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RAISING A SUNKEN STEAMSHIP.

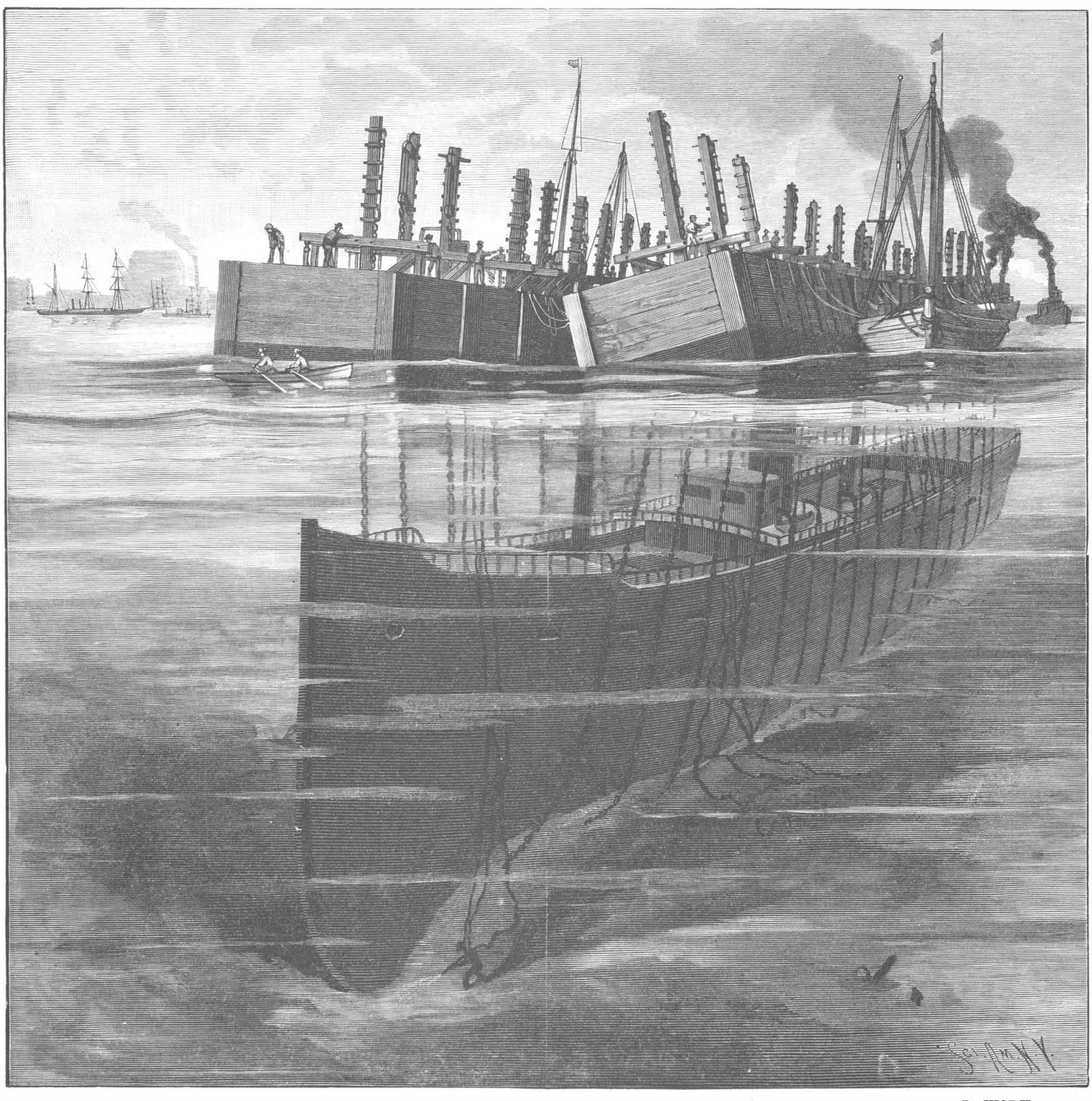
Those who have had occasion to cross the Jersey City or Hoboken ferries may have noticed a collection of nondescript craft anchored in the North River, well over toward the New Jersey shore, yet quite distant from it. Coming down the river or up from the bay, the group looked not unlike a swarm of big flies gathered about a dead beetle lying on its back with stiffened legs projecting up into the air. Near by, the mainmast of a submerged ship is readily made out, and the accompanying craft seen to be great box-shaped boats, some of them a hundred feet long, and in company a full-rigged schooner. The sunken vessel is the British steamer Welles City, and the craft about her the property of the Merritt wrecking organization, which has been engaged in raising her.

On a stormy afternoon in the early part of last February, the Welles City steamed up the Hudson River as far as Christopher Street, well over toward Jersey City, and dropped anchor.

The captain had chosen his anchorage with an eye to convenient delivery of cargo rather than to good holding ground, because, under ordinary conditions, there is not much strain on the cables of a ship riding at anchor in the smooth waters of a riverway; and so it was that when, toward daylight, a huge field of ice, having broken away, suddenly came pounding down upon him, he was wholly unprepared. His bower anchor tore its way through the soft mud of the bottom and was soon afoul. The holding fluke tripped, and permitted the anchor to fall over on to its side; and though he quickly dropped his big kedge anchor, whose broad stock or cross-bar prevents its fouling, the power of the mud to resist was not equal to the force of the oncoming ice, and the Welles City went drifting down stream. Directly in her track lay anchored the iron steamer Lone Star, of the Morgan line. She headed in the direction whence the Welles City was advancing, and, her crew perhaps not wide-awake nor quick enough to slip their cables, the Welles City came down upon the sharp iron prow of the Lone Star broadside on. It cut into her side just abaft the main channels as though she had been made of cheese, and giving a great list, she rocked forward and aft several times, and went to the bottom in eight fathoms of water.

On the other side of the world they are content, when a large vessel goes down in navigable waters, to take

(*Continued on page* 23.)



RAISING THE STEEL STEAMSHIP WELLES CITY, HUDSON RIVER, N. Y.—PONTOONS AND SLINGS IN POSITION FOR WORK.

Scientific American.

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NEW YORK, SATURDAY, JULY 9, 1887.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 601.

For the Week Ending July 9, 1887.

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ACCESSION OF THE UNITED STATES TO THE INDUSTRIAL UNION.

The following announcement is made in *La Propriete Industrielle*, the official organ of the International Bureau of the Union: "From a communication addressed to the Federal Council of Switzerland by the United States minister at Berne, the date of the accession of the United States to the Union for the protection of industrial property has been fixed for May 30, 1887." According to the above, the United States is now a member of the Union, and our citizens are entitled to the enjoyment of all its benefits. The fact, we presume, will be soon proclaimed by the President.

It is difficult at the present time to foresee all the results, advantageous or the contrary, that may accrue to us from this membership. It has been very extensively published in the daily press that, under the laws of the Union, all American patentees would enjoy a priority of time for seven months after the date of their American patents, during which they could take patents in all the several countries covered by the Union. But this is an error, as the laws of the Union provide for a priority of seven months, not from the date of the patent, but from the date of the *application for the patent.*

As the business of our patent office is considerably in arrears, in some classes more than seven months in arrears, in such cases the Union affords no benefit. In other classes the arrearage is not more than two or three months. In these cases the Union will be of some benefit.

The other laws of the Union relate chiefly to trade marks, concerning which the protection accorded to the members of the Union is full and satisfactory.

The following are the present members of the Industrial Union: Belgium, Brazil, Spain, France, Guatemala, Italy, the Netherlands, Portugal, Salvador, Servia, Switzerland, Great Britain, Mexico, Sweden, Norway, Paraguay, Uruguay, Roumania, Tunis, the United States.

In the official statement of the articles of the convention, published in the *Patent Office Gazette* of May 24, 1887, it was stated that Germany was a member of the Union; but this we believe to be an error. Germany, we are informed, has not yet become a member.

USE OF THE SIREN IN MARINE SIGNALING.

In certain cases, as in fogs and tempests, optic telegraphy is impossible. Cannons have long been employed in these cases. A slightly violent wind makes them nearly useless, and even in good weather they are of little use, because of the difficulty of sufficiently multiplying their detonations, as to whose number there are no certain and invariable agreements.

As for the ordinary whistle, these can only serve as toys, and could they be employed in signaling, the steam whistle, already much used, would be preferable. Here, too, the lack of agreement as to meaning of signals operates to restrict their use.

For some little time, ocean vessels owned by the large shipping companies have been provided with an instrument giving sounds of wonderful height and intensity. We speak of the siren. The siren, invented by Cagnard de la Tour, has been greatly modified, and steam has replaced the original currents of air. Applied to the same uses, the siren leaves far behind it the cannon, ordinary whistle, and steam whistle. Nothing remains but to fix a certain and invariable standard of comparison.

We give below the ideas emanating from M. Edme Genglaire, student of the naval school of medicine at Toulon.

The siren being in communication with the boiler, the current of steam can be governed by an ordinary valve. The sounds produced vary in height and intensity in proportion to the quantity of steam emitted, so that sounds of any given pitch can be obtained. A set of resonators completes the apparatus.

It is well known that two identical resonators vibrate together for the same sound and for that only. Starting with this principle, in two similar frames containing several resonators, the corresponding resonators will vibrate or sound only when the note corresponding to them is produced. The siren will produce these sounds causing vibrations in the resonators, and two distant ships, or a shore station and a ship, or two land stations, supplied with sirens of similar model and identical frames of resonators, could most conveniently communicate. For this end each resonator should have attached to it an invariable signification, the same for all the frames.

All the navy and commercial vessels possessing sirens and a frame carrying the same number of resonators, each marked with a number having its signification, will be prepared to communicate with each other or with the shore. It must be remembered that these acoustic effects can be conveyed intelligibly to an immense distance by the aid of the siren and the additional apparatus. The apparatus, moreover, does not cost much for establishment.

The preceding theory being admitted, the following is the practical way of carrying it out as proposed by M. Genglaire:

In front of each resonator will be placed two metallic reeds; one rigid, the other thin and producing extended oscillations with the least effort. Each of these pieces of steel communicates with one pole of a battery by means of the circuit wire. When the resonator vibrates, the thin reed oscillates, touches the other bar, and the two poles of the battery being connected, an electric bell rings, thus giving a signal, so that the call, whether from ship or shore, can be recognized, while the bell of the signaling station by its sounds shows that the desired vibration or note has been produced. —*Electricite.*

THE ECONOMICAL DISPOSITION OF PRIMARY BATTERIES.

The true action of a primary galvanic battery in some of its features is not generally comprehended, even by those familiar with the ordinary phenomena of electricity. The size of a battery, and the direct effects of varying it, and the deleterious effects of internal resistance, are among the factors least grasped. At the present day the error is sometimes made of supposing that the size of a cell affects its electromotive force, and internal resistance is often spoken of as a beneficial element.

Yet if the subject be brought down to facts, the case is a very clear one. The electromotive force is quite independent of dimensions, and a cell the size of a percussion cap will produce as high electromotive force as the largest made. This, to many, sounds a truism, yet it is by no means universally realized. But on the subject of resistance a more firmly fixed misconception prevails to a considerable extent. It is often asserted that low resistance batteries are not wanted. The truth is that they are wanted, and that the invention of a non-polarizing or constant and low resistance battery would be a valuable contribution to the resources of the electric engineer. The source of the error on the subject of resistance is doubtless due to the universal application of Ohm's law for fixing the number of cells in a battery for given external resistance.

By simple mathematical demonstrations it is proved that the most economical distribution of battery, as far as the number of cells is concerned, is attained when the internal, or battery, resistance and the resistance of the external circuit are equal. Thus with ten ohms resistance on the outer circuit, enough cells should be provided to have the same resistance internally. This, however, refers only to the number of cells, and not to their economic working. This limitation is very generally overlooked. The arrangement of battery so as to make internal and external resistance the same is considered the ultimatum, and the low resistance of cells is held not to be a specific advantage.

The ordinary calculation of the number of cells required to supply a circuit may be used as an example. Suppose a difference of potential of 35 volts is to be maintained between the extremities of an external circuit of 40 ohms resistance, giving a current of 0·875 ampere, and assume each cell of the given battery to yield 1·75 volts with an internal resistance of 1 ohm. In making the calculation, it is at first taken for granted that the internal resistance of the battery must be 40 ohms. Therefore the total resistance to be overcome is 80 ohms, so that the effective voltage of the battery is reduced one half. Dividing, therefore, 35 volts by 0·875 volt, the dividend 40 is the number of cells that must be arranged in series. Then, as these will have a resistance of 40 ohms, the problem is solved, and this is treated as the most advantageous possible arrangement. This it is far from being; it is the best arrangement of forty elements in the given circuit. It contains the minimum number of elements that will maintain the given current through the circuit, but it is not an economical arrangement as regards consumption of material.

The battery in the case cited having exactly the same resistance as the external circuit, absorbs one half of the current. One half of the electrical energy disappears in forcing the current through the battery. This represents fifty per cent of the chemicals and zinc which is actually wasted or spent on useless work. A battery run on this principle by no fair principle can be compared with a steam boiler, to settle the point of efficiency. It is doing only a shade over half the useful work that it is capable of. To compare the cost of a battery with any other prime generator, it must work under widely different circumstances from that instanced. Its difference of potential, and at the same time its resistance, must be lowered. This can be done by increasing the number of elements and arranging them in several parallel series.

The battery and circuit above cited having a resistance of 80 ohms with 70 volts difference of potential in the battery, maintains a current of 0·875 ampere. By arranging four such series of cells in parallel, the internal resistance would be reduced to 10 ohms, the total resistance to 50 ohms, and a current of 1·4 amperes would be produced. To reduce this to 0·875 ampere, four parallel series of twenty-three cells each would be required. This is an increase in cells. The total number is 92 instead of 40. But as the battery would only have one seventh the resistance of the whole circuit, it would absorb one seventh instead of

one half the electrical energy, thus indicating at once a saving of nearly 50 per cent in consumption of zinc and chemicals. The limit of efficiency is approximated to by using a little over double the original number of cells.

In all applications of primary batteries to motors, this principle should be kept in mind. In storage batteries it has received a high development. They have such low internal resistance that it is treated as of no value, or as zero. It is for this reason that they have become of no practical value. Were they of high resistance, and were they used so as to possess within themselves one half the total resistance, then, instead of developing an electric efficiency of 85 to 90 per cent, they would give a return of only 42½ to 45 per cent of the charging current. Their constructors in order to obtain a commercial efficiency were obliged to construct them of low resistance. But the inventors of primary batteries having their minds fixed on other considerations, such as economy of space, rather than economy of material consumed, have overlooked the evil effects of high resistance.

The resistance may be reduced by bringing the plates closer together. In the primary battery the solution of a metal has to be provided for, and the difficulties due to the low rate of diffusion of liquids have prevented too near an approach of the plates to each other. In the storage battery this trouble is of course absent. But it is clear that in low resistance lies the hope for a future use of the primary battery for small powers or for electric launches. So many points tell in favor of the primary battery that it seems a pity that it cannot be more generally used. But it can never be economically employed if the minimum number of cells only is adopted as the basis of installment.

Photography in Natural Colors.

A very remarkable chemical paper by M. Cary Lea is now in course of publication in the *American Journal of Science*, in which the author gives the results of his laborious and extensive investigations concerning the salts of silver and their relations to the photographic image. The ease with which the author produces the most splendid colors, their richness and variety, is really marvelous. He reaches the gratifying conclusion that photography in natural colors is now among the possibilities of science. We give a few extracts from the concluding portions of his paper:

Almost any silver solution brought into contact with almost any reducing agent, and then treated with HCl, gives rise to the formation of photo-chloride. Almost any chlorizing influence brought to bear on metallic silver has the same result. Or when silver is brought into contact with almost any oxidizing agent and HCl, it may be said without exaggeration that the number of reactions that lead to the formation of photo-chloride is much larger than that of those leading to production of normal chloride.

Exposed to ordinary diffused light, all the bright shades of silver photo-chloride quickly change to purple and purple black. The darker shades are more slowly influenced.

Mercuric chloride gradually changes it to a dirty white.

Mercuric [nitrate dissolves it] easily and completely, but apparently with decomposition, as it can only be recovered as white chloride.

Potassic chloride seems to be without effect.

Potassic bromide soon converts it to a dull lilac, which at the end of twelve hours showed no further change.

In contact with potassic iodide, the color instantly changes to blue gray; this change is produced by a quantity of iodide too small to dissolve even a trace of silver; the filtrate is not darkened by ammonium sulphide. With a larger quantity, silver is dissolved abundantly. By acting with renewed iodide solution, the substance continually darkens and diminishes until only a few black points, barely visible, are left.

Treated with dilute solution of potassium chlorate and HCl, the red substance gradually passes to pink, to flesh color, and finally to pure white.

The action of heat on the photo-chloride is very curious; its tendency is generally toward redness. Specimens appearing quite black are rendered distinctly purple or chocolate by heating to 212° Fah. in a drying oven. Often when the substance first separates by addition of HCl, it is pure gray; this gray will often be changed to pink by simply heating to 212°. (This happens when a gray form is produced; if the grayness is due to admixed metallic silver, it is only removed by boiling with nitric acid.)

The somewhat surprising change of color which is often seen when the crude substance is boiled with nitric acid (sometimes from dull dark gray to crimson) is due to three concurrent actions—that of the mere heat, the removal of the silver, and the breaking up of uncombined subchloride.

RELATIONS OF PHOTO-CHLORIDE TO HELIOCHROMY.

The photo-chloride was examined both with the spectrum and under colored glass.

The rose colored form of photo-chloride was that which gave the best effect. In the violet of the spectrum it assumed a pure violet color, in the blue it acquired a slate blue, in green and yellow a bleaching influence was shown, in the red it remained unchanged. The maximum effect was about the line F, with another maximum at the end of the visible violet, less marked than the one at F.

Under colored glass the colors obtained were brighter; under two thicknesses of dark ruby glass the red became brighter and richer. Under blue glass some specimens gave a fair blue, others merely gray. Under cobalt a deep blue was easily obtained, and under manganese violet a fine violet, very distinct in shade from the cobalt. Green produced but little effect; yellow was sometimes faintly reproduced, but rarely. But the yellow glass of commerce, even the dark yellow, lets through portions of nearly the whole spectrum, as can readily be seen by testing it with the spectroscope.

The dark purple forms of chloride do not give as good results as the rose and coppery shades. These last have many points of resemblance with the material of Becquerel's films—resemblance of color, probably of composition, as far as we can judge of the constitution of those films from their origin; they were far too attenuated to admit of analysis; and resemblance in the curious way in which their color is affected by heat, so that the conclusion seems inevitable that they are at least closely related.

There is certainly here a great and most interesting field for experiment; hardly any two specimens of photo-chloride give exactly the same results with colored light, and this suggests great possibilities. There is the very great advantage in this method over any previous, that the material is easily obtained in any desired quantity, and in a condition most favorable for experiment.

The action of light on proto-chloride can be a good deal affected by placing other substances in contact with it. Any substance capable of giving up chlorine seems to influence the action somewhat; ferric chloride often acts favorably, also stannic and cupric chlorides.

Evidently an important point in all heliochromic processes is that as white light must be represented by white in the image, it is an essential condition that white light must exert a bleaching action on the sensitive substance employed. Red chloride does not bleach but darkens in white light, but the property of bleaching, to a very considerable extent, may be conferred on it by certain other chlorides, and particularly by lead chloride and zinc chloride.

This I look upon as very important.

Another matter of interest is exaltation of sensitiveness, and this I find is accomplished in quite a remarkable way by sodium salicylate, the presence of which at least trebles the action of light on these substances, and probably on others.

I am persuaded that in the reactions which have been here described lies the future of heliochromy, and that in some form or other this beautiful red chloride is destined to lead eventually to the reproduction of natural colors.

Employers' Liability.

In many cases of injury to workingmen running machinery, it is difficult to decide which party is to be held responsible, or whether it is attributable to mere unavoidable accident, which it was impossible to caution or guard against. Each of the parties wants to shift the responsibility upon the other, the employe to recover damages from the employer, and the latter to shirk such obligation. Where the case is not quite plain, or is not settled by compromise, endless lawsuits are frequently the consequence. The legislative bodies of the various States and of all industrial countries have endeavored, therefore, to define the liability of employers; and building inspectors, factory inspectors, boiler inspectors, and a number of other similar functionaries have been appointed to see that the laws are observed and that the regulations regarding precautionary measures to prevent accidents in factories are complied with. But the more numerous and the more specialized such enactments become, the less security they afford to the parties concerned, and the wider a field do they open for legal trickery and the more loopholes for evasion.

The fact is, the very oldest part of our common law affords the best common sense as to the proper standpoints for judging of such liability, and there is perhaps more danger that legislators will, by statute, limit and impair the efficacy of the common law than that they will improve upon it by newly devised regulations. The English government has lately been collecting information as to the law in relation to this matter in other countries, and the reports seem to confirm the idea that in no other country are the provisions of the law so generally sound and wholesome as in France. All such questions in France are still regulated by common law, and its provisions concerning them are thus formulated by the civil code:

ART. 1382. Any action whatever of a man which causes an injury to another obliges the person by whose fault the injury has occurred to repair it.

ART. 1383. Everybody is responsible for the injury he has caused, not only by his action, but also by his negligence and imprudence.

ART. 1384. A man is responsible, not only for the injury he has caused by his own action, but also for that which is caused by the action of persons for whom he is answerable, or of things in his charge.

The father, or the mother, after the decease of the husband, are responsible for the injury caused by their children [here the Roman law has: also guardians for injuries caused by their charges.—ED.] who live with them, being minors.

Masters and employers for the injury caused by their servants [Roman: slaves] and overseers in the performance of the functions in which they have employed them.

Tutors and artisans for the injury caused by their pupils or apprentices during the time they are under their supervision.

This responsibility is incurred unless the father, mother (guardian, masters, and employers), tutor, or artisan prove that they could not prevent the action which gives rise to the responsibility.

ART. 1385. The owner of an animal, or the person using it, is responsible, so long as it is being used by him, for the injury which the animal has caused, whether the animal was in his charge or whether it had strayed or escaped.

ART. 1386. The owner of a building is responsible for the damage caused by its fall, when such fall has taken place in consequence of defective maintenance or faulty construction.

The principles laid down in these articles are almost verbatim translations of the Roman law, and are also nearly in the same wording contained in the old Prussian "Landrecht" compiled by Suarez, under the reign of Frederick II. They would undoubtedly be held as good common law in all our courts to-day, where not limited by some statute. They include, in fact, all cases of reponsibility imaginable, and our law makers have actually nothing more to do than to make regulations in reference to the use of steam power and machinery, whose violation puts the owner, employer, or overseer in a position of responsibility analogous to the owner of a building, animal, slave, etc., after the Roman law.

Uses of Slate.

Slate is not confined to its use as a roofing material by any means, but, on the contrary, is probably more universally used than any other stone. In composition and texture, it is admirably adapted to the reception of carved and moulded designs, is susceptible of a high polish, and possesses great power of resistance to the principal destructive elements, besides having the additional merit of wide range of color, embracing black, dark blue, purple, purple clouded green, gray clouded green, light green, and a clear, bright red. The scope of consumption is rapidly expanding, and among the uses to which slate is applied the following may be enumerated: Flagging, flooring, floor tiles, moulding for tiles, vestibule trimmings, slabs, etc., wainscoting, mantels, hearthstones, steps, risers, platforms, sills and lintels, turned balusters, laundry and bath tubs, sinks and wash trays, meat and water tanks, refrigerator and cooling room shelves, cistern linings, brewers' vats, mangers, butchers' and curriers' tables, bar fixtures, billiard table beds, urinals, school slates and blackboards, countertops, vault work, grave linings and covers, and memorial tablets. Of the above, no record of production or value can be obtained that would prove at all useful as a basis for estimates. Possibly, a faint idea of the proportions devoted to these various uses might be obtained from the production of the Slatington (Pa.) section, where, besides an output of 108,000 squares * of roofing slate, there were also made (in 1885), in round numbers, 39,900 cases of school slates, 31,850 pieces, or 1,430 cases, or 27 carloads, of flagging, 5,900 cases of blackboards, 30 cases of mantels and hearths, and 47 car loads of shaved slate.—*Mineral Resources of United States.*

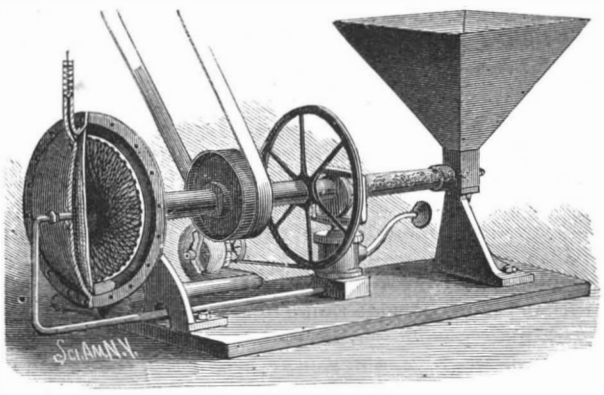
A New Light for Instantaneous Photographs.

At a recent meeting of the Berlin Physical Society, Prof. C. W. Vogel communicated the most recent discovery in connection with instantaneous photography, by which it is now possible to obtain instantaneous photographs not only at night, but also in the darkest places. Messrs. Goedicke and Miethe have prepared a mixture of pulverized magnesium, chloride of potash, and sulphide of antimony, which when ignited produces an explosive, lightning-like illumination of such intensity that by means of it an instantaneous photograph can be taken. The speaker then gave a demonstration of the discovery by taking photographs of several persons present. He used the artificial light, of which each flash lasted one-fortieth of a second, and in a few minutes produced a picture during the meeting. The powders, as prepared by the discoverers, cost only a few pfennigs each, and will hence readily come into general use.

* A "square" is 100 square feet, weighs 600 lb., and covers the same area as 1,000 shingles.

A MILL TO FREE RICE FROM ITS HULLS.

The invention herewith illustrated, which has been patented by Mr. John A. Lockfaw, of Wilmington, N. C., provides a mill designed to receive the rice as it comes continuously from the thrashing machine, and separate the grains or kernels of rice from the hulls. The central operating shaft is hollow, and as the rice is fed down the hopper it is carried along the inside of this shaft by a spirally flanged conveyer, shown in dotted lines, and delivered in the center of the casing at the opposite end of the shaft, the shaft carrying upon this end a disk with roughened surface. Just in front of this disk, and held at its edges by the flanges of the two sections of which the casing is made, is a flexible diaphragm, preferably made of heavy canvas. At the rear of this diaphragm, and opening centrally into the chamber in which it is situated, is a tube connected with an air pump operated by an eccentric on the main shaft, so that as the latter revolves, and feeds the rice forward from the hopper delivering it between the roughened disk and the diaphragm, there will be an air pressure at the back of the latter. This diaphragm is intended to be sufficiently yielding to prevent the rice from being broken as it is caught between the roughened face of the disk and the diaphragm, by which the hulls are stripped from the kernels of the grain; and in order to prevent too high an air pressure being kept up in the chamber, a safety valve is provided in the top of the casing, through which the pressure is regulated by the tension of a spring. There is also mounted upon the shaft a pulley which drives a fan, the blast from which is delivered in front of an opening near the bottom of the casing, out of which the rice and hulls fall when the mill is in operation, the hulls being thus

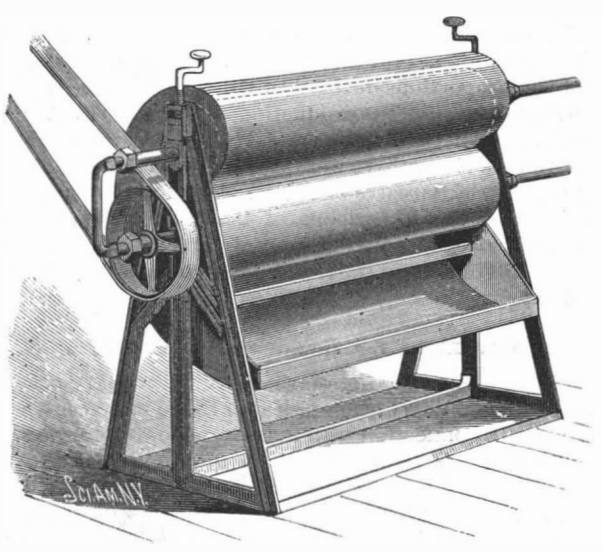


LOCKFAW'S RICE MILL.

blown off. It is said that this mill works well practically, and exceeds the anticipations of its inventor.

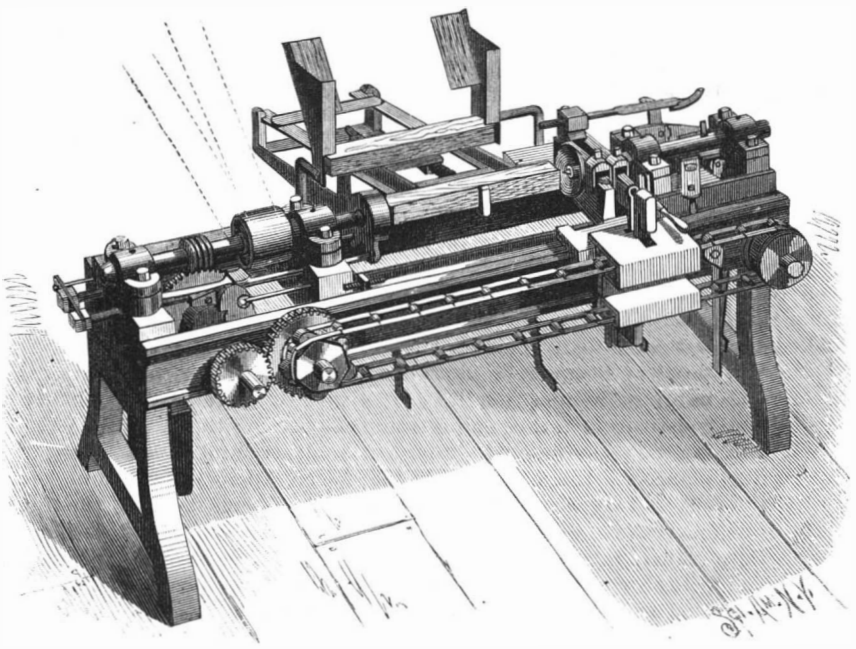
A STEAM HEATED IRONING MACHINE.

The machine herewith illustrated is designed to facilitate the ironing of towels, napkins, table cloths, and other goods. It has two steam heated cylinders partly



CORBETT'S IRONING MACHINE.

inclosed in a sheet iron drum, in which are two doors, by the opening or closing of which the goods are made to pass out at the rear of the machine or are returned to the front, as the operator desires. In ironing collars, cuffs, and similar articles, which may require to be passed several times through the machine, one of these doors is closed, so that the goods passed through on that side are returned to the front until the work is sufficiently ironed, when the articles are finally passed through on the other side and delivered through the other open door on the rear side of the machine. The ironing is effected by the hollow metallic rollers shown, which are operated by a belt from any convenient power, the journals of the rollers being tubular, for the entrance and escape of the steam necessary for properly heating the rollers, and any desired pressure is obtained by turning the small crank handles shown.



ROHLMANN'S WOOD TURNING LATHE.

For further information address the patentee, Mr. Frank Corbett, No. 354 Bowery, New York City.

AN AUTOMATIC WOOD TURNING LATHE.

It will be readily understood from the illustration how the power communicated through the driving pulley operates the lathe spindle and its mandrel, and the worm on the same shaft, through which motion is imparted to the sprocket chain seen in front, which moves the tool carriage. The latter is adapted to slide on guideways on the main frame, and carries two adjustable tools. It also has an upper and a lower pocket, through which pass the upper and lower parts of the sprocket chain, engagement of the tool carriage with either part of which--thus giving the backward and forward movement—is effected by the engagement of arms on the tool carriage with tripping arms on the main frame.

The rear part of the tool carriage actuates a feeding mechanism for placing the wood to be turned automatically in the lathe between the mandrel on the operating shaft and the opposite end centering spindle, the feeding mechanism being supported upon ways secured to the main frame, which also support a rack or hopper, in which the wood to be turned is placed. As shown in the illustration, the block to be turned is held by the feeder in position to be grasped and held between the end spindle and the mandrel on the shaft of the driving pulley. The forward motion of the tool carriage effects this by disengaging a pivoted latch, when a weighted bell crank lever throws the spindle forward, the spindle taking hold of one end of the block, while forcing the other end centrally on the mandrel opposite, and the block is rotated by the operating spindle. At the same time the movement of the tool carriage turns a forward projecting rod of the feeder, which had acted as an arm to hold the block in position, thus releasing the block, and, by another lever, the carriage which had fed the block up into position is caused to slide backward till its front is directly under the rack or hopper, when another block of wood slides down upon it.

As the tool carriage moves to the left, the cutting tools, properly adjusted, finish the turning of the block, when the chuck on the tool carriage comes in contact with the one on the operating mandrel, pushing the latter to the left, thereby disengaging one end of the turned block, and raising a weight which holds the mandrel in locked position, while a lug of the tool carriage operates a bar that forces the spindle at the other end to slide backward, disengaging the other end of the turned block, which then drops out of the machine.

On the backward motion of the tool carriage, a lug thereon engages a lever which causes the feed carriage to slide forward, with the new block of wood to be operated upon held in position to be engaged by the mandrel on the operating shaft and the opposite spindle, as at first. The tools are easily adjusted or changed, their position on the top of the tool carriage rendering them readily accessible, and the special manner in which the feeding mechanism is supported and operated holds its devices and the blocks being fed well out of the way, so that they will not interfere with the free working of the other parts of the machine.

This invention has been patented by Mr. Joseph Rohlmann, of 2001 Messaine Street, St. Joseph, Mo.

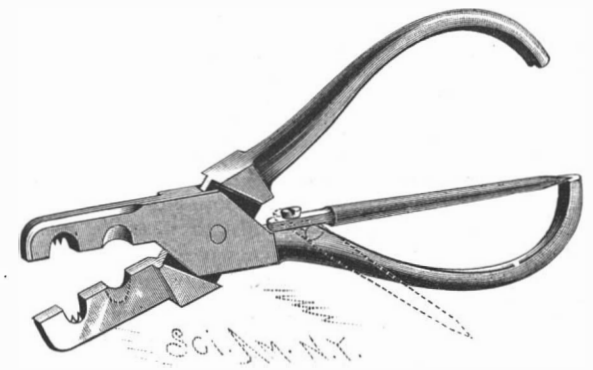
Do not Eat Raw Eggs.

In the *Monatschrift zum Schutze der Vogelwelt*, Professor Liebe adduces reliable data in answer to the question whether living worms are to be found in hens' eggs. A short time previously his sister had found a round, thread-like worm, the length of a little finger, in the white of an egg. It moved itself in a very lively manner. She at once took the white of the egg to a druggist, who put the worm in alcohol. Professor Mobius, of Kiel, decided that the specimen was an example of the thread worm of fowls—*Heteratis inflexa*—often found in the small intestine of the domestic hen. Only a few instances of the existence of the same in the white of the egg have been recorded.—*Allgemeine Medicinische Central-Zeitung.*

A MINER'S TOOL TO CUT FUSES, SET CAPS, ETC.

The invention herewith illustrated provides a combination tool for miners' use, to cut the fuse, fasten the cap thereon, and to make a cavity in the powder, when desired, for inserting the fuse and cap, preparatory to its being fired. Near the pivot connecting the blades of the plier like tool are half round openings or slots having curved cutting edges, by which the fuse can be squarely cut into two parts. Near the front end of the tool are half round openings having inwardly projecting tusks or prongs, and when the firing cap is slipped over the cut-off end of the fuse, and the tool applied thereto, these prongs embed themselves in the thin metal forming the sides of the cap and firmly clinch it to the fuse. Within the handle is pivoted a pin, which can be readily swung out, as shown in dotted lines, and forms a serviceable tool for making a proper cavity for the fuse in the powder.

For further particulars relative to this invention,

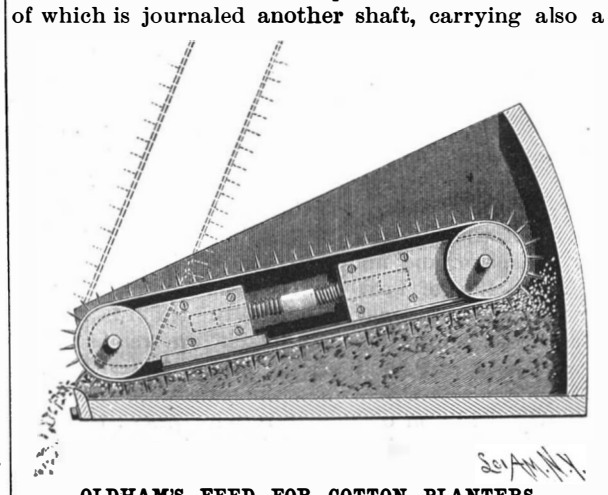


HALE'S FUSE CUTTER AND CAP SETTER.

address Mr. C. D. Hale, patentee, or Mr. F. H. Cole, box 377, Leadville, Col.

A DEVICE TO FEED THE SEED IN COTTON PLANTING.

Our illustration shows a hopper and seed feeding device therein which has recently been patented by Mr. Charles W. Oldham, of Mitchell, Ind. At or near the front of the hopper is journaled the crank shaft for operating the feed, the crank itself not being shown in our view, the shaft carrying a drum, and a block being attached to the shaft by cheek pieces. Connected to this block by a right and left hand screw rod is a similar block with cheek pieces, in the outer ends of which is journaled another shaft, carrying also a



OLDHAM'S FEED FOR COTTON PLANTERS.

drum, the distance apart of the shafts being adjusted by turning the screw rod. Over the drums thus carried by these shafts is placed a feed belt carrying outwardly projecting teeth, which, as the crank handle is revolved, carry the seed from the hopper over a low projection secured to the front end of its bottom. The hopper is filled with seed by lifting out the frame and feed belt to the position shown in dotted lines, and in operation the belt and frame rest upon the mass of seeds, feeding from the upper surface and lowering in the hopper as the mass diminishes.

THE PREMIUM FOLDING STOOL AND CHAIR.

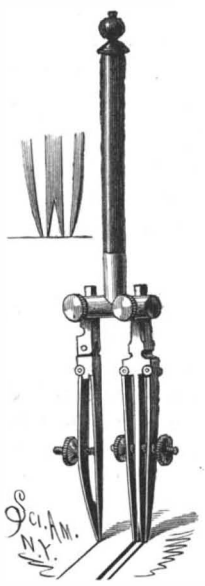
The object of this improved form of chair is to permit a greater spread of the legs, which renders it more steady and more firm on its foundation, and also enables it to be packed into a small space for storage or transportation. It will be noticed that the slant of the back rest and of the legs is not the same, and to provide for these different slants, the back rest and legs are made in separate pieces. It is not possible to construct the back and legs of one continuous straight piece and accomplish this. If the legs were continued straight up to form the back, the inclination would be too great, while if the back is raised to a comfortable angle the legs would be too close together, rendering the chair uncomfortable and unsteady. This objection is sometimes overcome by curving the back and legs to an angle, but this prevents the chair from being folded into a very compact form. Since the back is independent of the slant of the forward legs, it may be adjusted to any angle desired, by simply changing the point of its pivoted connection. When folded, the chair occupies only about one inch and a half in thickness, and a space of 60 ft. will hold enough chairs for 500 people, or chairs of this design can be placed in a hall or opera house for seating 2,000 people, and yet may be stowed away under the stairs or beneath the side benches.

A very desirable feature of this chair is that the back section is made detachable, and the chair may thus be readily converted into a neat camp stool.

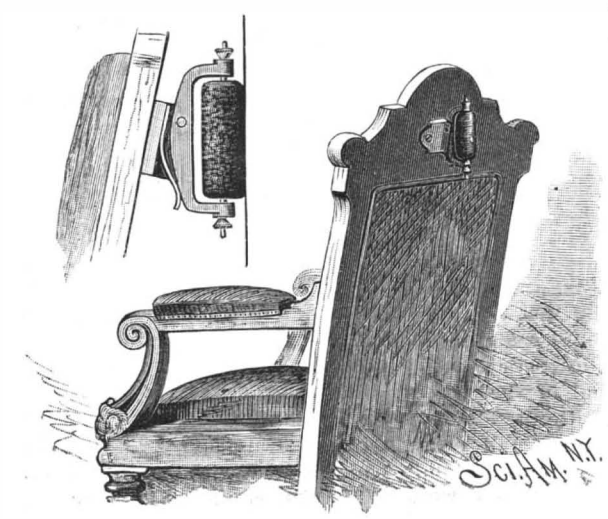
This chair is the property of Mr. Hiram F. Henry, of Gowanda, N. Y.

A PEN FOR DOUBLE AND SINGLE LINE RULING.

A ruling pen, consisting of two pens combined in convenient form for use, one of the pens capable of making two lines at a time and the other a single pen, is shown in the accompanying illustration, and forms the subject of a patent recently granted to Mr. Christian A. F. Orlob, of Salt Lake City, Utah Territory. The pens have each a square shank which fits into a corresponding aperture in a cross piece secured to the handle, and to use either pen singly one has only to turn the other in its socket at right angles to the normal position, or it can be readily removed from the socket. The center plate of the double pen is split into two prongs at the point, and the distance of the side plates therefrom is regulated in the usual way by the small nuts, according to the thickness of the line to be made, the pen, when filled with ink, making a double line without permitting the ink to run from one pen to the other. The other pen is such as used for ordinary ruling, but it has a joint to permit of swinging the lower end of the pen toward or from the double pen, decreasing or increasing the distance between the double line and the single line.



ORLOB'S RULING PEN.



BARROWS' FURNITURE ATTACHMENT.

A New Repeater.

According to the semi-official *Berlingske Tidende*, the new repeating rifle of Captain Wadsen and Lieutenant Rasmussen is to be introduced in the Danish army. In this rifle the barrel is not fixed to the stock, but is secured by a spring. In firing, the barrel is forced backward, by which motion the bottom plate of the breech is opened, the empty cartridge ejected, and a fresh cartridge pushed forward into its place, the magazine holding six cartridges. The bottom plate is then closed again, and all these movements are made automatically, so that the rifle need not be taken from the shoulder. All that is required to be done is that, as soon as the six shots are fired, the magazine is refilled. The rapidity of firing is stated to be marvelously rapid, as many as six shots having been fired in a second (?) In aiming, of course, more time is required; but if the aim is once taken, the six shots may be fired in succession.—*Broad Arrow.*

Gold on Alaska Islands.

Samples of ore from a new mining discovery in Alaska are on exhibition at the office of Geo. W. Sessions, in Nevada Block. The new mines are on Ounga Island, one of the Choumagin group, 100 miles west of Sitka, 200 miles east of Ounalaska, and 1,200 miles north of San Francisco. The island is near the southwestern shore of the Alaskan peninsula. It is about 14 miles long and 6 wide. Geo. C. King, who went there for the Sitka Mining and Commercial Company last summer to look for coal and copper, found the ledge in September. In December another expedition of the same company went up and made more careful investigation. The result was that early in April another expedition, with a number of miners, a five stamp mill, and supplies, landed on the island.

Active work was begun on the ledge. It has been traced for some 10,000 feet. It was found that the porphyry hanging wall on the east was 200 feet from the outcrop, the granite foot wall on the west was 800 feet from the outcrop, and the outcrop was at no point less than 100 feet in width.

To determine the value of the rock in the ledge, two crosscuts were started—one from the east side and one from the west—at a vertical depth of 50 feet. The crosscut from the west, at a distance of 20 feet, struck a body of galena ore, which was from 2 to 4 feet thick in the bottom of the cut, the day before Mr. Sessions left for home. The assays were from $5 to $200 in gold and silver, and the ore also carried from 70 to 80 per cent galena, which alone, at present quotations, is worth $80 per ton.

It will be remembered that the big mine of Alaska, known as the Treadwell, is on an island—Douglass—and there are plenty more islands to prospect. This new discovery will doubtless cause a more vigorous prospecting on the islands as well as mainland of Alaska. A mining district has been formed on Ounga Island, where the big ledge has been discovered.—*Min. and Sci. Press.*

A DUSTLESS CARPET SWEEPER.

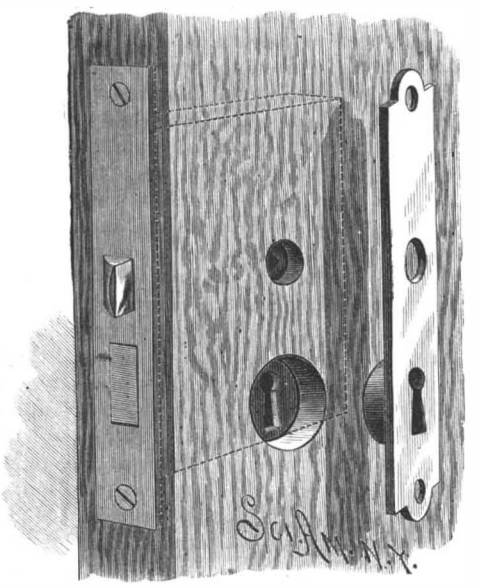
The invention herewith illustrated, which has been patented by Mr. John M. McClain, of Catlin, Col., consists of a fan wheel rotated in a sweeping box and a moistened dust catching wheel emptying into a water trough. The sweeping box has low runners on the sides, on which the device is pushed forward over the floor, and on its front is a vertically adjustable brush, one edge being provided with wire and the other with hair and jute bristles, the brush being reversible at will. As the device is pushed forward, a fan wheel in the front compartment is revolved by turning the crank, when a current of air is caused in the direction shown by the arrows, catching the dust raised by the brush and carrying it back over a dust pan and upward against a dust wheel. This dust wheel, which is set in motion by the current of air, just dips its rim in a water trough in the bottom, thus keeping it moist, and at the same time deposits the collected dust there, the heavier particles not thus carried up on the dust wheel being deposited upon the dust pan, which is situated between the water trough and the open bottom part of the sweeping box in front.

A WALL PROTECTING ATTACHMENT FOR FURNITURE.

To preserve walls from being broken and furniture from being marred or scratched, Mr. Frederick Barrows, of Haverhill, Mass., has devised and patented an attachment, such as shown in the accompanying illustration. It consists of a roller of wood, rubber, or other suitable material, mounted to turn loosely on its axle, the latter being held in the upper and lower ends of a bowed supporting arm, which is pivoted between lugs upon a bracket secured to the back of the sofa or other article of furniture. A plate spring is also employed to exert a slight outward pressure against the back of the bowed supporting arm below its pivot. It is intended that two of these rollers shall be attached to the back of a sofa, bedstead, or other large article of furniture, while one will be sufficient for chairs and similar small pieces.

AN IMPROVED KEY HOLE GUIDE AND ESCUTCHEON.

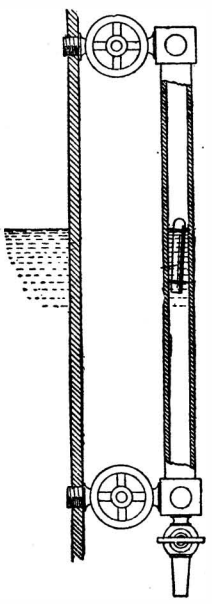
The practice of cutting a slot in the wood, where a mortise lock is used, to guide the key to the key hole, and covering this slot with the ordinary key hole escutcheon, is often carried out in so unworkmanlike a way as to make it difficult to insert the key in the lock. The register of the slot with the aperture in the lock is generally only approximate, and it is usually roughly cut and a good deal too large. To overcome this difficulty, Mr. Samuel S. Patterson, of 233 South Street, Wilkesbarre, Pa., has patented the combined key hole guide and escutcheon shown in the accompanying illustration. A circular recess is cut in the framing over and leading to the key hole, and therein is fitted a cylindrical boss, formed integrally with the escutcheon, but having a key hole slot which continues and exactly registers with that in the escutcheon, and also registers with the key hole of the lock. The escutcheon may be secured to the framing by screws in the usual way.



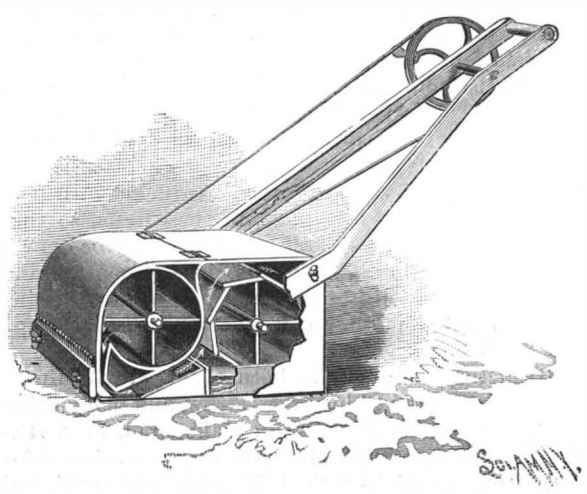
PATTERSON'S KEY HOLE GUIDE AND ESCUTCHEON.

AN IMPROVED WATER GAUGE FLOAT.

The accompanying illustration represents a glass water gauge attached to a boiler, and within the gauge a float of novel design, which has recently been patented by Mr. Loudon Campbell, of Alexandria, Va. The float is made of dark blue glass, highly tempered to prevent its breaking, and is provided near each end with encircling rings forming projecting flanges. These rings serve as scrapers within the tube of the water gauge, during periods of ebullition and under the normal action of the boiler, scraping the froth and scum from the inner surface of the tube, and keeping it always in a bright and cleanly condition. The float thus indicates the height of water in the boiler in so plain a manner that it cannot fail to be observed by a casual glance, while it can be easily seen from a considerable distance. A spiral spring, not shown in the illustration, is placed in each end of the gauge tube to prevent breakage of the float when the tube is blown out and the float goes to the bottom.



This improvement is applicable to all classes of steam boilers, being especially desirable in gauges where the water used is muddy or impure. It is now being used by steamers on the Potomac River and by several manufacturing concerns.



McCLAIN'S CARPET SWEEPER.

Death of a Notable Elephant.

Bijou, the great pet elephant who has for two years been on exhibition in the World's Museum on Washing Street, Boston, and previously was a resident of the Central Park menagerie in New York, is dead. This animal is the oldest and had been in captivity longer than any elephant ever on exhibition. Bijou has been in this country for sixty years, and while he is known to be seventy-five years old, the probabilities are that he was born nearly a hundred years ago. Recently he had suffered greatly from old age, and his efforts to stand up and receive cakes and candies from visitors at the museum, as he used to, were painful in the extreme. In the last two weeks his massive legs refused to support the weight of his huge body, and his attempts to respond to the call of his old trainer were very affecting. He would try to raise himself on his knees, and then reaching his trunk toward his keeper, the huge beast would settle back and moan.

The old elephant had also lost his appetite and was growing thin. He found it hard to sleep, and lay awake nights groaning and in such evident pain that it was decided to kill him. A box of chocolate drops saturated with a powerful poison was given Bijou after the museum closed on the night of June 19, and in forty-five minutes the beast twined his trunk affectionately around his keeper and died. Bijou's body will be buried in an underground air tight vat until decomposition is complete. This will require some nine months, after which the bones will be separated, bleached, and then prepared, and in another month the skeleton will be placed on exhibition at the World's Museum.

Bijou was an African elephant. Sixty years ago he came to this country, since which time he had traveled with nearly every circus on the road. Twenty times, it is said, his ownership changed hands, and with each stranded show poor Bijou would get a new master. When a youngster he was owned by a London tavern keeper, who exhibited him with a pair of immense gorillas in his tavern, and from there he drifted across the Continent. When but an infant, Prince Albert of England rode him and made him a pet, but his after life was not so pleasant.

In 1840 he visited Germany with a prominent showman, and tramped back and forth throughout the world until 1873 and 1874, when he was an attraction in the Great Eastern Circus. Then O. P. Older, a well known circus man, purchased him, and later Bob Frier, an equestrian with Barnum's circus, broke him to tricks.

Bijou then went to California, and at last drifted back to New York. On the way home, in crossing a bridge Bijou refused, after trying the planking, to make the passage. His keepers, it is claimed, goaded him on. He took a few more steps and plunged through the rotten boards, spraining his ankle, and since then he has never been himself.

While in the Central Park menagerie in New York, the agent of the World's Museum bought him. That was two years ago, and until within three weeks Bijou was never off his feet, even to lie down. He was considered one of the best trick elephants in the country. He played five tunes on the harp, played the harmonica, stood on his head, and did the housekeeping business for the circus with all the intelligence of his nature. During his sickness he has been fed largely on fruit, and a day's allowance included two dozen oranges, twelve loaves of bread, one hundred and fifty pounds of hay, half a bushel of grain, and a bucket of shorts.

Bijou was valued at $3,000, and was probably better known throughout this country than any elephant ever on exhibition.—*New York World.*

Test for Animal and Vegetable Fibers.

A new method has been enunciated by Hans Molisch, in *Dingler's Polytechnisches Journal* (No. 261,135), for distinguishing between animal and vegetable fibers, depending on two new sugar reactions. α-naphthol and thymol give characteristic reactions with cane and grape sugar, which are more delicate than the tests of Trommer and Fehling in common use. The method of procedure is as follows: 5 cub. cm. of the sugar solution are mixed with one or two drops of a 20 per cent solution of α-naphthol in alcohol, and then concentrated sulphuric acid is added in large excess. A deep violet coloration is produced, which gives rise to a bluish violet precipitate on dilution with water. Thymol similarly gives a red brown precipitate. Glucosides and carbo-hydrates, after treatment with sulphuric acid, will also respond to these tests, so that the cellulose in the cell walls of plants may be detected by its use. As animal fibers do not contain any sugar or carbo-hydrates which are capable of giving this color reaction, they can be readily distinguished from plant fibers.

Satisfactory results have been obtained with linen, cotton, hemp, jute, China grass, straw, and many other substances of vegetable origin; while wool, hair, etc., give no reaction. With silk, however, a transient color is produced, especially if the boiling has been continued for some time. When wool is to be tested, it is necessary that it should be first well cleansed, as "wool lice," a feature of vegetable origin, gives the color reaction. Also, many fabrics made from animal fibers are finished with gum or mucilage, which must be removed before the test is applied. Any coloring matter present, according to the author, does not prevent the reaction from being seen.

A NEW STYLE OF THERMOMETER.

In the SCIENTIFIC AMERICAN for December 5, 1885, we published an interesting letter from Dr. Warren, of Boston, Mass., in which he described at considerable length the disadvantages of the common thermometer and the urgent need there was of a new form of instrument, especially for medical purposes. Since that date there has been brought into market a new and ingenious form of thermometer, Immisch's avitreous thermometer, which seems to answer many, if not all, the requirements. We give an engraving of its exterior

appearance and size, the cut being the same size as the article itself. The interior mechanism consists of a small tube, bent in circular form, having one of its ends fixed to a support, the other end free to move, but connected by a fine spring with a shaft carrying the indicating or dial pointer. The tube is filled with a highly expansible liquid. Any variation of temperature causes the tube either to curl or expand, as the case may be, and thus moves the pointer. There is a stop catch, by which the pointer may be held or locked to show its indication as long as desired.

The instrument is waterproof and durable, very sensitive to slight changes of temperature, and very accurate. This fact is established by the guarantee of the Kew Observatory, which accompanies each instrument. Altogether, this is a scientific and desirable form of thermometer, which every medical man especially should be provided with. Messrs. Sardy, Coles & Co., 96 Maiden Lane, New York, supply the instruments and give further information.

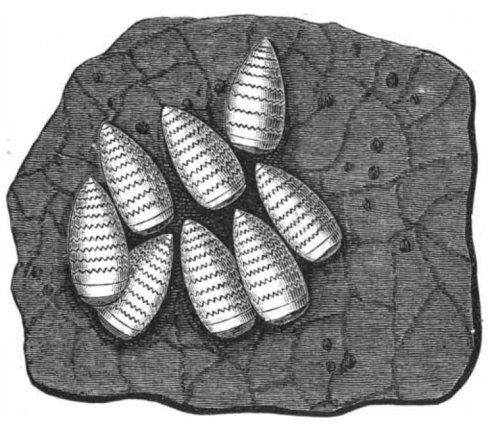
LARVÆ OF BOT FLY IN HORSE'S STOMACH.

BY JAMES F. M'DOUGALL.

I have lately had sent to me, by the son of one of our most eminent breeders, a portion of a horse's stomach, containing a great number of large maggots (the larval form of the horse bot fly) adhering in thick clusters to the lining of the stomach. The gentleman in forwarding specimen writes me that the number of maggots in the entire stomach would have filled a peck measure. I am strongly of opinion that these maggots are much more prevalent in horses' stomachs than has hitherto been made plain.

I have spoken to a number of veterinary surgeons with large country practices, and they inform me it is quite a common thing with horses that have died between January and June to find these maggots in large numbers in the stomach, especially if the animals were at pasture the previous summer or autumn.

The maggots are produced from eggs laid by the horse bot fly (*Gastrophilus equi*). The female deposits her eggs upon those places which are most easily reached by the animal's tongue, as, for instance, the



HORSE BOT FLY MAGGOTS ON LINING OF STOMACH.

shoulders, the legs, the inside of the knees, etc. The effect of the moisture and heat of the tongue seems to be such that licking the places where the eggs have been deposited liberates the minute maggots contained in the eggs, which adhere sufficiently to the tongue to be carried from thence with the food into the stomach. On reaching the stomach they immediately attach themselves to the lining by means of two small hooks with which their mouths are furnished. Here they remain till the following spring, feeding upon the mucus secreted by the mucous membrane. When full grown, they are about an inch in length. When the maggots are fully developed from the larvæ, they are removed from the stomach during ordinary evacuations. —*The Farmers' Gazette, Dublin, Ireland.*

Many Items of Interest.

At a recent meeting of the Polytechnic Society of Berlin, says the *Journal of the Telegraph*, the question was asked, What studies are best to fit one to be an electrical engineer? Herr Frischen, one of Siemens and Halske's experts, replied that much practical experience was required. After graduating from school, a rigid course in an advanced technical school should be taken, followed by an apprenticeship in a factory. He remarked that at present the title of electrician is used too freely, and that the claim of some to it is that they have nailed up a few wires.

A lens which magnifies, and yet is perfectly flat on both sides, is a scientific novelty. It is made at Jena, by the manufacturer of Professor Abbe's new optical glass. The lens consists of a single disk, whose density varies so that its refractive power decreases regularly from the surface inward.

To purify water in glass vessels and aquariums, it is recommended to add to every 100 grammes of water 4 drops of a solution of 1 gramme of salicylic acid in 300 grammes of water. The *Norsk Fiskeritidende*, published at Bergen, Norway, says that thereby the water may be kept fresh for three months without being renewed.

An observer down South says an alligator's throat is an animated sewer. Everything which lodges in his open mouth goes down. He is a lazy dog, and instead of hunting for something to eat, he lets his victuals hunt for him. That is, he lies with his great mouth open, apparently dead, like the 'possum. Soon a bug crawls into it, then a fly, then several gnats, and a colony of mosquitoes. The alligator doesn't close his mouth yet. He is waiting for a whole drove of things. He does his eating by wholesale. A little later a lizard will cool himself under the shade of the upper jaw. Then a few frogs will hop up to catch the mosquitoes. Then more mosquitoes and gnats will light on the frogs. Finally a whole village of insects and reptiles settle down for an afternoon picnic. Then all at once there is an earthquake. The big jaw falls, the alligator blinks one eye, gulps down the entire menagerie, and opens his great front door again for more visitors.

The application of soda ash or any other scale resolvent to a dirty boiler, the editor of the *Locomotive* says, should be followed by a thorough cleaning shortly afterward to remove any scale which may be detached or loosened, or injury to the boiler may result. The idea obtains in some cases that it is only necessary to put the solvent into the boiler and let it work, no further attention being necessary. This is a great mistake. If a solvent does any good, its action is either to loosen scale so that it becomes detached in flakes, or it dissolves it so that it remains in the water, either in a finely divided state or in solution. In the first case, the accumulation of a mass of scale on the bottom of the shell is more than likely to result in burning the plates. The only thing to do is to open the boiler and remove it mechanically.

In the second case the result will depend more or less upon the nature of the scale and the amount and character of impurities that find their way into the boiler. If the scale is cut by the action of the solvent into a fine powder, and grease gets into the boiler, as it will in all cases where an engine exhausts into an open heater for the purpose of heating the feed, trouble is sure to result. Burned plates may always be expected under these circumstances. The only thing to do is to blow off all the water in the boiler, thoroughly clean it out, and begin again, omitting the grease.

Gold will only melt at a comparatively high temperature, as we all know, but what is not generally known, the *Jewelers' Journal* says, is that if two per cent of silica be added to the gold. it can be melted over the flame of a common candle.

From the same source the reader may learn that a pretty alloy, said to resemble gold exactly, can be made with 16 parts copper, 1 of zinc, and 7 of platinum. The copper and platinum are covered first with borax and then with powdered charcoal and melted, then the zinc added, and the alloy thus produced is exceedingly malleable, and can be drawn into the finest wire, while it never tarnishes.

Food Adulterations.

The examinations as to tea, coffee, and sugar conducted by Edward G. Love, Ph.D., for the New York *World*, resulted as follows:

A review of the 300 reports discloses that of the samples of tea, 88 were not adulterated and 12 were adulterated, mostly with "lie tea" and foreign leaves; that of the samples of ground coffee, 72 were unadulterated and 28 were adulterated, mostly with chicory and peas; that of the sugar samples, 98 were pure and only 2 adulterated with starch glucose. In all, there were, of the 300 samples, 258 good and 42 more or less bad. As to the weights of the samples, those of 270 were correct and 30 were light.

Resin in Soaps and Fats.

According to the authors, the methods of Sutherland, Gottlieb, and Heiner do not give quantitatively useful results. They recommend a modification of Gladding's process. From 1 to 2 grms. soap are dissolved with heat in 80 per cent alcohol, the solution, if acid, is neutralized with ammonia, mixed with excess of a 10 per cent alcoholic solution of calcium nitrate, and filtered when cold. The filtrate passes through at first turbid, and must be repeatedly poured back. The precipitate is washed several times with 80 per cent alcohol, mixed in a roomy flask with an excess of silver nitrate solution, and diluted with three volumes of water. After some shaking, the precipitate (if a sufficiency of silver solution has been used) collects on the surface, and the solution is nearly clear. It is filtered, and the precipitate is washed with cold water until the washings no longer give a precipitate with hydrochloric acid. The washed precipitate is dried at 70° to 80°, and washed with ether into the same flask in which was the silver precipitate, and which must have been dried internally in the mean time.

After some time the ethereal solution is filtered through a dry filter into a graduated 100 c. c. cylinder, and the undissolved portion is washed with ether until the filtrate makes up 90 c. c. The ether which flows through last must be colorless. If 90 c. c. do not suffice, a larger graduated cylinder of about 250 c. c. may be used. The solution is then mixed with about 10 c. c. of dilute hydrochloric acid, well shaken for a long time. The cylinder is then filled with ether or hydrochloric acid up to the mark and shaken again. If the operation has been well managed, the precipitate of silver chloride settles quickly, and the ethereal solution of the resin is quite pure and transparent. The volume is read off, from 50 to 60 c. c. are taken with a pipette, the ether is distilled off, the residue dried at 100°, and the resin weighed. From the weight we must deduct 1·6 mg. for every 10 c. c. of the ethereal solution, on account of oleic acid which has been dissolved.—*A. Grittner and J. Szilasi, Chemiker Zeitung.*

A Steam Engine of 1809.

Retained in perfect running order in the United States Steamboat Inspector's office at Louisville, Ky., says the Louisville *Courier Journal*, is an oscillating engine constructed in 1809 by Daniel French. It is only of model size, and is probably the first engine of the kind ever constructed. Its description is simple. Having its piston rod attached directly to the crank pin, as the crank revolves, the cylinder oscillates upon trunnions, one on each side of it, through which the steam enters and leaves the steam chest. The valves are within the steam chest, oscillating with the cylinder. It is perhaps as satisfactory an engine of this class as has ever been built, for it is well known that the mechanism actuating the valves in oscillating steam engines has seldom proved perfectly satisfactory in its operation.

The inventor, whose son carried on a shipyard for years at Jeffersonville and was well known to many of the older citizens of the city, was contemporaneous with Robert Fulton, who built a steamboat on the Seine in 1803 with Chancellor Livingston, and who, in 1806, with Livingston, had a boat built on the Hudson, in which he placed machinery claimed to have been made by Boulton & Watt in England.

Daniel French had litigation with Fulton about this steamboat, claiming that the latter had appropriated his invention, but Fulton was backed by Livingston's influence and capital; and, though the case was before the courts for many years in one form and another, French was finally defeated. Although the oscillating engine on exhibition in the steamboat inspector's office was not built till 1809, it was by no means the first attempt French had made to invent an engine applicable for steam navigation. He had been known as an inventor for a quarter of a century before, and his numerous inventions of different kinds had given him an extensive and esteemed reputation. Those who knew him were wont to say that he was half a century ahead of the time in which he lived.

It is not improbable that Fulton was familiar with French's experiments with steam. It is an historical fact that in connection with his profession as an engineer he had passed years in the scientific experiments the result of which forever identified his name with steamboat navigation. It is not to be doubted, therefore, that he was acquainted with the efforts of every experimenter of the power of steam in this direction, from the time that Blanco de Garay is supposed to have actually applied steam to the propulsion of a ship at Barcelona, in the year 1543, up to the time when, in 1763, William Henry, of Chester County, Pennsylvania, tried his model steamboat on the Conestoga river. Fulton witnessed that experiment, and it is a matter of record that he was familiar with the work of the numerous contemporary inventors in America, and had visited England, where he found others at work on the same problem. But with this invention, as with all others, though the claimants may be numerous, the credit attaches to the one most successful in bringing it before the public.

Roburite, the New Explosive.

A most important and interesting series of experiments was lately carried out at the School of Military Engineering, Chatham, England, under the superintendence of Major Sale, R.E., and in presence of Lieutenant-General Sir John Stokes, K.C.B., R.E., Admiral Colomb, Major Cundill, R.A., Her Majesty's Inspector of Explosives, and a large gathering of other officers and gentlemen.

The new German explosive, roburite, belongs to what is known as the Sprengel class or type, being a mixture of two substances, neither of which separately possesses explosive properties. In this case both components are solid, and the resulting mixture has a sandy, granular appearance, somewhat resembling the commonest yellow sugar. Roburite is the invention of Dr. Carl Roth, an eminent German chemist and analyst, who claims for it the following advantages over other explosives:

1. That the two components are perfectly harmless and inert separately, so that they can be stored and transported without any restriction whatever.

2. That even when mixed or ground up together in an ordinary coffee, cement, or flour mill, the mixture is perfectly safe to handle and use, as neither percussion, friction, nor the application of an ignited or heated body will cause it to explode. This can only be effected by using a detonator charged with fulminate of mercury.

3. That, when detonated, roburite produces neither spark nor flame, and will not, therefore, ignite firedamp nor coal dust in mines. Dr. Roth states that this point was decided by the trials of the Imperial German Commission upon Accidents in Mines, and that, in consequence, this explosive is now being introduced into the coal mining regions of Germany, as affording absolute safety to the men employed.

4. The amount of noxious gases produced by its explosion is so infinitesimal, that for this reason alone it is superior to other exlosives in common use for longitudinal and deep mining work. The report from a mine in Westphalia, with shafts about 1,500 ft. deep, states with reference to roburite: "The men are not inconvenienced by the gases, and experience no difficulty whatever in breathing the moment after a shot has been fired, and they resume their labor at once."

5. Roburite is not subject to deterioration through climatic variations of temperature. It should be kept dry, but if it becomes damp, its strength can be safely restored by drying.

The object of the trials was to test roburite in comparison with gun cotton, dynamite, and blasting gelatine. The programme of the experiments actually carried out was as follows:

A. *Safety Tests.*—After being ground through a small hand mill, the substance was struck direct and glancing blows with heavy hammers upon iron plates, without any result. Flame was then applied to a portion of it by means of a short length of Bickford fuse, but without igniting the mass. Thrusting a red hot iron from a portable forge into the roburite caused only slow combustion and crepitation locally, which ceased when the iron was withdrawn. When a quantity was put on the forge fire, it merely burnt away like an ordinary combustible. Dr. Roth wished to fire a powder charge in contact with the roburite, but it was considered that the above named tests were more severe.

B. *Test on Mild Steel Plates*, 2 ft. 6 in. by 2 ft. 6 in., and of various thickness.—These plates were supplied by the Patent Shaft and Axletree Company, Limited, and were laid flat in shallow trenches, a hollow being left underneath the central portion of each plate; heavy timber balks were stacked around each square trench, with the object of showing the comparative dispersive force of each explosive.

I. Three pounds each of dynamite and roburite were placed on the center of plates 2 in. thick, some sandy loam being piled loosely on top. The results of detonation were that the dynamite produced a dent in center of plate 1¾ in. deep; the indentation produced by the roburite was about 1½ in. deep, but the bulge appeared to have a wider area than in the former case.

II. Five pounds each of roburite and gun cotton were then exploded upon the same plates, with the result that in the former case the plate was smashed into four tolerably equal pieces, while the gun cotton made a breach through the center of the plate somewhat resembling that which would be caused by the penetration of a large projectile. The diameter of the hole was roughly 12 in., with five radial fissures almost reaching the edges, the longest 15 in., the plate being at the same time bent into the shape of a pack saddle. This would seem to have been a remarkably tough piece of metal. The timber balks were scattered in all directions.

III. Eight pounds each of dynamite and roburite were then detonated upon plates 3 in. thick. The dynamite caused an indentation 2¼ in. in maximum depth, while the roburite gave a bulge 3 in. deep in the center, and of a larger area, reaching apparently almost to the corners of the plate.

IV. This series of tests was concluded by exploding 12 lb. each of roburite and gun cotton on plates 4 in. thick, rather more loam being heaped on top of each. The roburite caused a wide indentation 1⅞ in. deep in center, while the tremendous local force of the gun cotton was exemplified in a striking manner. In addition to an indentation 3½ in. in greatest depth, a small crack appeared to extend right through the plate, this crack corresponding with one edge of the lowest slab of gun cotton, the rectangular shape of which could be clearly seen indented on the steel plate, the depth being ¼ in. at the crack and ⅛ in. along the other edges of the slab. There is a circular hole drilled in the slab of wet gun cotton to receive a small cylindrical disk of dry gun cotton, as a primer, and the position of this disk was marked by a circular hollow in the steel plate ½ in. deep in center.

C. *Blasting or Mining Test in Brickwork.*—Three holes, each 1¼ in. in diameter and 18 in. in horizontal depth, were drilled in the solid brickwork of the counterscarp wall, and were respectively charged with 2 oz. of gun cotton, blasting gelatine, and roburite. The holes were then tamped with loam in the ordinary manner, and fired by means of short lengths of Bickford fuse. The gun cotton produced no apparent effect upon the brickwork, but Major Sale was of opinion that the hole must have been open or very weak at the back. The blasting gelatine produced violent local action, displacing the brick through which the hole had been bored and the four adjacent to it. There was a slight bulge in the wall, the cracks extending radially from 10 in. to 12 in. The roburite exhibited a more widespread rending action upon the wall, the radius of disturbance being 15 in. or more, and the bulge being also greater. Rather larger charges of each explosive would have afforded a more satisfactory comparison.

D. *Ground Mines.*—Ten pounds each of gun cotton, blasting gelatine, and roburite were loaded into holes in the bottom of the ditch 4 ft. deep by 8 in. in diameter, filled up with sand, and slightly tamped. The explosion of these charges cast up tremendous fountains of loam and sand, and resulted in the following craters: Gun cotton, 10 ft. 6 in. wide by 1 ft. 8½ in. deep; gelatine, 14 ft. 6 in. wide by 3 ft. 7 in. deep; roburite, 12 ft. 3 in. wide by 2 ft. 9 in. deep. The explosion of the gun cotton mine appeared to cause great local action, but it will be seen that the area and depth of its crater was considerably less than that caused by the roburite, which again must yield the palm, in this instance, to the blasting gelatine. It is, however, to be remarked that these mines had been placed much too close to one another, so that their craters crossed; this would give whichever charge was the last to explode a certain advantage.

In summing up the results of the foregoing experiments, we must bear in mind the great difficulty—we had almost said the impossibility—of obtaining any absolute standard of comparison of the relative strengths of two or more explosives. Each will seem to prove itself superior for certain purposes. Judged, however, by any standard of comparison, it appears that the new explosive has acquitted itself very well, and—especially when we consider its absolute safety—must have a great future before it. Roburite has shown itself to be in some respects more powerful than dynamite, to which it is likely to prove a serious rival in the industrial field, although the latter has the proverbial advantage of strong possession of the ground. An important element in the struggle for ascendency will be the price at which roburite can be supplied, as compared with dynamite, and this will be, we understand, strongly in favor of the new substance.

As regards the military application of explosives, there is nothing in the results of these trials to disturb the firm conviction of our government that gun cotton is the best adapted for torpedo charges, submarine mining, and hasty demolitions of all kinds. Its superiority in local force to dynamite, when employed without any confinement, is once more strikingly demonstrated, to say nothing of the far greater safety of wet cotton, and its applicability for use under water with no other confinement than that of a net to keep the slabs together. But although quite outside the scope of recent experiments, the great power and perfect safety of roburite seem eminently to fit it for use as a bursting charge for shells, into which its granular form would allow it to be conveniently loaded. Much stronger than any picric powder, and doubtless better able to withstand the concussion of the discharge of the gun, an extended series of trials would be necessary to determine the best mode of so employing it.—*Engineering.*

Coppered Tin.

Mr. P. H. Laufmann, Pittsburg, is manufacturing copper-plated sheet steel, which indicates a new use for that metal. The sheet is made of decarbonized steel, and is manufactured at the Apollo Sheet Iron Mills. After being rolled to the proper thickness, it is electroplated with copper on both sides and tinned on one side, and in this condition, it is stated by the manufacturers, it is a better article for many purposes than solid sheet copper.

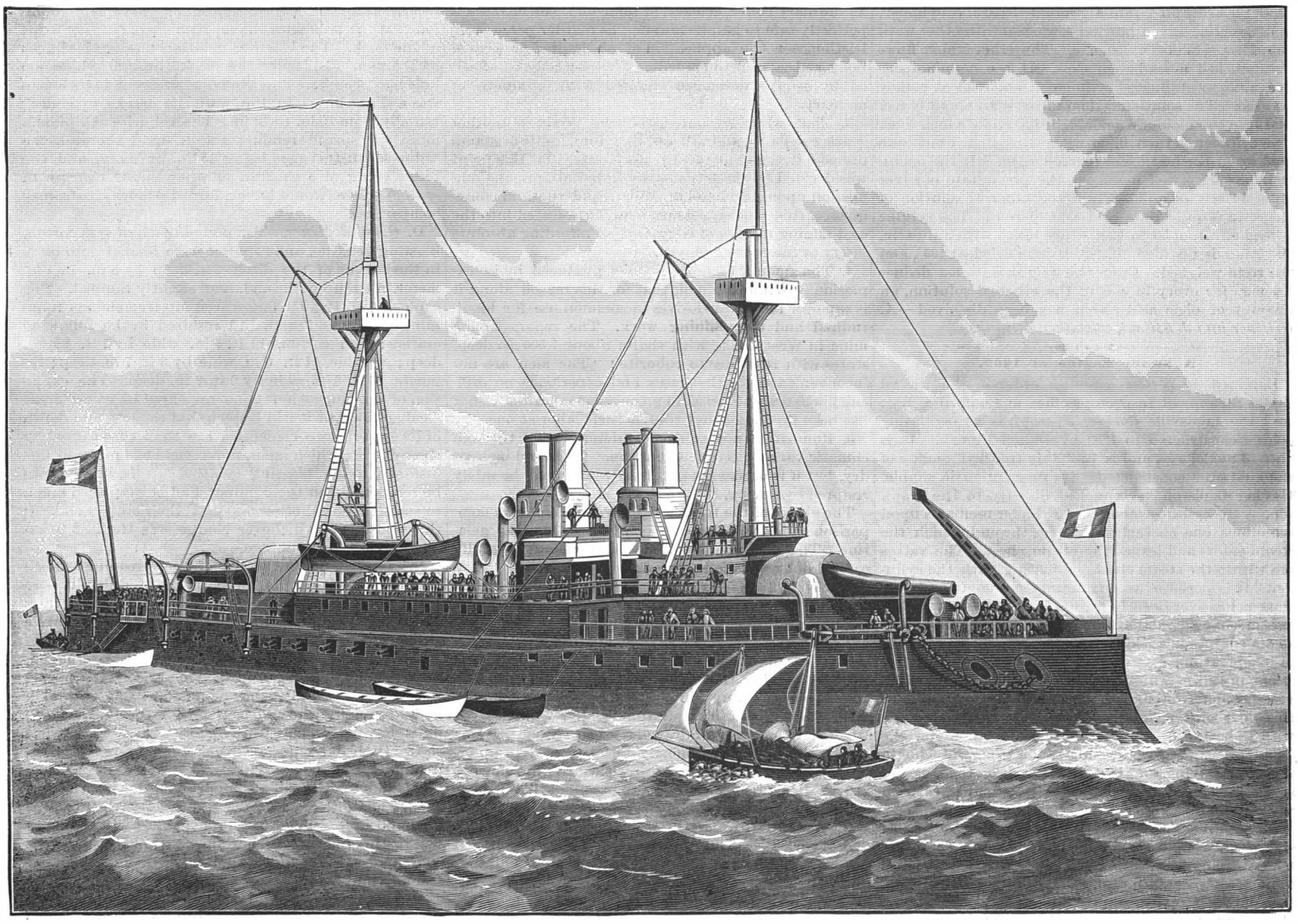
NEW FRENCH ARMORCLAD CRUISER LE TERRIBLE.

It appears that the fleet of armorclads, which not long since appeared to have grown senile in the presence of the more modern torpedo boat, is now more in favor than ever with the navy men. All the great nations are taking every step to increase the efficiency of their navies, both in constructing ships of enormous tonnage and in constructing new types of ships. Without leaving out of sight the necessity for a fleet of torpedo boats, France ought to follow this movement. The maneuvers of last year have not dethroned the ironclad. Those of this year, we are ready to affirm, will not lessen the prestige of those magnificent ships which are the honor of our navy. Let us rejoice at this most recent addition to the fleet of a new type of cruiser.

The Terrible, which was launched in 1881, satisfactorily finished its trial test during the latter part of the winter. It is now entirely finished. This ship is a mate of the Requin, which was constructed in the shipyards of the Loire, and which was launched in 1885.

The hull is of iron and steel, and measures 280 ft. in length, 59 ft. beam, with a draught of 23 ft. 9 in., 7,168 tons displacement, with armor plating 50 centimeters in thickness amidships, 37 centimeters forward, and 33 centimeters aft. It is provided with 12 boilers.

The armament, mounted on the forecastle, consists of two cannons of 47 centimeters, four cannons of 10 centimeters, and ten machine guns. There is a complement of 332 men.—*L'Illustration.*



THE NEW FRENCH ARMORED WAR SHIP TERRIBLE—7,200 TONS DISPLACEMENT.

Stability of Patents.

Although the patent system of the United States involves a search on the part of the government as to the novelty of the invention, yet it has been a frequent remark on the part of the general public that few patents can stand the tests of the courts. This ratio is sometimes stated to be as high as nine out of ten, or some equally conventional fraction. A member of the bar has recently tabulated the adjudication of patents by the United States courts, as recorded in Meyer's Federal Decisions from 1776 to 1835, and finds that 73 per cent of the patents upon which suit was brought were sustained. The total number of patents brought to an issue was 983, and of these 269 were annulled, and of the remaining 714 which were held valid, 480 were sustained in full, and 234 were held to be valid in part. When it is considered that the United States patent law requires that protection can be accorded only to the original inventor who has added to the state of the art, and to that portion of his invention which does not include any portion of public knowledge, or the work of other inventors, whether patented or not in any country, and that the time covered by this investigation covers the early period of their history before the system was thoroughly formulated and crystallized by legal decisions, this is a remarkable showing, testifying to the skill of the patent solicitors, and also the examiners in their patent department.

It is difficult to estimate the value of the patents still in force. Although such estimates have been made, they are necessarily vague and void of the precision essential to accurate statistics; yet the amout of capital invested in faith upon the validity of patent protection is very large, and generally remunerative to a satisfactory degree.—*Engineering.*

The Exhaustion of Petroleum.

A writer in *Home Knowledge* discusses the problem of the exhaustion of our oil fields in the following manner:

It can hardly be doubted, I fear, that the supply both of oil and gas has now been so largely drawn upon that within less than a score of years scarcely any will be left which can be brought at reasonable cost into the market. The boundaries and extent of the oil regions have been determined. All the sands in which oil will ever be found in such quantities as to be worth working are known, and have been drilled through in various places. It is scarcely possible that any new fields will be discovered which will be comparable, either in extent or productiveness, with those now known. So far back as January, 1883, Professor Lesley pointed out that no petroleum is now being produced in the Devonian rocks, either by the process akin to distillation or otherwise. What has been stored up in the past, a process which probably lasted for millions of years, may be got out. But when these reservoirs are exhausted, there will be an end of the petroleum supply. "The discovery of a few more pools of 2,000,000 or 3,000,000 each can make little difference." Mr. Carll, whose opinion on the geology of the oil-bearing districts may be regarded as decisive, has come to a similar conclusion. "There are not at present," he pointed out quite recently, "any reasonable grounds for expecting the discovery of new fields which will add to the declining products of the old, so as to enable the output to keep pace with the shipments or consumption."

The stored petroleum in this region has then been very nearly exhausted. In less than a generation a small part of the population of this continent alone has used up nearly all the valuable stores of energy which had been accumulated during millions of years of the geologic past.

More recent inquiries confirm the conclusions of Professor Lesley and Mr. Carll. The signs of exhaustion in the oil-producing regions can now be clearly recognized. During the last four years there has been a steady diminution in the output, accompanied by an increase in the price per barrel, which nevertheless does not even maintain the nominal annual value of the supply. Mr. Wrigley announced in 1882 that 154,000,000 barrels of oil had already been raised up to the beginning of that year, and expressed the opinion that not more than 96,000,000 barrels remained to be raised. In this last estimate he was undoubtedly mistaken, for up to the beginning of 1885 no fewer than 261,000,000 barrels had been raised, and in the year 1885 as many as 21,042,041 barrels (nearly 3,000,000 fewer than in 1884) were obtained. But although the estimate of 1885 of the quantity of oil still remaining fell far short of the truth, and though we may admit as possible that even now much more oil remains to be put out than the most experienced geologists suppose, the signs of approaching exhaustion are yearly becoming more unmistakable. The expense of bringing the oil to the surface grows greater year by year, and threatens soon to become so great that the profit of working the oil stores will be evanescent. So soon as that state of things is approached, we may be sure that the oilmen's occupation in Pennsylvania and western New York will be gone. It has been stated that the Japanese, unwilling to let the least fraction of the earth's interior stores be lost, have been known to excavate a vertical shaft to a depth of 600 feet in order to raise a few gallons of oil per day. But in America, when the oil mines are so near exhaustion as this, they will be abandoned; nay, they will be abandoned long before they approach such a condition. With the failure of the oil supply all the collateral branches of industry associated with it will fall, too.

THE green diarrhœa of infants is, according to Dr. Hayem, caused by a microbe which secretes the coloring matter characteristic of the complaint. The disease is epidemic and contagious. The best treatment, he said in his communication to the Academy of Medicine, is to give the child after each feeding a teaspoonful of 2 per cent lactic acid.

RAISING A SUNKEN STEAMSHIP.

(*Continued from first page.*)

out as much of the cargo as the depth and other conditions admit, and then, if the hull is dangerously near the surface, blow it apart. The Merritt wrecking organization of this port, however, had such success in raising a sunken ship, the Lornty, in New York bay some time since, that the owners of the steamer determined to trust to them the work of raising the wreck. In spite of difficulties other than those interposed by nature, and which could scarcely have been foreseen, the steamer Welles City will in all probability soon be lifted intact from the bed of the river.

The work done by the wrecking company is as unique as it is interesting, and we will endeavor, by means of the clever drawings made by our artist, to describe its progress and the nature of the difficulties which from time to time appeared, though ineffectually, in the way of its accomplishment.

Fig. 3 is a picture of the steamer, and is from a photograph taken shortly after the steamer went down. As will be seen, she is half-brig rigged. Her topsail yards are cock-billed, showing that when she went down she had been made ready for docking. The shrouds and stays are intact, and her smokestack shows its white band under the black—the insignia of the line to which she belongs. Here are her dimensions: Length, 275 feet; beam, 36 feet; depth, 23·6 feet; tonnage, 1,936 gross. The upper structure is of iron, and the hull of steel.

She was loaded with 25,000 boxes of tin and other cargo amounting to 1,900 tons, and before anything was done toward lifting her, this was removed by the aid of divers, as in the ordinary way.

In the old method of lifting a small vessel to the surface, ropes were made fast to the hull, fitted with a traveler, and then watertight casks forced down and made fast. Later on, this system was improved by sinking pontoons filled with water and carrying temporary weights; and when these were hooked on and the weights removed, the water was pumped out by means of hose connecting the pontoons with a steam pump affixed to the deck of the tender on the surface. This was an awkward, a costly, and, worse than all, an uncertain method, and utterly inadequate for the floating of a great ship like the Welles City. Captain Merritt's pontoons (see Fig. 1, A A) are of three sizes—100, 60, and 50 feet in length—and have apertures or wells isosceles triangle shaped (B B), which on deck are only large enough to admit heavy chains, but gradually enlarge toward the bottom, so as to admit of the play of the chains which descend through the pontoons which float on one side of a sunken vessel, and, passing under her hull, are carried up through the centers of the pontoons on the opposite side. These chains are hauled taut by the aid of fall-and-tackle and hydraulic jacks, and are then toggled on securely.

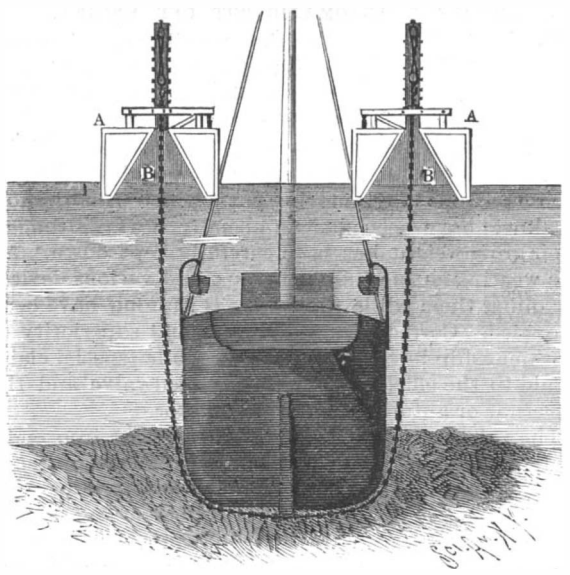


Fig. 1.—CROSS SECTION OF THE SUNKEN STEAMER, PONTOONS, AND SLINGS.

In the present instance, it was a difficult matter to get the chains under the ship, first because her hull was in some places sunk fully fourteen feet in the muddy bottom of the river, and again because of the unusual size of the chains required If the reader will refer to Fig. 2, he will see a representation of the preliminary process of keel-hauling a sunken ship. The "sweep" chain, a light chain, has been dropped over the bow, and the diver is engaged in thrusting it under the fore-foot of the stem, so that it will run clear when pressure is put on from above to work it completely under the hull. This operation is called "sawing," and consists in working the chain from side to side until it forces its way through the sand and reaches that part of the hull where the first heavy or lifting chain is to be placed. The links of this sweep chain are only one-half inch in diameter.

Now the men attach a one inch messenger chain, and when the end has been pulled by the sweep chain completely around the hull and up to the surface on the opposite side, another and larger chain, and, perhaps, even another yet, takes the place of the first, until finally a big chain, with links 2½ inches in diameter and 14 inches long, is finally pulled completely around the hull. This process is continued until a series of big chains are wrapped about the hull and brought up, as said before, through the openings in the center of the pontoons overhead.

The front page cut furnishes a good view of the sunken ship, with most of the large-sized lifting chains already set in position at stated intervals from stem to stern; the chains being closer together and most numerous immediately under that section of the hull which contains the boilers and engine. Immediately above, and on either hand, the big pontoons are floating; being kept apart, those on one side from those on the other, by stout cross beams, so that, when the ship is finally lifted, there will not be any impediment in the way of her reaching the surface. While some of the seventy men who comprise the wrecking crew are engaged in hauling and setting the chains, others lower away hogsheads filled with water into the open hatches of the sunken ship. When a score of these have been thus lowered, the process momentarily stops, and the diver at work down deep in the bowels of the hull makes them fast, and then attaches the end of a hose, let down from above, to the bunghole of each in turn. The men on the deck of the wrecking schooner above apply the steam pump to the upper end of the hose, and the hogsheads, as they are emptied of their contents, have their plugs driven home by the submarine workman, who wields a heavy hammer fitted with a tapering driving end. These empty barrels, as may be imagined, add to the buoyancy of the hull and sensibly

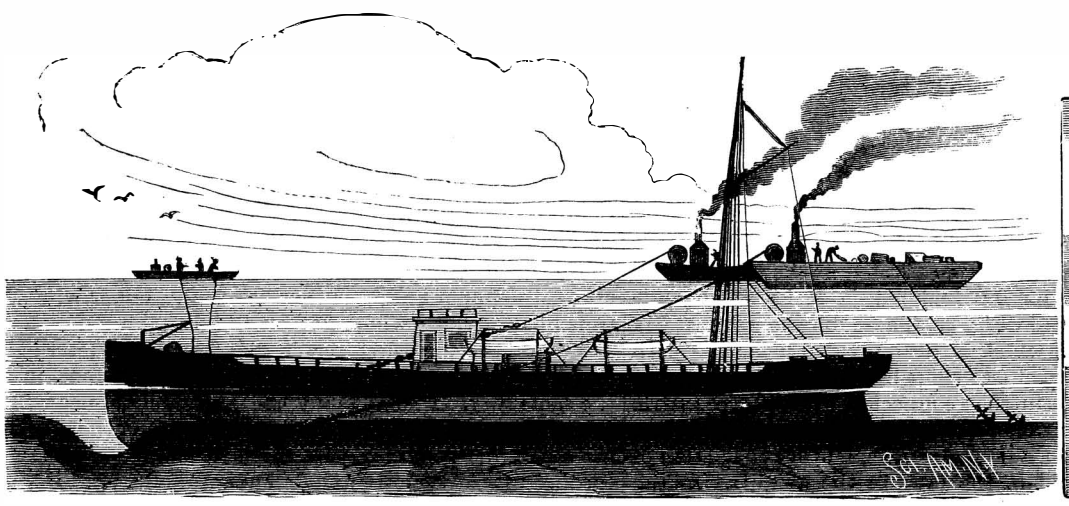


Fig. 2.—MODE OF PLACING THE SLINGING CHAINS.

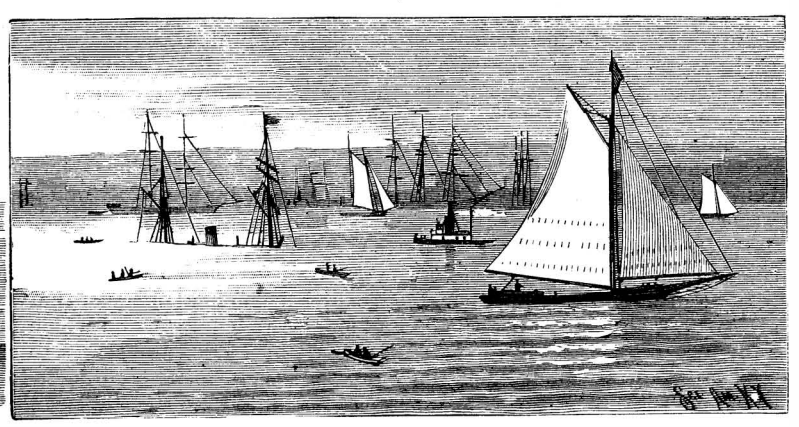


Fig. 3.—VIEW OF THE STEAMER SOON AFTER THE ACCIDENT.

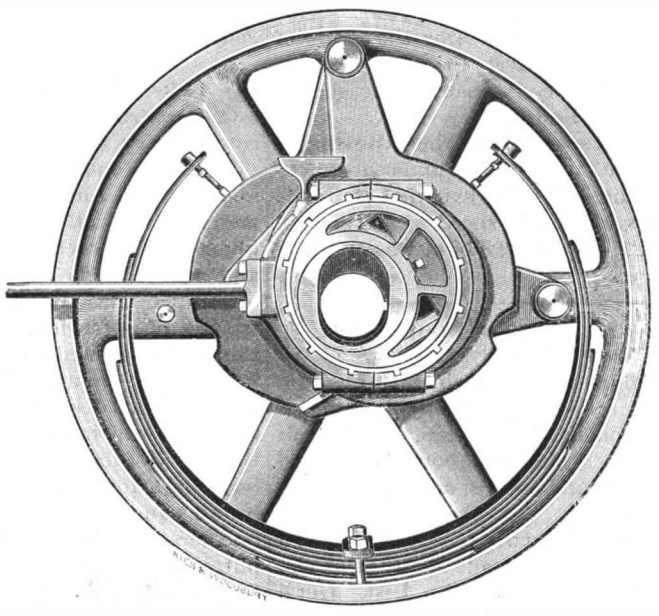


Fig. 2.

Fig. 3.

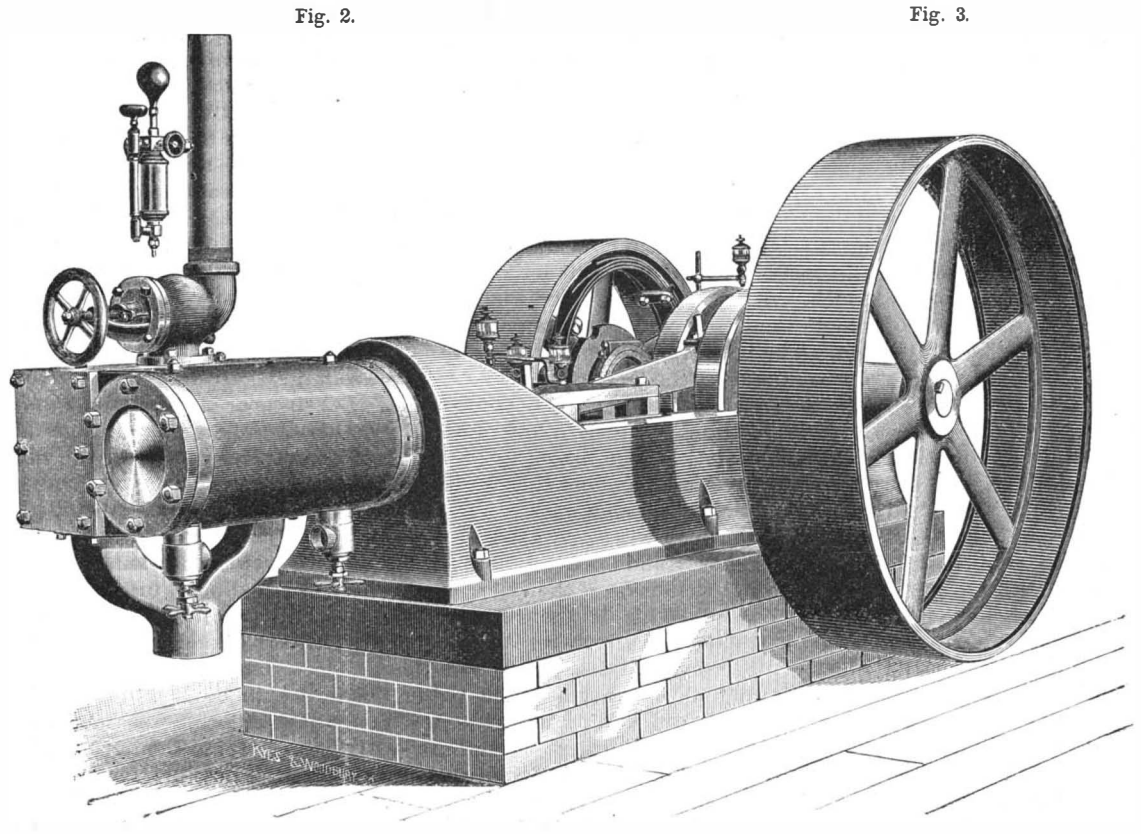


Fig. 1.—IMPROVED AUTOMATIC CUT OFF ENGINE.

[FOR DESCRIPTION SEE PAGE 24.]

lessen the lifting power required to raise the ship. And now we have the pontoons, the chains, and the tackle all ready, and only await the change from the ebb to the flood tide to begin bringing the sunken steamship to the surface. As soon as low water slack occurs, the river water is let into the great pontoons till their decks are fairly a-wash in the surface of the river. The slack of the chains is quickly gathered in, the fall-and-tackle, which, as may be seen in the frontispiece, depend from the tops of the standards on the pontoons, are called into action, the hydraulic jacks are worked, and the chains hauled taut. As the flood tide serves and the waters gradually rise, the great steam pumps are set to work and the water is pumped out of the pontoons, and it is now a question whether the weight of the sunken ship—2,000 tons—which keeps her below is greater than the inclination of the great submerged pontoons or air chambers to force their way to the surface with their burden. If not, then the hulk will leave the bottom of the river, and the whole mass—pontoons, tenders, and the depending wreck—guided by powerful tugs, follow the flood tide up stream. Referring to the hydrographic chart, a shoal spot is discovered in the river bed, and pretty soon the sunken ship is directed toward and grounded upon it, and, at the next low water, the pontoons are again flooded.

Once more they sink to their upper surfaces, once more the slack of the chains which support the hull is gathered in, and the water again pumped out of the pontoons. At the next flood tide, the pontoons show more and more of their sides above the surface, and the hulk again forsakes the river's bottom and is towed to another and still another shoal spot, the pontoons being flooded at low water and pumped out at high water till finally her decks are above the surface. Then the steam pumps are set to work upon her, and she is freed from water. Now the great, ugly pontoons and wrecking schooners that so ill become her are cast off, and once more the gallant ship is free for a further career of utility.

The difficulties which beset the way of wreckers engaged in such an enterprise as raising a great ship like this from the bottom of the river are many and continuous, and sufficient to deter even the most skillful were they not led by so courageous and resourceful a master as Captain Merritt. Little or nothing could be done save during slack water, say two hours during the twenty-four at most, and often not so much as this, because the spring tides this year, owing to the unusual rainfall, were very heavy, and consequently the low water slack has been so short in duration as to be at times scarcely perceptible; the great rush of waters down stream toward the estuary formed by the junction of the two rivers often overpowering the incoming flood from seaward until well along toward the end of the first quarter. The ebb has claimed the mastery for more than its allotted six hours; the effect being the backing up of the waters of the bay against the yet running ebb of the river. In this swash the wreckers had to work while the pontoons rolled from side to side in the contention of the waters.

At times, toward the middle of the ebb tide, when the swollen waters of the upper river got fairly under way, the current rushed by the point where the wreckers were at work, at a speed of quite four knots an hour; and one day, while the struggle for mastery between the ebb and flood tide was in progress, and the waters of the bay were backing up against the river's ebb, so severe was the wrenching of the great chains against the steel keel of the sunken steamer, caused by the bobbing about of the pontoons holding the ends above water on either side, that one of these great chains was cut in two. The writer saw the parted link. It was fourteen inches long by two and a half in diameter, and was almost bent double, being cut through the center as if by a knife.

At times, before the heavy chains were fairly made fast around the hull of the wreck, the wrecking colony were almost torn from their moorings by tows coming down stream and stupid lightermen going up. On one of these occasions—it was on the early morning of March 27, before the cargo of tin had been taken out—two barges, the one loaded with brick, the other with plaster, drifted down upon them. The first scraped clear, while its mate ran foul of the protruding foremast of the sunken steamer, carried it away, and then went down, cargo and all, and settled itself athwart the fore hatch and foc'-s'le deck of the wreck. This had to be removed before the work could go on, because it was directly in the way of the sweep chains while passing under the bows of the sunken ship,

It is worthy of remark that the steamer Lone Star of the Morgan line, whose bow cut down the steamer Welles City, was destroyed by fire while lying at the cotton wharf on February 28.

The Photography of Projectiles.

A photographer at Pesth has succeeded in taking photographs of projectiles, fired from a Werendler gun, while having a velocity of 1,300 feet per second. The projectiles appeared on the impressions enveloped in a layer of air hyperbolic in form.

IMPROVED AUTOMATIC CUT OFF ENGINE.

The engine illustrated on the preceding page is manufactured by Messrs. McIntosh, Seymour & Co., of Auburn, N. Y. Great care has been taken that all the details should be in accordance with the best practice, and in design the engines are as compact and rigid, and as heavy in the stationary part, as could be desired. Those sections of the moving parts which usually show weakness have been made unusually heavy, although their gross weight has been carefully kept down. All the wearing surfaces are generous, and various devices for oiling them while the engine is running have been provided. Correctness, simplicity, and superiority of workmanship have been aimed at, while especial claim is laid to the efficiency of the balanced valve and the governor or automatic cut off regulator.

The valve is made very tight, has cast iron ends, and a tube connecting them. This is like the ordinary piston valve, and has been made in this form because it is very simple in form, is easy to make, and is perfectly balanced. In order to obviate the ordinary wear and tear from friction and the consequent loss of steam, an adjustable seat is provided, which consists simply of a crescent-shaped ring having steam ports through it which match with the ports in the steam chest itself. The ring is split, and is adjusted in place by a stem, which extends to the upper side of the steam chest, where it can be turned by a wrench. This construction enables the ring to be adjusted at any time a leak is discovered, and this may be accomplished quickly and easily. By using valves of large diameter and somewhat long travel, quick steam admission is secured and sharp cut-off.

The governor is located in the fly wheel, and consists mainly of a pair of weights pivoted at the periphery of the wheel and having inclined jaws, in which slide blocks, as shown in Fig. 3. These blocks turn freely in a pendulum, which is also pivoted near the periphery of the wheel (see right hand of governor in Fig. 2), and which is further connected with the eccentric and serves to either raise or lower the eccentric when it is subjected to a similar movement by the action of the sliding blocks in the jaws of the weights. As the speed of the engine increases, the weight will be lifted by centrifugal force against the action of the springs, and as they move outward the pendulum will be thrown over by the inclination of the jaws. This brings the center of the eccentric nearer the center of of the shaft and shortens the travel of the valve, thereby reducing the cut off and, consequently, the supply of steam supplied to the cylinder.

The extreme change of speed from when the engine is running light to when it is working under its maximum load is very slight. In some experiments made to test this point the variation in speed when the load was changed from 1·1 h. p. to 38·8 h. p. was only one half a revolution.

How to Catch and Preserve Moths and Butterflies.

There is no part of our country in which one cannot form a beautiful local collection, and any young person who wants amusement, instruction, and benefit from two, three, or more weeks in the country can find all in catching butterflies and moths, arranging them, and studying them up.

Provide yourself first with two tools, a net and a poison bottle. The net may be made of any light material. I find the thinnest Swiss muslin best. Get a piece of iron wire, not as heavy as telegraph wire, bend it in a circle of about ten inches diameter, with the ends projecting from the circle two or three inches; lash this net frame to the end of a light stick four or five feet long. Sew the net on the wire. The net must be a bag whose depth is not quite the length of your arm—so deep that when you hold the wire in one hand you can easily reach the bottom with the bottle (to be described) in the other hand. Never touch wing of moth or butterfly with your fingers. The colors are in the dusty down (as you call it), which comes off at a touch. Get a glass bottle or vial, with large, open mouth, and cork which you can easily put in and take out. The bottles in which druggists usually get quinine are the most convenient. It should not be so large that you cannot easily carry it in your pocket. Let the druggist put in the bottle a half ounce of cyanide of potassium; on this pour water to the depth of about three-fourths of an inch, and then sprinkle in and mix gently and evenly enough plaster of Paris to form a thick cream, which will *set* in a cake in the bottom of the vial. Let it stand open an hour to set and dry, then wipe out the inside of the vial above the cake and keep it corked. This is the regular entomological poison bottle, used everywhere. An insect put in it dies quietly at once. It will last several months.

These two tools, the net and the poison bottle, are your catching and killing instruments. You know where to look for butterflies. Moths are vastly more numerous, and while equally beautiful, present more varieties of beauty than butterflies. They can be found by daylight in all kinds of weather, in the grass fields, in brush, in dark woods, sometimes on flowers. Many spend the daytime spread out, others with close shut wings on the trunks of trees in dark woods. The night moths are more numerous and of great variety. They come around lamps, set out on verandas in the night, in great numbers. A European fashion is to spread on tree trunks a sirup made of brown sugar and rum, and visit them once in a while at night with net and lantern. Catch your moth in the net, take him out of it by cornering him with the open mouth of your poison bottle, so that you secure him unrubbed.

Now comes the work of stretching your moths. This is easy, but must be done carefully. Provide your own stretching boards. These can be made anywhere with hammer and nail and strips of wood. You want two flat strips of wood about seven-eighths or three-fourths of an inch thick and eight to fourteen inches long, nailed parallel to each other on another strip, so as to leave a narrow open space between the two parallel strips. Make two or three or more of these, with the slit or space between the strips of various widths, for large and small moths and butterflies. Make as many of them, with as various widths of slit, as your catches may demand. Take your moth by the feet, gently in your fingers, put a long pin down through his body, set the pin down in the slit of the stretching board so that the body of the moth will be at the top of the slit and the wings can be laid out flat on the boards on each side. Have ready narrow slips of white paper. Lay out one *upper* wing flat, raising it gently and carefully by using the point of a pin to draw it with, until the lower edge of this upper wing is nearly at a right angle with the body. Pin it there temporarily with one pin, carefully, while you draw up the *under* wing to a natural position, and pin that. Put a slip of paper over both wings, pinning one end above the upper and the other below the under wing, thus holding both wings flat on the stretching board. Take out the pins first put in the wings and let the paper do the holding. Treat the opposite wings in the same way. Put as many moths or butterflies on your stretching board as it will hold, and let them remain in a dry room for two, three, or more days, according to size of moths and dampness of climate. Put them in sunshine or near a stove to hasten drying. When dry, take off the slips of paper, lift the moth out by the pin through the body, and place him permanently in your collection.—*Wm. C. Prime, in N. Y. Jour. of Commerce.*

The Identification of Artificial Butter.

C. Fruwirth, of Vienna, Austria, in a letter to our cotemporary the *Country Gentleman*, states that the following proposition with regard to oleomargarine and artificial butters generally has been made in Germany. The indiscriminate coloring by some dye or pigment of all such articles had already been proposed and rejected. In consequence of this, Prof. Soxhlet, of Munich, has proposed a new treatment, which is worthy of attention. He proposes—and his proposition will be offered to the House of Representatives in Germany—to make it a law that all bogus butter must be mixed during the preparation with phenolphtalein, which is made out of one of the products of the dry distillation of tar, and one gramme of it will be enough for 100 kilogrammes of bogus butter. The butter can then be offered for sale colored yellow, or uncolored, or in any way desired, and the phenolphtalein will not be seen at all. But by adding a solution of soda, or ammonia and water (*liquor ammonii caustici*), or even a teaspoonful of water and the ash of a cigar, to a piece of butter the size of a bean, the whole of the butter will become a nice red if it is bogus butter, or if bogus butter is mixed with it.

It will be immediately seen that this is a proof which can be made by every policeman in any shop, by every guest in a dining room, etc. In your country it would be easy to enact that no butter shall go out of the factories to which has not been added the phenolphtalein. The internal revenue officers, which have to deal, since the first of November, 1886, with bogus butter, could very easily took at this point also.

Rag Bleaching.

Dr. C. Wurster gives a description, in a recent number of the Berlin *Papier Zeitung*, of a process for resolving chlorine gas and collecting the gas for reuse. He connected the different bleaching vats with lead pipes with water valves and sucked out the gas with a ventilator. All the parts of this apparatus were coated with paraffine, which resists the action of the gas. Between the vats and the ventilator was placed a lead cylinder, full of coke, with water dropping upon it, to prevent volatilization. A false bottom with small siphons, whose upper edges are cut off obliquely, forms the distributing apparatus. The original plan of using lime water or a solution of soda for absorption of the chlorine was found unnecessary, as water alone answered the purpose. The use of this apparatus makes it possible for the men to step upon the vats in ten minutes and obviates the hurtful effect of the gas upon the workmen's health and the rusting of the machinery, because the air which flows from the ventilator scarcely even smells of chlorine.

SIMPLE PHOTOGRAPHIC AND PHOTO-MICROGRAPHIC APPARATUS.

A photographic outfit that will do very good execution may be purchased for a few dollars, but notwithstanding the small expense, many are deterred from making a beginning in photography on account of the first outlay.

While first class photographic instruments can be made only by makers having the greatest skill and large experience, an ordinary camera that will serve the purposes of the amateur may be made by the amateur himself with the expenditure of an insignificant sum for materials.

Figs. 1 to 12 show a camera tube, box, and tripod the materials of which cost less than a dollar. The construction is within the range of any one having a little mechanical ability. The camera is intended for 4 by 5 plates, therefore the size of the plate holder and the focal length of the tube will determine the size of the camera box. To avoid turning the camera or plate holder, the box is made square, and the inside dimensions of the plate holder are such as to permit of placing the plate either horizontally or vertically, according to the subject to be photographed. The plate holder is 5¾ inches square inside, and is provided with a wooden back of sufficient thickness to support the hooks employed for holding the plate. There are four V-shaped wire hooks, *a*, at the bottom of the holder, two for receiving the end edge of the plate, and two farther apart, and arranged higher up, for receiving the side edge of the plate; and near the top of the holder there are three Z-shaped hooks, *a*, one in the center for engaging the end edge of the plate, and one near each side of the holder for receiving the side edge of the plate. The top of the frame is slotted, and the sides and bottom are grooved to receive the slide, which covers the plate before and after exposure. To the under surface of the upper part of the frame of the plate holder is attached a looped strip of elastic black cloth, such as broadcloth or beaver, which closes over the slot of the plate holder, as shown in Fig. 10, when the slide is withdrawn, and thus shuts out the light. The interior of the plate holder, as well as the slide, should be made dead black, by applying a varnish made by adding three or four drops of shellac varnish to one ounce of alcohol, and stirring in lampblack until the required blackness is secured.

The main frame of the camera box is made square, and is secured at right angles to the base board. The frame is provided with a narrow bead or ledge that will enter the front of the plate holder and exclude the light.

To the front of the frame are secured four trapezoidal pieces of pasteboard, of the form and size given in Fig. 6. These pieces of pasteboard are secured to each other and to the camera box frame by tape, glued on as shown. If the box is made of junk board, it may be nailed together with wire nails. In this manner a pyramidal box is formed which is strong, light, and compact. In the smaller end of the box is fitted the beveled centrally apertured block shown in Fig. 7. The aperture of this block must be made to fit the camera tube shown in Figs. 1 and 2, after having received a lining of plush or heavy felt.

The camera tube may consist of paper or metal. Paper answers well, and costs nothing. The internal diameter of the tube is determined by the diameter of the lenses. Ordinary meniscus spectacle lenses of eight inch focus are employed. These lenses are secured in place by paper rings, shown in Fig. 3, the inner rings being glued in place, the outer ones being made removable for convenience in cleaning the lenses. The lenses are arranged with their convex sides outward; the distance between them is 1¼ inches, and in one side of the tube, half way between the lenses, is made a slot to receive the diaphragms, as shown in Figs. 1 and 2. Upon each side of the slot, within the tube, are secured flat rings, shown in Fig. 4, which together form a guide for the diaphragms, as shown in Fig. 2.

The tube is adjusted at the proper focal distance from the plate by temporarily securing at the back of the box a piece of ground glass or tracing paper, in exactly the same plane as that occupied by the plate in the plate holder. The tube is then moved back and forth until a focus is obtained which shows the image fairly sharp throughout the field. In arranging for a fixed focus, it is perhaps best to favor the foreground rather than the distance. The tube should move with sufficient friction to prevent it from being easily displaced. By using a small diaphragm, it will be found unnecessary to focus each subject separately.

In Fig. 12 is shown a combination of cheap lenses devised by Mr. Henry Mead, which is effective for portraits and for other classes of work when focusing is admissible. It consists of two meniscus lenses, each of 8½ inch focus, having their convex sides arranged outwardly, and a plano-concave lens, 16 in. focus, arranged with its concave side against the concave side of the outer lens of the system. The plano-concave and the rear meniscus lenses are arranged 1½ inches apart. Diaphragms may be used as in the other case, and a box about 8 inches deep will be required.

The tripod is formed of a triangular centrally apertured board, to which are hinged three tapering wooden legs, by means of ordinary butt hinges, as shown in Fig. 11. The base of the camera box is secured to the tripod by means of an ordinary thumb screw.

This outfit will enable the amateur to cultivate his tastes, and learn much about photography. Dry plates will of course be used. They are procurable almost anywhere, and are inexpensive. As to the treatment of plates after exposure * and printing and toning, the reader is referred to the works on the subject of photography. The amateur who possesses one of the microscopes described in a previous article of this series may arrange it for projection as described on page 393 of vol. lvi. of the SCIENTIFIC AMERICAN, and may insert the end of the microscope tube in the camera box above described, after removing the tube, and project the image of the microscopic object on the sensitive plate, and thus produce good negatives of the objects, from which prints may be made which will be interesting both to the operator and his friends. The eyepiece of the microscope referred to is a very good objective for photo-micrography. In photographing microscopic objects, it will be necessary to employ a focusing ground glass, and to focus very carefully by the aid of a magnifier.

Slow plates are preferable for this use, as they bring out the detail much better than fast plates. The time of exposure will vary with the object, from fifteen seconds to a minute or more.

Fig. 13 shows the arrangement of the lantern, the microscope, and the camera box. It will be noticed that the annular space in the end of the camera box around the microscope tube is stopped by a black cloth wound loosely around the microscope tube. This and other precautions are necessary for preventing the light from reaching the plate except through the object and the microscope. G. M. H.

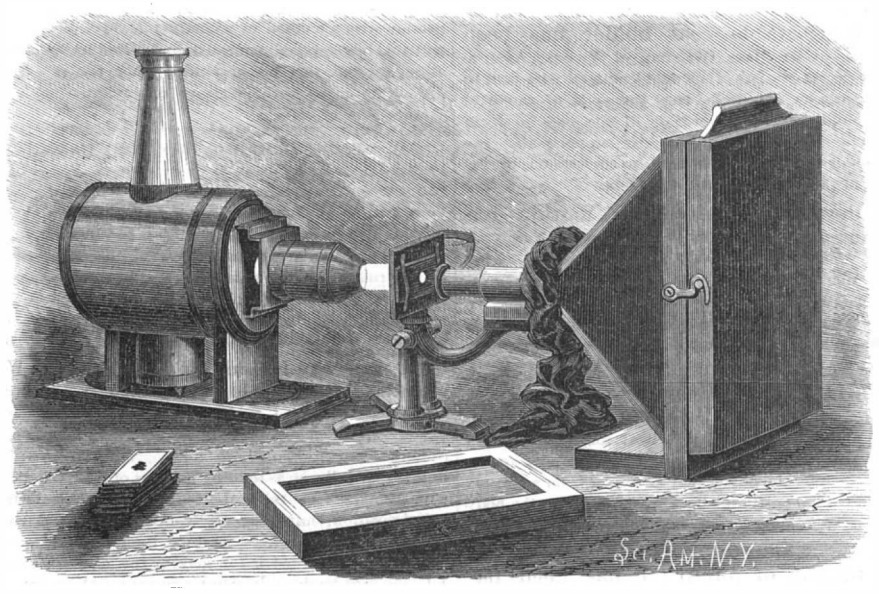
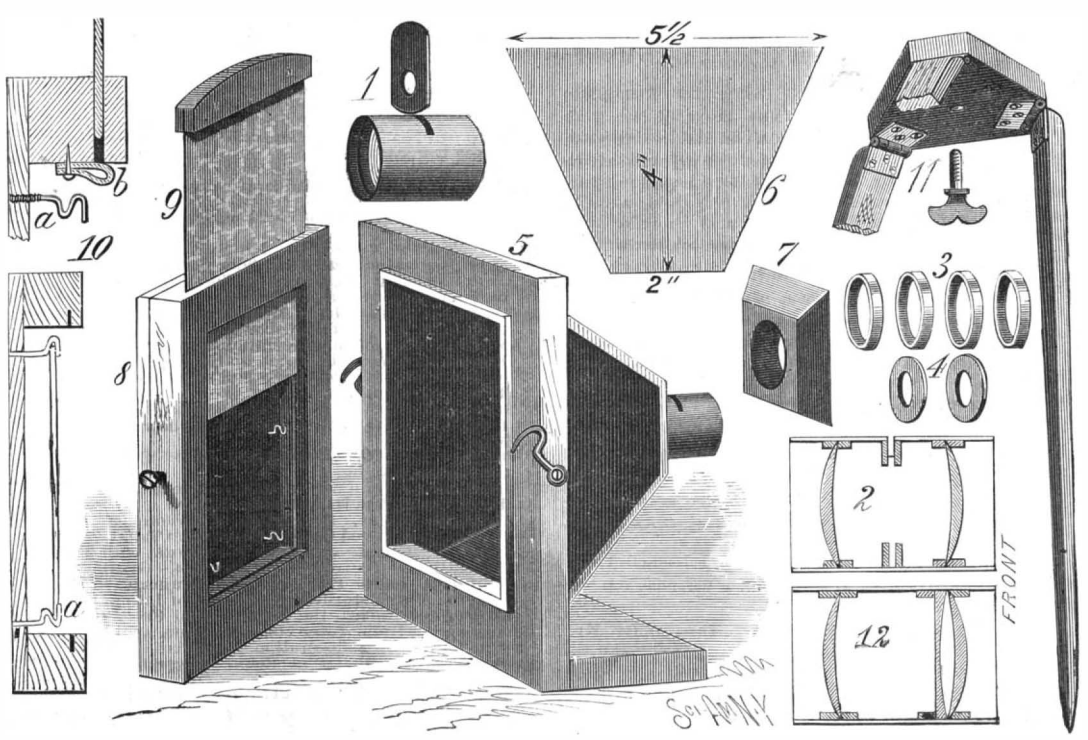


Fig. 13.—MICROSCOPE AND CAMERA ARRANGED FOR PHOTO-MICROGRAPHY.



SIMPLE PHOTOGRAPHIC CAMERA.

* See Supplement, No. 541.

Pita.

According to a report of Consul Burchard, of Ruatan, in Honduras, the pita plant has never been cultivated, but grows wild in patches on the borders of rivers and lagoons. The stalks of the plant contain the fiber of commerce, and grow sometimes to a height of 12 feet. The Indians scrape off the hard skin of the stalk with a bamboo knife, and thus obtain the fibers which form the heart of the stalk. Another plan is to steep the stalks in water until the skin decomposes; but this is said to injure the fiber somewhat. In recent years machines have been devised to decorticate the fiber, but these have all been failures, owing to the fact that no machine has yet been invented capable of operating on a profitable scale. In Honduras the pita or "silk grass" fiber is used chiefly for thread, nets, fish line, and cordage. Samples of the fiber sent to the United States and Europe have been manufactured into lace handkerchiefs, ribbons, and wigs. It is held to be a substitute for silk or linen; and if proper machinery were forthcoming, the wild pita fields of Honduras might be utilized in commerce. Consul Burchard indeed expresses the opinion that the fiber is destined to become a very important element in the future commerce and industry of this country.

A Curiosity in Photometry.

It is interesting at the present day, when the photometry of gas and electric lights has been brought to some degree of perfection, to read of an expedient adopted in former times in Paris to control the quality of the street lamps. The method has very recently been made public. The Police Department of Paris, in whose charge the matter was placed, had paper patterns cut out representing what they considered the proper size, or profile, of a gas flame. These were furnished to their inspectors, who compared them with the flames of the street burners, and judged accordingly of their quality. In case of deficiency, fines were imposed. These fines were levied, and not collected until some 600,000 francs stood against the gas company. The method was so crude that the authorities did not venture to submit it to a court of law. The devisers of the plan overlooked the fact that a small flame may, and often does, give more light than a large one, and reduced it all to a question of size. Nevertheless, our present system is far from perfect, from analogous causes. Complaints of its inaccuracy have grown more frequent since the introduction of water gas, and several have appeared during the last year. It is known that a water gas that shows sixteen candles on the bar photometer is far from satisfactory, while a sixteen candle coal gas will always be accepted as of good quality. The whiteness of the water gas flame probably introduces an error. This appears especially probable when we recollect that the standard of comparison is a candle having an extremely yellow flame. Polarization photometers have been little tried, and it is hardly known how efficiently they will act, but at this late day the absolute photometer has yet to be constructed. The effect of light on the human eye is the ultimate standard. This introduces a subjective element into the question that is very hard to cope with.

ENGINEERING INVENTION.

A lock for bolts of pistons has been patented by Messrs. Joseph Wormald and Joseph Wormald, Jr., of Missoula, Montana Ter. Combined with a fixed plate and studs is a lock plate, with circular slots adapted to engage the studs to hold the lock on the fixed plate, and projections on the rim of the lock plate engage one side of the bolt heads of the usual bolts, preventing the latter from turning. This invention has also been patented in Canada and in England.

MISCELLANEOUS INVENTIONS.

A vehicle spring attachment has been patented by Mr. Stephen M. Wier, of New Haven, Conn. The invention consists in yokes resting upon or suspended from the axles near the wheel bearings, with stirrups for receiving the ends of the springs, the stirrups capable of springing to permit of the elongation of the spring due to its compression.

An ironing table has been patented by Mr. Franklin P. Burcaw, of Hazleton, Pa. Its construction is such that the legs may be folded to have the device occupy only a small space when not in use, but the several connections are of such a character that when the table is opened and in position for use it will be perfectly steady and cannot accidentally collapse.

A drip trough for doors or windows has been patented by Mr. William W. Pitmon, of Waseca County, near Smith's Mill, Minn. The sill is made with a gutter or groove and a channel leading thence outward, a tube fitting at its inner end within the outer end of the channel, and having an outlet opening with a plug or knob.

A combined hook and clasp for horse collars has been patented by Mr. Louis T. Anderson, of Carroll, Iowa. The invention consists of a clasp made to be slipped upon the rim or front roll of a horse collar, with a tongue or hook stamped from the material of the clasp, making a cheap and convenient device for attaching sweat pads to the collars.

A wagon box lock has been patented by Mr. Nathan O. Calkins, of Elm Creek, Nebraska. It is for fastening an auxiliary wagon box on top of an ordinary one, and do away with the employment of slats and staples for such purpose, the lock consisting of a hook latch of peculiar construction and a retaining device for holding the latch in locked position.

A druggist's mortar has been patented by Mr. Edmund G. Purdy, of Ballston Spa, New York. It has one or more lugs projecting from its outer surface, and an annular frame is to be used therewith adapted to partly inclose the mortar, and having recesses for receiving the lugs, thus holding the mortar in a fixed position while in use.

A vehicle wheel has been patented by Mr. Robert A. Townsend, of Sibi, Beloochistan, India. The invention covers the application of an inclined plane at the hub to lengthen the radii of the wheel to compress the spokes, fellies, and rim, with tire jacks, operated by the spokes, to bridge the space between the fellies caused by the shrinkage of the latter.

A mouth harmonica has been patented by Mr. John F. Stration, of Brooklyn, N. Y. It is to be played in the same manner as the mouth harmonicas now in general use, but is provided with an upper set of reeds, of which each reed forms a chord with the corresponding reed of the lower set, making a rich and harmonic tune when played, forming a duet.

An accordion has likewise been patented by the same inventor. It is constructed in accordance with the principle noted in the preceding invention, having an additional set of bass reeds tuned to a higher or lower pitch than the ordinary bass reeds, but in harmony therewith, so as to produce harmony in the accompaniment when the accordion is played.

A cider press has been patented by Mr. Hiram P. Latham, of Denver, Col. A series of rollers is journaled in a case, combined with which is a feeding device of a tube opening to the rollers at the side of the case, with a hopper, a conveyer screw rotating within the tube to force the substances to be ground to the rollers, and other novel features, the press being also adapted for pressing and grinding other substances.

A rinsing and drying device for dishes and other articles of table use has been patented by Mary Purvis, of Plainview, Minn. It is designed to be used after the dishes have been washed, when they are placed in particular places or on racks provided therefor within a case, in such way that hot water poured through an aperture into a pan in which the utensil stands will thoroughly rinse and quickly dry them.

A flour bolting reel has been patented by Mr. Francis E. McMaster, of Millburn, Pa. The reel is provided with external cloth flaps at one edge of its periphery, in combination with the bolt chest, the flaps to brush the outer face of the bolting cloth, and also brush the bolted material from the walls of the chest, the device being simple and inexpensive, while making the action of the reel more quick and effective.

A mattress has been patented by Mr. Karmell Brooks, of New York City. The invention provides a detachable strip of non-heat-conducting material to protect the top and bottom of the mattress, such material being of rubber or paper backed with linen or otherwise, or other suitable substance, whereby a thinner mattress may be used, and cold will not so readily penetrate it.

A pocket knife has been patented by Mr. Carl Hollweg, of Barmen, Prussia, Germany. The handle has side plates immovable with respect to each other, there being also a locking lug and outer independent handle, with other novel features, whereby the blades can all be independently opened and closed, or locked in position, without touching them, and no springs are employed.

A kindergarten game for teaching children has been patented by Imogen B. Oakley, of Pittsburg, Pa. Combined with a copy book having illustrated objects and their names in printed letters are detached cut or stamped letters made to form facsimiles of the printed letters in the book, the child forming the names or titles from the loose cut or stamped letters.

A gas burner has been patented by Mr. Josiah Burgess, of Zanesville, Ohio. It is principally designed to produce and burn gas from petroleum and its products, and for the burning of other gases, in laundries, coffee wasters, stove heaters, etc., providing means for vaporizing the oil supplied by a tank and distributing it through suitable burners in properly regulated amounts.

An improvement in folding furniture has been patented by Mr. Joseph B. Brolaski, of St. Louis, Mo. The invention covers especially the construction of an improved bureau, which may be easily knocked down and its parts closely packed, and in which the joints may be readily tightened or loosened in case of shrinkage or swelling of the different pieces, thus making each joint adjustable.

An adjustable coat holder has been patented by Mr. Hans Christian, of Vienna, Austria-Hungary. It consists of a single length of wire bent to form two sets of parallel bars, the ends of the wire being coiled at the inner ends of the bars to form hooks, in connection with shoulder supports that can be moved inward and outward to correspond to the width of the garment at the shoulders.

A device for converting motion has been patented by Mr. John W. Ledyard, of New York City. This invention covers a novel construction for converting reciprocating into rotary motion, which is designed to give more power with the same length of stroke, and so that the dead centers will be more easily and smoothly passed than when a crank is used in the ordinary way.

A wire cloth delivering reel has been patented by Mr. Silas E. Ratekin, of Kansas City, Mo. It has a vertical body and a vertical roll holder, with a horizontal pivot or shaft connecting the holder to the body, whereby the holder may be swung from a vertical to a horizontal position, a locking device upon the body engaging and holding the roll holder in either of its two positions, with various other novel features.

A pitman or pump rod has been patented by Mr. John F. Loomis, of Shelby, Iowa. It is designed especially for windmills, and the invention consists in the interposition of a spring or elastic cushion in the direction of its length, to render the rod elastic, and take up excessive strain and jar, causing a shorter stroke for the pump piston in proportion to the increased speed of the wheel.

A hair or mustache curler has been patented by Mr. Morris N. Posner, of New York City. The main body part of the device has a slot in one end, with a spring-pressed clamp bar mounted on the slotted end and normally pressed down thereon, to firmly hold the mustache or tuft of hair while it is being wound around the device, the spring clamp being readily lifted by pressing with the thumb on its rear end.

A vehicle tongue support has been patented by Mr. Alva N. Rooks, of Alpha, Mo. Two parallel and spaced semi-elliptical springs are pivoted to the under surface of the tongue, their inner ends bearing against the under side of the forward axle at each side of the king bolt, and so held adjustably that they will support the pole in any desired position, relieving the horse from such weight.

A road grader and leveler has been patented by Mr. John Skinner, of Newman, Ill. This invention covers an improvement on a former patented invention of the same inventor, providing a better method of elevating and lowering the framework carrying the harrow teeth and scraper, so that the machine can be easily supported at any desired height from the ground.

A coin or ticket receiving turnstile has been patented by Mr. Walter Peake, of New York City. The turnstile post has a cam and locking plate, combined with a locking dog and two pistons, one connected to the dog and the other acted upon directly by the cam, with other features, whereby the turnstile is operated only when a ticket, coin, or check, or other device, is dropped or pressed into the lock mechanism.

A washing machine has been patented by Mr. George W. Wilson, of Lanesborough, Minn. The tub has a false bottom, and secured to its side is a support for a lever designed to operate a pneumatic washing head or pounder in the tub, the action of which not only squeezes the clothes, but by pressure and suction forces air and water through them to quickly free them from dirt.

Saliva-proof mouth pieces for cigarettes form the subject of a patent issued to Mr. Joseph B. Underwood, of Fayetteville, N. C. The invention consists of a new method and machine to do work heretofore done by hand, the cigarette being made to rotate on its own axis in contact with a surface supplied with the material to be applied, such as paraffine, varnish, etc.

A horseshoe has been patented by Mr. Charles J. Le Roy, of St. Louis, Mo. It has a calk recess open at one end, with an independent calk fitting therein, there being a longitudinal groove between the calk and adjacent side of the calk recess, and the groove being enlarged and closed at its inner end, whereby a nail driven into the recess will have its point bent over or clinched against the closed end of the groove.

A photographic camera has been patented by Messrs. Nicholas Schroder and Edward G. Adams, of Brooklyn, N. Y. The patent provides for a construction whereby the front and back of the camera may be angled in various directions to adapt the focus to parts of the subject not lying in the same plane. An adjustable or sliding base frame may be dispensed with, while making a light and efficient camera and plate holder.

A device for swaging insertible saw teeth has been patented by Messrs. Nels H. Wheeler and Neil M. Newhouse, of Corvallis, Oregon. It is for restoring old and unserviceable teeth, the swage blocks being adjustable in relation to each other for the proper size of tooth, and firmly seated in a vise or socket, when the old tooth, at a cherry red heat, is placed in position, and, by the movement of a cam-headed lever, is drawn and swaged to the proper configuration at the point, receiving a roll temper.

A wheel and axle form the subject of a patent issued to Mr. Henry Q. Maurino, of Albuquerque, New Mexico. The invention provides a wheel on which the tire may be placed without heating, and tightened when necessary, there being devices for expanding the felly sections by endwise pressure of the spokes at the felly joints, with retaining washers or plates held at the faces of the wheel to overlap the ends of the spokes and the felly sections.

A machine for making paragon umbrella ribs has been patented by Mr. Daniel M. Redmond, of Philadelphia, Pa. It is designed to flatten, re-enforce, and perforate the ribs in continuous lengths, instead of in separate pieces, as has been heretofore done, in connection with a method of manufacture by which they will also be tempered, annealed, and tested in the operation, without the aid of skilled labor, the machine presenting many novel features of construction and arrangement of parts.

An adding machine has been patented by Mr. James Richardson, of Tarrytown, N. Y. It has two series of numbered wheels, a series of numbered keys, with means for imparting motion to the numbered wheels from the keys, mechanism for insuring the operation of the numbered wheels in succession and for returning the wheels and the wheel-moving mechanism to the point of starting, together with a registering and summing mechanism and a disk for registering the number of the addition.

An improved card clothed roller and a machine for making card clothing forms the subject of two patents issued to Mr. Ernst Gessner, of Aue, Saxony, Germany. A strip of card clothing having its rows of teeth set obliquely to its length is wound spirally on the roller so as to bring its rows of teeth parallel with the axis of the roller and the arms of the teeth in radial position, improving the working effect and enabling the teeth to better withstand the working strain. The machine patented is for making the card clothing with the card teeth set in rows arranged obliquely to the length of the band.

Business and Personal.

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

NEW BOOKS AND PUBLICATIONS.

McCARTY'S ANNUAL STATISTICIAN. 1887. Pp. 650. San Francisco, Cal. : L. P. McCarty.

This is the eleventh edition of Mr. McCarty's work, each issue being more full and complete than its predecessor. It is a sort of *omnium gatherum* of matters pertaining to history, politics, geography, and trade, with much curious and useful information not classifiable under either of these headings, and to a large circle of readers cannot fail to fill a valuable place as a ready reference book.

IMPROVED PLUMBING APPLIANCES. By J. Pickering Putnam. Pp. 129; 94 illustrations. New York: William T. Comstock.

This book treats only of lavatories, including wash basins, bath tubs, and kitchen and pantry sinks, together with water closets, traps, and waste pipes. It presents forcibly the need of the best work in plumbing, with all the work so constructed that inspection will be easy, and urges the need of greater simplicity than has lately obtained in the fittings adopted in some of our more expensive dwellings. Illustrations are given of some of the latest patterns of water closet flushing arrangements, but the writer, who is an archi-

tect, and has developed a special device of his own of this kind, naturally argues strongly in favor of his own device.

THE CONVERSION OF HEAT INTO WORK. By William Anderson. London: Whittaker & Co. New York: D. Van Nostrand.

The simple and direct but extremely interesting way in which an ordinarily complicated subject is here presented will doubtless render this book of exceptional value to young mechanics who know little of the theoretical side of their business, and to other students who have to "dig out" their education from books, without the aid of teachers. Although now published as a practical handbook on heat engines, it contains but little matter in addition to that which appeared in the original form in which it was published, as lectures before the Society of Arts and Manufactures, London, which were printed in six successive numbers of the SCIENTIFIC AMERICAN SUPPLEMENT in the latter part of 1885.

A HISTORY OF SALT LAKE CITY AND ITS FOUNDERS. Salt Lake City, Utah: Edward W. Tullidge.

This is a handsome octavo volume of nearly 1,100 pages, profusely illustrated with fine steel engravings of the principal Mormon notables from 1840 to the present time, with biographical sketches. It is in fact a history of Mormonism and its growth and development in Utah, written by "authority of the Council and under supervision of its Committee on Revision," and therefore giving a picture of Mormonism in the most favorable light in which it is possible to present the institution to the public. There are too many outside evidences of material prosperity and thrift everywhere to be seen in the resourceful valley where the Mormon emigrants from Illinois and Missouri began to make their home in July, 1847, and the vitality of the community has been too plainly manifested on many occasions, for any one easily to escape the conclusion that the "Mormon question," as it is called, is still one of no insignificant importance. It is no part of our purpose to discuss the matter, but just why and how it has become of such material significance is probably more fully explained in this volume than in any other one work published.

The British Guiana Directory for 1887, published by C. K. Jardine, Demerara, cannot fail to be a valuable aid to such of our merchants and manufacturers as are seeking to extend trade in that exceedingly fertile and resourceful tract of 600,000 square miles lying just under the equator, on the northeast coast of South America. The book gives full details of all departments of the little government, with classified directory for the principal trades in different cities, the prominent country estates, etc.

* * Any of the above books may be purchased through this office. Send for new catalogue just published. Address Munn & Co., 361 Broadway, N. Y.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) W. M. L. writes: 1. In building an eight light dynamo as illustrated in SCIENTIFIC AMERICAN, April 23 and 30, can I substitute brass instead of bronze for making sleeve A, flange B, and cylinder E, Fig. 6 (SCIENTIFIC AMERICAN, April 30), also for yoke-holding shaft, or only make cylinder E of bronze and the rest of brass. A. Brass may be used, but bronze is preferred on account of its hardness and durability. 2. Does it make any difference in the winding of the field magnet whether I wind both posts right or left handed, or should they be wound different? A. Wind so that if placed endways the direction would be uniform. Both must be wound either right or left handed. 3. How can I attach machine to wooden base? A. Drill and tap the polar extremities, and insert tap bolts through the wooden base. 4. What is the best wood to use for the armature core? A. Well seasoned mahogany or maple. 5. What are the wedges made of that are use for dividing the coils on the armature? A. Hard rubber, vulcanized fiber, hard wood, or bone.

(2) R. T. asks: In regard to pumping cold water into a boiler when the water is low and the flues heated, is it not the gas that is generated in coming in contact with the hot iron that causes an explosion? A. It is dangerous to pump cold or hot water into a boiler with the line of water below the top flues; at such times the flues out of water may become red hot, as also the sides of the boiler above the water. Pumping up the boiler at such times largely increases the generation of steam, possibly carrying the pressure up to the point of rupture. The theory that explosions are thus caused by gas formation is in no way sustained.

(3) C. H. D. & Co. ask the ingredients of a solution in which to steep burlap or jute bags in order to make them more durable when used for transporting acid fertilizers, such as dissolved phosphate rock. A. Plunge the bagging into a solution, at 142° Fah., and leave for an hour, the solution consisting of sulphate of alumina 2¼ pounds, water 5½ gallons, and borate of lime 2¼ pounds. The borate of lime is added after the sulphate of alumina has dissolved, and the whole decanted when settled. After taking out of this bath, the textiles are put into a second bath, composed of 2¼ pounds resinous soap and 2¼ pounds Marseilles soap dissolved in 5½ gallons water and carried to the boiling point. At the end of ten minutes the bags are allowed to drip, are next dried, and then rewashed and dried. Bagging made in this way, it is claimed, will resist the action of acids or chemicals.

(4) E. T. H. asks how to make a mahogany stain for wood, and a varnish to coat it to re present a polish. A. The following is a dark stain: Boil ½ pound of madder and 2 ounces logwood chips in a gallon of water, and brush over while hot; when dry, go over the whole with a pearl ash solution, 2 drachms to the quart. Or put 2 ounces dragon's blood, bruised, into a quart of oil of turpentine, let the bottle stand in a warm place, shake frequently, and when dissolved, steep the work in the mixture. To polish, take a piece of pumice stone and water, and pass repeatedly over the work until the rising of the grain is cut down. Then take powdered tripoli and boiled linseed oil, and polish the work to a bright surface.

(5) H. W. F. asks: 1. What cement, either liquid or otherwise, can I use to mend china so as to hold hot substances, and the cement to be transparent or white? A. See article on cements in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, for this information. 2. How is oak finished as "antique oak"? Is it possible to do over oak furniture so that it will be antique? A. By intensifying the stain, the oak can be made to resemble the antique article. New furniture restained has that appearance. 3. What is the cause of the "gapes" in chickens, etc., and what can be used to prevent and cure it? A. Camphor pills, it is said, will cure this disease. Sulphur is also used. 4. How do you multiply hyacinth bulbs? A. They multiply from the small bulbs which form at the base of the large ones.

(6) H. A. L. and others.—Your question has been many times answered. Try and look a little more closely into the exact terms of the problem. No part of the periphery of a wheel of a wagon moving along a road travels faster around its axis than another part. The axis moves along the road with the mean speed of the top and bottom of the wheel. The top of the wheel moves twice as fast as the wagon. *Per contra*, the periphery of the wheel is during one half of its revolution gaining, and during the other half losing speed, as compared with the forward motion of wagon and axle, so that the bottom of the wheel, or part in contact with the ground, does not move in a measurement of this onward movement.—A snake climbs a tree that is small enough to allow of its peculiar manipulation, by a spiral movement around the trunk or a return bending of its coils nearly half way around, by which the snake obtains a grip. Their favorite trees are the kind that have low limbs, which give them a natural rest.—For the manufacture of steel see back numbers of SCIENTIFIC AMERICAN SUPPLEMENT.

(7) W. J. B. writes: Referring to article in SCIENTIFIC AMERICAN, April 23, 1887, upon eight light dynamo, will you please inform us through your paper: 1. What size of wire and how many layers to wind upon field magnet to make a plain series machine of it, using but one strand for conductor? A. Use eight layers of No. 12 (Am. W. G.) wire on each leg of the magnet. 2. What changes will be required to make it operate 12 standard 16 candle power lamps instead of 8? A. Put coarser wire on the armature, say No. 18, and increase the speed, and increase all of the dimensions of the machine about 20 per cent.

(8) P. S. asks: How many gallons of water per hour will a 3 inch pipe line 7,000 feet long deliver into a tank, the point of delivery being 38 feet above ground and the head of water being 13 feet higher than point of delivery? A. 1,400 gallons per hour.

(9) R. F. asks how large to make a balloon and of what material, to lift 5 pounds. A. You will require a globular balloon of 7½ feet diameter when filled with the carbureted hydrogen of your gas works to lift 5 pounds and the weight of the balloon of say 2 pounds. For material use strong tissue paper or Chinese silk well varnished with rubber varnish. See Balloon Making, SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249, 413.

(10) G. K G. asks: What will remove bicycle oil from corduroy without leaving a stain? A. Use ether or a mixture of ether and ammonia. Apply in a circle all around the stain, and sponge off the spot last of all.

(11) H. K. asks (1) the most practical method for making brass signs. A. Use nitric acid to eat into the metal. 2. How to permanently blacken the letters and scroll work? A. Mix asphaltum, brown japan, and lampblack into a putty-like mass, and then fill in the spaces, finally cleaning the edges with turpentine.

(12) S. O. N. writes: We have a driven well about 25 feet deep, with seven feet of water in it, but it does not pump easy. We think the point is in clay, and we cannot turn the pipe in ground Can you suggest a way to make the water flow more freely—like exploding a dynamite cartridge in it? A. The pipe should either be drawn up so as to allow the strainer to receive the surface water lying upon the clay, or be driven deeper, to reach the next sand stratum, which may give a better supply. It will be of no service to torpedo the well in the clay. Besides, your point should have a strainer which precludes the use of a torpedo without first withdrawing the tube. Better drive deeper and find what is below the clay.

(13) J. J. asks the best way to tin tempered steel (small pieces) with a smooth thin coating without injuring temper or getting too hard. I have first cleaned the pieces in a hot solution of potash, then put them in diluted muriatic acid and then in zinc acid, before going into the tin, but cannot get them smooth and even. A. Your manuipulation appears to be right, only that the surfaces should have a half polish or be quite smooth. Also the tin bath should have a clean surface, which can be made by sprinkling a little powdered sal ammoniac upon the surface and skimming. Have the tin pretty hot and draw the pieces slowly out of the tin.

(14) E. P. asks: How are photographs on boxwood obtained? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 428, page 6830, also No. 584, page 9320.

(15) C. E. E. asks how to make an enamel on steel, one that will dry quick and black. A. Use japan varnish and bake in an oven at 250° temperature.

(16) J. M. L. asks what to put in common coal tar to make it adhere to iron better than it does when simply boiled, and then applied. A. Mix with pulverized plumbago or lampblack. Thin with benzine if necessary. If color is no object, use Prince's metallic paint.

(17) H. S. sends a plant to be named, and asks whether it has any medicinal properties. A. The plant is a species of elder, *Sambucus glauca*. Its medicinal properties, if it has any, are probably the same as those of the eastern species, the flowers of which have been reported diaphoretic and discutient, the berries aperient and sudorific, the bark purgative, and, in small doses, diobstruent.

(18) W. S. asks: What is the greatest height at which a siphon will work, and the largest pipe that can be used therefor? A. There is no limit to the capacity of a pipe for a siphon. The greatest height depends upon the pressure of the air. It may be 33 feet, practically 28 to 30 feet.

(19) G. S. D. asks how hair clippers are ground or sharpened, whether on flat surface or between the teeth, and what is used to sharpen them with. A. Never sharpen the clippers on the flat side. Always on the bevel side. Use Washita or Arkansas stone and oil. You can buy the stone in long sticks, ½ inch diameter, through the hardware trade.

(20) P. & S. ask as to the feasibility of running an upright shaft direct from engine, through a six story building and connecting with it shafts on each floor by gearing. A. Vertical driving shafts in mills are only to be tolerated as a necessity, or as turbine shafts. The step of a long vertical shaft is a source of constant trouble, which added to the noise has about driven the system from present mechanical practice.

(21) H. M. D.—Six inch copper pipe may be bent to a radius of 3 or 4 feet by filling, after annealing, with resin. Allow the resin to cool, and bend slightly over a curved block of wood hollowed out, so that the pipe will bear half way round to keep it from flattening. Bend a little, then melt the resin out and anneal again. You may have to do this two or three times.

(22) F. E. writes: I wish to make a wire rheostat with resistance of 3,000 ohms, divided into 10 divisions or more—or 15. What size wire will I have to use to put 200 ohms resistance in each coil, and how much to each coil? Also give same with 300 ohms resistance to each coil. A. Of No. 35 German silver wire, one pound gives about 8,136 ohms resistance. Therefore one twenty-seventh pound will give you about 300 ohms, and one fortieth pound will give about 200 ohms. The exact resistance of each coil has to be determined experimentally. One pound of No. 40 wire gives about 41,248 ohms, so much less of this, about one-fifth the above amounts, would answer.

(23) C. H. G. wishes further directions about making a kite without a tail, such as was described in SUPPLEMENT, No. 595. A. The directions for making the bow, which you do not seem to understand, read: "The bow . . . consists of two pieces of osier, each 5½ units in length, that form, through their union, a total length of 7 units." This simply means that the two ends of the osier that are to form the center of the bow should be lapped over each other to a sufficient extent to make the entire length of the bow when the two pieces are joined seven-tenths the length of the central stick.

(24) G. C. H. asks: 1. What is the best steel for making compass needles, and what temper will they require before magnetization, and what is the best shape to make them? A. Use cast steel, hardened and drawn to a purple. The straight bar form is probably the best. 2. Would a heavy coiled flat spring, say ¼ inch thick and 6 inches wide and 20 feet long, be eight times as strong as one one-sixteenth inch thick, 3 inches wide, and the same length as the first? A. It would be more than eight times as strong. 3. Will the lighter spring lift 150 pounds? A. You have left out the element of time and distance. It will lift 150 pounds if connected with the weight by suitable mechanism.

(25) D. M. G. writes: In the article "Inexpensive Arc Lamp," in the June 11, 1887, number, what kind of a battery can be used? Will a telegraph battery answer, and how many? Where can I get the carbons, in Cleveland? A. It will require from 25 to 50 Grove or Bunsen cells. The ordinary telegraph battery will not answer. You can get carbons from any house dealing in electrical materials.

(26) J. D. McC. asks: 1. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, article on induction coils, what is the object gained by having the secondary coil in two sections, with insulating resin between them? A. The construction in sections is for the purpose of more effectually separating those layers of the coil having the greatest differences of potential, so as to prevent sparks jumping across and destroying the insulating material. 2. Is there any good reason for preferring naked wire to silk-covered wire, except its greater cheapness? A. Naked wire lies closer and is cheaper than covered wire; no other reason exists for its employment.

(27) O. R. asks: 1. What is a good glue to use in making camera bellows? Ordinary glue becomes hard and the rubber cloth breaks. A. Use rubber cement. See "Cements," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158. 2. A developing formula in which quinol is used in place of pyro? A. You probably refer to the hydroquinone developer. The formula is as follows: A. Water 80 cubic centimeters, hydroquinone 1 to 2 grammes. B. Saturated solution of carbonate of ammonia in water. To 8 parts of A add 1 part of B.

(28) W. D. B. S. asks: 1. Is there any difference in the lifting power of an elevator rope or ropes when the rope is passed through an eye, and the two ends attached to the drum, and when the rope is separated and attached in two places on the crosshead of the elevator, the ropes being all of one size? A. There is no difference. 2. What is the strain on a rope that two men are pulling on, one at each end, supposing one pulls 200 pounds one way, and the other pulls 200 the other way? A. The strain is 200 pounds.

(29) B. P. G. writes: About four years ago a young man in this place boiled a hen's egg and put it away. On breaking it open the other day, he found that everything in it had shrunk to a mass about one-twentieth the size of the egg, almost perfectly egg shaped. It looks like a piece of amber, being most beautifully translucent. A. The white of eggs contains about 85 per cent of water and 12 per cent of albumen. By boiling, the albumen is coagulated, but without much if any loss of water. By lapse of time the water gradually evaporates, and the result spoken of was probably due to this evaporation.

(30) Subscriber asks: Has it been definitely ascertained yet what caused the sinking of the Oregon? A. It was caused by collision with a vessel believed to be a coal schooner.

(31) W. S. asks: Does the brake of a car wheel when set up so as to nearly but not quite cause the wheel to slide, stop a train quicker than when the wheel slides? A. Yes. If the wheel is kept from rotating, the part in contact with the rail becomes polished and slides easily. If allowed to slowly turn, a new surface is continually presented to the rail. The latter practice stops the car quicker.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 21, 1887,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Atomizer, A. P. Lighthill 365,265
Awnings, device for operating, T. Charron 365,239
Axle, R. Gracey 365,178
Axle lubricator, H. Augustine 365,223
Axle, vehicle, W. F. McNutt 365,144
Bag hinge stay, telescopic, C. Reinisch 365,276
Baling press, W. A. Laidlaw 365,187
Baling press, A. Wickey 365,211
Barium sulphate, process of and apparatus for treating, Page & Krausse 365,318
Barrels, guard head for, G. H. & F. O. Knifton 365,079
Battery. See Electric battery.
Bed bottom, T. E. O'Brien 365,272
Bed guard, T. D. Smith 365,105
Bedstead, folding, F. E. Muller 365,348
Bell, call, Comstock & Buxton 365,241
Bending rails, etc., machine for, J. Abbott 365,325
Billiard cues, machine for trimming the ends of, J. S. Gold 365,301
Bit. See Bridle bit.
Bitters, stomach, I. Cooper 365,242
Blast furnace top, Kennedy & Scott 365,077
Blast machine, sand, King & Maw 365,261
Blood, instrument for transfusion of, E. E. Allen 365,327
Bobbin winders, thread roll pin for, C. D. Austin 365,291
Boiler. See Steam boiler.
Bookcase, revolving, D. C. McMartin 365,085
Box. See Cock box. Journal box. Packing and show box.
Box lock, W. Clark 365,048
Bottle stopper, W. Werts 365,286
Brace. See Rail brace.
Bracelet, T. C. Hudson 365,257
Bracket. See Coffin bracket.
Brake. See Car brake.
Bread, making, J. D. Cox 365,331
Bridge gate, draw, G. A. Johnson 365,132
Bridle bit, H. T. Richmond 365,151
Brush handle attachment, G. J. Cline 365,329
Buckle, J. F. Bartlett 365,226
Buildings, corrugated ridge capping for, W. H. & B. F. Powers 365,096
Bustle, H. O. Canfield 365,045
Button and buttonhole marking machine, Hatfield & Sorge, Jr 365,126
Button fastening attachment, E. O. Ely 365,299
Buttonhole cutter, C. Dickenson 365,333
Cable roads, grip releasing device for, J. T. Cooney 365,168
Can. See Oil can. Packing can.
Candy pail and show case, combined, J. Lutted 365,346
Car brake, C. K. Corliss 365,243
Car coupling, D. R. Covenhoven 365,330
Car coupling, J. H. Dunn 365,172
Car coupling, O. E. Long 365,139
Car coupling, W. Metcalf 365,210
Car coupling, W. H. Phillips 365,149
Car coupling, D. H. Sherman 365,278
Car, safety, F. D. Knight 365,309
Car, safety railway, Maron & Bohni 365,143
Car seat, reversible, J. Lemman 365,311
Car seats, head rest for, H. W. Fackrell 365,248
Car starter, B. C. Pole 365,274
Cars, sand box for railway, H. W. Jordan *et al.* 365,076
Carding machines, top flat stripping mechanism for, A. Falls 365,250
Carpet sweeper, J. M. McClain 365,192
Carriage, child's, V. Doane, Jr 365,298

Case. See Book case.
Chain, drive, M. Garland ... 365,123
Chain, ornamental, S. O. Bigney ... 365,115
Chair. See convertible chair.
Churn, D. Snyder ... 365,205
Cider, preserving, J. C. Mott ... 365,148
Cigar perforator, F. C. Gudebrod ... 365,303
Cinder escape and draught regulator, F. S. Bragg. 365,235
Clasps to strips, machine for forming and attaching, Gardner & Lovedahl ... 365,251
Closet. See Dry closet.
Clothes line support, Palmer & Carter ... 365,196
Clothes rack, T. H. Eulass ... 365,060
Coal kindler, Obersky & Fischer ... 365,271
Cock box, stop, C. F. Bingham ... 365,232
Coffee roaster, J. C. Salzgeber ... 365,321
Coffin bracket, adjustable, C. E. McLaughlin ... 365,268
Combination lock, B. Fry ... 365,177
Combination lock, J. G. O'Neill ... 365,317
Condenser, W. Craig ... 365,119
Convertible chair, Lawrence & Batchelder ... 365,344
Conveyer, J. M. Dodge ... 365,171
Cotton openers, dust trunk cleaner for, H. W. Fairbanks ... 365,175
Cotton picking and cleaning machinery, W. H. Goldsmith ... 365,125
Coupling. See Car coupling. Rod coupling. Thill coupling.
Cultivator attachment, D. M. Ditto ... 365,056
Cultivator, cotton, C. N. Hutchins ... 365,073
Current motor, H. Kessler ... 365,133
Curtain pole and fixture, F. C. Schastey ... 365,203
Cutter. See Buttonhole cutter. Fuse cutter. Glass tube cutter. Meat cutter. Paper cutter.
Damper, J. W. Yates ... 365,219
Dental chairs, lowering mechanism for, L. Stuck ... 365,322
Dental engine, H. C. Register ... 365,098
Desk and type writer cabinet, combined, W. H. Porter ... 365,275
Domestic press, J. S. Bird ... 365,292
Door check, F. W. Andres ... 365,038
Door check, W. S. Barlow ... 365,224
Dredger, H. H. Lynch ... 365,140
Dress form, C. H. Griffin ... 365,302
Dress shields, die for making seamless, A. J. Hiscott ... 365,069, 365,070
Drier. See Fruit drier.
Drill. See Grain drill.
Drill stock, ratchet, C. H. Wilmoth ... 365,214
Dry closet, L. B. Robb ... 365,202
Ear and neck protector, L. Friedman ... 365,061
Electric battery, P. Germain ... 365,359
Elastic compound, rubber covered, H. W. Libbey. 365,137
Electric currents, apparatus for transforming, L. Bollmann ... 365,116
Elevator lock, T. F. Morrin ... 365,088
Engine. See Dental engine. Multi-cylinder engine. Oscillating engine.
Envelope, letter, G. L. Jaeger ... 365,260
Eraser, blackboard, J. Travis ... 365,356
Extracts, process of and apparatus for clarifying, A. Morand ... 365,087
Feed water purifier, K. A. Petzold ... 365,093
Fence machine, E. S. Plackard ... 365,150
Fence machine, wire, L. C. Lowden ... 365,312
Fence post, T. F. Richart ... 365,099
Fifth wheel, W. C. Engel ... 365,174
Filtering plate, compound, J. Kroog ... 365,134
Files, making, C. M. Fairbanks ... 365,249
Fire escapes, R. Belches ... 365,230
Fire extinguisher for car heaters, S. P. Canfield ... 365,237
Flambeau, Vaughn & States ... 365,284
Frame. See Spectacle frame.
Fruit drier, C. Pattenger ... 365,319
Furnace. See Hot air furnace. Smoke consuming furnace. Steam generating furnace.
Furnace, A. J. Holden ... 365,071
Furniture, rocking, A. G. Wicker ... 365,288
Furniture, wall protectingattachment for, F. Barrows ... 365,225
Fuse cutter, cap setter, and inserter, combined, C. D. Hale ... 365,179
Gauge. See Track gauge.
Galley, G. E. Jones ... 365,308
Gas, apparatus for manufacturing, B. Brazelle ... 365,294
Gas generators, acid chamber for, H. Hoff ... 365,254
Gate. See Bridge gate.
Generator. See Steam or hot water generator.
Glass tube cutter, L. P. Lindgren ... 365,190
Glazier's diamond tool, A. T. Duncan ... 365,057
Grain binders, cord tying mechanism for, W. Butterfield ... 365,044
Grain binders, cord tying bill for, R. H. Corey ... 365,050
Grain cleaning machine, A. Laidlaw ... 365,080
Grain drill, L. E. Waterman ... 365,109
Guard. See Bed guard.
Hammer, tack, L. H. Hoover ... 365,255
Harrow, S. H. Chadwick ... 365,046
Harrow, D. W. Shares ... 365,104
Harvester platforms, clearing attachment for, D. Ralston ... 365,097
Harvesting machine, W. N. Whiteley ... 365,324
Hat wire, H. H. Kellner ... 365,185
Hay loader, W. S. Nichols ... 365,194
Hay rake and gathering machine, A. L. Courtright ... 365,118
Hay rake and loader, W. H. Lyon ... 365,082
Hay stacker, D. B. Craig ... 365,332
Hay stacking device, O. H. King ... 365,262
Heat regulator, E. Zickwolff ... 365,220
Hinge, lock, J. Wolf ... 365,160
Hoe, planting, W. & I. H. Trabue ... 365,108
Hoisting machine, W. R. Thatcher ... 365,107
Holder. See Pen holder. Pillow sham holder. Tire bolt holder.
Hot air furnace, L. J. Mueller ... 365,193
Hub, wheel, J. M. Sweet ... 365,106
Ice chute, J. Hall ... 365,338
Indicator. See Station indicator.
Insulating material, composition of matter for, J. B. Williams (r) ... 10,846
Iron. See Sad iron.
Joint. See Sheet metal joint.
Journal box, W. J. Perkins ... 365,199
Journal box and lubricator, A. Eagle ... 365,246
Key, F. A. Gurney ... 365,304
Kitchen cabinet, V. E. Wigginton ... 365,289
Knife. See Pocket knife.
Knitting machine, Covell & Cram ... 365,244
Ladder, fire, H. T. Hayes ... 365,128
Label, bottle, E. L. Moodie ... 365,146
Lamp attachment, J. V. Bulger ... 365,164
Lamp, gas, L. G. Francis ... 365,336
Lamp, incandescent electric, J. Smith ... 365,351
Lamp socket and cut-out, incandescent, Lemp & Wightman ... 365,189
Lamp socket and cut-out, incandescent, Wightman & Lemp ... 365,159
Lamp, street car, C. E. Garey ... 365,062
Land roller and clod crusher, combined, F. Twick 365,209
Last, Stevens & Smyth ... 365,154
Latch, M. S. Thorud ... 365,281
Latch operating device, A. H. Calkins ... 365,236
Light. See Locomotive headlight. Vault light.
Lock. See Box lock. Combination lock. Elevator lock. Nut lock. Seal lock.
Lock, S. Simson ... 365,152
Lock for bolts of pistons, J. & J. Wormald, Jr. ... 365,218
Locomotive headlight, I. A. & C. I. Williams ... 365,112
Loom, circular, R. Sauter ... 365,101
Loom shuttle, C. Widmer ... 365,111
Looms, shuttle operating mechanism for circular, Winckler & Heilmann ... 365,216
Lounge, A. C. Abramson ... 365,326
Lubricator. See Axle lubricator.
Marker, corn row, Andrew & Vendrick ... 365,039
Marking wheel for transferring patterns, W. Heidenhain ... 365,129
Measure, shoemaker's, A. S. Adler ... 365,221
Meat cutter, G. H. Stallman ... 365,206
Meter. See Water meter.
Milk, centrifugal apparatus for testing, G. De Laval ... 365,120
Mill. See Rice mill. Rolling mill.
Mirror, P. Hufeland ... 365,183
Mirror, F. W. Levering ... 365,264
Mould. See Pipe mould.
Mop head, F. L. Whittemore ... 365,287
Mop wringer, J. F. Chase ... 365,167
Mortising machine, A. L. Grinnell ... 365,065
Motor. See Current motor.
Multi-cylinder engine, A. D. Linn ... 365,081
Musical instruments, coupler for, W. D. Parker ... 365,092
Nails, machine for and method of making double pointed wire, G. Doolittle ... 365,121
Nut lock, Campbell & Hetzler ... 365,165
Nut lock, C. S. Wenger ... 365,285
Nuts and washers, machine for manufacturing, S. Brightmore ... 365,328
Nutshell cutting machine, C. Pecht ... 365,198
Odometer, H. O. Brooks ... 365,043
Oil can, W. W. Hills ... 365,130
Oil can, siphon, C. N. Tyler ... 365,157
Oiler, automatic, J. T. Smith ... 365,153
Oiler for car axles, J. Gibbons ... 365,063
Ore concentrator, G. D. Stonestreet ... 365,279
Oscillating engine, S. Maltby ... 365,267
Packing and show box, J. W. De Graff ... 365,245
Packing apparatus, F. Wolf ... 365,217
Packing can, H. R. Gillingham ... 365,064
Pantaloons, H. T. Caullet ... 365,296
Paper box machine, H. A. House ... 365,072
Paper boxes, machine for making bands for, J. Godfrey ... 365,124
Paper cutter, F. W. Drosten ... 365,334
Paper pulp, etc., suspended in liquids, separating apparatus for, R. Kron ... 365,343
Paper stock, apparatus for treating vegetable substances for making, A. Chambers ... 365,166
Paper, waxing, C. A. Wilkinson ... 365,213
Pen holder, W. G. Ingram ... 365,307
Pen holder, M. I. Rodrigue ... 365,320
Pick and shovel, combined, A. H. Storey ... 365,208
Pillow sham holder, T. Van Duzer ... 365,158
Pin. See Safety pin.
Pipes, coupling for joining, E. E. Hendrick ... 365,068
Pipes, means for making curved, J. A. Whitney ... 365,110
Pipe mould, W. A. Frick ... 365,176
Piston, horizontal, H. See ... 365,102
Planter, corn, C. A. Beerstecher ... 365,229
Planter, cotton, J. W. Bartlett ... 365,041
Planters and other machines, adjustable driving gear for corn, P. J. Lawton ... 365,188
Planters, feed for cotton, C. W. Oldham ... 365,195
Plow, Turley & Bryant ... 365,156
Plow, R. W. Whitehurst ... 365,358
Plow, double shovel, F. C. Geiger ... 365,252
Plow, side hill, C. Anderson ... 365,162
Pneumatic cabinet, W. J. Harris ... 365,067
Pocketbooks, satchels, etc., frame for, L. B. Prahar ... 365,200
Pocket knife, G. W. Miller ... 365,086
Policeman's club and making the same, E. D. Bean ... 365,228
Post. See Fence post.
Pot. See Tea or coffee pot.
Press. See Baling press. Domestic press.
Presses, automatic brake for power, J. H. Clapp ... 365,047
Printing machine, chromatic, F. H. Ludington ... 365,313
Printing machines, feed guide for, J. T. Hawkins. 365,127
Printing machines, web feeding mechanism for, L. C. Crowell ... 365,051
Printing shell, O. J. Smith ... 365,352
Protector. See Ear and neck protector.
Puller. See Stump puller.
Rack. See Clothes rack.
Rail brace, C. Alkins ... 365,222
Railway rail tie and fastening, A. Roelofs ... 365,350
Railway signal, electric, M. W. Long ... 365,345
Railway tie, G. De Beaulieu ... 365,169
Railways, triplex motor for street, B. C. Pole ... 365,273
Railways, with means of insulating the rails, tramway for elevated electric, B. F. Hamilton 365,341
Rake. See Hay rake.
Reflector, lamp, R. E. Williams ... 365,215
Registers, heat deflector for, H. P. Klein ... 365,078
Regulator. See Heat regulator.
Rice mill, J. A. Lockfaw ... 365,191
Road making machine, F. T. Lomont ... 365,138
Roaster. See Coffee roaster.
Rod coupling, J. Leib ... 365,263
Rods, machine for upsetting collars on, C. O. Wilder ... 365,212
Roller. See Land roller.
Rolling mill, H. Sack ... 365,100
Roof, sheet metal, A. Wightman ... 365,290
Rope making machine, E. E. Pierce ... 365,094
Sad iron, Pierce & Snyder ... 365,095
Safes, etc., compound welded plate for burglar-proof, J. Farrel ... 365,300
Safety pin, J. Jenkins ... 365,075
Saw level and set gauge, J. Beaulieu ... 365,163
Saw sharpening machine, S. A. Gould ... 365,337
Saw wheel, band, D. K. Allington ... 365,037
Scale beam latches, device for disengaging, E. O. Deming ... 365,170
Scale, coin operated electrical weighing, Smith & Washburn ... 365,353
School seat and desk, W. P. Connor ... 365,297
Seal lock, M. F. Berry ... 365,231
Seal lock, C. V. Boughton ... 365,117
Seat. See Car seat. School seat.
Shaft support, T. A. Knox ... 365,310
Sheet metal joint, J. G. Battelle ... 365,042
Shutter worker, J. Wayland ... 365,357
Signal. See Railway signal.
Skirt facings, woven fabric for, L. Moschcowitz ... 365,147
Slate, folding tracing, W. D. Heyer ... 365,182
Sled, A. Wolff ... 365,161
Smoke consuming furnace, J. W. Hubber ... 365,342
Snow plow, A. E. Dietz ... 365,055
Snow plow, H. Pangborn ... 365,197
Sofa or divan, reclining, W. J. Maddox ... 365,266
Soldering machine, can cap, E. Norton ... 365,316
Soldering tool, H. Brasch ... 365,293
Spark arrester, F. S. Bragg ... 365,234
Spark arrester for smokestacks, M. M. Wilson ... 365,114
Spectacle frame, J. L. Newell ... 365,090
Spinning frames, roving guide for, F. A. Thomas. 365,280
Spinning machines, yarn separating device for, G. E. Taft ... 365,155
Spring. See Vehicle spring.
Station indicator and calendar, F. C. Jones ... 365,184
Steam boiler, E. G. Durant *et al* ... 365,173
Steam boiler, M. Mahony ... 365,141
Steam engines, oil trap for, F. F. Ide ... 365,259
Steam generating furnace, W. Gerkhardt ... 365,253
Steam or hot water generator, R. J. Malcolm ... 365,347
Stencil plates, die for cutting, J. L. Haberling ... 365,066
Stereoscope, G. D. Horton ... 365,256
Stirrup, W. S. Cardell ... 365,238
Stopper. See Bottle stopper.
Stove, cooking, J. A. Price ... 365,349
Stovepipe attachment for flues, A. M. Mealey ... 365,145
Stud and necktie holder, collar, D. Stone ... 365,207
Stump puller, J. H. Schindly ... 365,304
Sugar, device for loosening and cutting, W. P. Elliott ... 365,247
Suspension device, J. A. Evarts ... 365,335
Tablet, interchangeable account, J. G. Mark ... 365,084
Tank. See Water closet tank.
Tea or coffee pot, Beach & Babbitt ... 365,227
Telegraph, printing, S. V. Essick ... 365,059
Telegraphy, automatic, C. Selden ... 365,103
Temperature alarm system, A. E. Morrison ... 365,089
Thermometer, G. B. St. John ... 365,354
Thill coupling, F. R. Crumbaker ... 365,052
Thill coupling, D. A. Johnson ... 365,131
Tie. See Railway rail tie. Railway tie.
Tile for ceilings and floors of buildings, J. H. Bright ... 365,295
Tire bolt holder, J. C. Markam ... 365,142
Toy, flying, J. M. Richard ... 365,201
Track gauge, automatic, D. Willard ... 365,113
Train order catcher, R. J. Mickey ... 365,314
Trammel, A. Heiron ... 365,181
Trap, C. J. Erikson ... 365,058
Trolley track, L. Coburn ... 365,240
Truck for electric railways, guide, B. F. Hamilton 365,339
Truck for electric railways, swivel, B. F. Hamilton ... 365,340
Tubes, device for reducing the ends of, E. O. Daniels ... 365,053
Umbrella support, D. E. Tillman ... 365,282
Valve, balanced, J. Lewis ... 365,135
Valve, elastic balance, J. Lewis ... 365,136
Valve mechanism for water mains, electric, G. B. Bassett ... 365,040
Valve, rotary, J. L. Mitchell ... 365,315
Valve, thermal, J. Hurt ... 365,258
Vault covering, illuminating tiling, etc., T. Hyatt. 365,306
Vault light, P. Herzog ... 365,305
Vehicle spring, H. C. Swan ... 365,335
Vehicle wheel, J. Fraser ... 365,122
Velocipede, T. B. Jeffery ... 365,074
Velocipede, F. D. Owen ... 365,091
Vessels, construction of, T. J. Hanlen ... 365,180
Vise, J. Kenyon *et al* ... 365,186
Vulcanizing apparatus, W. B. Mann ... 365,083
Wad winding machine, A. Dickerman ... 365,054
Wagon, dumping, J. M. Blake ... 365,233
Waistbands, attaching elastic straps to, E. A. Todd ... 365,283
Washing compound, J. K. McWhorter ... 365,269
Washing machine, M. V. B. Watson ... 365,210
Water closet tank, J. Collett ... 365,049
Water meter, piston, F. L. Sylvester ... 365,323
Wheel. See Fifth wheel. Marking wheel. Saw wheel. Vehicle wheel.
Wood turning machine, A. Schuch ... 365,277
Wringer. See Mop wringer.

DESIGNS.

Bath tub, earthenware, W. C. Peet ... 17,410
Bridle front, E. R. Cahoone ... 17,400
Brush, hat or clothes, C. T. Grosjean ... 17,404
Corsets, ornamentation of, M. P. Bray ... 17,398
Easel, T. A. Abbott ... 17,396
Grate, fireplace, H. G. & W. R. Dawson ... 17,401, 17,402
Hot air register front, W. Schickel ... 17,411
Intaglio, A. Becker ... 17,399
Oil cloth, C. T. & V. E. Meyer ... 17,405 to 17,409
Toy pistol, P. Adams ... 17,397
Type ornaments or combination border, font of, G. F. Giesecke ... 17,408

TRADE MARKS.

Aerated waters, C. H. Phelps ... 14,534
Blacking, liquid, paste, and waterproof, Day & Martin ... 14,544
Candy, R. & T. Candy ... 14,533
Cigars, V. S. Wright ... 14,543
Cigars and cigarettes, Reynolds, Rogers & Co ... 14,541
Coal and wood, T. M. Hackett & Co ... 14,536
Cod liver oil, Isdahl & Co ... 14,538
Cough medicine, M. J. Breitenbach ... 14,531
Cutlery and edge tools, W. Bingham & Co ... 14,530
Furniture finish, T. H. Nevin & Co ... 14,539
Harmonicas, Rogge & Koch ... 14,542
Leather and metal goods, preparation for cleaning and polishing, B. Beddow & Sons ... 14,529
Medical compound, tonic, H. H Ayer ... 14,525
Medicines containing sarsaparilla, proprietary, J. C. Ayer Company ... 14,527
Medicines for malarial diseases, proprietary, J. C. Ayer Company ... 14,528
Medicines for pulmonary and throat diseases, J. C. Ayer Company ... 14,526
Preserves, fruits, vegetables, fish, cheese, and sauces, C. P. F. Holtz ... 14,537
Rubber goods, hard, Butler Hard Rubber Company ... 14,532
Seeds, farm, garden, and lawn, Northrup, Braslan & Goodwin Company ... 14,540
Towels, figured and plain, Turkish, G. S. Cox ... 14,535
Wrenches, American Saw Company ... 14,524

A printed copy of the specification and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 361 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For **full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.**

PROPULSION OF STREET CARS.—A paper by A. W. Wright, in which an endeavor is made to solve the problem as to the amount of power required to start a street car and keep it in motion under average conditions. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **533.** Price 10 cents. To be had at this office and from all newsdealers.

STEEL GUNS, GUN METAL, GUNPOWDER, etc. A paper by G. W. Summer, Commander, U. S. N., treating of the relative merits of different materials used in gun making, describing the peculiarities of the Whitworth system of artillery, and discussing the subject of slow-burning gunpowder. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **589.** Price 10 cents. To be had at this office and from all newsdealers.

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CAPILLARY ATTRACTION.—AN INTERESTING paper by William Thomson, discussing the question whether the attraction between any particle of matter in one body and any particle of matter in another continues to vary inversely as the square of the distance, when the distance between the nearest points of the two bodies is diminished by various degrees. With 30 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **562** and **563.** Price 10 cents each. To be had at this office and from all newsdealers.

Proposals for Steel-cast Guns for the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *June* 23, 1887.

Under authority conferred by the act of Congress, approved March 3, 1887, making an appropriation "for the purchase and completion of three steel-cast, rough-bored and turned, six-inch, high-power rifle cannon, of domestic manufacture, one of which shall be of Bessemer steel, one of open-hearth steel, and one of crucible steel," sealed proposals from domestic manufacturers, to furnish the same, will be received at this Department until Tuesday, the second day of August, 1887, at 12 o'clock noon, at which time the proposals will be opened.

Proposals may be made either to furnish three completely finished six-inch, breech-loading, high-power rifle cannon, made from unforged castings, one of Bessemer steel, one of open-hearth steel, and one of crucible steel, or three unforged, rough-bored and turned castings for such cannon, of the same material, respectively, to be finished by the Department in accordance with the bidder's design.

Such finished guns or such castings must be in accordance with the specifications prepared in the Bureau of Ordnance, and each gun, when completed, must be capable of safely discharging projectiles weighing 100 pounds each, with a muzzle velocity of not less than 2,000 feet per second.

No gun or casting for a gun will be paid for until the gun "shall have been completed and have successfully stood the statutory test required by the act of July twenty-sixth, eighteen hundred and eighty-six," entitled "an act making appropriations for the naval service for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes."

Proposals may be made separately for one or more guns or for one or more castings as aforesaid, but no proposal will be considered unless accompanied by satisfactory evidence that the bidder controls a plant adequate to the production of the gun or guns, casting or castings, which he proposes to furnish.

Each successful bidder will be required to execute, within fifteen days after notice of award, a formal contract in accordance with his proposal, and to furnish a bond, with satisfactory sureties, in a penal sum equal to fifteen per cent. of the amount of his bid, conditioned for the faithful performance of such contract.

Copies of the specifications, with blank forms of proposals, and all additional information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

All proposals must be in duplicate, inclosed in envelopes marked "Proposals for Steel-cast Cannon," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

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

WILLIAM C. WHITNEY,
Secretary of the Navy.

Proposals for Steel Gun Forgings for the Navy.

NAVY DEPARTMENT,
WASHINGTON, *June* 4, 1887.

Sealed proposals from domestic manufacturers of steel, to furnish ten sets of steel forgings for 6-inch B. L. rifle guns and one set of chase—hoops for a 10-inch B. L. rifle gun, all oil-treated, annealed, and in accordance with drawings and specifications prepared in the Bureau of Ordnance, will be received at the Navy Department until Wednesday, the 6th day of July, 1887, at 12 o'clock noon, at which time the proposals will be opened.

The kinds of forgings required and the estimated quantity of each, the aggregate being about sixty-five tons, are stated in blank forms of proposal, which together with copies of said drawings and specifications, may be obtained on application to the Bureau of Ordnance, Navy Department.

Prices per ton of 2,240 pounds must be stated in the proposals, which must be made on forms furnished by the Department. Proposals will include, in addition to items embracing all the work required in the manufacture of the forgings as specified, separate items for *tubes, jackets*, and *trunnion bands* to be rough-bored and turned by the Department. In case the Department shall find it advantageous to have that part of the work done at the Navy Yard, Washington, D. C., such forgings will be delivered by the contractor before roughing, the Department paying freight to and from the Navy Yard, and the rough-bored and turned forgings will be returned to the contractor, F. O. B. at his works.

The contract will be awarded for the forgings as a whole. No proposal for less than the whole will be entertained; nor will any proposal be considered unless accompanied by satisfactory evidence that the bidder is in possession of a plant adequate to the production and delivery of the required forgings. All forgings delivered under the contract must conform in material, manufacture, and quality to the aforesaid drawings and specifications, and must successfully pass the required inspection and tests.

The successful bidder will be required, within ten days after notice of award, to enter into a formal contract binding himself to deliver one set of gun forgings within sixty days from the date of the contract, and not less than one set every twenty-one days thereafter, and to complete the deliveries within nine months from the date of the contract. A bond with sufficient sureties in a penal sum equal to fifteen per cent of the total contract price must accompany the contract.

Blank forms of contract and all additional information desired can be obtained on application to the Bureau of Ordnance, Navy Department.

Each proposal must be accompanied by a certified check, payable to the order of the Secretary of the Navy, in an amount not less than five per cent of the total amount of the bid. Checks of unsuccessful bidders will be returned within five days after the bids are opened. The check of the successful bidder will be returned when he shall have executed the formal contract and furnished the requisite bond; in case of his failure to comply with this stipulation, the check will become the property of the United States.

All proposals must be in duplicate, enclosed in envelopes marked "Proposal for Steel Gun Forgings," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

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

WILLIAM C. WHITNEY,
Secretary of the Navy.

Proposals for Iron Floating Gate or Caisson.

NAVY DEPARTMENT,
BUREAU OF YARDS AND DOCKS,
WASHINGTON, D. C., June 7, 1887.

Sealed proposals, addressed to the Chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C., indorsed "Proposals for Floating Gate," will be received at this bureau by the undersigned until one o'clock p. m. of Thursday, the thirtieth day of June, 1887, at which time and place the proposals will be opened in the presence of bidders for furnishing the necessary labor and material for the construction of an iron floating gate, or caisson, for the dry dock at the Navy Yard, Boston, Mass.

Plans of the floating gate, or caisson, and all attachments pertaining thereto, can be seen and copies of specifications and instruction to bidders obtained by applying to the Bureau of Yards and Docks, Navy Department, the Civil Engineer's office at the Navy Yard, Boston, Mass., or at Navy Pay Office, cor. Broadway and Chambers Street, Stewart Building, New York city.

The bureau reserves the right to reject any or all bids that may not be deemed advantageous to the government. No proposal will be considered unless accompanied by the prescribed bond which forms a part of the same.

D. B. HARMONY,
Chief of Bureau.

EDUCATION OF THE AMERICAN Citizen.—A lecture by Prof. R. H. Thurston on the theme: "How may we best aid in those mighty social movements and those tremendous political changes which mark the mighty progress of the race toward a better and a more prosperous future?" Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **524.** Price 10 cents. To be had at this office and from all newsdealers.