæ of graphite, which is easily converted into graphitic oxide. If the diamond is placed in a small carbon crucible in the electric furnace previously described, and is subjected to the action of an arc produced by a current of 70 volts and 400 amperes, the crystal first breaks up into small fragments along the planes of cleavage, and then at higher temperature swells up and is completely converted into graphite, which yields yellow graphitic oxide. It follows that at the temperature of even a moderately intense electric arc, the stable form of carbon is graphite. When heated in a carbon envelope at the temperature of the oxyhydrogen blowpipe, the diamond is covered with an adherent black mass, which slowly dissolves in a mixture of potassium chlorate and nitric acid, but which is not graphite. Amorphous boron, prepared by means of magnesium, volatilizes without fusion in the electric arc, the extremities of the electrodes being converted into partially crystallized boron carbide. Crystallized silicon, when heated in the arc, first melts and then boils, the extremities of the electrodes at the end of the experiment being covered with pale green crystals of carbon silicide. The phenomena in the arc were observed by projecting on a screen by means of an intense arc an image of the arc of lower intensity in which the substances were heated.

### THE NEW BATTLE SHIP INDIANA.

The latest and the most formidable thus far of our new warships had her preliminary trial on March 7. The course was off Cape May, where she was practically under five hours' continuous steaming at high speed, everything working smoothly. The first runs were made with natural draught, and the speed averages were 14·02 and 14·12 knots; then a moderate forced draught was used, bringing the speed to 15 knots, which is that called for by the government contract. Two trials were then made with the full forced draught, bringing the speed to 15·6 knots, a result considered highly satisfactory by the builders. From the results obtained on this trial it is predicted that the ship will make sixteen knots or more on her official trial. A premium of $25,000 is paid by the government for every quarter knot attained over fifteen knots.

The Indiana was built by the Messrs. Cramp, of Philadelphia, and the contract price was $3,020,000, exclusive of armament. She was launched February 25, 1893. She is designed to meet in battle the best modern war ships, carrying the heaviest guns and armor. She is built entirely of steel, with a length between perpendiculars of 348 feet; extreme breadth, 69¼ feet; mean draught, 24 feet; displacement, 10,281 tons. Her hull has numerous watertight compartments, and the armor protection consists of a heavy belt of Harveyized nickel-steel armor, 18 inches thick, extending along the water line. Rising from each end of this will be an armored redoubt, 17 inches thick, extending to a height of 3½ feet above the main deck. Within the redoubts will be two 18 inch turrets (one in each), containing the heaviest guns. There will also be other armor elsewhere on the ship of less thickness.

The powerful armament, however, is the feature of the ship, it being the most efficient afloat. It will consist of four 13 inch breech-loading rifles, mounted in pairs in the two turrets referred to; eight 8 inch breech-loading rifles, in four turrets, placed at each corner of the superstructure; four 6 inch breech-loading rifles and a secondary battery of sixteen 6 pounder and four 1 pounder rapid fire guns and four Gatlings. There will be also six torpedo tubes. The vessel is cut up forward beneath the water line, making a powerful ram bow, doing away with excessive bow waves on account of easier lines so obtained, as well as greatly adding to her maneuvering qualities.



THE NEW BATTLE SHIP INDIANA.

### Saccharin.

Saccharin is regarded by a French writer (*London Lancet*) as a valuable antiseptic. A strength of 1 to 500, as an addition to mucilaginous and other solutions, prevents the formation of low organisms. Thus a valuable, inexpensive dentifrice may be prepared by simply dissolving saccharin in water, to the proportion of 6 per cent. A teaspoonful of this in a half pint of water forms an admirable antiseptic mouth wash. In cases of malignant or other diseases of the stomach, requiring the washing out of that organ, a solution of saccharin of the strength of 2 per cent will be found very suitable.

### EMIL GREINER'S AUTOMATIC PIPETTE.

The ordinary chemist's pipette is a troublesome apparatus to manipulate. It is filled by absorption with the mouth, and its contents, of course a fixed quantity in all cases, are determined by the liquid standing exactly at the level of the marks surrounding its upper stem. In filling a small surplus is invariably drawn into it and by closing the top with the finger it will be kept full. By admitting air at the top, the liquid is suffered to descend until the mark on the upper stem is reached, when it is ready for delivery. It is quite difficult to reach the upper mark exactly. As ordinarily used by mouth absorption, there is always more or less danger of the liquid being drawn into the mouth, which in the case of sulphuric acid, or ammonia and similar chemicals, is a source of absolute danger.


The cut illustrates an automatic pipette, due to Emil Greiner, of this city, which, in its construction, does away, not only with all danger in its use, but which makes the measuring of the liquid instantly effected by the filling operation. The upper stem of an ordinary pipette terminates in a contracted nozzle somewhat bent over; from this upper nozzle to the lower one it holds the exact quantity for which it is marked. A second glass bulb fastened airtight to the upper stem of the pipette is fitted with an India rubber bulb at its upper extremity. To use it the bulb is squeezed, the lower end of the pipette is placed in the liquid and the bulb released from pressure. As it expands the liquid rises in the pipette until it overflows from the upper end. When the bulb has fully expanded the overflow ceases, and on removal from the liquid the pipette is accurately filled. Its contents can then be delivered as desired by squeezing the rubber bulb. A certain amount of overflow collects in the upper glass bulb, which is removed by pulling off the upper bulb and emptying it from the upper end. For chemists, especially in operations of the silver volumetric assay, in the mixing of standard solutions, its applicability is obvious. For the photographer it is admirably adapted, supplying him with an accutate measure of volume, instead of the grossly inaccurate graduate so generally used.

### Aluminum Bronze.

At the recent meeting of the American Society of Mechanical Engineers, Dr. Leonard Waldo presented to the members some specimens of what is called "aluminum bronze," by which is meant an alloy composed of nearly 10 parts of aluminum to nearly 90 parts copper. This, it was stated, was an alloy which could not be separated into its constituent metals again by any ordinary process, had 90,000 pounds tensile strength, with 15 per cent elongation, would cast, forge, roll hot and cold, draw into wire, work in the lathe about as well as steel did, took a high polish, and did not readily tarnish. He pointed out that the difficulties in making most large castings had been substantially overcome, and that the bronze was particularly available for castings to replace complicated steel forgings for steel tooled work where the labor was large. The bronze was stronger than the steel. "It was a mistake," the speaker said, "to classify the alloy of aluminum and copper among the bronzes. Such evidences as we possessed seem to show that a chemical reaction took place when aluminum was added to copper, and that the new compound was soluble in molten copper. There were reasons for thinking that the maximum effect of strength and ductility combined was obtained with an alloy of 10 per cent, and in order to distinguish this alloy from the other alloys containing a less amount of aluminum, it was proposed to call aluminum bronze having 5 per cent of aluminum, or one-half the amount of the standard bronze alloy, half aluminum bronze, and so also a bronze containing one-quarter of the amount of the standard, one-quarter aluminum bronze."

These grades have very markedly different qualities, the grades containing but little aluminum possessing the higher ducility and less rigidity. They all possess a greater resistance to corrosive influence than any other commercial copper alloys.

Spoons were shown made of an alloy containing about 5 per cent of aluminum, and called "half aluminum bronze," these appearing much like solid gold, and, in fact, being passed as such in some instances by jewelers. He expressed the belief that this bronze would prove to be exceedingly valuable in machine construction, especially in view of the possible cheapness of the metals of which it is composed, it having been shown, for instance, that copper could be laid down in New York at a cost of 6¾ cents per pound and that aluminum could be made at a cost of 28 cents per pound.

### The Manufacture of Slag Bricks.

The manufacture of bricks from blast furnace slag has attained considerable dimensions in Germany, the Luhrmann furnaces, near Osnabruck, alone having turned out 5,100,000 bricks. The manufacture has also been taken up by other iron works. The granulation of the slag, the first essential portion of the process, which is substantially the same everywhere, is effected by running the slag along a channel together with a stream of water into a reservoir, in which it is collected. The lime to be mixed with it, in the proportion of one part to six of granulated slag, is slaked with sufficient water to yield a moist sludge, and the two ingredients are thoroughly incorporated in a mill, which process is conducted in the following way: The mixed slag and lime are conveyed by a spout, to which a shaking movement is communicated, to a pair of rolls, which stop the access of unduly large fragments of slag or foreign bodies to the mixer proper, and mingle the slag and lime still more thoroughly while reducing them somewhat in size. The final mixing is effected by a set of three drums with radial projections fitting into each other with only a slight amount of clearance, so that the ingredients are brought into the most intimate contact. A machine absorbing two to three horse power will serve to prepare the material for 9,000 to 10,000 bricks per shift of 10 hours. The mixture is moulded into bricks by a machine, which is provided with a hopper kept filled by the laborer in charge, and an arrangement whereby the quantity necessary to form one brick is let down into the mould and then the aperture closed, while the movable sides of the mould are brought into position by eccentrics, and by this means pressure is exerted upon the mass to shape and consolidate it. The finished brick is pushed out of the machine and the operations of filling the mould and applying pressure are repeated. A machine absorbing seven to eight horse power will turn out at least 9,000 to 10,000 bricks per shift, its capacity being limited chiefly by the time consumed in removing the finished bricks. The bricks thus prepared are weak at first, and have to be handed carefully, and must be stacked and protected from rain for the first day, a precaution that is not afterward necessary. They become sufficiently strong for use for building purposes after the lapse of six to twelve months.

### Australian Eggs.

Eggs are now shipped from Australia to England. A trial shipment, made by the Hon. J. H. Conner, of Victorian eggs and cheese, was lately inspected by an officer from the department of the Agent-General for Victoria. With regard to the packing of the eggs, they had, in the first place, been rubbed over with grease and afterward placed with bran, flour, lime, and pollard in small cases. When opened they were found to be perfectly fresh and sweet. The cheeses, which consisted of both 40 pounds and "small loaf" sizes, were sound and of good flavor.

THE largest monolith ever cut in this country was quarried of granite in Missouri and transported to the East on a specially prepared train.