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TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT

## INO. 589

## For the Week Ending April 16, $188 \%$.

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## THE NEW COMMISSIONER OF PATENTS.

The President has appointed the Hon. Benton J. Hall, of Burlington, Iowa, to the Commissionership of Patents. The office recently became vacant by the resignation of the Hon. Martin V. Montgomery. The new official is a lawyer of standing and promi nence. He was born in Mt. Vernon, Ohio, in 1835, and graduated at Miami University in 1855 . His law practice began in the office of his father, Mr. J. C. Hall, of Burlington. This gentleman, in his day, was regarded as one of the leading and best lawyers of the State. His son is the second Commissioner from the State of Iowa. His predecessor from that State, Charles Mason, was appointed in 1852, his commission dating from the 24th of March of that year, and his term lasting five years.
We hope and believe that the State of Iowa will be as well represented now as it was by Mr. Mason, over thirty years ago. The position of Commissioner of Patents yields in importance to few government offices. In times of peace especially, when the inventive arts are exercising so many minds, and when the true conquests over nature are being won, the arbitrament of interests of the greatest magnitude rests in the hands of this official. The products of the thought and labor of some thirty thousand inventors have annually to be examined, and their claims adjudicated. To carry out this work systematically, the influence of the head of the department should be felt in every bureau. Consistency in his rulings will reduce the practice of the office to a uniform standard.
The indusiries of the country, on which its wealth and position among nations depend, pass in continual review through the Patent Office. Every modification of its practice, as dictated by court decisions or as inspired by the personal convictions of the Commissioner, is felt far and wide. Patent after patent could be cited whose value has gone up into the millions ; and were it possible to arrive at the aggregate value of all patents
issued, the interests represented would be enormous issued, the interests represented would be enormous. even of the Treasury itself, would yield in true importance to such statistics, as the value and profit of patents affects the personal interests of the people individually and directly.
Besides this aspect of the case, the influence of patents and the mode of granting them upon the prosperity of the country, not only in peace but in war, illustrates the importance of rightly filling the office of Commissioner of Patents. The recentlegislation in the direction of building up a navy for this country will have a successful issue largely dependent upon patents. The successful gun, its powder, its projectiles, will probably involve many patents, while the ships of war will include in their construction still more. The industries of the nation, by which it lives, are based upon patents, and the defense of these interests in case of war will depend upon the same. It is only by American genius, fostered by our patent laws, that the manufacturers of America are able to compete with the lowpriced labor of other countries, and this genius will be called on, if war occurs, to invent methods of defense. The effect of patents is felt upon the arts both of war and peace. The administrator of the office, in one sense, holds in his hands, or has a strong influence upon, the destinies of the country.
The Western judges have rendered some of the best and most enlightened decisions in patent cases. In receiving from one of these States a new Commissioner of Patents, we'venture to augur good from the selection. The past record of Mr. Hall entitles us to hold this conviction. If he will continue the work of his predecessor, and gradually bring business up to date, so that less delay will intervene before the consideration of a case, he will be entitled to the thanks of the community of inventors, and he will do the entire country a great service. The coming year may see the delays done away with; and the work of the Patent Office on a regular business basis.

## JUDGE HONTGOMERY.

On April 1 the President appointed Martin V. Montgomery an Associate Justice of the Supreme Court of the District of Columbia, to succeed Justice MacArthur, who has retired. The new incumbent is a resident of Lansing, Mich. He was born in 1840, in Eaton Rapids, Eaton County, Mich. He was admitted to the bar in the circuit court for that county in October, 1865. Since that time he has been admitted to practice in all the Federal courts, including the Supreme Court. His private practice in the State of Michigan was very extensive. His first active participation in politics dates back to 1870, when he was elected by the Democrats to the State Legislature. In 1876 he was a delegate to the
National Convention at St. Louis. Hes appointed National Convention at St. Louis. He was appointed
Commissioner of Patents in the beginning of President Cleveland's administration, this being one of his first important appointments. The experience of his office as Commissioner should render him a peculiarly valuable addition to the bench of the court in question, before which so many patent cases are brought on ap
peal from the Commissioner of Patent's decisions.

## hatubal gas in midiana <br> н. с. ноrex.;

At New Albany, Ind., there is a thin seam of bituminous shale whence little rills of petroleum trickle down into the Ohio River. In former days, before the geology of the region was understood, it was supposed that this indicated coal, but now it is known that the shale in question belongs to an older period than the carboniferous. Attempts to use it for fuel were not successful. Last summer, however, the idea occurred to the capitalist, Washington De Pauw, that boring for natural gas might meet with a better reward. He tried the experiment, hoping thus to facilitate the manufacture of glass, in which he is extensively en gaged, so as to compete with Pittsburg and other points where fuel is cheaper than it is in southern Indiana. Mr. De Pauw was warned by Prof. Collett that in order to find gas he would have to "bore up instead of down" at that point, geologically speaking. He was finally convinced that his labor would be fruitless, and gave it up. But the rumor of his experiments went abroad, and others repeated them in different localities with varying success. 1 have taken some pains to ollect the facts from authentic sources.
Early last fall a boring was drilled at Portland, near the Ohio line and about forty miles north of Richmond. The result was a small flow of gas, but not in quantity sufficient to be of commercial importance. After this failure matters stood still at Portland for a while, and then courage was revived by successes elsewhere, and now there are three good paying wells at Portland. Two years ago the Ft. Wayne, Cincinnati, and Louis ville R.R. Co. prospected for coal at Eaton, a village ten miles north of the city of Muncie. They went down 600 feet, and then abandoned the works. Last October, in view of the experiments referred to above they decided to sink their wells deeper in search of gas and found it in a good, strong flow, which gradually increased, until now the discharge is known to be a million cubic feet in twenty-four hours.
The next well was drilled at Muncie (a city of 9,000 nhabitants) by the citizens of that place. Since then there have been six other wells drilled there, making seven in all, varying in capacity from 300,000 up to $2,000,000$ cubic feet per diem. These wells are controlled by the "Natural Gas Company of Indiana," to the courtesy of whose manager, Mr. C. N. Wilcoxon, the writer is indebted for much of his information. Since then, three good wells have been drilled in Kokomo, three at Marion;-and two at Noblesville, smaller and of ess pressure than those farther east. The gas is used now in all these places both for purposes of heating and illumination, supplanting everything else.
All these gas wells are found in Trenton limestone, where the rock is porous and the strata have been free from disturbance. In localities where there have been upheavals, there are indications that gas once existed, but escaped through crevices, leaving the rocks barren The strata vary in their depth below the surface from 850 to 950 feet. Their thickness varies from 30 to 75 feet, and with a very slight dip. The overlying formations are as follows: Soil and drift, varying from a few feet to 250 feet; Niagara limestone, about 250 feet more; then slates and shales till the Trenton lime stone is reached.
The field as now developed covers an area of 20 miles wide by 60 long from east to west, and the strata run in a direction from north west to southeast. The region has been prospected on all sides of this area, but thus far with no success. Borings have failed at Richmond, Shelbyville, Fort Wayne, Union City, and other points. At least fifty wells are now being drilled, besides those now flowing, and until these are completed there is no means of knowing positively whether gas will be found outside the area already indicated.
Expensive experiments are in progress at Indian apolis. A well was drilled there last fall to the depth of 2,100 feet without indications of gas. A number of test wells are now being sunk at Brightwood, a suburb of Indianapolis, but are not yet down to the level of the gas-bearing strata. Of course this development in Indiana, mostly within the last six months, has stimulated speculation. All the towns where gas has been struck are laying systems of mains for supplying domestic and manufacturing demands, and the supply promises to be as constant as it has proved to be elsewhere.

## Artificial Whetstonem

The Ouide Scientifique describes the following ethod of making artificial whetstones. Gelatine of ood quality is dissolved in its own weight of water, the operation being conducted in a dark room. To the solution $11 / 2$ per cent of bichromate of potash is added, which has previously been dissolved in a little water: A quantity of very fine emery, equal to nine times the weight of the gelatine, is intimately mixed with the gelatine solution. Pulverized flint may be anbstituted for emery. The mass is moulded into any desired shape, and is then consolidated by heavy pressure. It is dried by exposure to strong sunlight for several hours.

## The Bell Telephone Company

The American Bell Telephone Company's annual directors' meeting was held in Boston, Mass., on March 29, 1887. It was called to order by William H. Forbes, President, at $11 \mathrm{~A} . \mathrm{M}$. The following are the principal figures, interesting to the public, contained in the annual report read at the meeting. In the year 1886, 9,318 new subscribers were enrolled, as against 2,969 in 1885. The company's wires have a mileage of 14,185 ; of these, 2,613 miles are underground. The average connections for the year are $312,605,710$. Among the improvements promised for the ensuing year are further extension of underground wires, and terminal facilities between New York and Boston and Philadelphia. The Philadelphia line will soon be open to the public, and the Boston line will be completed during the present year. The Canadian company's earnings the present year. The Canadian company's earnings
have increased from $\$ 158,000$ in 1885 to $\$ 190,565$ in 1886 .

| Telephones. | \$597,749.84 |
| :---: | :---: |
| Stock | 22,605,925,03 |
| Merchandise, machinery. | 14,159.71 |
| Cash, deposits, etc. | 1,691,499.30 |
| Capital stock | 9,802,100.00 |
| Bills payable | 638,344.67 |
| Patent account. | 9,373,836.07 |
| Proft and loss. | 3,352,445.72 |
| Reserves | 251,227.24 |
| Surplus.. | 1,491,380.18 |

Giving a total of $\$ 24,909,333.08$. The gross earnings for 1886 were $\$ 3,097,000$, against $\$ 2,765,884$ in 1885 ; net earnings for same periods, $\$ 1,947,283$ and $\$ 1,793,196$. The qividends paid in 1886 came to $\$ 1,176,252$ regular, The dividends paid in 1886 cal
and $\$ 392,084$ extra dividends.
The above remarkable array of figures is a good illustration of what a patent may be worth. This immense business is built upon a single clain of the single 1876 patent of Alexander G. Bell. All others in the present aspect of things, such as his later patents, and the many other patents owned by the company, are of quite secondary importance. Eventually, their value will appear. A striking item is the patent account of over nine millions of dollars, an amount very nearly equal to the capital stock. The company has acquired such financial strength that whatever the decision of the Supreme Court may be, it can view the limitation or even extinction of the Bell patent with equanimity.

## Stomach Digeation.

Opportunities for studying gastric digestion through fistulous openings into the stomach are, thanks to modern surgery, more frequent than formerly. This is important, as the physiology of digestion, as understood at the present day, requires more than the classical instance of Alexis St. Martin to place it on a sound experimental basis. Such a case with experiments ad hoc is recorded in the Revue Scientifique by Von Herzen, of Lausanne. The subject was a man, æt. 28, on whom gastrostowy had been performed for occlusion of the cesophagus. The observations made were as follows: Bile always appears in the stomach during digestion, but generally only in the later stages. The amount of HCl amounts to 1.8 to 1.9 grm . pro liter; it increases during digestion, and reaches its maximum in the third hour. Sodium chloride appears rather to diminish the amount of acid. When the stomach was empty in the morning but little pepsin was found, and a large amount of propepsin ; peptogen accelerated digestion. In the first hour, of a quantity of albumen introduced, two per cent was digested without peptogen, twelve per cent with it. In the second hour, gen, twelve per cent with it. In the second hour, twenty-three per cent was digested without, forty-five
per cent with peptogen. In the third hour, fifty-one per cent without, seventy-six per cent with peptogen.
These results agree with those obtained by Schiff. These results agree with those obtained by Schiff.
Chloral, quinine sulphate, and above all potassic iodide, retard digestion. The author would forbid red wine in disturbances of digestion, but would recommend bouillon and dextrin ; blood fibrin is also indi cated in many cases.-Medical Press.

The Pontion Taken During Sleep.
A very large number of adults form the habit of sleep ing in one particular position, such as lying upon thei right or left side. A smaller number sleep upon the back. Some persons sleep with the head greatly extended; more often it is flexed considerably upon the trunk. Many must have the head greatly elevated; others can only sleep with the head very low. Some observations made by Dr. G. Nosovitch (Wratsch) upon 235 soldiers showed that 37.5 per cent slept upon the right side, 23 per cent on the left, and 6.5 per cent on the back.
It has yet to be determined whether any particular harm can come from sleeping in a certain position which the individual unconsciously assumes. A popular belief exists to the effect that the liver, being a
heavy organ, tends to press upon the other abdominal heavy organ, tends to press upon the other abdominal
viscera when a person lies on the left side. At any rate, more persons, probably, sleep on the right side than on the left, as experience and Nosovitch's statistics show The author in question believes, also, that the posture ia sleep influences the extension of a bronchitis. He
of whom had this disorder, in 97 it was left-sided, in 72 right-sided, and in 66 on both sides. He thinks that the preponderance of the bronchitision the left side was due to the fact that there was a greater expansion of this side during sleep, and, consequently, a greater ingress
of cold air or of the morbific particles causing the of cold
disease.
Some writers have thought that the position in sleeping has an infiuence upon the passage of fæcesthrough ing has an influence upon the passage of fæces through
the colon, the position on the right side being especially unfavorable to emptying the colon. Repose on the left ide, on the other hand, favors the gravitation of fæces from the transverse into the descending colon, and is therefore to be preferred by those suffering from hab itual constipation (J. S. Jewell).
A recent writer has argued strongly for the view that the head should be lower than the feet during sleep, and he claims that more perfect health and greater longevity will result from such approximate topsy-tur viness. The contrary position, with the head and trunk considerably raised, sometimes relieves cramps in the legs. It is well known that some chronic nervous af fections, more particularly nocturnal epilepsy and some forms of insomnia, are sometimes benefited by sleeping in a partially erect posture.
It appears, therefore, that the posture during sleep is a matter deserving of some attention from physicians and that some actual therapeutic results may be ob tained by looking after its details.-Med. Record.

## The Largest Powder Charge ever Fired.

The final proof experiment with the first of the 111 ton guns for the Benbow took place at the Woolwich Arsenal Butts on Wednesday, March 9. When it was announced that $1,000 \mathrm{lb}$. of gunpowder would be discharged, with a projectile weighing $1,800 \mathrm{lb}$., serious doubts were expressed as to the possibility of the gun surviving the ordeal. The loading of the gun, which will be performed on board ship by hydraulic power, was a difficult and tedious process, but at length the shot was driven forward of the powder chamber, and eight octagonal cartridges were packed in behind it, each weighing 125 lb ., or an aggregate of in behind it, each weighing 125 lb ., or an aggregate of
exactly $1,000 \mathrm{lb}$. The powder was of a slow burning description known as "S. B. L.," and the grains or segments were prisms of about one inch diameter. Most of the rounds in preceding experiments have been fired with Westphalian brown powder, and the velocities have varied with the weight of charge from 1,699 ft. per second, with a pressure of 9.65 tons, to $2,078 \mathrm{ft}$. with $18 \cdot 7$ tons. pressure. The gun, it may be said, is guaranteed to bear a strain of 25 tons and more upon the square inch, a test which in the days of the old and "brutal" powders has often been realized, but is not likely to be ever again applied. The spectators, warned by the alarm bell, got under cover or repaired to a safe distance to see the gun fired, the electric spark was transmitted from the instrument room, and, with a tremendous sound, the gun recoiled at an easy rate up the railed incline on which it stood. The projectile had achieved a velocity of $2,128 \mathrm{ft}$. per second with the remarkably low pressure of 16.1 tons, and the gun was apparently none the worse for the shock, but a second
round was deemed necessary to show that it was unround was deemed necessary to show that it was un-
injured. The only adverse consequences were a few broken windows.-Admiralty Gazette.

## The Comparative Effecte of Heat and of Solar Light.

All the actions of combustion which heat can produce may be also produced by light, but the converse does not hold good. There are many reactions which light alone seems able to set up. All these reactions may be summed up as a disturbance of the primitive molecule which is decomposed into simpler elements. These elements are few in number; they are, if we limit ourselves to volatile bodies, formic, acetic, and butyric acids, methylic and ethylic alcohols, and ethylic aldehy. These stable groups are generally found the same with one and the same body, whatever the source from which it derives its oxygen. But this is
not always the case. Thus lactic acid, if burnt by not always the case. Thus lactic acid, if burnt by
means of atmospheric oxygen, yields acetic acid, but produces butyric acid if it obtains its oxygen from the salts of mercury. These stable residues of combustion do not pre-exist as groups in the original molecule, but result from a new arrangenent of the molecules during combustion. This is proved by the fact that they are found identical in bodies of different types, and are not always the same with one and the same body. These products contain a smaller number of molecules of hydrogen and carbon than the bodies whence they are derived. The sole exceptions to this rule, the formation of formic acid at the expense of oxalic acid, and that of butyric acid from lactic acid, disappear if we double the formulæ of oxalic and lactic acids. Potassium permanganate, which often acts in the cold and in darkness, does not yield other products than those resulting from the action of the sun and of heat. The bodies which it attacks best are those which are found least stable under other oxidizing conditions. Bnt if it does not occasion any novel facts, we may study with
ment and the conditions of initial and final acidity or alkalinity which determine the result. These last conditions play a great part in the combustions made at the expense of oxygen, free or combined. -E. Duclaux.

## John Mercer's Procens of Alkalization and oxidation.

Many years ago, John Mercer, the famous old Lancashire calico printer, discovered that, if a piece of calico is steeped for a few minutes in a strong solution (sp. gr. $1 \cdot 252$, or $29^{\circ} \mathrm{Be} ., 50 \cdot 4 \mathrm{Tw}$.) of caustic potash or oda, it becomes quite gelatinous and translucent in appearance; and after washing out the alkali, it was found to have considerably contracted, so as to render it much closer in texture, stronger, and better adapted to dyeing and printing, having acquired a greater attraction for dyestuffs. He largely utilized this action of caustic alkalies upon the cotton fiber, and took etters patent for the alkalizing process, which is genrally known as "mercerization." The microscopical examination of a mercerized cotton fiber shows it to have lost all its original characteristics ; it has lost its surfacial markings, its fiat shape, and spiral twistings, but appears thick, roundish as if infiated, straight and transparent. A cross section shows that in fact the cell walls have become thicker from the outside toward the center, giving the fiber a cylindrical form and narrowing the interior channel down to an irregular puncture or slit.
A parallel discovery as regards wool was made by Mercer when the French had begun to make their "mousselines de laines," or simply "de laines," the article now plainly denominated as "half woolens," or "cotton worsteds," consisting in woolen warp and cotton weft. This stuff was at a time much in vogue as a fine "French woolen" article, though it cannot be said that it was generally intended as a fraud (at first it may have been) to pass off a mixed stuff for all wool, because the name of "mousseline" (muslin) could be interpreted as referring to the cotton contained in the tissue. When these colors were to be dyed and printed with steam colors, a great difference was found between the two fibers in their capacity to attract the dyestuffs. The cotton threads were distinctly set off by their deep fuil color against the much lighter and imperfectly colored woolen threads; the goods were "thready," as it is called. This fault was particularly conspicuous in the blues (Prussian blue) and greens produced with ferrocyanide (also with ferricyanide) of potash and iron salts. Mercer hit upon the idea that wool possessed a deoxidizing property which might be counterbalanced and neutralized by some process the reverse of the mer cerization process, and he found that by a passage in an acid bath of bleaching powder the object was perfectly accomplished, the wool fiber being deanimalized as it were, that is, oxidized by the mixture of acid and bleaching powder, which was known to possess great oxidizing power. He tried chromic acid, or in its place a mixture of bichromate of potash and sulphuric acid, and hydrochloric acid with bleaching powder, but retained the latter, because the former two, although effecting the desired oxidation, gave the wool a yellow color, while the chlorine left it perfectly white.-T'extile Colorist.

Turkey Red from Castor Beans.
A. Braunstein has taken a German patent for the direct production of Turkey red oil from oleaginons seeds, as follows ${ }^{\text {in }}$ The oil seeds, eastor beans preferably, are first freed from their shells by passing them through horizontal rollers, then washed, and treated with strong sulphuric acid of at least $66^{\circ} \mathrm{Be}$. The acid may be mixed with the seeds, and the mass ground up together; or the seeds are ground to a fine meal and treated with the acid in a suitable vessel with a stirrer,
and which can be kept cool. After 40 to 60 per cent and which can be kept cool. After 40 to 60 per cent acid has been gradually added and stirred together with the meal, the mass is allowed to rest for several hours, when the sulphated oil, which has separated out at the top, is drawn off. The sediment is then washed out with two waters. to extract from it the remaining oil, and the washing waters being added to the first product, the whole is again allowed to stand for several hours, when some common salt is added to completely separate the sulphated oil, which is then neutralized with ammonia or caustic soda in the ordinary manner.

## Remarkable Tunnel Work.

For some time past there has been much friendly rivalry between the foremen and their men in the several headings of the new aqueduct for supplying this city with water, conceraing the amount of work that could be done in a certain time. The best record, so far, is for the week ending February 26, during which time the south heading of shaft 15 was driven 102 feet, the section removed measuring 9 by 17 feet. The men worked but thirteen shifts, so that the time was not quite a full week. Three Rand Slugger drills, No. 13, were employed, and rackarock powder was used. No time was lost by the use of this explosive, as there was no delay required in order to permit the gases generated by the explosion to escape, as would have been od by the explosion to escape, as
uecessary had dynamite been used.

## WARNER'S IMPROVED DRY PLATE HOLDER

 One of the most serious annoyances a photographer has to contend with in the present day of lightning dry plates is a leaky plate holder, particularly when the latter is composed of one or more separable parts,ranged to fly outward by a miniature spiral spring between them, as the slide is withdrawn, and effectually close the slit, may be seen in Figs. 1 and 4.
In removing the sensitive plate, the pivoted clamp is first turned up. At once the springs underneath force one end of the plate up and out of the holder, when it is easily caught with th fingers and slipped out. This feature of the holder is quite important, since in ordinary holders the operator is obliged in many cases to dig out, as it were, $t h$ e plates with the fingers, being very apt to injure or scratch portions of the film. Fig 3 is an enlarged view of the rigid view of the rigid angular strip Fig. 4 shows the pivoted clamps
down, when hold-
since the slightest trace of light entering at some minute crevice will frequently damage a day's work. By its simplicity, solidity, and ease of operating, the holder here shown possesses features very desirable for out of door photography, in that it is perfectly light tight, strong, and compact.

Fig. 1 represents a longitudinal section, in which the upper slide is withdrawn. The body of the holder consists of a light hard wood frame, having a metal septum or division in the center, upon each side of which are riveted very light flat steel springs, shown clearly in


## CONDUIT FOR UNDERGROUND CONDUCTORS

Fig. 2. In the lower half of the holder (Fig. 1) may be seen a plate in position. An angular metal strip is rigidly secured on the left hand end of the inside of each plate compartment, intended to hold one end of the sensitive plate, while at the opposite end is a movable or pivoted angular strip or clamp provided with projecting ends, which, when thrown up, permits the sensitive plate to freely drop down into the holder, resting, as it were, upon a bed of springs.
To insert the plate, the holder is held with its narrow end resting on a support at a slight angle, then the exposing slide is withdrawn, and the plate, film side out posing slide is withdrawn, and t the spring under the left hand angular strip. In this position the other free end of the plate projects slightly above the holder. The right hand clamp is now turned down over the end of the plate, pressing the same down into position. The springs compensate for any variability in the thickness of the glass. Hence the film side of the plate remains always in the same plane and in focus. The exposing slide is next inserted, and the holder is filled ready for use.

Special cut off light valves, consisting of plates with one side bent down, forming an angle, to prevent slipping, and also ar-


Elevation.


Plan.
movement. In building a conduit, the plates of one layer or series are arranged so as to break joint with those of the other layers, a proper binding material or cement being interposed between each series. This binding material holds the plates together, and insures the perfect insulation of the wires. By varying the size of the recesses, the plates may be arranged to receive single wires or couples of such size as may be equired. The wires are insulated from the earth and rom each other, and are protected against the action of water.
This invention has been patented by Messrs. Hans Loesner and M. De Bravura; further particulars may be obtained by addressing the former at No. 84 West Broadway, New York City.

## FEED WATER REGULATOR.

The accompanying engraving represents a balance valve feed water regulator which is entirely inclosed within the steam and water chamber in which it acts, and which requires no stuffing box for its stem, to impair or interfere with its freedom of action. In the engrav ing, the device is shown situated in the dome of a boiler. At the delivery end of the pipe leading from the pump


ADERHOLD'S FEED WATER REGULATOR.
is a valve box made in two sections, screwing together and fitted with two disk or puppet valves, one of which is arranged to close an opening in the upper section, while the other closes an opening in the lower section. These valves are connected by a common stem, so that they virtually form but one balance valve, which pens downward. Each valve is formed with wings or guides, arranged to fit the openings, for the purpose of steadying and directing the double valve in its move ment. The lower valve is connected by a central rod with an open float, as shown.
It is evident that as the water lowers, the valve will descend and permit the passage of steam through the outlet pipe to the pump or injector, or to a whistle. And when the water again reaches its normal level, the valve will be closed by the float, to which steam is admitted to equalize the pressure and prevent collapse This action of the valve is automatic, and in case of any sudden leak in the boiler, unnoticed by the engineer, the valve will open to ad mit of the pump supplying more water. And it may, if desired, be inade to blow a whistle or give an alarm in case of the pump failing to supply water, by using an extra valve for that purpose. The valve moves easily, without friction, and is perfectly balanced. When one pump is supplying more than one battery of boilers, the regulator is placed at the discharge end of the feed pipe, either above or below the float; if above, the opening in the float is protected, so that water cannot fill it as it enters the boiler.
This invention has been patented by Mr. Alexander J.

Aderhold, whose address is care of Birmingham Ice Aderhold, whose address is care of Birmingham Ice
Factory, Birmingham, Ala., at which place one of these regulators is now in use. One-half interest in this patent is for sale.

## A NOVEL PICTURE EXHIBITOR.

The simple and inexpensive device here illustrated is for showing pictures, especially photographs. It is artistic in appểarance, and may be easily handled to allow the pictures to be viewed with greater comfort than by means of an ordinary album. The picture-


## BOOS' NOVEL PICTURE EXHIBITOR.

holding case is made with a main body portion to which is hinged a cover or lid, and both the front of the body and the cover are formed with suitable openings, through which the pictures may be viewed. The case is provided with fixed opposite end studs, journaled in the forked upper ends of side posts fixed to an ornamental stand. The studs have neat hands, which may be graped conveniently to slowly rotate the case on the stand. Within the case are picture slides, so arranged that as the case is revolved the pictures will appear in rotation before the openings. The pictures are so arranged that part may be seen through the openings in the body of the case and the others through the openingsin the cover. The capacity of the case, or the number of pictures it will contain, depends upon its depth. There is no complicated mechanism to get out of order, as the parts are all very simple.

This invention has been patented by Mr. Arthur M. Boos, of 570 Main Street, Buffalo, N. Y.

TAKE-UP AND LET-OFF MECHANISM FOR LOOMS.
By means of this mechanism a given length of warp is let off intermittently from the warp spools or from


WILLIAMS' TAKE-UP AND LET-0FF MECHANISM FOR LOOMS.
the warp beam, as the case may be, in weaving, and the cloth taken up as woven. Fig. 1 is a side elevation of a loom for weaving cloth, with this improved mechanism attached; Fig. 2 is a top view of a part
loom, showing the take-up and let-off mechanism ; and Fig. 3 is a detail view. In the drawings, $A$ is the frame of a loom of the usual form and construction, upon which are mounted the several operating parts employed in weaving, consisting of the creel, B , with the spools, $\mathbf{C}$, thereon, warp, $\mathbf{E}$, let-off roller, K , heddles and harness, F , lay, G , having race board, $H$, cloth roller, I, and take-up roller, L. One of the two similar cog wheels, $J$, is secured to the end of a let-off roller, $K$, and the other is secured to the take-up roller, I. These wheels are geared into pinions, $M$, mounted upon shafts, to the opposite ends of which are secured like pinions, $N$, which mesh with worms. $\mathbf{R}$, on the ends of a shaft journaled in bearings on the outside of the frame. Near the center of the shaft are two bevel wheels, SS' $^{\prime}$, having an equal number of teeth, and one being upon the shaft, $P$, while the other is upon the shaft, $Y$, at the other end of which is mounted a ratchet wheel, T
To operate the ratchet wheel at the proper time to let off, through the mechanism connected therewith, the required length of warp at each beat of the lay, a pawl, $U$, is pivoted to the upper end of the vibrating lever, V , the lower end of which is slotted to receive a pin extending from the lay, so that at each beat of the lay the pawl will turn the ratchet wheel a given distance, by which the let-off roller, $K$, is revolved to supply the length of.warp required, and the take-up roller, L , revolved to take up the woven cloth on the roller, I. The latter roller is driven by friction by the other, upon which it rests, so that it will take up the same length of cloth as the roll increases in dianeter. Above the let-off roller, K , is placed an independent friction roller, the warp, $E$, from the spools passing between these rollers. To vary the length of the warp to be let off, the pinions, $M$, are changed to larger or smaller ones, as the case may require. To permit the worms to be disengaged from the pinions for shifting the latter, and also to enable the weaver to draw up the cloth to have access to the interior of the loom for repairs, the bearings, $O$, of the shaft slide outward on the brackets, $\mathrm{O}^{\prime}$. A stop pawl prevents the backward movement of the ratchet wheel
This invention has been patented by Mr. Matthew Chapman Williams, of Wilkinsonville, Mass.

## Passenger Lift for the kifel Tower.

The enormous height of this proposed French Exhibition tower renders a hydraulic lift, in which passengers could perform the whole journey in one operation, quite impossible; and a succession of shorter lifts, requiring frequent changes, would naturally be considered too cumbersome by the public who will use the tower. On the other hand, the employment of a winding engine and a lift similar to those used in mines would not be sufficiently safe, and for these reasons $M$. Eiffel has devised a new type of lift, in which the whole ascent can be made in one journey, while at the same time it presents absolute safety. The main idea of the lift is that of a huge screw and nut. Below the lift cage is placed a trolley, with three or more wheels running upon an equal number of rails, which ascend spirally, and thus form a screw having so mp.ay threads. The trolley will be revolved either by an eiectric motor or by a water engine; but the cage will be prevented from revolving by guide bars. Thas the passengers will not feel anything of the rotary mıtion of the trolley underneath; and by selecting the pitch of the screw sufficiently small, any degree of safety against a too rapid descent can be obtained.

## Gluing up stock.

When the pattern maker is at work on a very thin pattern, he is obliged to use his stock made in two parts glued together, so as to bring the grain of the wood across each other, to keep the pattern from splitting; but there is another tendency to be provided for. A very little of the shrinkage in wood comes with the grain ; it is nearly all found in its width, and the Boston Journal of Commerce says it makes one of the best hydrometers when glued together crosswise, curling and warping the stock in both ways, a feature that is not desired in pattern making. Besides, the ends are very likely to show by extending beyond the finished work as soon as the least change takes place in the absorbing of moisture; and in many respects it would be much better for the pattern if the right angle grain laying was not resorted to in the make-upof the stock. When two thin parts are to be glued together for the purpose of avoiding the tendency to split, they can be placed at a slight angle with each other, instead of at square across with the grain. This will give them all the cross laying that is required, and avoid much of the tendency to warp or shrink away from the edges.

## IMPROVED CAR COUPLING.

The drawhead is provided with the usual link recess, and is formed with two sets of coupling pin apertures, one being arranged to receive a retaining pin formed with a tapering point, while the other receives a removable coupling pin. The latter pin is connected to an arm carried by a :horizontal cross
end of the shaft is provided with lever arms, one of which is arranged to engage with a notched spring, so that the coupling may be held in a raised position, as shown at the right in the engraving. The coupling link, shown in the lower part of the cut, is formed with a slot and a circular aperture through which the retaining pin passes, while the slotted end extends outward beyond the drawhead. The outer end of the link is pointed, and the forward edges are rounded off. In order to hold the link in a horizontal position, the retaining in is provided with a flange which rests upon the link the weight of the pin thus serving to hold the link in proper position.
By making the pins tapering, they may be firmly seated within or disconnected from the flanges. When the cars are to be coupled, the coupling pins are held in their raised position. As the cars approach, the ex-


## DIETZE'S SAFETY CAR COUPLING.

tending ends of the links will enter the recesses of the drawheads, one link riding above the other; and when they have reached the position indicated in the engraving, the levers are released from the springs to per mit the coupling pins to fall through the links and couple the cars. In operating this coupling, it is unnecessary to enter between the cars either to couple or uncouple. Suitable rods are provided, in order that the parts may be manipulated from the top of the cars.
This invention has been patented by Mr. August 0 . Dietze, of Syracuse, Nebraska.

## IMPROVED SADDLETREE AND CHECK-HOOK.

The saddle is fitted upon the upper side of the saddle tree, and is formed with an aperture coinciding with a screw-threaded aperture in the center of the tree. The lower portion of the check-hook fits upon the saddle, and is formed with an aperture to coincide with the two others, so that the hook and saddle may both be secured to the tree by a single screw inserted from the top. In this arrangement there is no danger of the screw working out, and it is impossible for it to come in contact with the horse's back and do injury. The head of the screw is formed with orifices for turning it beneath the upper part of the hook, and the lower end of the screw is formed with a square socket, as shown in the small cut, extending up into the screw, so that in case of breakage a square instrument may be inserted in the socket from the upper side of the tree for turning out the remaining portion of the screw, so that a new one can be turned in. This permits of having the repairing done without injury to the saddle. The check-hook is prevented from turning upon the screw by a small stud project-


PALMER'S IMPROVED SADDLETREE AND CHECK-HOOK.
ing from its under side, and entering a recess formerl in the saddle. The two lower views in the engraving illustrate different forms of check rein holders
This invention has been patented by Mr. D. W. Palmer, of Detroit, Maine.
singing the foundation for the new hariem RIVER BRIDGE
The foundation for the center pier of the bridge now being erected over the Harlem River at 181st Street, this city, is rapidly nearing completion. The bottom of the caisson now rests upon solid rock at a depth of forty-five feet below the surface of the river, and the air-chamber is"being filled with concrete; the masonry of the pier is now being rapidly carried up. The bridge consists of two metallic arcnes, each 510 feet clear span, one of which spans the entire width of the river, and the other the whole distance from the easterly bank of the river to Sedgwick Avenue. Each span consists of six separate steel-plate arches, spaced 14 ,feet between centers and connected by bracing. The floor system is carried on vertical columns supported by the arches. The floor is 80 feet wide, and consists of a roadway of 50 feet and two footwalks of 15 feet each. The grade of the roadway is 150 feet above mean high tide. The arched masonry approaches are as nearly symmetrical at both ends as practicable.
The work of sinking the foundation for the center pier of the bridge is of particular interest, owing to the nature of the material to be passed through and its peculiar disposition. Borings showed that about fifteen feet from the surface of the water the eastern edge of the foundation would encounter rock, sloping down ward at a sharp angle toward the center of the river on this rock lie the soft mud and sand of the river bed. During the greater part of its downward journey the caisson rested both upon rock and mud and sand, and the work of sinking it vertically was, therefore, ren dered extremely difficult, since there was a constan tendency to shift or move sidewise toward the river This formation of the rock made necessary the exten sive use of explosives, and it is most probable that in this instance more rock was removed by blasting than in any other similar work ever undertaken The size of the drill holes and the quantity of ex plosive used were not influenced by the fact that the discharge took place in compressed air confined in a comparatively small chamber in which the men were. There was a possibility of the caisson being in jured by flying fragments of rock if too large charges were used, and this consideration alone controlled the quantity of explosive of each blast.
In a closed chamber like a caisson, the replacing of foul by pure air is a very slow operation; and as the condition of the men depends directly upon. the purity of the air they breathe, it is of vital importance to preserve it in its normal state by preventing pollution. Such being the case, it naturally follows that of different explosives of equal power, the one producing the least hurtful gases is best adapted for all work which cannot be quickly and thoroughly ventilated. In this caisson both dynamite and rackarock were tried, and the experience gained concerning the effects produced upon the men by breathing the gases resulting from the explosion of each is of great value.
The caisson was designed, and the foundation built, by Messrs. Anderson \& Barr, of this city. The bottom of the caisson measures 54 by 104 feet, the dimensions of the top being one foot less. The roof is six feet thick, and is built up of pine timbers one foot square laid in courses running in different directions. The side walls are three feet thick, and are also made of timbers one foot square; the outside and inside courses are horizontal, while the intervening course is vertical. The inner lower portion of each wall is beveled off to form a shoe or cutting edge, which is 9 inches wide and is protected by an oak strip. The outside of the walls is covered with a three inch sheathing, and the entire in terior is sheathed. From the bottom of the shoe to the top of the caisson is 13 feet, and the interior is 7 feet in height from shoe to ceiling. The chamber is divided into three compartments by two longitudinal partitions, which are two feet thick by five feet high and in which are formed suitable openings that serve as passage ways. The bottoms of the partitions and of the side walls are connected by heavy timber struts and iron
tie rods. tie rods.
In the center of the roof is placed the supply lock, through which all excavated material is passed and all supplies received. The shaft of the lock is 5 feet in diameter, and extends up above the surface of the water. To the bottom of the shaft, which just enters the chamber of the caisson, is attached a rectangular air lock provided with doors at two opposite sides, so that the loading and unloading of the lock can be carried on simultaneously from two points, the work is third door, opening downward or toward the interio ${ }^{2}$ do the other two. It is evident that when the sha door is closed, the others may be opened without pemitting the escape of air ; and when the two inner dows are closed and the air admitted to the lock to make thepressure equal to that in the caisson, the shaft door mit be opened. The excavated material is placed in buosets in the lock and then raised by hoisting machiner and dumped into cars at the top.
extending through the roof, a ladder furnishing the means for ascent and descent. This lock is 12 feet long by 4 in diameter, and is provided at each end with a chamber closed by two doors opening inwardly. As this forms two independent locks, no time is lost in waiting, as one lock may be always entered from the interior, and the other from the exterior. Although
eight or ten men can crowd into one of these locks, eight or ten men can crowd into one of these locks,
their small size is a decided advantage, since one man their small size is a decided advantage
On account of the rock, the method of sinking the caisson was somewhat different from that usually followed. In the solid rock under the shoe, and in the large fragments, the holes were drilled by hand; but in the center of the chambers the drilling was done by a Little Giant drill* No. 3, of the Rand Drill Company, which was supplied with air at 80 pounds pressure, and as the greatest pressure in the caisson was about 18 pounds-the depth sunk below high water being about 45 feet-there was ample power to run the drill effectively. The pure air thus supplied was also an advantage. This drill was well adapted for the work, as it could be easily moved from place to place, could be quickly set up so as to drill at any required angle, and required no particular attention. The adjustable tripod upon which this drill is mounted renders the tool of special service in work where there is not much room, and where it is necessary to drill the holes at almost all conceivable


## mixing the ingredients of rackarock.

angles. The tripod legs are telescopic, and may be lengthened or shortened to accommodate uneven ground. After a blast, the loose rock was removed from under the shoe, and earth was put in its place. When all the rock under the edges had been removed to a depth as deep as it was practicable to go at one time, and earth had been packed under the shoes, the caisson was in condition to be sunk, as it was supported wholly by earth. The earth was removed, a
little at a time, at intervals around the entire shoe, and as the supporting power of the earth was thus diminished, the caisson gradually settled down. Its downward progress was closely watched, four stakes, one in each corner, forming guides that indicated the settlement; and if one side advanced more rapidly than the other, the earth was repacked under ite shoe so as to offer more resistance and retard that side. In this way the caisson was sunk vertically, and so truly and evenly that, when it finally rested upon its bed,
the four corners and the center did not vary an inch from being in the same horizontal plane.
As the caisson descended, the masonry of the pier was added on the top. This furnished the weight neces
In an engine house located just across the railroad tracks are the compressors for supplying air to the caisson, and a separate compressor for the drill. The electric light plant consists of a dynamo capable of running seventy-five 16 candle power incandescent lamps. The experience of Messrs. Anderson \& Barr has shown that in interior work such as this many lights of small power distributed through the chambers afford a much better illumination than a few arc ights arranged at long distances apart, and their use does away with the annoyance caused by the carbon
dust of the arc lights.
At the time of blasting, the men pass into the furthest chanber, so that the intervening partitions, or
partition, if the blasting takes place in the center chamber, will prevent the passage of flying rocks. Care is also exercised to keep out of live with the openings in the partitions; and in order io raise the feet, so they may not be struck by rocks passing under the partitions, which are but five feet in height, the men generally climb upon some of the cross braces. The effects produced by the discharge are very different from those caused by the same quantity of a like explosive fired in the open air. The sound is decidedly duller, and although its source is apparently very close, there is no sharp and sudden concussion. Even the simultaneous explosion of five $11 / 2$ inch cartridges of rackarock produces no unpleasant sensation whatever upon the ear. But the effect upon the caisson was certainly startling. The waves of air seemed to bound from one wall to the other, causing heavy vibrations of all parts of the structure. This disturbance continued several seconds, and the motion could be distinctly perceived some time after all sound had ceased. The sound did not die away in the distance, but even when last heard appeared to be in the chamber.
During the first part of the sinking, dynamite was exclusively used, and after each firing the men complained of severe headache, and suffered from nausea. These troubles were caused entirely by the gases generated by the dynamite, and their severity depended directly upon the quantity used at one time-a small charge not vitiating the air to such an extent as a large one, and consequently not creating such disagreeable results. The pains continued until the constant inflow of fresh air either displaced the hurtful gases or so reduced them as to render them harmless. The danger always attending the handling of dynamite cartridges was another great disadvantage, especially in work of this character, where, during the charging, the holes were surrounded by workmen.
Rackarock was then tried, and its better adaptability for all operations in closed chambers was conclusively demonstrated. The fumes generated by it were comparatively harmless; nausea disappeared completely, and there were but few and slight cases of headache, while the immunity from risk in handling it lessened the anxiety of all connected with the work. This explosive, as is well known, consists of two ingredients, a fluid anā a solid, whieh are shipped and delivered to the consumer in separate packiages, and eaeh of which is absolutely non-explosive. When needed, the two ingredients are combined by pouring a certain proportion of the fluid over the solid, which is contained in a bag of the usual cartridge form, as illustrated by the engraving upon this page. In a few seconds the oil has thoroughly saturated the cartridges, one of the tied ends of which is then cut, the cloth case opened, and the fuse inserted, when the end is retied and the cartridge is ready for use in the ordinary way. Enough of the ingredients may be mixed to produce charges for a single blast, a shift, or a week's work. This explosive is as powerful as dynamite, is safer to handle after the ingredients have been mixed, and for all tunnel and mining work, where it is difficult to quickly change the air, it is decidedly superior.
After the caisson had been carried down so that almost the entire shoe rested upon solid rock, the rock was cleaned of all debris and the three chambers completely filled with concrete, the filling being commenced at the corners and carried toward the shafts. Sand and Portland cement, in the proportion of 1 cement to 2 sand, were mixed and moistened outside and introduced through a long lock, consisting of a tube 18 inches.in diameter, extending from the caisson to the surface, and provided at each end with a door. Upon the lower door being closed, this shaft was filled with sand and cement, when the upper door wasclosed, the compressed air admitted, and the load allowed to fall into the caisson.
The two main shafts were extended from time to time, as the caisson descended, by additions secured to their outer ends. As the lock for the men was at the upper end of the shaft, it was necessary to close the lower end while the air lock was removed and an additional length of shaft put on. The inner end of the shaft was closed by a heavy timber piece, fitted airtight on it. Upon the escape of the compressed air from the shaft, the pressure in the caisson served to hold this cap firmly in place.

## New Procens for Making steel Pipes.

The new method of making steel pipe at Barbach, Germany, is said to be very successful, and the process of manufacture is briefly as follows:
As soon as the steel is cast into the round mould, a core is thrust into the steel, so that the tube is formed between it and the sides of the mould. In order to prevent cracking of this annular casting during cooling, the core is made up in such a manner that it follows up the shrinkage of the steel. The steel cup thus obtained may then be rolled in an ordinary train. It is stated that a large firm in Paris proposes to aping.

## THE NEW 110-TON GUN.

The 110-ton gun now undergoing its firing proof at Woolwich must be regarded as a fine specimen of the most recent practical achievement in very heavy guns. It is true that Krupp has supplied four ordnance of 118 tons to the Italians, but the power of guns does not depend entirely upon their weight, and we believe that our piece has already shown itself superior to its Ger man rival, by delivering a heavier blow than any which has yet been given, as far as our information goes, although the heaviest charges have not yet been fired from the English gun.
To lay before our readers the plan on which the power of a heavy armor-piercing gun is estimated, and how it may happen that a comparatively light strong gun of good design may be superior to one of heavier metal, we may compare the gun now under trial with the four 100 -ton R.M.L. guns purchased by our government in 1878 from Sir W. Armstrong \& Co., when the famous $£ 6,000,000$ was hurriedly voted for war stores. These four guns are now mounted on the fortifications of Malta and Gilbraltar; but although only a few years have elapsed, designs have so changed that the new gun is intended to fire double the charge of the older piece, and the energy of its blow is expected to increase in almost the same proportion. We will explain how this has been accomplished. The 100 -ton guns were made of coils of wrought iron, the inner tube only being of steel. The latter was made in two parts joined together, the junction being sealed by a so-called gas ring, as, at that date, there was a difficulty in procuring the long tube in one length of steel, and this 110 -ton gun is entirely of steel, and the inner tube is made in one piece by the firm of Sir J. Whitworth \& Co., on the same principle as the propeller shafts for steamships.
A striking difference between the two designs is the proportion of the weight of projectile to that of the gun. In the 100 -ton gun, with a projectile of $1,968 \mathrm{lb}$., the ratio is 1 to $113 \cdot 8$; while in the 110 -ton gun, with a projectile of only $1,800 \mathrm{lb}$., the ratio is 1 to 137.5 . We thus see that in the new system the projectile is lighter by some 17 per cent, in proportion to the weight of the gun, than in the older design. This change has been made in order to attain the present high muzzle velocity of over $2,000 \mathrm{ft}$. Since the effect of the blow, or the "energy" of a projectile-expressed mathematically by $\frac{\mathrm{W} v^{2}}{2 g}$-depends directly on its weight, but varies with the square of the velocity, an increase of velocity is more important than an increase in weight. Thus, for example, suppose a projectile of 100 lb . moves at a velocity of $1,000 \mathrm{ft}$. per second, it, will deliver a certain definite blow. If its weight is doubled the energy will be doubled, but if its velocity is doubled the energy will increase fourfold: Consequent on the reduction of the weight of the projectile, there is a reduction in caliber from 17.72 in. in the 100 -ton gun to 16.25 in. in the 110 -ton gun. The energy of the 100 -ton gun projectile is 32,700 foot-tons. The greatest yet attained by that of the 110 -ton gun was 53,895 foot-tons, but as much as 62,000 foot-tons is expected to be reached.

Some idea of the work or energy impressed on the shell may be given from the fact that the ship for which the new gun is intended, the Benbow, of 10,000 tons, could be raised upward $5 \cdot 39 \mathrm{ft}$. if the same amount of work ( 53,895 foot-tons) were epployed for that purpose; or we may, perhaps, give a better comparison by stating that the Benbow must steam at a speed of 10.5 miles an hour to inflict a blow with her ram having an energy equal to that attained by the projectile of the new gun. The disastrous and fearful effects of large vessels ramming at speed, when provided with strong bows, are well known. A considerable change has been made in the amount of capacity, on which depends the utilization of the effects of the combustion of the powder charge. In any gun, if the charge is increased, the energy of the projectile will not increase to the same extent, unless the interior capacity of the gun is also increased.
The projectile should not only receive pressure, but the pressure must act over a considerable distance. In other words, the greater number of times the compressed gas produced on explosion is allowed to expand in the bore, while at the same time it presses on the base of the projectile, the greater will be the energy imparted to the projectile. The same principles are involved as in the expansive working of steam. The greater the number of expansions allowed, whether in one, two, or three cylinders, the greater work will be performed by a given amount of steam under a given pressure. The object of the gun designer is, therefore, to increase the interior capacity of the piece as much as possible; but, as we have already seen that it is desirable to reduce the caliber, additional capacity must be obtained by increased length. The bore of the 100 -ton gun is 363 in., while that of the 110 -ton gun is 487.5 in . in length. An increase of capacity is also given by enlarging the diameter of the chamber or part allotted to the charge. In the 100 -ton it is $19 \cdot 7$ in., while the bore is 17.72 in., but in the 110 -ton gun this
difference is much more pronounced, the figures being diference is much more pronouncestively $21 \cdot 12 \mathrm{in}$. and $16 \cdot 25 \mathrm{in}$.
respect
It should be stated, however, that increase in the diameter of the chamber imposes a greater circumferential stress on the metal of the gun, for the same reason that water under pressure in a tube may burst it if the diameter is large, but? it will not do so if the diameter is smaller, although the thickness of the me tal is the same in each case. The strength of the new steel gun is, however, sufficient for the increased stress imposed by the enlargement of the powder chamber. The total capacities of the old andnew gun are respectively 90,700 cub. in. and 112,600 cub. in., and we have dwelt at some length on this point, because of the importance of the principles involved. Four rounds have already been fired from the 110 -ton gun, with charges of $600 \mathrm{lb} ., 700 \mathrm{lb}$., and 800 lb ., on February 10, and 850 lb. , on February 16.
Westphalian prism brown powder hasbeen employed up to the present time, and the velocities attained have been satisfactory (from $1,685 \mathrm{ft}$ to $2,078 \mathrm{ft}$.). With the highest charge yet employed, the maximum pressure has been as much as $183 / 4$ tons on the square inch. This, however, need cause no surprise. It merely indicates that a slower burning powder should be employed when very large charges are fired. As the volume of the powder chamber is a constant, it follows that when the charge is a small one a certain amount of "air space" is left. This serves to receive the initial expansion of the gases produced on explosion, and lowers the maximum destructive pressure, while, at the same time, some useful effect on the projectile is lost. On the other hand, when a large cartridge is employed, the air space is diminished, and the maximum pressure rises considerably. It.is desirable that the pressure should never rise to a very high maximum, but that it should be well sustained. Hence it is possible that one description of powder might give good results when a small charge is used, but a slower burning powder might be employed with advantage when the charges are large.
We give herewith a longitudinal section of the gun, and diagrams in plan and elevation of H. M. S. Benbow, for which the 110 -ton guns are intended. These show the method of barbetite mounting. The central part only of the vessel is armored, and the ends of the vessel are protected by an armored deck below the water line. The four guns of 118 tons supplied by Krupp to the Italians are of crucible steel, the caliber ( 15.75 in.) being even smaller than that of our 110-ton guns.
The greatest energy yet attained, of which we have information, is some 50,700 foot-tons, with 864.67 lb . of powder and a projectile of $2,028 \mathrm{lb}$., with a muzzle velocity of $1,900 \mathrm{ft}$. per second. It thus appears that although the Krupp gun is heavier than ours, and has employed a slightly larger charge than any yet flred in England, the muzzle energy attained by its projectile is somewhat less than that impressed upon the proo shot of the British gun.-Industries.

## Carbonic Acid.

The manufacture of liquid carbonic acid is now an important industry in Berlin, where, according to Industries, a company established for this purpose are making daily over half a ton of this commodity. The acid is sent out in steel bottles, each containing from 17 pounds to 18 pounds, and the price charged is a lit tle under 1 s . per pound. The acid contained in a bot tle when expanded into gas occupies over 10,000 cubic feet. It is principally used in the manufacture of mine ral waters, and for beer engines. An important use of carbonic acid was suggested as early as 1879, by Dr. Raydt, of Hanover, for the raising of wrecks, who demonstrated the possibility of this application by an experiment at Kiel. The apparatus consisted of a stee bottle containing the liquid acid, and a collapsed canvas bag placed over the neck of the bottle. When the whole is submerged, and attached to the object to be raised, a cock is opened, and the liquid in the bottle is allowed to expand into the bag, inflating the latter, and thus causing it to rise. Another application was introduced by Herr Krupp, of Essen, for compressing liquid steel, and a large plant for the production of liquid carbonic acid has already been at work for some time at the Essen factory.

COMBINATION TOOL FOR \&QUARING, LEVELING, ETC. The engraving represents a tool which bas been recently patented by Mr. David W. Warnock, of Lexington, Ky. The tool may be used for squaring, leveling, plumbing, centering cylinders, laying off angles, starting a saw kerf for cutting a keyhole, and for cut ting lace leathers for belting. In one edge of the body is a groove, held in one end of whirh is a square blade which is cut away at an angle of $45^{\circ}$ upon its inner edge, to form a beveled shoulder for recei ving and supporting the end of a slotted bar, when in the position shown in Fig. 1. This bar is fitted in the slot, and is provided with a pivotal pin projecting through a second slot formed in the side of the body. This pin retains the
position for use or folding it into the body when not in use. The end of the second slot, near the blade; is curved toward the blade, and the opposite end is branched. In the main groove is placed a thin pair of compasses with a pivotal pin projecting through the side slot. When it is desired to use the slotted bar, the compasses are drawn forward into the branch of the side slot, and the pin of the bar is moved forward to the extremity of the slot beyond the branch, when the compasses may be pushed back entirely within the body. When the bar is folded over upon the shoulder, a left miter can be obtained; and when it is pushed


WARNOCK'S COMBINATION TOOL FOR SQUARING, LEVELING, ETC.
back in the slot to the angle of the body and blade, and then inclined outward at an angle of $45^{\circ}$, a right miter can be obtained.
Both right and left miters can be obtained without reversing or turning the square over. In the body is a cavity, into which the protractor may be turned when not in use. Fitting in a slot in the outer edge of the body is a keyhole saw, the inner end of which is slotted to receive a pin, as shown in Fig. 2. To facilitate the opening of the saw, its back is provided with a nick for receiving the thumb nail for lifting it out of its slot. In one side of the body, near the middle, and at one end, are secured spirit level bulbs; which are used for leveling and plumbing in the usual way.
In a transverse groove in one side of the body is a teel bar, A, Fig. 3, which is bent at right angles at its extremity toward the blade, and is formed into a knife having a shank projecting through a slot in the blade, to receive a nut for clamping the knife in any desired position in the slot. This knife is designed for cutting lace strings for kelting, and is made adjustable, to admit of cutting laces of different widths. When not in use, the knife is moved into a notch in the edge of the body.

## A NOVEL GAME BOARD.

This novel form of board is designed to be used in the playing of a game which not only affords much amuse ment, but requires considerable skill and steady nerves. The disk may; be of any appropriate size, and is provided with a haridle and formed with holes arranged and nuinbered as shown in the cut. To the enlarged portion of the handle is secured a bail, which acts as a sup port for the marble used in playing the game. Should the marble leave the disk, it would be prevented from


## THE MARBLE PUZZLE OR NERVE TESTER.

falling to the floor by the encircling hoop. The main feature of the game is to cause the marble to pass from he bail around the disk, past the several holes, to and around the central hole, and back again to the bail. The marble should pass the holes marked with the lower numbers first, but if it should fall from the outer edge of the disk, or into either one of the two large inner openings; no count could be pade. It is evident that the shape of the disk and the arrangement-of the holes may be changed as desired.
This invention has been patented by Mr. C. E. Tranchell, of Willmar, Minn.

A correspondent of Wood and Iron asks what he shall do under the following circumstance: He says that he is foreman of a certain shop, but that he is foreman only in name. The proprietor, who, he says, has no mechanical knowledge, continually interferes with the men, giving them orders contrary to his directions. He asks our advice as to whether he had " better quit or kick him out of the shop." We have been, says the editor, in precisely that situation ourselves, and we think on the whole he had better seek "pastures new." Where a proprictor of that kind interferes in the management of the shop at all, he will continue to do it, and the less he knows about mechanics, the more he will interfere.

A little incident in the life of the late President Rutter, of the Lake Shore Railroad, may not be out of place as illustrating the relative positions of proprietor and foreman. When Mr. Rutter first hecame general baggage agent for the Vanderbilt system, he came upon a very knotty problem, and not knowing what decision to give, he went to Vanderbilt for advice on the subject. When he had stated the case, Mr. Vanderbilt turned to him and asked: "What salary do we pay you?" "Eight thousand dollars a year." "What do we pay it to you for?" "For acting as general baggage agent." "Well, do you want me to earn your salary for you ?" Mr. Rutter immediately came to a decision, and never again troubled Mr. derbilt with his conundrums.

## SCIENCE IN TOYS.

ix.
the toy microscope.
The world of the minute existing beyond the range of the unaided vision is little realized by those who never have had an opportunity of using the microscope The beauty and per fection of the smaller works of nature can never be fully known through the medium of literature or art; the objects themselves must be observed by the stu dent personally.
In every pond and stream may be found microscopic forms of life. In every plant and flower, upon leaves and stalks, among the sands and rocks, almost every where in all seasons, may be found objects of absorbing interest to the student of microig. 2.-DIAPHRAGM AN FINE ADJUSTMENT. scopy. Animals and insects, food and manufactured articles, yield objects which may be examined microscopically with pleasure and profit. Chemistry and mineralogy afford attractive fields. In fact, one so inclined cannot fail of finding objects of interest with little difficulty.
Some have erroneously supposed an expensive instrument and elaborate accessoties necessary to the pursuit of microscopical investigations. These things are, of course, desirable; but when one has learned all that can be learned by the aid of the simple and inexpensive microscope shown in the engravings, he is very far advanced, and may with propriety present his instrument to some one unable to purchase for himself, and proceed to the selection of something better suited to his advanced position in microscopy.
The microscope referred to was devised, at the suggestion of the writer, by one of our leading manufacturers. It costs six dollars and fifty cents, and although not as complete and convenient as more expensive instruments, it is more perfect and satisfactory than its predecessors of the same price.
It is 8 inches high, and has a draw-tube, which permits of extending it to a height of 11 inches. The foot and arm are of japanned iron. The tubes are well finished and lacquered. It bas an objective divisible into two powers. The mirror may be swung over the stage for the illumination of opaque objects. The instrument has a neat cherry case, in which it may be placed when not in use
To the instrument as received from the manufacturer is applied a home-made diaphragm, as shown at A, in Fig. 2, and a fine adjustment, as shown at $B, C$, in the same fagure. The diaphragm consists of a piece of perforated thin sheet metal, extending
along the under surface of the stage and neatly bent over the outer edge of the stage, so as to be self-sup-porting-the perforations of the metal being respectively one-sixteenth, one-eighth, three-sixteenths, onefourth, and five-sixteenths inch diameter, all arranged on a longitudinal line of the metal plate intersecting


Fig. 3.-SUBSTITUTE FOR REVOLVING TABLE.
the mirror and source of light, or between the mirror and the stage, modifies the light so as to greatly relieve the eyes.
The lamp should be provided with a shade of some sort to prevent the light from passing directly from the lamp to the eyes. A small Japanese fan suspended from the chimney by a wire, as shown, forms a very desirable shade.
Most objects viewed by transmitted light in an instrument of this class require an absolutely central light, that is, the light must be reflected straight upward through the object and through the tube.
When opaque objects are examined, the mirror is raised above the stage and made to concentrate the light on the object. Different angles of illumination should be tried, as some objects are greatly relieved by their shadows, while others require illumination as nearly vertical as possible.
Experience will soon indicate the right magniflcation for different objects. This may be varied by taking off or putting on the lower half of the objective, also by drawing out or pushing in the draw tube.
Various forms of apparatus have been devised for gathering objects from ponds and streams; but much can be done with no other aids than the spoon and bottle above mentioned. The mud at the bottom, scraped up with the spoon and placed in the bottle, will probably be found to contain microscopic life in
the axial line of the microscope tube, so that the centers of the holes of the diaphragm may be made to coincide with the center of the hole in the stage.
The attachment for fine adjustment is made by bending one end of a thin metal plate twice at right angles, so that it will spring on the side of the stage and clamp the stage tightly. The opposite end of the metal plate is bent in a similar manner, but the space between the body of the plate and the bent over end is made wider, to permit of a small amount of movement of this end of the plate. In the portion of this end of the plate extending under the stage is inserted a screw with a milled head, by means of which the free end of the plate may be made to move either up or down through a small distance. The body of the plate is inserted under the stage clips, and the object slide is inserted between the clips and the plate.
The instrument has no rack adjustment, but the main tube slides easily and smoothly in the guide tube, so that little or no difficulty is experienced in focusing. Besides the instrument and accessories, only the following articles will be required to begin in earnest the study of microscopic objects : A small pair of spring forceps, a bottle, a teaspoon, a few concaved glass slides, a few thin cover glasses, a glass drop tube, a small kerosene lamp: and if the investigator desires to entertain his friends microscopically, he will need a Japanese or tin tray, large enough to contain both microscope and lamp, as shown in Fig. 3, so that the relation of both may be preserved while the tray is moved to bring the instrument into position for different observers, by simply sliding the tray on the table.
A little caution as to illumination is necessary, as the beginner is generally unsparing of his eyes, using far too much light. A blue glass screen placed between


Fig. 1.-THE TOY MICROSCOPE.
abundance. The under surface of leaves of aquatic plants and of grasses hanging over into the water may be scraped with the spoon, and more or less of the matter adhering thereto will be secured. Occasionally a long leaf like that of the flag may be lifted from the water and traversed by the spoon with good results. Small twigs and dead leaves floating in the water are often found teeming with life. The thousands of animalcules and forms of minute plant


Fig. 4.-Transferring objects to the slide.
life found in water will afford the most zealous student a life-long supply of subjects for examination.
The objects are transferred from the bottle to the concavity of the slide for examination in the manner shown in Fig. 4. The drop tube, which has a funnelshaped top, is stopped by the finger at the upper end, while its lower end is inserted in the water in the bottle above the matter to be removed. The finger is then removed and some of the water, togefiner with the objects carried by it, rushes upward into the tube. While the lower end of the tube is still in the water, the finger is again placed on the tube and the tube is withdrawn from the bottle and held over the cavity of the slide, as shown in the engraving, when a drop or so of the water is forced out by pressing down the end of the finger on the top of the tube; the soft end of the finger acting as a sort of diaphragm in forcing out the required amount of water. Care must be taken to avoid getting solid matter upon the slide around the edge of the cavity, as it will prevent the cover glass from seating itself properly. The cover glass is placed over the cavity and pressed down lightly to squeeze out the surplus water, when the slide may be inserted under the clips of the stage and examined.
It would be futile, in a paper like this, to attempt anything more than the mere mention of a few of the interesting objects that may be seen to advantage in a small microscope. In Fig. 5 the engraver has beautifully shown some of the common objects which are easily secured, readily examined, and always interesting. At 1 in this engraving are shown various seeds; the lace-covered one at the top being the seed of the Nemesia compacta. The seed in the center is that of heather. That on the right of the lace:covered one is the seed of the poppy. The fringed one below it is that of the climber. At the bottom of the disk the seed of sorrel is shown at the left, and portu-
lacca at the right. The remaining seed at the left is that of aucharidium.
2 represents the proboscis of the blowfly as it appears in the field of the microscope, except that the intricate structure of the pseudo-trachea is not shown in the cut as it appears in the microscope.
3 shows the doubling hooks of a bee's wing, which enable the insect to connect the wings of each:pair so that they may be used as a single wing.
4 shows the silicious stellate hairs on the back of a deutzia leaf. The upper half of 5 shows several forms of diatoms, and the lower half is filled with desmids.
In 6 branchipus is shown at the top, cyclops at the left, a young cyclops at the bottom, and daphnia or the water flea at the right. These are common in almost every pond.

In disk 7 are shown on the left the stentor, so named on-account of its trumpet-like form; in the center the beautiful and sensitive vorticella, and upon the right of the vorticella common rotifer, and upon the extreme right the sheathed trumpet animalcule. All of these have cilia around their margins, which by their peculiar vibratory motion give the bell-shaped mouths the appearance of rotation. In the common rotifier, and in the animals shown in disk 6, the internal organs may be readily seen in operation.
In the upper part of disk 7 are shown a few of the hundreds of forms of life found in water in which animal or vegetable matter has been infused.

In disk 8 are represented a number of the exquisite little shells of foraminifera. At 9 are shown various spicules of sponges, sea urchins, etc. At 10 are shown sponge spicules and the anchor of Synapta inherens. 11 shows the pollen of marsh mallow, and 12 and 13 are examples of plant hairs. 14 shows arborescent crystals of silver, and 15 the fern-like crystals of gold.

The following books are recommended to the beginner in microscopy: Wood's "Common Objects for the Microscope;" "One Thousand Objects for the Microscope," by M. C. Cooke; "Evenings at the Microscope," by Gosse; and "Practical Microscopy," by George L. Davis.
G. M. H.

Hemp Cultivation in Yucatan.
The cultivation of hemp (heniquen) is the principal agricultural industry of Yucatan, and of this the greater portion is imported into and consumed in the United States, theimports thereUnited States, theimports there-
of during the year 1885 amountof during the year 1885 amount-
ing to 36,401 tons, valued at ing to 36,401 tons, valued at
$\$ 2,564,000$. We are, therefore, largely interested in this industry, which is carried on in a very primitive manner. The plant, says Consul Thompson, to whom we are indebted for the following facts relative to its cultivation, is a species of agave. It is best propagated by cuttings, the young plants being allowed to grow at will until three years old, after which they are transplanted into regular rows and fields. Eight years are given them to mature into plants able to bear the cutting, and then the result of these years of patient waiting will continue to flow uninterruptedly for many years if moderate care be exercised. The leaves are cut by a peculiar instrument, a cross between a sickle and a carving knife, called by the natives corba, and are made into a systematic bundle of about 25 each, and carried by the laborers upon their backs to the tram car or cleaning wheel, where they are passed through the process before mentioned. This cleaning wheel is the only kind of agricultural machine, as we understand the term, in use upon the farms of Yucatan. Even the plow is practically unknown. Each meate of hemp land should prodace yearly four arrobas of merchantable hemp. Arroba is the equivalent of 25 lb ., therefore each acre, or 10 mecates, should yield atleast $1,000 \mathrm{lb}$. of heniquen fiber ready for shipment.
To cut and pack 1,500 leaves is considered to be an ordinary day's work. These 1,500 leaves, when cleaned and dried, will produce about 3 arrobas, or 75 lb ., of fiber. One cleaning wheel with two men to tend it is calculated to clean easily 7,000 leaves per day. A 400 lb. bale of fiber-cut off from the plant, but still in the leaf-is estimated to cost $\$ 4$, or 1c. a pound ; when cleaned, bleached, and baled seady for shipment, the


1. Seeds. 2. Tongue of Fly. 3. Bee's Wing. 4. Deutzia Leaf. 5. Diatoms and Desmids. 6. Entomostraca. 7. Infusoria,
Rotatoria. 8. Foraminifera. 9. Spicules. 10. Spicules and Plates. 11. Pollen of Marsh Mallow. 12. Plant Hairs. Rotatoria. 8. Foraminifera. 9. Spicules. 10. Spicules and Plates. 11. Pollen of Marsh Mallow. 12. Plant Hairs.

## Fig. 5.-VARIOUS MICROSCOPIC OBJECTS.

lant for some reason seems to be let severely alone by hem. This is providential, and enables the planter, by selling his fiber, to obtain from the United States the grain that the locusts deprive him of the power o raise at home.

Picrate of Ammonia in Malarial Diseases
Dr. H. Martyn Clark, of the Amritsar Medical Mission, Punjaub, has treated no less than 10,000 cases of malarial diseases with picrate of ammonia, and in half the cases he has kept a record. In nine cases out of 5,000 did the picrate fail, and in these quinine cured at once. The usual dose is from $1 / 8$ grain to $11 / 2$ grains four or five times a day in pill. Half a grain is a fair average dose. Thus given the result is soon visible. In the great maority of the cases treated, $1 / 2$ grain doses in the interval prevented the recurrence of the next attack of the fever, while in about 20 per cent of the patients two or three attacks followed before the fever ceased. In only one case of quartan ague, despite large doses of the salt, the fever recurred for six periods, gradually diminishing in intensity, and then yielded to it. It is equally successful in all the forms of ague, but it is a curious fact that the cases in. which it failed to cure were all of the tertian variety. Dr. Clark has also employed this gent in the treatment of $t_{1}$ 'enty-five cases of malaria, neuralgia of various nerves, six cases of malarial head-
ache, and one of malarial colic. In all these instances it cured completely and speedily. In addition to being cheaper and given in smaller doses, picrate of ammonia does not produce the unpleasant effects that quinine does, such as headache, deafness, tinnitus, etc.; nor does, such as headache, deafness, tinnitus, etc.; nor
does it, like quinine, disorder the digestion or cause does it, like quinine, disorder the
nausea, as quinine does in India.

## A Spontaneons Effusion.

Brick Pomeroy's Democrat has a high appreciatior of this paper, as the reader will conclude when he reads the following unsolicited editorial notice, taken from a recent issue of the Democrat:
The Scientific American is in fact what the Bartholdi statue is in theory-the giver of light and conveniences to the world. It has encouraged and stimulated the inventive genius of the country, and thus helped to develop.thousands of ideas that are now positive facts and most useful blessings to humanity and great helps to progression. Year after year it has opened the door for new thoughts to enter. Never has opened the door for new thoughts to enter. Never has
it joined in the senseless, deadening yawp of over-production. On the contrary, it has ever urged the bring-
ing forth of the new, the multiplying of devices and inventions, and the making and giving of employment to millions in this country who to-day are engaged in useful avocations that were unknown when the writer of this was a boy. The world moves, and more of the credit than people think for is due to the Scientific AmeriCan and its help to make Ameri cans scientific. It is published by Munn \& Co., 361 Broadway, New York, at $\$ 3$ a year. The Scientific American SuppleMENT, 16 pages, weekly, $\$ 5$ a year. The two, $\$ 7$ a year. It is no uncommon thing for one number of either to benefit the subscriber more than ten times the yearly subscription for both publications, especially if he has a brain for machinery and a de sire to lead on from one thing to another.

## The Variable Star Algol.

Estimating the distance of Algol from the ascertained distance of the few stars which are near enough to have had their parallax accurately measured, it would take light not less than thirty years to reach the earth We see Algol, not as it is to-day, but as it was thirty years ago When we see its brightness dim med, the phenomenon which we are observing is one which actu ally occurred thirty years ago the light which left the star at that time having just reached our eyes. During those thirty years the image of that phe nomenon, if I may so express it, has been on its rapid way to ward us. But less than thre days after it started, when it had just commenced its journey, having come only fifty thousand million miles on its way, another period elapsed, another partial obscuration took place, and the image of that started on its hitherward course. This was followed, three days later, by another, 50,000 .000,000 miles behind it; and that by another, and another ; and thus, during the whole period of thirty years, the life of a generation, these successive images have been winging their way toward us. There are 127 of these periods in a year, and nearly 4,000 in thirty years. When, therefore, we see the obscuration of Algol, we know that 4,000 such obscurations have taken place since the one we are observing, the images of which are following each other at invervals of 50,000 ,000,000 miles along the vast space which separates us from that wonderful star.-Henry M. Parkhurst.

Among the numerous collectors of curiosities of every kind who abound in Paris, there is one wealthy virtuoso, according to the Pottery Gazette, who amuses himself by collecting deaths' heads and skeletons fantastically carved or modeled in' marblo, earthenware, wood, or precious stones. These he has gathered together in a kind of museum of death, which at first sight seems hideous and macabre, but on closer inspection proves highly interesting. Some of the heads have been detached from those old mediaval rosary beads which were usually ornamented on one side with the profile of a king or a saint, and on the other with the grinning face of a ske'eton.

## Uncle Sam's Curiostry shop.

It may not be known to many out-of-town readers of the Scientific American that the United States court in which patent cases are tried in this city is held in the Post Office building.
It is necessary to know this fact to understand what impelled a newspaper reporter to climb so high to find the miscellaneous articles he describes.
"Climbing flight after flight of stairs in the Post Office building, by an inside passage, until there was nothing between him and the sky except the roof, an Evening Sun reporter, very much out of breath, reached at last the curiosity shop of Uncle Sam. Two large rooms and a small one are devoted to the curiosities. They are piled up on the floor in great heaps, while tiers of long, broad shelves are filled with them. There are so many of them that the custodians would very much like to get rid of them. But they are preserved with jealous care. They are the exhibits made by contesting parties in patent casos. The testimony is taken on the floors below in the offices of the United States Commissioners, and the exhibits, after being properly marked for identification by the examiner, are stowed away.
"It needs but a cursory glance to come to the conclusion that nearly everything that man uses is patented, and that nearly everything that is patented has to fight infringements, or at least what are claimed to be infringements.
"Bundles of cloaks, corsets, hats, ready-made clothing, and hat sweats are piled up on the middle shelves. Hoopskirts, frames used for clothing in shop windows, fire screens, patent medicines, and paints add variety to the scene. The 'shoo-fly ' rocker is largely represented, made in the shape of a bird.
"The floor of the smaller room is completely covered with a pile of school furniture. High up on the wall hangs a model of a sliding car door. Near it are several sets of heavy iron shutters. Huge furnaces rest by the side of tiny oil stoves.
"The veteran exhibit is a specimen of the first refrigerator invented. It consists of a barrel within a barrel, the spaces between the inner and outer one being filled with brick. The inner barrel is divided by a partition, one side being intended for the ice and the other for the storage of the articles to be preserved. An equally curious exhibit is the model to show how wet tan is burned. It is made of tin, and consists of a large number of curiously arranged boxes.
"There is a full coilection of railroad signals, with white and red headlights. One of the towers is a leaning tower. Near by is a set of electric bells, a patent bottle stopper, a hopper, a cotton press model, and a great variety and number of scuttles. Patent pails are equally numerous, and there is a large assortment of tin oil cans. A very odd spring has a triangul
base, with a straight rod working up and down. base, with a straight rod working up and down.
"Among the most profitable inventions is the
"Among the most profitable inventions is the box, with its numerous compartments, made with straw boards. Photograph instruments, bed springs, and odd wagon springs rest side by side. Several yellow bags, curiously tied, arrest the attention. These are intended to show how hams are tied up. The style of tying is patented. Patent cuspidors occupy an upper shelf. Just under them are a number of coffee mills.
"There is a very interesting bit of machinery for making barrels and hooping and heading them. On the shelf above it is an equally curious exhibit of a brick machine. Two very clumsy and heavy exhibits are the models of a machine for making boot heels, and another for manufacturing envelopes. The latter is old-fashioned and very complicated. Two other clumsy exhibits are the knitting and ruffling machines, and also one for pegging.
"Soda fountains are very numerous, and there are buttonhole and kid glove machines, with countless sewing machines, whole and in parts. Only a small fraction of the entire collection has been named. It is apparent that in the matter of a patent, eternal vigilance is the price of success."

## Exhibition of Locks and Keys.

An Austrian locksmith, Herr Audreas Dillinger, has been for eighteen years collecting locks and keys of ancient and modern manufacture. The work was undertaken with a view to benefit the locksmith trade, by diffusing useful knowledge, and the articles were first exhibited two years ago, in an industrial museum at Vienna. On the initiative of the Educational Department of the Austrian Ministry, the collection was sent for ex hibition into various towns in Austria, and after the round was completed Herr Dillinger carried his collection to Germany, and exhibited it there in various important industrial centers, the last in turn being Berlin, where the collection has recently been on view. It contains 606 different locks, the earliest examples dating from the year 400, and the latest being quite modern. Awong the collection are seventeen locks from the middle
ages, which, in point of workmanship and artistic design show the high state to which this industry was developed in those times.-Industries.
the decoration of a home.
In the "Grammar of the Decorative Arts," by Prof. Charles Blanc, of the College of France, and a member of the Academy, the author tells us that "effects of


## dEENETIAN GLAB8-SEVENTRENYH CENTURY.

perspective are absolutely forbidden in the decoration of the floor," and that "in furniture the straight lines should be mainly vertical and the curved lines mainly horizontal in direction." In the beautiful cabinet of which we give an illustration, though the vertical lines are partially destroyed, enough of them remains to give a sense of stability. The top has no pediment, but is terminated with a straight line, affording a shelf on which vases buste or other beautiful things may
rest. The pillars are carved and channeled and cut rest. The pillars are carved and channeled and cut their and yet do not suggest want of strength, because on the when cannot be great. The elaborate carving cabinet of such workmanship would be a worthy re cabinet of such workmanship would be a worthy re-
pository of precious trophies as well as serve its other $r$ and ostensible purpose of decorating an apartment.


FRENCH CABINET-OIAVENTEENTH CENTURY.

The seventeenth century glass shown in our illustration is the product of the period.at which Venetian art is considered to have reached its highest point. The workmen of that period attained extraordinary facility in twisting and drawing out the ductile mass into the most elaborate forms, intertwining and work ing together stems and wreaths of various colors. The points of support were usually very slender, and these objects were consequently so fragile that comparatively few of them have come down to us.
Although Venice, from the twelfth to the fifteenth centuries, introduced the glass manufacture to France, Germany, England, and other countries, and for a long period maintained an undeniable leadership in this in dustry, she has obtained no especial distinction therein since the latter part of the last century. Nearly every general industrial exhibition continues to have brilliant examples of the products of the Venice and Mu rano Glass Company, but the company is composed chiefly of English capitalists, and glass beads constitute probably the larger part of the Venetian glass manufacture to-day.

## Do Something.

A man who kept quite a number of men employed in different ways, so that largely they could not be under his immediate control, complains, in the Industrial Gazette, that the worst trouble he had was to secure men upon whom he could rely to do something. He would tell them plain enough what he wanted, and then start them out. If anything should turn up different from what they had expected, the larger proportion of his men would come back without accomplishing anything.
As an illustration, he had a man with a team handling bridge lumber quite a distance from one of his saw mills to a railroad shipping point. By securing a reasonably early start, the team could make a good load every day. One afternoon, as he was returning with a load, and had got perhaps half way home, in coming down a hill, through a strip of timber, one of the hind wheels struck a stump and, by some means, broke the axle of the wagon. The man always carried an ax and an extra chain or two, especially to guard against accidents. He was in timber where, with very little trouble, he could have arranged something that would have enabled him to háve taken his load into town. He might have been a little longer than usual. Instead of this, he pulled his load to one side of the road, unhitched his team, and mounting one of the horses, rode into town. His employer did not happen to be at home, so nothing was done until the next morning, when he borrowed another wagon and went out and brought in the lumber, and then, leaving the wagon, rode out, rigged a pole under the broken axle, and brought the wagon to town to the shop. Another day was lost in getting the wagon repaired. At least a full day lost more than was necessary, simply because he could not see that it was his business to do something. "I could," he said, " have stood a heavier loss with better grace if the man had only tried to do something rather than spend his time doing nothing. He could at least have shown a disposi tion to do the best he could. There are plenty of men who see a thing, routine work, done every day, and yet if they were told to do the same thing, would ask to be shown how. They learn nothing from observation. They may see lumber piled up every day, or see and even help put up machinery, load a car with certain material ; yet ask one of them to go ahead and do by themselves just what they have been helping do, and they will want to be shown how. They are either in capable or indifferent of learning by observation, or even helping. With some this is simply the result of thoughtlessness. They do not stop to think that they are failing to work as they should to their employers' interests. With others, it is simply indifference. So the day's work, or time rather, is put in; it is a small matter whether the work accomplished is in any way profitable to the emplover or not.
A great many employers will recognize their own experience with indifferent, thoughtless employes in the above well told story from our excellent Western contemporary.

## A Curious Clock.

A correspondent in The $N$ ew Church Messenger describes a clock recently patented in France, in imitation of a tambourine, on the parchment head of which is painted a circle of flowers, corresponding to the hour figures of ordinary dials. On examination, two bees, one large and the other small, are discovered crawling among the flowers. The small bee runs rapidly from one flower to another, completing the circle in an hour, while the large one takes twelve hours to finish the circuit. The parchment surface is unbroken, and the bees simply laid upon it, but two magnets, connected with the clockwork inside the tambourine, move just under the membrane, and the insects, which are of iron, follow them.

## BRAON'S ELECTRO-DYNAMIC AIR SHIP

The balloon of this air ship is in the form of half a cigar, presenting a flat under side, and made with a number of independent gas cells, seven of these cells being represented in the view given in our illustration; but these cells are again divided longitudinally with the axis of the ship, thus making fourteen separate compartments in all. The base and contiguous faces of the cells or chambers are straight, their exterior being curved to conform to the desired shape of the balloon, and the walls of the cells may be made of silk or other fabric impervious to air, or they may be made of thin sheets of aluminum. These cells or chambers are surrounded and held together by a netting or covering, making a sectional gas holder, whose bottom is supported upon a framework with horizontal cross pieces, resting in the middle upon a grate-like keel, a binding wire or rope passing around the outer edge, connecting the ends of the horizontal cross pieces, and holding the netting or covering in place. 'The boat or cabin is suspended from this framework, and from it the elevating. propelling, and steering apparatus is controlled. The cabin carries a battery for the motors, a windlass with cable and grappling hook, compass, electric lamp for night work, instantaneous photographic apparatus, and other conveniences.

The controlling idea in this construction is to have the balloon comparatively small, so that the whole apparatus, when the gas cells are filled, will be about the ordinary weight of air, the ascensional and propelling power to be obtained from an electric motor of any approved form, one of two horse capacity being deemed to have ample power to make a practically operative air ship according to this invention. The elevating and propelling mechanism consists of two horizontally revolving wheels, operated from the main shaft mounted in the car, each wheel being an air screw or an elevator and a propeller combined, the air screw being directly above the propeller, which is designed to act upon the air like the wing of a bird, regulating also the course of the ship to right or left, by means of a hand wheel under the control of $t h e$ aeronaut in the cabin where
the cabin, where
by also the vanes or blades of the propeller screw may be readily changed to different inclinations. The rudder is operated by a tubular steering rod, supported within the car by a stationary bracket, and having a hand lever, whereby the rudder is adapted to be rotated about its longitudinal axis and be deflected laterally to the axis. In order to compensate for the weight of the occupants, and keep the vessel in a horizontal position, a shifting weight is employed, adapted to run on wire ropes or tracks, the weight being attached to and moved by an endless band; this weight under the framework forward and the rudder at the stern both being made to act as balances, and under control by the aeronaut from a common standpoint in the cabin.
This invention has been patented by Dr. Martin Braun, of Cape Vincent, N. Y.

## Determination of High 'Temperatures

M. Walrand, a civil engineer, has invented the fol lowing highly practical process for determining the temperature of metallurgical furnaces. It has already been applied to a Siemens-Martin furnace, but the principle is equally applicable to other systems of furnaces. It is based on the observations of the oscillations of a seconds pendulum, hung against the wall of the furnace near the furnace tender. It is a sim ple rod, with suspending eye at one end and screw at the other, for holding and adjusting its bob. It is first regulated by a reliable watch, so as to beat seconds. When the operative wishes to know the temperature of his furnace, he introduces a bar of iron into it by a suitable opening. This bar is made of iron 8 millimeters
(one-third inch) in diameter, and is kept 21 seconds in the furnace, according to the pendulum, which is started swinging. It is then withdrawn, and if it has attained a welding heat, that is to say, if it throws out sparks as it is withdrawn, the furnace is hot enough. This method, of course, gives no absolute temperature but it is accurate enough for practical needs.

## Plaster for Interior Work.

The mortars used for inside plasterings are termed coarse, fine, gauge, or hard finish, and stucco. Coarse Stuff.-Common lime mortar, as made for brick masonry, with a small quantity of hair, or by volumes, lime paste ( 30 pound lime) 1 part, sand 2 to $21 / 4$ parts, hair $\frac{1}{6}$ part. When full time for hardening cannot be allowed, substitute from 15 to 20 per cent of the lime by an equal proportion of hydraulic cement. For the second or "brown coat" the proportion of hair may be slightly diminished. Fine Stuff (Lime Putty).-Lump lime slaked to a paste with a moderate quantity of water, afterward diluted to the consistency of cream, and then allowed to harden by evaporation to the re quired consistency for working. In this state it is used for a " slipped coat," and when mixed with sand or plaster of Paris, it is used for the "finishing coat." Gauge Stuff, or hard finish, is composed of from three to four volumes fine stuff and one volume plaster Paris, in proportions regulated by the degree of rapidity required in hardening; for cornices, etc., the proporrequired in hardening; for cornices, etc., the propor-
tions are equal volumes of each, fine stuff and plaster.


BRAUN'S ELECTRO-DYNAMIC, AIR SHIP.
heco is composed of from thre to four volumes of white sand to one volume of fine stuff or lime putty. Scratch Coat. -The first of three coats when laid upon laths, and is from $1 / 4$ to $3 / 8$ of an inch in thickness. One coat work is plastering in one coat without finish, either on masonry or laths-that is, rendered or laid. Two coat work is plastering in two coats, done either in a laying coat and set or in a screed coat and set. The screed coat is also termed a floated coat. Laying the first coat in two coat work is resorted to in common work, instead of screeding, when the finished surface is not required to be exact to a straight edge. It is laid in a coat of about half an inch in thickness. Except for very common work, the laying coat should be hand floated. The firmness and tenacity of plastering is very considerably increased by hand floating. Screeds are strips of mortar 6 to 8 inches in width, and of the required thickness of the first coat, applied to the angles of a room or edge of a wall, and parallelly at intervals of 3 to 5 feet all over the surface to be covered. When these have become sufficiently hard to withstand the pressure of a straight edge, the interspaces between the screeds should be "filled out" flush with them, so as to produce a continuous and straight, even surface. Slipped coat is the smoothing off of a brown coat with a small quantity of lime putty, mixed with 3 per cent of white sand, so as to make a comparatively even surface. This finish answers when the surface is to be finished in distemper or paper hangings. Hard finish is fine stuff applied with a trowel to the depth of about oneeighth of an inch.-C. H. Haswell, in the Architect (London).

Electric Bleaching.
At a recent meeting of the Society of Chemical In dustry, a paper by Messrs. Cross and Bevan was read on "Hermite's System of Electrolytic Bleaching." The authors stated that in ordinary bleaching the bleaching powder added to water gives hypochlorite of lime, which acts upon organic compounds by oxidation. Sometimes, however, oxychlorination takes place. In these actions chlorine may be regarded as an accumu lator of oxygen. Other suitable oxygen yielding substances are permanganate of potash and hydrogen per oxide, but of the three, bleaching powder is the most economical.
M. Hermite's new source of supply of bleaching com pounds consists of the electrolysis of the chlorides of the alkalies and alkaline earths, preferably the latter, and of these chloride of magnesium gives the best re sults. The whole energy of the current may be utilzed when the hydrogen given off in the process is collected and burnt. There is evidence, however, of a re tention of a portion of the hydrogen. In the electro lysis of magnesium chloride there are great chemica complications, and the bleaching efficiency of the re sulting solution is in excess of that of the chlorine produced, as calculated by the electrolytic law. Its efficiency is also greater than that of a solution containing bleaching powder, although it may be argued that there are theoretical grounds for believing this to be mpossible. Time affects the results in bleaching opeone of the results being asmall consumption of bleaching oxygen as compared with that used up froul ordinary bleach ing solution. $\mathrm{Mr}^{2}$ Cross illustratic this by placing some linen yarn in a solution of bleaching pow der, and some more yarn in the liquid produced b y electrolysis. The action of the latter was the more rapid of the two. Chlorine the authors said, can be turned out by Hermite's process at the rate of 100 kilo. per hour, with the consumption of 570 horse power. The authors found that in producing what is known as "the three-quarter bleach" with flax, the electrolytic chlorine, as it may be called, has twice the efficiency of the chlorine of bleach ing powder. In this comparison they used the word " chlorine" for convenience. On account of the efficiency just stated, one or more of the usual alkaline treatments of the yarn may be suppressed.
Paper pulps had been bleached by the authors with economy. The bleaching efficiency of the electrolytic chlorine, or rather oxygen, is to that of bleaching powder as 5:3. This ratio is also the mean of a large number of determinations on the vegetable substances of various kinds used in textile and paper manufactures. The e.m.f. of the current being taken at 5 volts, the ratio of chemical effect to the power is 1.47 grin. bleaching chlorine for 5 watts. From this fundamental equation, the economy of the system is directly deducible, taking the cost of 1 horse power at $£ 9$ per annum, and the effective yield of one h. p. at 600 watts. Taking also the cost of the unit electrolytic installation $i, e_{\text {, }}$ for a current of 1,000 amperes, at 5 volts, at $£ 350$ (the electrodes being plantinum and zinc), the costs on one ton of the hypothetical bleaching powder are : For mechanical power, $£ 110 \mathrm{~s}$. ; for the electrolysis (interest and depreciation at 15 per cent), $£ 1$; for waste of salt, etc., 10s. ; total, £3.
W. McC. writes: I noticed the following question asked by B. T. R. in your journal, under date of 19 th March, 1887: "Why is stale bread considered more wholesome than new?" Fresh bread is not allowed in the British army. It must be at least twelve hours old before using. Could not Canadians and Americans learn a useful lesson from the custom in the British army? Experience only solves the question.

## ENGINEERING DNEETIONS

An electric railway signal has been patented by Mr. Joseph McMasters Scott, of Allegheny
Pa. The invention consists of an electric circnit con Pa. The invention consists of an electric circuit con
necting the central office and the signal box, and of a signal block, which when moved alternately opens and closes the main line circuit, making a block signal which the opera
the central office.
A frame for power drilling machines has been patented by Mr. John S . Wallace, of Nelson
ville, Ohio. It has a cylinder with apertures near on ville, onio. It has a cyinder with apertures near on
end, an inlet pipe with a valve, and a pawl pivoted o end, an inet pipe with a valve, and a pawi pivoted on operating in the cylinder and carrying rack teeth en gaged by the pawl, with other details, making a fran
especially adapted for quick adjustment in mines.

## agricultural inventions.

A combined cotton chopper and cultivator has been patented by Charlie L. Ferriott, of Armour, Texas. It is constructed in such a manner as and dirt the standing plants, at one passage along th rows, the construction being simple and the machin being easily controlled.
A listing cultivator has been patented by Mr. William R. Wilson, of Waterville, Kansas. can be attached to any ordinary cultivator, and is de-
signed to level the ridge between the rows and work the signed to level the ridge between the rows and work the
dirt gradually to the corn without injuring it, leaving dirt gradually to the corn without injuring it, leaving
the ground level, so that it can be worked as easily as the ground level, so that it can be work
planted corn with an ordinary cultivator.

## miscellaneous inventions.

A fence machine has been patented by Mr. George W. Williams, of Economy, Ind. This in vention covers a novel form of tension device, and a
peculiar twisting device, for cheap, durable, and ef peculiar twisting dev
fcient fence building.
A machine for making veneer dishes has been patented by Messrs. Charles H. Treat and Andrew B. Banghart, of Georgetown, Del. This inven tion covers a novel construction, combination, and ar-
rangement of parts in a machine designed to saw out the veneer
A dispensing apparatus for soda and mineral waters has been patented by Mr. George A.
Hearn, Jr., of New York City. Combined with a Hearn, Jr., of New York City. Combined with
decorative counter, which is itself a refrigerator, the necessary coils, connections, ice and sirup jars, with self-measaring distributers, a suitable ice cream repository, and other novel features.
A photographic camera has been patented by Mr. William H. Lewis, of Brooklyn, N. Y.
The invention covers novel means for focnsing and indicating the foccas in connection with a sliding ground indicating the focus in connection with a sididgg ground
glasi an plate holder carrier and a lens or lens tube,
which has or may have a fixed position, with other new which has or may ha
A garment supporter has been patented by Mariana T. Jones, of Boston, Mass. It consits
of an upper garment supporter loop provided with a spring strip or loop, the object being to provide means whereby the upper loop, usually caught upon the button
of the waistband, will be held to the button and preof the waistband, will be held to the
vented from accidental displacement.
A bathing stove has been patented by Mr. Gustav Boegler, of Carlsruhe, Baden, Germany. The invention consists of a boiler mounted above the
fireplace aud provided with a central conical compartfireplace
ment, having a powidowwardly extending flue with water ment, having a downwaraly extending IIte with water
circulating pipes, making an improved stove for heating water as well ss rooms.
A riveting machine has been patented by Mr. John S. Snedeker, of New York City. It conaists of a vertically siding tool holder carrying the
tool, and an adjustable rivet block having a seat for the head of a rivet, the machine being specially adapted for riveting the ends of hoop iron together without first panching a hole.
A churn dasher has been patented by Mr. Martin $\mathbf{O}$. Dolson, of Wichita, Kan. The dasher rod has screw wheels so arranged that they revolve in
opposite directions when forced up and down through opposite directions when force whe and and down throigh
the cream, making a dasher which is simple and inexpensive, and which may be easily taken apart for clean-
ing.
An artificial tooth crown has been patented by Mr. George A. Colomb, of Convent, La. It is
composed of an outer composition shell and an incorporated hollow metal structure, making a tooth crown of novel construction, to be inserted on the roots of
natural teeth, which it is designed to seal up and pronatural teeth, which it is designed to seal
tect from decay.
A motar has been patented by Mr.
A motor has been patented by Mr.
Josiah P. Watson, of Leesburg, Texas. It is designed Josiah P. Watson, of Leesburg, Texas. It is designed
as a cheap and eflicient churn power to be used in connection with the ordinary form of vertically reciprocating dasher churn. and the inven arangemant of
novel features of construction and arran parts.

A key for stringed instruments has been patented by Mr. Hiram W. White, of Yankton,
Dakota Ter. A shaft ie mounted to have a sliding Dakota Ter. A shaft ie mounted to have a sliding
movement in its bearings and carrying a losely mounted pinion, with means to effect the coupling of its shaft sapported in open-ended sockets of brackets.
An animal exterminator has been paThe Invention consists esseutially of two cylinders, one The invention consitst essentialy of two cylinders, one construction, making a convenient device for forcing a
rolnme of smoke within the burrows ${ }^{\text {Sof }}$ squirrels and rolnme of smoke within the burrows fof squirrels and other animals.

An animal trap guard has been patAted by Mr. William R. McCracken, of Brady, Ohio. width than the jaws, and extending above and in alignment with them, whereby an open space is left between
the guards over the teeth of the jaws, to prevent ani als caught in the trap from guawing themselves loose,
A box for holding ruffling has been patented by Mr. Abraham H. Enyel, of New York City. tis a simply constructed receptacle, designed for shopherein and advantageonsly exhibited and measured of to customers without exposing or handling the
An egg preserving compound has been patented by Nils Colling Jurgens, of Clifton, Texas. I consists of a cumposition consisting of silicate of
sodium, gum arabic, sagar, and water, the compound to be applied by d.pping or in any other way so as to ef fectually exclude the air, and by which eggs
kept a long time without regard to the weather.
A pencil sharpener has been patented G Georee R. Lewis and Helen L. Bowman, of Lamoille, .int his a rectangular box with a cover, to which are hinges formed of cranked or offset wires, arranged to close the top of the box or rest in an inclined position,
so the dust from the pencil points will go $n$ the box. A key board attachment for pianos ond organs has been patented by Mr. John H. Rheem, sapported over the key board and provided with a de vice for operating five keys by pressing on two levers at
a time, the levers projecting from the top of the box a time, the levers projecting from the top of the box
and there being a device for indicating different keys.
An embankment protector has been atented by Mr. Abraham M. Kanters, of Holland, Mich. It consists in a covering of willow branches,
cane, bark, cornstalks, or other flexible material, to the equired depth, fastened by means of stakes and cross wires, the stakes having conical or pyramidal po
applied to and projecting beyond their lower ends.
A hand power attachment for sewing nachines has been patented by Mr. James M. Cosby Elberton, Ga. This invention covers a combination a lever having a spring fulcrum and a special pitman chine, whereby the machine may be operated by hand
A hand ironing machine has been paented by Mr. Frank Corbett, of New York City. Comined with a closed casing are inclosed rollers joarolding the jornals in place, the machine to be heated by placing in a frame, so that all the heat will be combined within
or furnace.
A horse detacher has been patented y Mr. John A. Berg, of Ashburton, New Zealand. It consists of a special device of shaft or thill conpling,
piving increased facility for detaching the shafts or giving increased facility for detaching the shafts or
pole of the vehicle, and so that it can be done by the driver from his seat in case the horse runs away, while
giving ase.
A wagon box has been paterted by Mr. Francis Fisher, of Scotia, Neb. Coribined with connecting the body and upper section, with handles rigidly connected to the upper leaves of the hinges and ree at their lower ends to strike the sides of the body nd support the sides of the upper section in an inclined

An,
An adjustable bed for invalids has An patented by Mr. James Miller, of Adelaide, Sout truction in a bed cause the invalid to take any desired position on either ide, and also may be aajusted at its head portion to
apport the upper part of the body as wished between apport the apper part of the
An epr; carrier has been patented by Mr. Augnstus Heliner, of st. Elmo, Col. It is constructed with inner celle a and an outer case, being pre
a'lly made of paper, the outer casing having a re f a l y made of paper, the outer casing having a re-
movable top, and a light base piece having apwardly stending soo be used for friit and other articles.
An attachment for smelting furnaces has been patented by Messrs. Elliott R. Moffet, Jr., and of pokers arranged to he operated from the side, aud to be thrown inward and upward by a shaft turned by a crank, the pokers being arranged in connection with
hovel or plunger, to obviate the necessity of standing in front of the fire when stirring or poking it.
A feed grinder has been patented by Mesirs. IIsaac and James C. Jay, of Azapahoo, Neb. With the frame and hopper and its sapport is a recipro-
cating grinding plate and $a$ rocking grinding cylinder. with cranks aund driving mechanism arranged to grind he grain as it passes between the plate and cylinder he machine being simple in construction, but readil
A mechanical movement has been pa tented by Mr. August C. Arneen, of Clark's Grove,
Minn. It consists in an annular internal gear supported on a suitable frame, with shaft journaled axially to the gear and having a gear wheel, between which and the
annular gear is placed a traveling pinion on a tumbling

## versal joint.

A supporting column for drilling ma Weir City ben patented by Mr. Millard F. Smith, of Weir City, Kansas. The operating mechanism of the
machine is carried by a single post, which is so arranged that it may be swang apon screwe, by which it it sup-
ported and upheld without in the least interfering with the rigidity of the connections, the machine being mo especially applicable for the drilling of coal.

An apparatus for preserving eggs forms
he sabject of two patents issued to L . Adelle Hapgood, he sabject of two patents issued to $L$. Adelle Hapgood, Rinngolph, N. Y. It consists in a tilting case con-
anays made of slats, in which are fitted comparted frames made shorter than the trays and arranged
to slide therein, there being yielding cushions at the to slide therein, there being yielding cushions at the
ends of the trays for preventing the breaking of the ends of the trays for preventing the breaking of the agd stored or shipped
A fence building machine has been Atented by Mr. W. H. Harry Fauber, of Marshfeld, d. This invention provides a light, portable hand wires employed to bind the pickets to place may be varied as desired, and also provides a novel form of twisting attachment and an operating mechanism therefor, means for accurately adjust
height; and other novel features.
An apparatus for dyeing skeins has een patented by Messrs. Charles Meadowcroft and Peter Denanhouer, of Philadelphia, Pa. It is calculated
for dyeing skeins of silk, wool, etc., and made to readior dyeing skeins of silk, wool, etc., and made to readily govern the number of revolations of the carrying
frame, while the latter will be automatically elevated from the vat when the set number has been reached, desigmed to being adjustable to any size of skein, al The ventilating of tobacco curing houses orms the subject of a patent issued to Mr. Nels, Bruette, of Jefferson, Wis. The general features o
construction called for by this invention are close sides with base ventilators fitted therein, a turret ventilato ith rotatable body having opposite closed and opei sides, with pivoted vanes and means for raising and
lowering them, whereby a downward or upward draught may be induced througi the curing house by arranging the vanes and the base ventilators.
A machine for casting and finishing ype has been patented by Messrs. Leon and Auguste
'oucher, of Paris, France. Combined with a carriage which slides on a fixed block are knives or cutters to cut or trim the top and bottom sides of the type, the carriage having a jaw which, together with the top cutting knife, carries the type to the bottom cutting knife, a planger being pressed downwardly by a lever
acted upon at its one end by a cam track, with other acted upon at its one end by a cam track,
ovel features, for making type ready for use
A pneumatic clock has been patented by Mr. Rudolf C. Wittmann, of East New York. Combined with gearing operated by weights are two wheels
revolved at intervals by the gearing, rods or bars being connected with the wheels, and tubes having compressible bulbs, which can be compressed by the rods, compressible halls at the other ends of the tuhes carrying the balbs, and machanism connected therewith to revolve the wherls, with other features, whereby a nom.
ber of hands on different dials can be operated from ber of hands
single clock.

## NEW BCOKS AND PUBLICATIONS.

a Systematic Handbook of VolitimeTRIC ANALYSIS. By Francis Sutton,
F.C.S., F.I.C. Fifth edition. Phila-
delphia•. Blakiston, Son \& Co. 1886.
$\underset{\text { Pp. 491. }}{\text { delphia }}$ illustrations.
We need oniy say that this work is welcome as bringing Sutton's Volumetric Analysis down to date.
The original book has been so long the standard, and is The original book has been so long the standard, and is
so well known, that description seems hardly neces. ary. Under the section devoted to gas analysis, one the most valuable features of the work., we ind the Hempfel and one or two other recent apparatus de-
scribed. The production of new and revised editions of standard works is a movement in the right direction, provided they are well in advance. The determination of carbonic acid in air has so very recently been
satisfactorily worked upon, that we can pardon the satisfactorily worked ppon
litte said upon this subject.

## TABles For the Determination Common Minerals. By W. <br> Crosby. Boston: J. Allen Crosby

1887. Pp. 74.

This work is.a asefal one, but its utility would be hals. The tables are strictly determinative ones, and he characteristics of the different species are given in columns, in the order of morphnlopical, physical, and hemical properties. All the tests represented under hese three heads are what may be termed working fielt tests. A carefur revew and lisest of apparatus anid reagents especially for blowpipe work comes next. A synoppis of the rational classifcation of minerals into
b-kingdoms, and thees into classes, is given. Nest subingdoms, and these into clases, is given. Nest irely on luster, color, streak, and hardness, and reerred by page numbers to the tables. The tables folow, the frrst column of which c ntains an anaiytical
key, by which the empirical classification is contiunally referred to. The remaining columns of the tables hardness, tenacity, specifc gravity, form, cleavage, other properties, and confirmatory chemical tests. In reducing the role of chemistry to the subordinate one
confrmation the author has done wisely, as the aim if the student of mineralogy should be to recognize minerals by their appearance and external characterisics. A useful note on how to ase the tables, and an de regard it as an admirable effort in a somewhat neglected field, and should hail the appearance of a more comprehensive treatise on the same lines with much

L'Annet Electrique, ou Exposé An-
NUEL DES Travaux SCIFNTIFIQUES
DES INVENTIONS. By Ph. Delahaye.
Baudry \& Co., Publishers, 15 Rue St.
Peres, Paris, France. Pp. 380 .
This work is a review of the progress made in the application of electricity to the arts and Industries during the year 1886. The book appears to be carefully predivided into several divisions, treating of such themes electric lighting batteries, the telegraph and tele
loyed electricity in the atmosphere, electricity as em notive force on tram cars, etc., electrolysis, metallurgy etc. It presents much information in a practical form, intable for ready use and reference.
Any of the above books may be purchased
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way, New York.

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or firms. 20 years' experience. Best references. Machine drawing and designing. A. K. Mansfield, Rolls
Rollstone variety lathe-bores, beads, and turns at the Iron and Steel Wire, Wire Rope, Wire Rope Tram ny, Trenton, N. J.
The 9th edition (22d thousand) of "Trautwine" ap predecessor by over 150 pages. the new index alone being
more than twice as large as that of the 8th edition. prere than twice as large as that of the 8th edition
Many of the old articles were modernized, and many Many of the old articles were modernized, and many
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## 

HINTS TO CORRESPONDENTS. Namen and Address must accompany. all letters,
or an antention will be paid thereto
ornis is for our



 Mincrals. sent for examination should be distinctly
marked or labeled.
(1) Copper asks how to stick copper coins to a plain board. A. Use shellac or sealing wax
applying it to the board and presing down on it the applying it to the board and pressing down on it the
heated coin. If you refer to the trick, see Surpiement heated coi
No. 299.
(2) T. D. McC. writes : I want to use some electric light carbons in a sal ammoniac battery.
Will nitric acid be a good thing to remove the thin coating of copper from the carbon? Or, if not, wha
will? A. It is the best, and will be very effectual will? A. It is the best, and will be very effectual.
the work out of doors, on account of gas evolved.
(3) J. P. asks: Will you please giv receipt in your nest issue to make a whitewash that
will stand the weather, and also what to color with to
 make a deep siate colorq A. Slate $1 / 2$ bushel lime,
gtrain, and add a peck of salt dissolved in warm water,
 a pound of clear glue dissoived in warm water. Mix these well together, and let the misture stand for several
days. Keep the wash thas prepared in a kettle or port days. Keep the wash thns prepared in a kettle or port
abbe furnace, and when used, put it on as hot as possiable furnace, and when used, put it on as hot as possi
ble, with painters' or whitewash brushes. Color to suit ble, with painters' or whitewash brushe
by adding sparingly of a dry pigment.
(4) W. F. C. asks how many Leclanche cells it ought to take to ring a bell through about 900 feet of No. 12 galvanized wire with good dround connec
tions at each end. Can I ring a bell with a ground tions at each end. Can I ring a bell with a groand
circuit? A. Two Leclanche cells should sufflce. You
(5) L. V., Sacramento, Cal., asks : 1 Can you tell me a simple, inexpensive way of prepar-
ing India ink so that it will keep in a liquid state, wihout becoming mouldy or losing any of its qualities A. The addition of a few drops of oil of cloves, oil o
almonds, or carbolic acid will prevent its becoming mouldy, and it may thus be kept a long time, there is have a glass ikikstand witt a brass hinged cover; by an accident the cover was detached from the stand; can
you tell me how to make a paste that will unite them? A. Useplaster of Paris. .3. Can you tell me how t make lather for cleaning windows that is merely rubbed on the glas, and when diy brushed off? . A. Mix 1 part
of olive oil, 1 part of spirit of sal ammoniac, 2 of lime and 1 of water to a thick paste. 4. What colors unic yollow and red until the desired shade is attained; the peculiarity of gold is its metallic luster, which of course cannot be obtained by any combination of tints.
(6) C. G., Baltimore, Md., asks : How can I restore the pliability of gas gum bags that have
become hard? A. To a limited extent rubber can be reatored by immersion in coal oil.
(7) H. E. B. writes : I have two powder horns that have been hanging in a cupboard for some
time. On looking them over recently, I find that there are several holes eaten or bored through them The holes are about one-eighth inch in diameter, au look like the work of the apple tree borer, but no insect
was visible. Can you explain what made the holess? A.
Proesor Professor Howard, of the Department of Agriculture infrequently subject to the attacks of insects of va rious orders, and notably of Coleoptera of the familie Dermestidx and Ptinidx. The latter family (i.e.,. those
species which have been observed to bore in horn) are too small for the size of the holes mentioned, but thi size agrees very well with the, holes made by species on
the genus Dermestes and among the varions species this genus, $D$. vulp pinus is most likely to have done the mischief. An accurate determination or the species in specimens themselves. Frequent handling of object made of horn, or exposing them to sunlight, will ef fectually protect them.
(8) Z. R. B. asks the best present quantities. A. Tin buttons to be japanned should fire be heated on sheet iron pans just hot enough to oxidize the tin slightly without melting it. This is to make the japan stick, as it is liable to crack off from bright tin. For dip work string the buttons on fine wire stretched acrosi a bow made or larer wire, a hundred or more on
a string. Make the bow with a loop to hang by. Heat the strung buttons, in the oven and dip in a long the proper consistency on a hook in the oven and touch the beads on
the butions with a wire to draw off the excess of Japan varnish Bake dre draw off the excess of for the kind of varnish used, say $250^{\circ}$ to $280^{\circ} \mathrm{Fah}$ For a finer fnish the buttons should have two coate the first a very thin one and the escond a thicker and
better varnish. There is a hand way used by placing better varnish. There is a hand way used by placing
the buttons on little studs made of wire set in a piece hold the buttoen iron, the studs hat the varrish can be put on with a brush, which enables the use of a stronger
varnish thinly laid on. Bake the butons on the pis.
(9) J. I. B. asks how to get the con densed steam or water that drains from the heating pipes of ayactory back into the boiler again by some an
tomatic method. The drain pipes are several feet above he water level of the boiler, and there is a check Will near the boiler, but the water will not go back.
We fear that you have not given the full pressure the boiler to the coils, as in a return system of feveral feet above the water line you should have a perfect cir-
culation through your coils, and the condensed water culation through your coils, and the condensed water
should flow back to the boiler. by gravity. To accomshould flow back to the boiler by gravity. To accom-
plish this in a satisfactory manner the steam pipe should be large and the valve wide open; the steam connections in the coils should also be proports ated is reguired on the coils. Every coil should have an air valve to void frequent blowing out to free the system of air. your pipe work is defective in its proportions. so that ou cannot carry the full pressure into the coils, you may have to conider the cost of enlarging the pipes or of adding a return stean trap near the boiler,
which will overcome the diffculty, at a cost of about which
8150
(10) J. W. K. writes : I have a great number of articles made of cold rolled steel, about 2
nches or 3 inches long, $1 / 2$ inch wide, and varying from fiftieth to one hundredth of an inch in thickness. 1 The eel is of good quality. I want to harden them
werably straight. When heated and planged shapes. What is also the best methody of tem
pering these articles? A. The hardening of thin pering these articles? A. The hardening of thin leces of steel of the character described should
dipenting each piece separately and vertically into the water or oil. No miscellaneous dumping will
bring them out straight. A pot of lead at full red orcherry bring them out straight. A pot of lead at full red or cherry
red heat is the best for heating. Dip each piece vertically n the lead, and also vertically to harden. If a sand ing out used for heating, there is much trouing. If the eees are of such form as to be strung on wires hale ozen at a time, the process becomes less tedious. method of hardening between cold surfaces of iron for perfectly flat and thin work has been practiced with ood results where hardness and flatness are required Ir a full spring temper only is required, the pieces may Possibly, if the pieces are now made from the rolled teel without annealing before heating for hardening ou will find your trouble in regard to curling. We do ot think it possible to heat rolled thin steel gnd harden without previous annealing by any known method
(11) T. H. B. writes : I am building launch 20 feet long, 28 inches beam, 6 inches draught
very fine lines, and wish to fit with twin screws. Wha diameter and pitch would be most suitable, and what peed could I probably obtain with 4 horse power ould I use two De Bay propellers on above boat with ny gain inspeed over Thornycroft's or other makes? if so, what diameter, pitch, and speed would be best? What is the highest speed at which 2 and 4 inches diame ter cast steel bevel gear wheels can be run with satet
and economy, if accurately cut? A. As your boat is of very shallow draught, you will have to immerse the 2 inch below the keel for good effects. Use a pair You should be able to obtain a speed of 8 miles pe our with 4 horse power, and will need to make 325 turns per minute for this speed. Steel gearing on shafts 3 inches diameter with 5 inches driver, giving
the engine 195 turns per minute, will give effective ser vice. We do not recommend the DelBay propeller screw it is too complex. The Thornycroft is good, but not in use for yacht launches. The plain radial wheel, with (12) C. G. Van B. asks: 1. What is the best method of soldering the ends of fine copper wire together, especially for use in the secondary coil or an
induction coil? A. Silver solder with vitrified or melted borax as the flux is the best material. You will find wires. You must use a blowpipe. 2. What are the objections, if any, to using resin as a fux for such purposes? A. Resin is the best ordinary flux for use on apparatus where it will make the solder take hold. Soldering acid should be avoided if possible. The following is recommended as a substitute: Lactic acid 1 ounce,
glycerine 11 ounces, water 8 ounces. 3. How to re-tin oldering coppers. A. File them to a clean, eve point, filing until no pits or depressions are left in the
faces. Heat them to a fair temperature, rather hot, dip or an instant in a solution of sal ammoniac. and then Turn the iron around continually. Or for the block of sal ammoniac you may sabstitute a brick, into which you have made a slight depression and pat resin and ome solder in it. Rnb the point up and down agains
(13) J. H. B. asks how to increase the strength of a magnetic horseshoe magnet and keep it
strong. A. You may preserve its strength by keeping strong. A. You may preserve its strength by keeping
its armature in contact with its poles. This will hardly ncrease its strength; you will do well if you can pre ve it unimpaired
(14) G. R. T. writes : I have a tennis racket on which the stringing is getting a little loose,
but not enough to have it restrung. Please let $m$ know whether there is any varnish $I$ can put on t without taking it apart. A. Oiling the strings with without taking it apart. A. Oiling the strings with and certain cure.
(15) G. S. writes: I have seen an acid sed for cutting steel, for making steel dies deeper, and to me was that it would not touch the steel until it was ouched with a piece of zinc. A. It is dilute nitric acid 1 to 10 with water. The zinc is used to establish a savanc current, which starts the acid into action on the
steel. It must be brought for a very short time int Contact with the steel and acid.
(16) F. N. D. asks : Why are the years
in length is 865 days $5 \mathrm{hrs} .48 \mathrm{~min} .40^{\circ} 054 \mathrm{sec}$. Hence the correction by adding one day in every four yeara overcorrects it, and the aunnal excess of $11 \mathrm{~min} .13{ }^{3} 946$
sec. a in four centuries to three days. correction is introduced by making but one out of fou centurial years a leap year. This is so nearly correct that an error of only one day in 3,325 years is intro wo digits of whose numbers are divisible by, the frit out a remainder.

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INDEX OF INVENTIONS
For which Letters Patent of the United States were Granted,

March 29, 1887,
AND EACH BEARING THAT DATE ISee note at end of list about copies of these patents.]
Acoustic apparatus, electro. A. A. Knudson.......
Adding machine, B. F. Smith ......................
Aricultural purposes. implement for, C. La Dow.
Animal exterminator, W. H. Leininger...........
Animal trap guard, W. R. McCracken..........
Annunciator and shunt circuit therefor, J. A. Animal trap guard, W. R. McCracken. Barrett.
Ant trap. S. A. Haines....... .....
Automatic lubricator, J. Patrick.
Bag catch, Reinisch \& Ochse....
Bags or satchens, strap loop for, C
Banjo, A. C. Fairbanks.... .... . ...
Bar. See Clothes bar. Grate bar.
Barrel cover, Broemser \& Bradshaw
Barrel cover, Broemser \& Bradshaw.......
Bath tub and wash basin, O. Hammerstein
Baths, process of and means for preparing med
cated, M. F. B. Rice
Battery. See Galvanic battery.
Bed, wardrobe,
Bed, wardrobe, L. G. Kellogg.-
Belt reel, E J. Word
Belt reel, E. J. Worden..........
Bending machine, M. Kennedy
Bicycletantern. Prin
Bit. See Bridle bit.
Blacking holder, J. F. Wood.....
Blind, window. Snell \& Van slyke
Blind, window. Snell \& Van Slyke........................
Block. See Paving block. Sheave block. Snatc
Board. See Bulletin board. Wash board.
Boilier. See Steam boiler
oiler cleaner and water heater, A. H. Crockford. 380,1
Boiler furnace, steam, J. Ander
Books, machine for cutting index steps in blank C. Sesbold..

Boots, machine for buttoning. J. Keith.
Boots, mechanism for the manufacture of rub
ber, C. F . Parker.......................................... A. F. Preston.
Bottle, H.
 Box. See Journal box.
Box, J. W. Sprowles...................
Box for holding ruffing, A. H. Engel.
Brake. See Car brake.
brake. Vehicle brake.

## Brake apparatus, R. H. Lapage

Westighonouse, Jui..................
Bridge, truss suspension, W. H. Haynes....
Bridges, composite pier for, A. Borneman.
Bridges, composite pier
Bride bit. C. E. Heinze.
Bridle, M. E. Zeller...
Buckle, harness, M. E. Zeller.
Buckle or fastening device, automatic, e. Buc
Bulletin board and broom h
W. Mahar.... .............
Bung extractor, P. Christman
Bung extractor, P. Christm
Bustle spring. . Bowers..
Button,
Button fasteners, machine for making. A.
English ................
Buttons, machine for making, L. E. Chace...
Buttons, machine for making, L. P. Warner.
Camera. See Photographic camera.
Candra. See Photographic camera.
D. Muffat (r)

## Cap. See Sewer cap. Car brake, J. S. Schu

Car brake, automatic. J. S. Sterre
Car brakes, slack adjuster for, Corson \& Crane
Car, railway, W. Marky.
Car replacer. A. McLeod
Car seat, M. N. Forney............................
Car, stock, G. D. Burton
Car strap, A. Brandon...

tinger...............................................

Carrier. See Cash carrier. Trace carrier.
artridge louding machine, G. M. P.
Case. See Shor case. Watch case.
ases. See Show case. Watch
cash oarrier, Flaga \& Clafin,
Cash rekister. W. C. Mcall... ,335

## 360,930

## 360,242

Casket covers, etc., fastening device for, A. E.
Lockhart............ . .....................................360,315

360,422 hair. See Surgical chair. | 360,288 |
| :--- |
| 360,213 |


Chopper. See Cotton choppe

Cider mill grinder and press, w. Seymour............. 350,3,3
Cigar machine, J. Prangles. ........ ........... 360,04
Cigar tips, device for drying and perforating, T.

Clock, alarm, A. B. Hawley.
Clock, burglar alarm, C. E. Burnham....
Clock, secondary electric. W. B. Harv
Clothes bar, bracket, E. C. Hisc
Clothes drier, G. J. Capewell.
Clutch, T. Rogers..
Coach pad, F. C. Kimball.
Coffnn handle, W. Hamilton ..................

Column for buildings. A. Blaser.......................... 360 360 134
Comb. See Curry comb.
Comb. See Curry comb.
Condenser, smoke, B. Roberts..................... 360,
Conduit for underground conductors, Loesner

Cork presser, Crouse \& Lewis......................... 3590,34
Corn cutter, R. Godfres........................ 300,21
Corn husking and crushing machine, E. APrter 30,04
Corn splitting and crushing machine, E. A. Por-
ter.................................... 360,045
Corset, I. Newman............................ 360,323

Coupling. See Pipe coupling. . Tube coupling.
Cultivator, T. J. Brown.................................................274
Cultivator, M. Danos.................21

Cultivator. listing, W. R. Wilison..................... 360,39
Cultivator, pulverizing, J. L. Paynter.......... 360109
Cup. See Grease cup.
Curry comb, O. Jenness ........................................ 360,301 Cut-off, automatic. E. Thomson..................... 300,124
Cut-off, electro-magnetic, E. Thomson........... 360,123
Cut-of for water pipes, W. G. Browne......... $30.19^{9}$
Cut-off for water pipes, automatic, w. G. Browne. 300,085 Cut-offralve, automatic, W. G. Browne........... so0,140
Cutter. See Corn cuter. Fodder cutter. Cutting flexible material, apparatus for, F. A.
Fowler............................ 380,149
Cre.
 Ditching machine, L. A. Dess........................ 980,282
Dorr check, pnumatic, . S. Perkins.......... 380,022
Dress shield and maklng the same, G. A. Close.... 360,143 Drier. See Clothes drier. Mait drier.
Drilling machines, frame for power, J. Wallace 360,183
Smith'................. ........................ 360,177
Drilling tools, box coupling for, A. W. Lewis..... 360,312
Dropper. See Fertilizer dropper. . Dumb waiter, M. J. Lawlor........................... 960,027
Dumping apparatus, portable, G. Warttinger...... 360,200
 Ekgester, M. Sexsmith................................. 3601176 Electric circuit controller, automatic. T. P. Co-
nant.................................... 360,37
Electric distribution, system of, E. Thomson,
$360,122,360.12$


 380,070 $\begin{aligned} & \text { Electric signal s8ytem, C. Lambdin.........................................000, } 360,12 \\ & \text { Electric sole. F. B. Wallis }\end{aligned}$

 Engine. See Steam engine.
Engine. J. A. Lidback ......................... 360,35 Extractor. See Bung extractor.
Fabrics and other sheet materials, method of and

| mechanism for testing. S. D. Locke. $\qquad$ 360,103 <br> Feed water heater, C. H. Holt. $\qquad$ 360,349 |  |
| :---: | :---: |
|  |  |
|  |  |
|  | nce, |
|  |  |
|  | Fence machine, G. W. Whiam |
| nce |  |
|  | nce wire tension device, J. L. Braffett........... 360,083 |
| vires, device for $t$ wist |  |
|  | zer dropper and hill former for tobac ants, combined, Coghill \& Unselt .............. |
|  |  |
|  |  |
|  |  |
| e lighter, M |  |
|  | , life-s |
| h, transporting live, W. G. Mur |  |
|  |  |
| Flour receptacle and sifter, combined, F. A. Tyler. $\qquad$ |  |
|  |  |
| Fruit jar, D. E. Ashby <br> Fruit jar cover, L. P. R. Le Compte..................... |  |
|  |  |
|  | urnace. See Boiler furnace. Straw burning furnace. |
|  |  |
| Gauge. See End gauge. |  |
| Gauge for mouldings, W. T. Farrell................. 300 |  |
|  |  |
| Galvanic |  |
|  |  |
| Gas generator, A. Ordonez y Ponce................ 360,240 |  |
| Gas meter, Langlais \& English....................... 380,026 |  |
|  |  |
| Gas producer, Herrick \& Topham.................... 380,222 Gas regulator, J. A, I.yon............................. 300,989 |  |

Generator. See Gas generato
Glass mould, R. G. A. Witt.... Glove fastener, S. Porter
Grading ditches, leveling instrument for, E.
Grain cleaner. L. Prevost
Grain drills, clearing attachment for, W. H.
Grate bar, E. W. Vanduzen.
Grease cup. J. E. Dunnigan.
Grinding mill feeder, M. N. Elweli
Handle. See Coffin handle
Harrow, A. Byington..
Harrow, wheel or disk. A. G. Hill
Harvester, J. F. Steward.
Harvesters, tilting qevtce for, J. Keller .
Harvesting machine, corn, C. w. Wardwell
Hay rake, horse, H. Myers..
Heating and cooling buildings.
tus for, E. H. Johnson.
Hog cholera remedy, E. H. Roberts ..........
Holder. See Blacking horaer. Rein holder.
Horse detacher, W.
Hose storing and drying device,
Hydrant, D. T. Perkins
Indicator. See Electric indicator.
ngots, apparatus for loading and unloading, $F$.
Le Blond...........
Intestines. machine for cleaning, D
Jack. See Carriage or wagon jack.
ack. See Carriage
ar. See Fruit jar.
ewelry, ornament
ewelry, ornamenting. W. C. Edge
ournal box. T. Mcurath
Eiln. See Charcoal kiln.
Knitted garment. J. Holm,
Lamp and socket, electric, C. G. Perkins.
amp, electric arc, I. Hanson..
Lamp extinguisher, J. A. Scharlin
Lamp post and signal, w. C. Smith
Lathe, automatic, F. E. Fisher
Lathe tool support, J. R. Bact
Level. plumb. E. Duffy.
Lock. See Nut lock. Sash lock. Seal lock.
Lock. C. R. Uhlmann.............................
Locomotion on steep inclines, effecting, R. H.
Loom shedding mechanism, w. Z. Woodstock
Lubricator. See Automatic lubricator
Machine brake, Barger \&
Marking letters. flgures, etc., J. P. Scott
Merchandise, device for exhibiting, J. H. Schoon-
Metal cutting machine, B. J. Malone
Metal surfaces, ornamenting, W. Hyland
Mould. See Glass mould. Pipe mould.
Moulding machine, G. Guntz...
Moulding machine, A. L. Stevens.
Mortising machines, gauging device for, J. E.
Motor. See Electric motor. Pump motor
Motor, J. P. Watson.
Mowers, cutting apparatus for, C. W. Bradford
Mowing machine, H. L. Hopkins.
Music boxes, speed regulator for. E . Sueur....
Musical instrument, mechanical, J. H. Ctrument, mechanical, C. IKretschmar
Musical instruments. keyboard for, P. Von Jan
Nail machine, wire, L. A. Fontaine...........
Number or letter plate, H. Z. Kimbal
Nut lock, D. P. Gienty,
Oil tank, measuring
Packing ring for pistons, W. W. St. John
Pad. See Coach pad.
Pan lifter, G. A. Germond
Paper and other material

Paper machines, screen cleaner for, F. M. Ed-
munds.
Pavement, street, D. Harger.
Paving block, L. B. Sawyer.
Pen holder tip. H. Hewitt..
Pencil sharpener, Lewis \& Bowm
Photographic camera, W. H. Le
Photographic camera, W. H. Lewis
Pianos and or
H. Rheem.
Pin. See Sare coupling, R. H
Pipe mould, W. Smith.
Planer feeds, gearing for wood, W. H. Gray...........................
Planter, corn, I. Haines
Plow, planting. J. P. Black
Plow, rotary. C. R. Foster.
Plow, rotary, C. R. Foster
Plow, sulky. H. Gale....
Post. See Fence post. Lamp.post
Press. See Cork press.
Printing apparatus, chromatic, Wheelan \&
Schurch.................................
Pump regulating device, F. M. Wheeler.
Rack. See Wagon rack. Whip rack.
Rack. See Wagon rack. Wh.
Radiator, steam, E. Mansell.
Railway rail splice Mansell.
Railway rail splice. S. M. Pre
Railway signal, G. H. Wright
Railway signal, electric, J. M.
Railway signal, G. H. Wright.
Railway signal, electric. J. M.
Railway tie, M. Y. Thompson
Railway time sigr r.l., , impson \& Strain
Rake. See Huy rake
Rake. See Hay rake.
Range. broiling, Calone \& Danton...
Recorder. See Time recorder.
Reel. See Belt reel.
Reel. See Belt reel.
Reflector for electric lights, D
Register. See Cash register.
Registering apparatus, F. H. H
mein holder, C. E. Austin.....
386.096
N. Elwe
Handle. See Coffin handle
Harrow, A. Byington..
Harrow, disk, C. La Do
Harrow, wheel or disk, ©. G. Hill
Harvester, J. F. Steward.
Harvesters, tilting qevtce for, J. Keller
Hawse and deck ne.
Hay rake, horse, H. Myers..
Heating and cooling buildings, electrical appara Hog cholera remedy, E. H
Holder. See Blacking horaer. Rein holder.
Horse detacher, w. W. Philips
Fave
Hydrant, D. T. Perkins.
Ingots, apparatus for loading and unloading, F
Insulator, W. F. Locke.
Intestines. macrine for cleaning, Dack.
Jewelry, ornamenting. W. C. Edge Kitn. See Chal McGrat
Knitted garment. J. Holmes
amp, electric arc Crow, C. G. Perkins.
Lamp, electric are, I. Hanson...
Lamp extinguisher, J. A. Scharinn.
Lantern, tubular, Burn \& Schuit
Lathe, automatic, F. . Fisher.
Level, plumb. E. Duffy
Lifter. See Pan lifter.
Lock. C. R. Uhlmann...........................
Locomotion ol steep inclines, effecting, R. H. L
Loom shedding mechanism, w. z. Woodstock.
ubricator. See Automatic linbricato
Malt drier, D. A. Wallace...
arking letters, figures, etc., J. P. Scott
maker............................... Metal surfaces, ornamenting, W. Hyland
Mould. See Glass mould. Pipe mould. Moulding machine, A. I. Stevens.
Motor. See Electric motor. Pump motor.
Mowers. cutting apparatus for, C. W. Bradford
Mowing machine, H. L. Hopkins.
Musical instrument, mechanical, J. H. Chase. Musical instruments. keyboard for, P. Von Jan
Nail machine, wire , A. A. Fontaine........... Number or ler L. Kimbal Nut lock, D. P. Gienty,
Packing ring for pistons, W. W. St. John
Pad. See Coach pad.
Pan lifter, G. A. Germond
M. Chester.........................................
Paper decorations, manufacture of J. E. Darnall
Paper machines, screen cleaner for, F. M. Ed
Pavement. stre................
Paving block, L. B. Sawyer
Paving block, L. B. Sawyer.
Pen holder tip. H. Hewitt...
Photographic camera, W. H. Lewis
Pianos and organs, keyboard attachment for. J Pin. See Safety pin.
Pipe mould, W. Smith..
Planer feeds, gearing fo
Plow, G. Wilson...........
Plow, planting , P. P. Blac
Plow, rotary, C. R. Foster
Plow, sulky. H. Gale.....
Post. See Fence post. Lamp.post
Power brake R. Solano. ess. See Cork press.

## 360,283

360,283
360,117
360237 Spring. See Bustle spring. Square and bevel, try, E. P. Kendall
Stanchion, D. J. Barnes Stanchion, D. U. Barles ...
Stand. See Umbrella stand. Steam boiler, F. D. Maltby
Steam boiler, N. F. Sawyer
Steam engine, $G_{\mathbf{V}}$ Smith.
Stereotype plates, base for L. Klopsch.......................... 360,057,307
Stool, piano H . Neppert
Stopper. See Bottle stopper. Hawse and deck
pipe stopper.
Stove, M. E. Birnbaum.
Stove, bathing, G. Boegler.....
Stove or furnace, H. E. Taber
Stove or furnace, H . E
Strap. See Car strap.
Straw burning furnace, M. Lafever...........
Stringed instruments, key for, H W. White. Supporter. See Garment supporter Surgical chair, F. E. Case....................... Tack driving machine, M. R. \& F. N. Ethridge Tank. See Oil tank.
Telegraphy, railway car,
Telephone, H. E. Waite.
Telephone, mechanical, C. M. Radford
Thermometer, night, C. H. Myers.
Tie. See Railway tie.
Time recorder, watchman's, E. J. Colby
Tongue support, C. Rupprecht.
Tongue, vehicle, A. Good year.
Tooth crown, artificial. G. A. Colom
Trace mechanical, D. H. Murphy
Trace carrier. W. S. Pritz.........
Transit instrument, F. J. Miller
Trap. See Ant trap.
Trap. H. C. Weeden.....................
Truck. adjustable stove, J. A. Hankins
Truck and hose carriage, combined
rel. . .............................................
Tub. See Bath tub. Wooden tub.
Tub. See Bath tub. Woo
Tub fastener, S . E. Moore.
Tube coupling, A. Reese..
Tubes, apparatus for bend
Tubes, apparatus for bend
Type channel. A. A. Low.
A. A. Low,
360,104,
A. Low,
$360,104,360,355$

Type distributing apparatus, Johnson \& Low,
Type writer cabinet, Harter \& Parker Type writing mach
Umbrella, F. Haitz.
Umbrella stand, G.
Umbella stand, G. W. Shanks...
Valve, automatic, W.G. Browne
Valve, balance throttle. W. A. Pendry
Valve, balanced throttle, W. A. Pendr
Valve, stop, D. Gilson.
Vehicle brake, H. J. Banta.
Vehicle, side bar, w. H. Bowe
Velocipede, E. C. Hernandez..
Velocipede, E. C. Herna
Velocipede, H. A. King.
Velocipede,
Veneer dishes, machine for making. Treat \&
Banghart...........................................
veneer. drums, machine for forming, Godfrey \&
Halstead.
Wagon rack, T. v. Edwards
Wash board, T. W. Dowling
Wash board, R. Grove .............
Wash board, wire, L. B. Kitchel.
Washing clothes, apparatus for, G. Hargreaves.
Washing machine, Dunlop \& Baley
Washing machine, C. W. Snyder..
Watch balaces and hair sp
ing, E. A. Marsh et al..
watch case, C. F. Morrill.
Watch case, C. F. Morrill.................
Water closet apparatus, W. Bunting, J
Water pipes, anti-freezing apparatus for, E. A.
Newman...............................360,106,
Water pi pes by automatic cocks, dev
ioning the shock in, J. G. Richert
Water. purifying. W. Tweeddale.
Weighing apparatus. grain, 1H. Hodge
Wells, socket for remoring tools from oill, A.
Leew is..............
Whip rack, H. G. Blish
Windmill, O. S. Willett

Wood working machine, w. R. Briggs
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