

SCIENTIFIC AMERICAN

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BELL'S PHOTOPHONE.

During a recent visit to Paris, Professor Graham Bell favored *La Nature* with an extended account of the investigations and discoveries which led to and resulted from his late remarkable invention, the photophone. He also supplied our scientific contemporary with certain details not previously made public, together with drawings of his apparatus and experiments, the engravings of which we here reproduce, with *Nature's* translation of the text.

Our readers are already aware that the object of the photophone is the transmission of sounds both musical and vocal to a distance by the agency of a beam of light of varying intensity; and that the first successful attempts made by Prof. Bell and his co-laborer, Mr. Sumner Tainter, were based upon the known property of the element selenium, the electric resistance of which varies with the degree of illumination to which it is exposed. Hence, given a transmitting instrument, such as a flexible mirror, by which the vibrations of a sound could throw into vibration a beam of light, a receiver, consisting of sensitive selenium, forming part of an electric circuit with a battery and a telephone, should suffice to translate the varying intensities of light into corresponding varying intensities of electric current, and finally into vibrations of the telephone disk audible once more as sound. This fundamental conception dates from 1878, when in lecturing before the Royal Institution Prof. Bell announced the possibility of hearing a shadow fall upon a piece of selenium included in a telephone circuit. The photophone, however, outgrew the particular electrical combination that suggested it; for not the least of the remarkable points in this research is the discovery that audible vibrations are set up in thin disks of almost every kind of material by merely throwing upon them an intermittent light. With the photophone as with the telephone, there are instruments of different degrees of perfection. The original telephone of Philip Reis could only transmit musical tones, because it worked by rapid abrupt interruptions of the electric current; while the articulating telephone of Graham Bell was able to transmit speech, since by its essential construction it was able to send undulating currents to the distant receiving station.

We may in like manner classify the forms of photophone under two heads, as (1) articulating photophones, and (2) musical photophones.

Up to the present time, Prof. Bell informs us, the simple receiving disk of ebonite or hard rubber has only served for a musical photophone; the reproduction of the tones of the voice by its means has not yet been demonstrated in practice—at least to his satisfaction. For while it produces unmistakable musical tones by the direct action of an intermittent light, in the experiments made hitherto with articulating speech the instruments

have by necessity been so near to one another that the voice of the speaker was audible through the air. Under these circumstances it is extremely difficult to say whether the sounds that are heard proceed from the diaphragm, or whether they merely come through the air to the ear, and if they come from the diaphragm, whether they are really the result of the varying light, and not mere sound vibrations taken up by the disk from the speaker's voice crossing the air. Prof. Bell hopes soon to settle this point, however, by appeal to experiment on a larger scale with the receiving

as an electric lamp, falls upon a mirror, M, and is reflected through a large lens, L, which concentrates the rays to a focus. Just at the focus is interposed a disk pierced with holes—forty or so in number—arranged in a circle. This disk can be rotated so that the light is interrupted from one to five or six hundred times per second. The intermittent beam thus produced is received by a lens, T, or a pair of lenses upon a common support, whose function is to render the beam once more parallel, or to concentrate it upon the disk of ebonite placed immediately behind, but not quite touching them. From the disk a tube conveys the sounds to the ear. We may remind our readers here that this apparent direct conversion of light into sound takes place, as Prof. Bell found, in disks of all kinds of substances—hard rubber, zinc, antimony, selenium, ivory, parchment, wood—and that he has lately found that disks of carbon and of thin glass, which he formerly thought exceptions to this property, do also behave in the same way. We may perhaps remark without impropriety that it is extremely improbable that the apparent conversion of light into sound is by any means a direct process. It is well known that luminiferous rays, when absorbed at the surface of a medium, warm that surface slightly, and must therefore produce physical and molecular actions in its structure. If it can be shown that this warming effect and an intermediate cooling by conduction can go on with such excessive rapidity that beams of light falling on the surface at

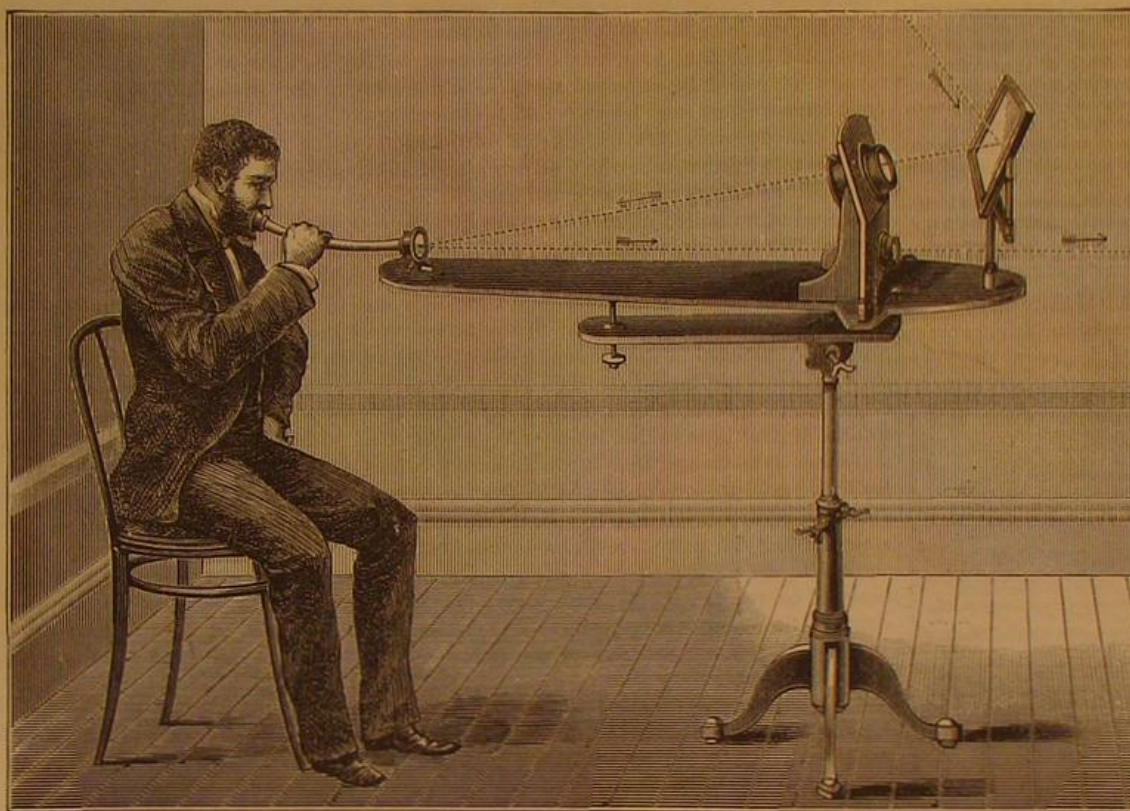


Fig. 5.—THE ARTICULATING PHOTOPHONE—THE TRANSMITTER.

and transmitting instruments at greater distances apart, and with glass windows in between to shut off all sounds.

In Fig. 1 we illustrate the simple musical photophone of Bell and Tainter. It might perhaps be described without injustice as an optical siren, producing sounds from intermittent beams of light, as the siren of Cagniard de Latour produces them from intermittent puffs of air. A beam of light from the sun or from a powerful artificial source, such

intervals less than the hundredth of a second apart produce a discontinuous molecular action of alternate expansion and contraction, then the mysterious property of matter revealed by these experiments is accounted for.

However this may be, the musical photophone, as represented in Fig. 1, produces very distinct sounds, of whose existence and dependence for their production on the light the listener may satisfy himself by cutting off the light at

any moment with the little opaque disk fixed on the end of the little lever just in front of the holes in disk, R, and which can be worked by a Morse key like a telegraph instrument, thus producing at will alternate sounds and silences. With this musical photophone sounds have been carried by an interrupted beam of light for a distance exceeding a mile; there appears, indeed, no reason why a much greater range might not be attained.

The articulating photophone is that to which hitherto public attention has been most largely directed, and in which a selenium receiver plays a part. Fig. 2 gives in diagram form the essential parts of this arrangement. A mirror, M, reflects a beam of light as before through a lens, L, and (if desired for the purpose of experimentally cutting off the heat rays) through a cell, A, containing alum water, and casts it upon the transmitter, B. This transmitter, shown again in



Fig. 6.—THE ARTICULATING PHOTOPHONE—THE SELENIUM RECEIVER.

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PATENT ROYALTIES ON SHOE MACHINERY.

The shoe manufacturers of the United States, or at least a considerable proportion of them, have lately been finding fault with our patent laws and the way in which they are enforced, without, as we conceive, a just apprehension of the grounds on which their complaint is based. They recently held a National Convention of the trade in Philadelphia, for the discussion of this question, and matters related thereto, during the progress of which, notwithstanding that many untenable propositions were made, and very extreme opinions were put forward by individual members, it must be allowed that great good sense was manifested, the conclusions reached pointing in what was perhaps the only direction from which practically beneficial results might be reached.

For some years past it has been an extremely unpopular and up-hill work to endeavor to sell to shoe manufacturers a machine for which a royalty was charged on the work done to cover the rights of the patentee. There were many in the trade, including some of its most influential members, who took the position that, for any machine that was of decided advantage to them, they would be willing to pay a sufficient round sum down, and then be the owners thereof, to use as they saw fit, while they did not believe it was possible to offer them a machine the payment for the patent rights in which was to be made on the basis of a specified tax for each pair of shoes produced. There are, of course, two sides to this question. There are many manufacturers who would not be able to purchase outright a machine covering the introduction of valuable patents, but who would find it no tax, comparatively speaking, to pay such royalty as would be enforced upon all other users of the same improvement, and hence would become a regular item in the cost of production in all goods of the kind. In this way the royalty system, where all are taxed alike, places the small manufacturer on an equal basis with the producer possessed of unlimited means. Perhaps quite as common a ground, however, for the adoption of the royalty system in the introduction of any particular patented improvement, is the skepticism with which new inventions are sometimes looked upon when first brought to the attention of those practically engaged in the particular industry for which the improvements are intended. The old workmen are prejudiced against and look with distrust upon the innovation, so that, if they give to the inventor any credit at all, their allowance is so meager that it would hardly afford a basis for fixing any proper compensation for the improvement, and even this concession is frequently accompanied by the assertion that the patent is for something not new, or not entitled to the protection of a patent. The last question must, of course, always go to the courts for final decision, although the patent itself is prima facie evidence of its own validity. But the manufacturer who takes a machine on trial, the patentee to be paid by royalties, seldom binds himself to pay anything for the improvement unless he finds it valuable to him; in other words, he need not produce his goods with its aid, but may keep on according to his old methods, and so be free from all royalty payments. In this way many of the most valuable patented improvements have been introduced, and, with a little practice and the removal of first prejudices, been made to work successfully, the tax at first being so light as to seem insignificant. The inventor, in fact, has been to all the expense of perfecting his machine, device, or process, overcoming objections thereto, and proving its practical success, before obtaining any return for his outlay, and, therefore, according to all business principles, is entitled to a proportionate reward. There are many inventors and patentees who have traveled this road to meet failure only; many more have achieved a fair degree of success; the few who have won the grand prizes can be counted on the finger ends.

The boot and shoe trade affords one conspicuous instance of the splendid success of a patented improvement, as exemplified in the sole-sewing machine. It was only by a long course of experiment and the investment of a great deal of money that it was perfected; it did not easily obtain a first introduction, so the system of putting it in factories, and allowing the manufacturers to pay for its use a small royalty per pair of shoes made, was the only one then thought practicable, and certainly was at the time eminently satisfactory to the trade. Under the able management of one who was as accomplished a mechanic as he was a shrewd business man, the machine almost revolutionized the boot and shoe manufacture, and has yielded magnificent profits to the patentee. This triumph, however, gave a strong encouragement to other patentees to adopt the royalty system, and the number has become so great as to cause much opposition to royalties in the trade; and this was a principal topic of discussion at the late convention in Philadelphia. The prime object in calling the meeting was to consult in regard to how much longer the royalties must be paid on the sole-sewing machine.

We noticed, a few weeks ago, the decision of Judge Blatchford, virtually affirming that the patents would hold good, and royalties thereon be collectible, till next August, but there are many in the trade who were not disposed to accept this as final. Ample discussion at the convention, however, showed the doubtful utility of any further contest on this point, as the representatives of the sole-sewing machine patents made it too clearly evident that they had the law on their side. Great as had been their profits, it was not denied that they had done a vast deal for the prosperity of the trade, particularly among small manufacturers;

but while they now stood, as a strong corporation, ready and able to meet the issues at law with the manufacturers, they were willing to confer and negotiate in regard to such future royalties as had not been decided upon in their favor by the courts. The convention thereupon appointed a committee of representative manufacturers to take charge of such negotiations, not only with this company, but with all others owning patents which were paid for by royalties, with power to commence legal proceedings should they deem such course advisable.

Patentees generally can certainly have no objections to negotiations looking to a settlement in cash in lieu of royalties for their rights, and such moderate action on the part of the convention is far more sensible than it would have been for its members to rush blindly into expensive and almost interminable litigation.

THE PRALL SYSTEM OF HEATING.

During their recent convention in this city the members of the American Society of Civil Engineers were entertained by the Prall Union Heating Company. The dinner was cooked throughout by superheated water; and whatever may have been the cost on the relative economy of the system, the cooking was accepted as unquestionably satisfactory.

That bread can be baked and meat roasted by hot water may seem quite incredible to those who think of boiling water only as commonly seen in open vessels. Under atmospheric pressure water can be heated no higher than 212°, far below a roasting temperature. But when confined there is no limit to the temperature it may receive save the weakness or strength of the containing vessel.

The Union Heating Company propose to supply heat and power to houses by a system of pipes circulating water heated under pressure to about 376°, that is, a pressure of about 160 pounds above the atmosphere. In being conveyed a mile in boxed pipes, under ground, the water, it is claimed, loses not more than 1°, so that a temperature of 375° can be maintained in the pipes of a cooking range, a heat sufficient for all culinary purposes. The heating of houses can be effected either by air currents circulating around hot-water coils, or by means of steam radiators, the hot water being converted into steam in small converting chambers.

In the operation of the system, central boiler stations will be established in districts of about one square mile area. The pipes conveying the superheated water from the central station and back again, are laid in the same trench, and are so connected as to allow a forced circulation. The return pipe conveys to the generator all the water not drawn off for domestic or other purposes, thereby saving all the heat not available for heating purposes or for steam power.

The alleged advantages of this system of circulating superheated water over systems of steam heating consist in the smaller size and cost of the service pipes; in the smaller loss of heat by radiation and condensation, owing to the smallness of the pipes; and the saving of fuel through the return of all the unused condensed water to the central generator.

At the trial station at 135th street about 3,000 feet of pipe have been laid. The water to be circulated is heated to about 342°, and is said to be driven through the system at such a rate that no water is allowed to be more than fifteen minutes away from the boiler. It is estimated that two or three cubic feet of water an hour will suffice for heating an ordinary city house, and that the cost to consumers will be much less than with any other system of heating. To determine this, however, we are inclined to think that something more than brief experimental trials, under the management of the company's engineers, will be necessary. However promising a system may be theoretically, serious difficulties are apt to be encountered when it is put to the test of practical use at the hand of ignorant and unskillful servants. In the ordinary use of steam at low pressure for domestic purposes, leaking joints and valves are a source of constant trouble; much more must they be troublesome, under a pressure four or five times as great. At any rate the successful use of superheated water in the way proposed will necessitate a style of valve making and steam fitting marvelously better than builders and house owners are able to obtain now.

THE RESTORATION OF OUR COMMERCIAL AND NAVAL MARINE.

No question before the American people to-day presents so wide a range of problems of national interest, so many problems having a direct and vital bearing on the prosperity and security of the country as a whole, as that which seeks an answer in the restoration of the United States to their former and proper place among the commercial and naval powers.

Our industrial interests cry aloud for a reconquest of the sea by a commercial marine flying the Stars and Stripes. The security of our coasts, not less than the protection of the mercantile fleets which our enterprising traders are bound to set afloat before another generation passes, demands the speedy building of a navy commensurate in magnitude, capacity, and power, with our position as a nation among the ruling nations of the civilized world. The universal reign of arbitration and international peace is yet a long way off; and it will not do for the wealthiest country of the world to leave her great depositories of wealth open to sudden incursions from powers less peacefully inclined. Besides the consciousness of insecurity inseparable from a lack of means

of defense may cost in comfort if not in cash more than the needed defenses would.

We may take it for granted, therefore, that the American people, now that they are comparatively free from pressing demands upon their thought and means arising from internal complications, and now that they have become pretty generally aroused to a sense of their maritime weakness, will pay to naval affairs henceforth that attention which can mean nothing less than ultimate supremacy in this direction. When the American people make up their minds to do a thing it is done, and usually on a scale that is not niggardly or mean.

At this juncture it is timely, to say the least, to inquire what the rest of the world has been doing in naval matters during the period of our naval quiescence. We shall find, as will be shown elsewhere, that other nations have not been idle; indeed, the past ten or fifteen years have covered a period of greater activity in naval affairs than any corresponding period in the history of navies.

Within this period, as has been so forcibly expressed by Chief Engineer King, in his splendid work on the war ships and navies of the world, "all the navies of Europe have been undergoing reconstruction, while those of Asia and South America have been in great measure created. Never has there been a period in time of peace when such large expenditures were being made for naval purposes as at present, and never a period in the history of steam screw navigation when such radical changes were being effected in the construction of ships of war, in the mechanism of steam propulsion, and in the application of machinery to various purposes on board ship hitherto accomplished by hand. Never before have such vast strides been made in so short a time in the fabrication of great guns for naval warfare, necessitating, of course, the introduction of new mechanical appliances for working them; while the development of torpedo warfare and the newly invented methods of operating those dangerous weapons, promise to add to future maritime contests an element hitherto almost unknown."

In all this activity there has been a large measure of progress; chiefly, however, along lines of improvement first marked out by American inventors; a fact clearly recognized by Mr. King in his concluding chapter on the needs of our navy. The beautiful outlines of American fast sailing vessels were copied in Europe. The first warship propelled by the screw was built in Philadelphia. Shell fire and subsequently heavy guns were first introduced here. The torpedo is an American invention, and so is the revolving turret for vessels of war. It remained, adds Mr. King, for European naval powers, having large appropriations at command, to develop and expand American inventions. The ideas for the present powerful mastless sea-going armored ships of the English grew out of the visits of our turret vessel Miantonomoh to British ports; and the unarmored fleet of fast ships, of which the Inconstant was the first in Europe, owe their development to the building of the Wampanoag.

It is not to be presumed that an approach has been made to the limit of possible improvement in war vessels and their equipment. And there is every reason to anticipate that when American inventors and shipbuilders again turn their attention to naval problems, the radical and daring novelties which made America the pioneer in the creation and development of the several types of modern war vessels and their equipment in use to-day, will be more than paralleled in the evolution of the war vessel of the future. In any case we shall have the advantage of the knowledge gained during the progress of the costly experiments made in Europe during recent years, both in teaching what to do and what to avoid, and our advancement should be correspondingly sure and rapid.

If we could be certain that our present peaceful career will continue unbroken—as we hope it may—for another score of years, some justification might be found for a continuance of the policy of inaction. Indirectly we cannot fail to be benefited by all the improvements, and the failures as well which Europe is making at such heavy cost in naval construction and armament, provided the improvements are not suddenly turned against us while we are unprepared to meet them. To rest, however, on such a precarious ground for idleness would be sheer foolishness, when we know that our coast defenses are antiquated and practically worthless for protection against a heavily armed and armored foe.

It is true that modern wars are not apt to be suddenly declared, and that much might be done in a few months to put our coast in a fair condition of defense. Still it must be borne in mind that many months are required for the construction of powerful cannon and fortresses, whether fixed or floating; and when the emergency comes we may not be called upon to meet a slow moving and honorable enemy, but a gang of dashing and irresponsible private adventurers, who might sail into any of our sea ports any day with a vessel so strong as to enable them to destroy property or levy tribute to a larger amount than the cost of a great navy.

That there is any need of our emulating England and France and Italy in the construction of enormous sea-going iron clads, costing millions each, is not at all apparent. Indeed it may rather seem that the line of experiment in that direction has already been pushed to the utmost extreme, and that the new conditions of naval warfare, as developed in great guns, torpedoes, and so on, demand a radically new departure in naval architecture. In any case it becomes our national government to make provision for such action in our public and private navy yards as shall invite our ship-

builders and inventors to show what American genius can do to meet our peculiar needs in this direction.

ELECTRO-BRASS PLATING.

Many articles of bronze composition, of zinc, or cheap alloys receive a coating of brass by electric deposition, as a basis for the bronze luster, which is more easily applied and better retained by such a surface. The brass finish is also applied by this method to iron, steel, and composition wire.

The preliminary and finishing operations and the disposition of the baths are the same for brass as for copper deposits. Heat is applied for brass deposits by those who electroplate coils of iron of composition wire, etc., with this alloy. For other articles the baths used are not usually heated. The hot bath is usually contained in an oblong open iron boiler lined with sheet brass, while that for cold plating is generally placed in a wooden tank coated with gutta percha or asphaltum. The anodes are of plate or sheet brass joined together and arranged along the sides, all connected with the last carbon or copper of the same battery. The strength of battery current is regulated by the surface of the articles to be electroplated. The articles are suspended in the usual way—by copper or brass hooks to stout rods of the same metal, all connected with the last zinc of the battery.

THE BRASS BATHS.

Where the ordinary cheap commercial cyanide is employed the following answers very well:

Sulphate of copper	4 oz.
Sulphate of zinc	4 to 5 oz.
Water	1 gall.

Dissolve and precipitate with 30 ounces carbonate of soda; allow to settle, decant the clear liquid, and wash the precipitate several times with fresh water—after as many settlements. Add to the washed precipitates:

Carbonate of soda	15 oz.
Bisulphite of soda	7½ oz.
Water	1 gall.

Stir to effect solution of these last two, then stir in ordinary cyanide of potassium until the liquid becomes clear and colorless. Filter if much iron or iron oxide (derived from impure zinc salt and cyanide) remains suspended in the liquid. An additional half ounce or so of the cyanide improves the conductivity of the solution.

COLD BRASS BATH FOR ALL METALS.

Carbonate of copper (recently prepared)	2 oz.
Carbonate of zinc	2 "
Carbonate of soda	4 "
Bisulphite of soda	4 "
Cyanide of potassium (pure)	4 "
Arsenious acid	1½ "
Water	1 gall.

Filter if necessary.

The arsenious acid is added to brighten the deposit—an excess is apt to give the metal a grayish-white color.

MANAGEMENT OF THE BATH.

The losses of the bath are to be repaired by the addition of copper and zinc salts (and arsenious acid) dissolved in fresh cyanide, and water.

The operator determines the requirements from the rapidity of the deposit, its condition, color, and so on.

The difficulty in brass electroplating, especially with small baths, is in keeping the uniformity of the color of the deposit, as the electric current having to decompose two salts, each offering a different resistance, must, according to its intensity, vary the color and composition of the deposit. A feeble current principally decomposes the copper salt and results in a red deposit; while too great intensity in the current decomposes the zinc salt too rapidly and the deposit is a white or bluish-white alloy. If the deposit has an earthy or ocherous appearance, or if the liquid is blue or greenish, the solution is deficient in cyanide. When in proper working order the liquor is colorless. If the coating becomes dull and unequal, a slight addition of arsenious acid will usually improve it.

If the deposit is too red, use more battery power or add more zinc salt; if too white, decrease the current or add more copper salt. The specific gravity of the bath may vary from 5° to 12° Baumé; when it exceeds this latter gravity it should be diluted with fresh water to decrease the electric resistance.

If the brass deposit is irregular, remove the articles from the bath, rinse, scratch brush, and put again into the bath until the color and thickness of the deposit are satisfactory. Scratch-brush again, and, if necessary, rinse in hot water, dry in warm white wood sawdust, and put in the stove room. The last three operations are indispensable for hollow pieces.

In the disposition of the brass plating bath it is always necessary to have all the articles suspended at about equal distances from the anodes.

The bath may be subdivided by several anodes, forming partitions, so that each loaded rod is between two anodes.

The anodes should always be removed when the bath is not in use.

In order that the brass electroplating of zinc or copper may be lasting the deposit must not be too thin, and must be scratch-brushed, washed in lime water, and dried in the stove room.

Generally ten to twenty-five minutes' exposure in the bath suffices in ordinary practice to throw on a good coating. Cast and wrought iron, lead, and its alloys require a bath richer in the metals than when brass plating zinc or its alloys.

The battery power should also be greater. For lead the bath works better warm (at about 90° Fah.). When once placed in the brass bath articles should not be moved about, as there is a tendency under such circumstance to the formation of a red deposit.

In brass plating wire the hot bath is usually employed. As before mentioned, the vessel containing the bath usually consists in an oblong open iron boiler, lined with sheet brass anodes, and heated by fire, steam, or hot water. A stout copper or brass rod in the direction of the length of the boiler rests upon the edges, from contact with which it is insulated by pieces of rubber tubing. The rod is connected with the zinc pole of the battery. The binding wires are removed from the coil, the wires loosened, and the ends bent together into a loop. The wire is then dipped into a pickle of dilute sulphuric acid, and hung upon a stout round wooden peg fastened in the wall, so that the coil may be made to rotate easily. After a scrubbing with wet sharp sand and a hard brush the coil is given a primary coating of copper. It is then suspended to the horizontal rod, where only a part of the coil at a time dips into the solution and receives the deposit; the coil is then turned now and then one-half or one-fourth of its circumference. By dipping the coil entirely into the liquid the operation is not so successful.

The wires are washed, dried in sawdust, and then in the stove room, and lastly, passed through a draw plate to give them the fine polish of true brass wires.

The temperature at which the hot bath is commonly used varies between 130° and 140° Fah.

Progress of the Great Bridge Between New York and Brooklyn.

The first shipment of the heavy steel beams for the superstructure of the East River Bridge has been received. Now that the requisite machinery has been made for turning out beams of the required size, the contractors claim to be able to produce them rapidly. The four great cables to be placed under the floor of the bridge from tower to tower, to strengthen the bridge against upward and lateral wind pressures, have also been received. They are regarded as the largest steel wire ropes ever made in this country. These ropes are made in seven strands each.

The central strand has forty-nine No. 11 wires, and the six strands surrounding and enveloping this have nineteen wires each, of Nos. 4, 5, and 7 gauge, making one hundred and sixty-three wires in all. Every wire put into these and all other ropes used in the bridge is tested in strength, elasticity, and tension. The strength must equal 160,000 pounds per square inch cross section. The stretch must be not less than four per cent, and the wire must stand being wound around an iron rod three times its own diameter without showing flaw or fracture.

The great ropes just received are each 1,550 feet in length, 3 inches in diameter, and their aggregate weight is 102,495 pounds.

Death of Henry R. Worthington.

Henry R. Worthington, one of the most prominent hydraulic engineers in this country, died Dec. 17, 1880, in this city, after a very brief illness, at the age of 63 years.

Mr. Worthington was a native of Brooklyn. He engaged in mechanical pursuits at an early age, and became a hydraulic engineer while a very young man. His success in his profession was marked, and he invented a number of important improvements in hydraulic machinery. He constructed the pumping machinery for the waterworks of a great many cities, including that for the new high service works at 97th street and Tenth avenue. He maintained an office at No. 239 Broadway, and was also President of the Nason Manufacturing Company, at No. 71 Beekman street.

He was Vice President of the American Society of Mechanical Engineers, which he assisted to found, and was a member of the Society of Civil Engineers.

The Freight Traffic of the N. Y. Central R. R.

The unprecedented activity of trade this fall is indicated by the unusual traffic of the great lines of railway. During the forepart of December 50 trains, of 38 cars each, passed eastward over the road; a total of 1,900 cars. For the West there was 40 trains, of 45 cars, per day; a total of 1,800 cars. For a week, going East, 13,800 cars; going West, 12,600 cars; a grand total of 26,400 cars. For a month, going East, 57,000 loaded cars; for the West, 54,000; a grand total of 111,000 cars for a month. These statistics are aside from the passenger traffic.

Mount Baker an Active Volcano.

On several occasions during recent years reports have come from Washington Territory that smoke columns and similar indications of volcanic activity had been seen on Mount Baker. A dispatch from Seattle, W. T., dated December 12, says that the mountain was then in eruption, and that a sharp shock of earthquake was felt the evening before.

THE AIR BRAKE PATENTS.—The suit brought by the Westinghouse Company against the Eames Vacuum Brake Company, of Watertown, N. Y., for an alleged infringement of air brake patents, was abandoned December 16, Westinghouse withdrawing the action and paying the costs.

THE ELECTRIC RAILWAY.—Messrs. Siemens and Halske have obtained a concession from the authorities for building an elevated electric railway in Berlin from Lichterfeld to Yelow.

BELL'S PHOTOPHONE.

[Continued from first page.]

Fig. 5, consists of a little disk of thin glass, silvered on the front, of about the size of the disk of an ordinary telephone, and mounted in a frame, with a flexible India-rubber tube about sixteen inches long leading to a mouthpiece. A second lens, R, interposed in the beam of light after reflection at the little mirror, renders the rays approximately parallel. The general view of the transmitting apparatus given in Fig. 5 enables the relative sizes and positions of the various parts (minus the alum cell, which is omitted) to be seen. The screw adjustments of the support serve to direct the beam of light in the desired direction.

It may be well to explain once for all how the vibrations of the voice can affect the intensity of the reflected beam far away. The lenses are so adjusted that when the mirror, B, is flat (that is, when not vibrating) the beam projected from the apparatus to the distant station shall be nearly focused on the receiving instrument. Owing to the optical difficulties of the problem it is impossible that the focusing can be more than approximate. Now, matters being thus arranged, when the speaker's voice is thrown against the disk, B, it is set into vibration, becomes alternately bulged out and in, and made slightly convex or concave, the degree of its alteration in form varying with every vibration of the voice. Suppose at any instant—say by a sudden displacement such as takes place when the letter "T" is sounded—the disk becomes considerably convex; the beam of light will no longer be concentrated upon the receiving instrument, but will cover a much wider area. Of the whole beam, therefore, only a relatively small portion will fall upon the receiving instrument; and it is therefore possible to conceive that, if perfectly adjusted, the illumination should be proportional to the displacement of the disk, and vary, therefore, with every vibration with the utmost fidelity. The receiver of the articulating photophone is shown on the right hand side of the diagram (Fig. 2) sketched by Prof. Bell. A mirror of parabolic curve, C C, serves to concentrate the beam and to reflect it down upon the selenium cell, S, which is included in the circuit of a battery, P, along with a pair of telephones, T and T'. Here again a general view like that given in Fig. 6 facilitates the comprehension of the principal parts of the apparatus. The sensitive selenium cell is seen in the hollow of the parabolic mirror, which is mounted so as to be turned in any desired direction. The battery standing upon the ground furnishes a current which flows through the selenium cell and through the telephones. When a ray of light falls on the selenium—be it for ever so short an instant—the selenium increases in conductivity, and instantly transmits a larger amount of electricity, and the observer with the telephones hears the ray, or the succession of them—hears, indeed, their every fluctuation in a series of sounds which, since each vibration corresponds to a vibration of the voice of the distant speaker, reproduce the speaker's tones.

The great difficulty to be overcome in the use of the selenium as a working substance arose from its very high resistance. To reduce this to the smallest possible quantity, and at the same time to use a sufficiently large surface whereon to receive the beam of light, was the problem to be solved before any practical result could be arrived at. After many preliminary trials with gratings and perforated disks of various kinds, Prof. Bell and Mr. Tainter finally settled upon the ingenious device to be described. A number of round brass disks, about two inches in diameter, and a number of mica disks of a diameter slightly less, were piled upon one another so as to form a cylinder about two and a half inches in length. They were clamped together from end to end, the clamping rods also serving to unite the disks of brass electrically in two sets, alternate disks being joined, the 1st, 3d, 5th, etc., being united together, and the 2d, 4th, 6th, etc., being united in another series. This done, the edges between the brass disks were next filled with selenium, which was rubbed in at a temperature sufficiently high to reach the melting point of selenium. After this the selenium was carefully annealed to bring it into the sensitive crystalline state. Then the cell is placed in a lathe and the superfluous

selenium is turned off until the edges of the brass disks are bared. Fig. 3 shows, in section, the construction of such a shell. Prof. Bell has also used cells in which the selenium filled only the alternate spaces between disks, the intermediate spaces being occupied by mica disks of equal diame-

great interest, especially to those who desire to repeat for themselves the experimental transmission of sound by light. The greatest distance to which articulate speech has yet been transmitted by the selenium cell-photophone is 213 meters, or 233 yards. When sunlight is not available recourse must be had to an artificial source of sufficient power. During the recent experiments made by Prof. Bell, in Paris, the weather has been adverse, and the electric light has been called into requisition in the ateliers of M. Breguet. The distance in these experiments between the transmitting diaphragm, B, and the parabolic reflector, C C, of the receiver was fifteen meters, the entire length of the room in which the experiments were made. Since at this distance the spoken words were themselves perfectly audible across the air, the telephones connected with the selenium cell were placed in another apartment, where voices were heard without difficulty and without doubt as to the means

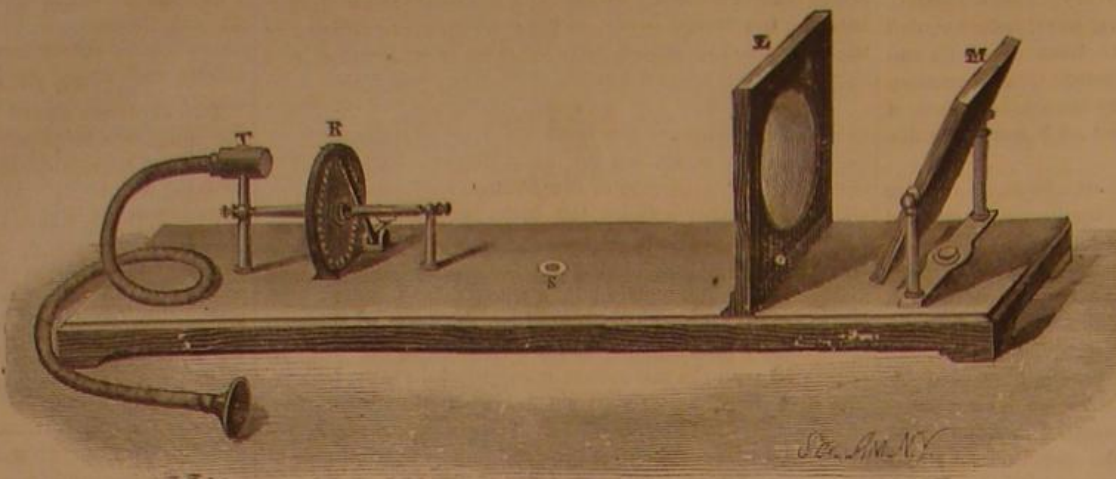


Fig. 1.—THE MUSICAL PHOTOPHONE.

ter with the brass disks. But this arrangement was in no way preferable, for in practice it was found that moisture was apt to penetrate at the surface of the bare mica, spoiling the effect.

Fig. 4 is a diagram which simply illustrates the action of

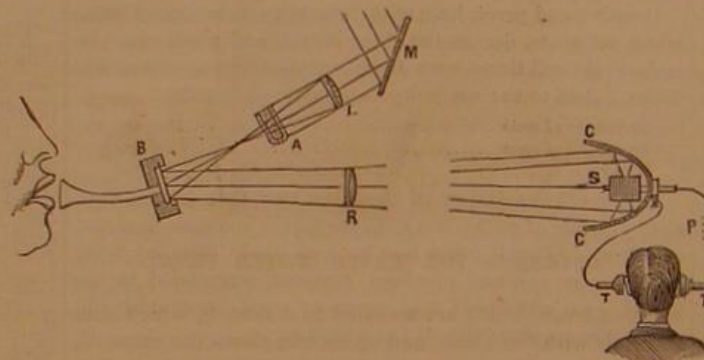


Fig. 2.—THEORETICAL DIAGRAM OF THE ARTICULATING PHOTOPHONE.

the selenium receiver, and shows, first, the way of connecting the alternate disks; and, secondly, that the current from the battery, P, cannot go round the telephone circuit without passing somewhere through selenium from one brass

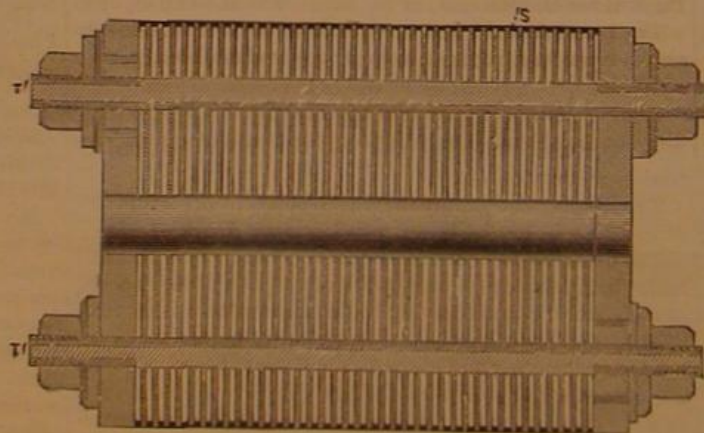


Fig. 3.—SECTION OF THE SELENIUM RECEIVER.

disk to the next. The special advantages of the "cell" devised by Prof. Bell are, that in the first place the thickness of the selenium that the current must traverse is nowhere very great; that in the second, this photo electrical

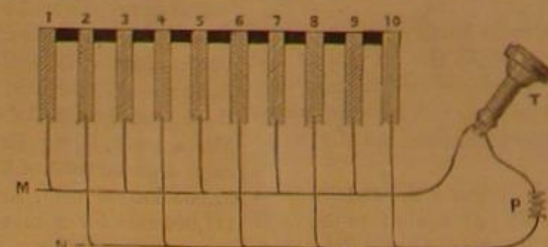


Fig. 4.—Diagram showing the action of the Selenium Receiver.

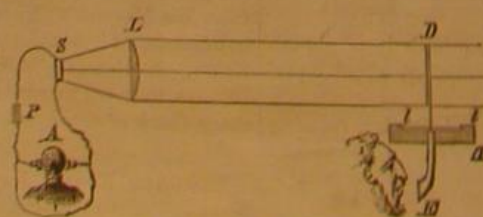


Fig. 5.—Condenser Receiver.

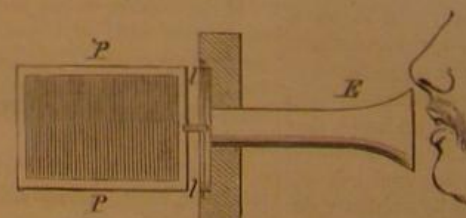


Fig. 6.—Slotted Transmitter.

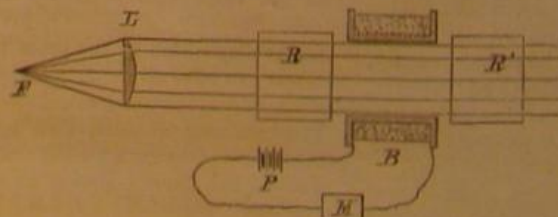


Fig. 7.—Polarized Light Transmitter.

action of light on selenium being almost entirely a surface action, the arrangement by which all the selenium used is a thin surface film could hardly be improved upon; and that, thirdly, the symmetry of the cylindrical cell specially adapts it for use in the parabolic mirror. These details will be of

of transmission. The transmitter shown in Fig. 7 consists of a fixed plate, P, provided with numerous slots and of a like movable plate attached to the diaphragm, D, mounted in a frame provided with a mouthpiece, E. The vibration of the movable plate varies the intensity of the light passing through it.

In Fig. 8 the transmitter is shown as used in combination with a collecting lens, L, in place of the parabolic reflector. In Fig. 9 a transmitter is shown which is based upon the effect of electricity on polarized light. A lens, L, throws the beam of a light, F, upon a Nicol polarizing prism, R, and the polarized beams traverse an analyzer, R'. A helix, B, is placed between the two prisms and in the circuit of an ordinary microphone, M. By speaking, the intensity of the current traversing the helix is varied, and this causes the plane of polarization of the rays to be turned more or less, and consequently more or less rays are extinguished by the analyzer, R'.

Of the earlier and less perfect forms of the photophone little need be said. One device, which in Prof. Bell's hands worked very successfully over a distance of eighty-six yards, consisted in letting the beam of light pass through a double grating of parallel slits lying close to one another, one of which was fixed, the other movable and attached to a vibrating diaphragm. When these were placed exactly one in front of the other the light could traverse the apparatus, but as the movable grating slid more or less in front of the fixed one, more or less of the light was cut off. Speaking to the diaphragm, therefore, caused vibrations which shut or opened, as it were, a door for the beam of light, and altered its intensity. The mirror transmitter of thin glass silvered was, however, found superior to all others; and it is hard to see how it could be improved upon, unless, possibly, by the use of a thin disk of silver, itself accurately surfaced and polished.

Whatever be the future before the photophone, it assuredly deserves to rank in estimation beside the now familiar names of the telephone and the phonograph.

Responsibility of Employers.

While a boy of 16 was at work upon a printing press in the press room of a New York paper the press was unexpectedly started. The boy sprang back from his dangerous position, and in so doing tipped over the bench he was standing on, causing him to fall against another press, which caught his arm and injured it so as to make it for ever useless. He sued the proprietor in the Superior Court and obtained a verdict for \$3,000 damages. The defense was that the accident was caused either by the negligence of the plaintiff or of a fellow workman, for which the proprietor was not responsible. In charging the jury, Judge Speir said that if the plaintiff or a skilled fellow workman were negligent the plaintiff could not recover damages; but that if the agent of the defendant employed persons not skilled in their work and the accident occurred through the negligence of one of such persons, the defendant was responsible. An appeal was taken from the judgment on the grounds that Judge Speir erred in thus charging, and in permitting the plaintiff to exhibit his mutilated arm to the view of the jury, thus arousing their sympathy. The General Term has affirmed the judgment in a long opinion written by Judge Freedman and concurred in by Chief Justice Sedgwick.

Another Cliff Town Discovered.

The occurrence of ancient cliff towns, built upon or rather in almost inaccessible places along the precipitous sides of river cañons in Colorado and New Mexico, was made known several years ago. Another very important discovery of this nature was made a short time since by Mr. James Stephenson, of the U. S. Geological Survey, in New Mexico. The city lies in a cañon thirty miles long, never before visited by white men, and is about forty miles from Santa Fé and ten miles from the Rio Grande. It consists of a succession of excavations in the solid rock throughout the length of the cañon, making, perhaps, the largest cliff town yet discovered.

The houses are dug out of the rock side to a depth of from fifteen to twenty feet. Apparently they were excavated with stone implements. They are almost inaccessible from the plains. Mr. Stephenson, however, managed to clamber up the rocky precipice, and entered and examined a number of articles that he thought remains of their first possessors. A scientist who has traveled in that region and visited other caves and excavations of a similar kind says he is disposed to believe that they have been tenanted within modern times by Indians at war with other tribes, seeking safety and advantage over their enemies. He thinks the remains found there are the remains of the things these belligerents have used, eaten, or worn, and not the relics of the first owners of the rock houses.

The Utilizing of the Tides.

A Philadelphia engineer has invented, it is claimed, a machine by which the power of the tides can be utilized. Numerous plans have been proposed for the accomplishment of this most desirable end, but only under exceptional conditions have they been practical or economical. If the new device can harness the tide in an open channel, so as to convert any considerable portion of the vast power into working force, the inventor will rank among the great benefactors of humanity. Emerson says somewhere: Hitch your wagon to a star. A device for utilizing mechanically the free tides, as they sweep along our shores, would come next to that, since it would enable us, through converters and carriers of electricity, to hitch our wagons to the sun and moon.

CREMATION TEMPLE.

The engraving shows the Cremation Temple lately built in the beautiful cemetery of Milan by Mr. Albert Keller. This temple, built in the Greco-Doric style, is surrounded by columns and pilasters, and surmounted by a cupola, forming a chimney through which the products of combustion escape. The furnace is in the basement, and nearly in the middle of the building. The interior of the building is divided into four large halls, in the first of which the mourners assemble before the body is brought into the urn or cremation chamber; adjoining this hall there is a room in which the bodies in their coffins are awaiting cremation. The next apartment is a large storage room for coal and wood, and beyond this are the furnaces. In an adjoining hall the "Cremation Society of Milan" has its office, and transacts all its business. Here is a curious collection of antique and modern vases, documents relating to cremation, models of furnaces, etc.

The cremating furnace is arranged transversely in the temple to permit of watching the entire operation through a small window in the side wall of the temple, as shown in the engraving.

The body is placed upon a grate, under which a basin is placed to receive the liquids and ashes that may drop down.

Two furnaces are now before the public, known as the Gorini and Venini furnaces, after the inventors.

The engraving shows Gorini's furnace, in which the flames and products of combustion pass over the body, thence down a flue and under the base upon which the body rests, thence up the chimney. The body, thus completely enveloped in the flames, is converted to ashes in from one and a half to two hours. Wood or coal may be used, and the expense is about one dollar.

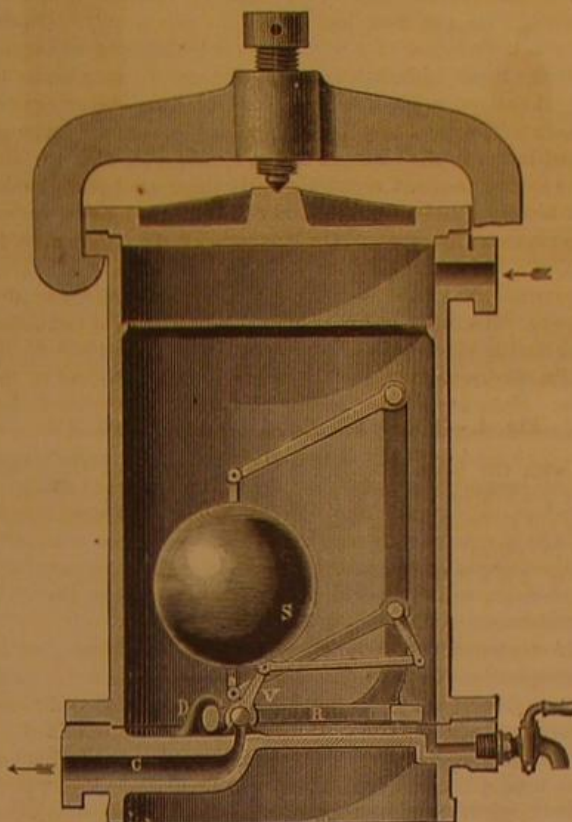
Mr. Venini's apparatus is more complicated than that of Mr. Gorini, but it transforms the tissues of the body into gases in a more perfect manner than any other furnace.

THE ELECTRIC LIGHTING.—The Commissioner of Public Works, New York city, has granted Mr. Edison a permit to introduce his system of electric lighting in the lower part of this city.

AUTOMATIC GOVERNOR FOR WASTE WATER PIPES.

The governor shown in the annexed cut, taken from the *Deutsche Gewerbe Zeitung*, controls the flow of the waste water from a surface condenser.

The valve, V, which closes the inner end of the outlet, C, is mounted in a frame, R, which has its fulcrum at D, and presses the valve upon the end of the outlet with considerable pressure, insuring a close joint, which is not affected by the accumulation of sediment. The valve is operated by a

**GOVERNOR FOR WASTE WATER PIPES.**

series of levers which are actuated by a float, S, which rises and falls with the water, and opens and closes the valve, V, accordingly. The apparatus is said to work equally well at low or high pressure.

Uncertainty of Blood Stains in Evidence.

The circumstantial evidence of minute blood stains in criminal cases has been made much of in several recent trials. The value of such evidence has been seriously questioned by Dr. Charles O. Curtman, of St. Louis, who shows that, even when the suspected blood has been shown to be unmistakably human, the accused may plead that the blood stains were caused by predatory insects. In his experimental investigations Dr. Curtman allowed mosquitoes to take their fill of human blood, then, after keeping them in close confine-

ment for periods of varying length, he killed them and examined the blood. In all cases, up to forty-eight hours after a meal, a large proportion of human blood corpuscles were unchanged and readily recognizable. The size and color of the corpuscles of mosquito blood are very different from human. As the result of more than a hundred careful measurements, he

An Ice Cave in Montana.

Two explorers named Lambert and Caruthers discovered, last summer, a large cave on the Dry Fork of Arrow Creek, in the Belt Mountains, in which was half an acre of solid ice of unknown depth. At the time of the discovery, about August 1, the ice was covered with ten inches of water, which prevented a thorough exploration of the cave. The *Fort Benton Press* says that the ice gives every indication of being in great body, and it is believed, from its appearance, and the fact that in the hottest season only a few inches of it was melted, that it is perpetual. The cave is described as being a great resort for game, as all kinds were killed close to its entrance.

Pampas Grass.

The cultivation of pampas grass, now so much used for decorative purposes, has become quite a profitable industry in Southern California. Three-quarters of an acre planted in pampas grass yielded, at 2½ cents per head, \$500. Another grower sold all he could raise at 7½ cents per head. Last year 10,000 heads or plumes of this grass were sold from that region.

ENGINEERING INVENTIONS.

A circulating device for steam generators has been patented by Mr. Dan Abell, of Carson City, Nev. This invention consists in combining with the feed water and circulation pipes of a steam generator a steam pump for keeping up a continuous and rapid circulation of the water within the space of the generator.

An improvement in that class of devices called "self-couplers" and "uncouplers," has been patented by Mr. Louis C. Slonecker, of Stauffer's Station, Pa. It consists of two spring-actuated spear-headed coupling pins or hooks, pivoted parallel with each other on either side of a vertically adjustable drawhead, and extending forward in front of the drawhead to couple with a like device.

An improved car truck has been patented by Mr. Edward P. Cowles, of Wequiock, Wis. The object of this invention is to provide running gear for a car or other vehicle designed especially to run on round rails, and to avoid the use of flanged wheels and the friction and abrasion caused by them. The invention consists of a car frame of novel design, provided with flat faced vertical wheels to run on the top of the track, and with inclined flat-faced guide wheels that run under the inside edges of the flat wheels squarely against the side of the track.

An improved propeller has been patented by Mr. Rio Gardner, of Westerly, R. I. The invention consists of a hub having short arms, and of blades united thereto by mortise and tenon joints and suitable bolts and screws.

Mr. John Forbes, of Harrisburg, Pa., has patented a core box having a lid fitted for use as a sweep in striking the core and apertured to give access to the box; also, in the combination, with the core box, of flanged tubes for strengthening the legs of the core and giving vent.

Mr. William J. Watson, of Marion, S. C., has patented an improved stump puller, so constructed that it can be readily applied to the stumps and will be powerful in operation. The invention consists in providing a stump puller with a lever strengthened by a truss rod and stud, and having a clevis at its forward end for the attachment of the draught, and a chain at its rear to be attached to a stump, a swiveled standard for connecting wheels, and an axle with the lever to carry it, and a right angled lever for adjusting the carriage and fastening it in place.

Mr. George W. Veil, of Bucyrus, Ohio, has patented a machine for opening and grading tile ditches, so constructed as to leave the bottom of the ditch straight and smooth.

An improved locomotive spark extinguisher has been patented by Messrs. G. A. Gunther, of Bath, and W. Kowalski, of Brooklyn, N. Y. The object of this invention is to deaden or extinguish sparks passing out through the smoke stack of a locomotive. The construction of this device is peculiar and cannot be readily described without engravings.

**THE MILAN CREMATION TEMPLE.**

THE GROWTH OF LARGE ELMS.

A Providence gentleman contributes to the *Journal* of that city an interesting description of the large elms in that neighborhood, with measurements of their girth and spread of limbs at different intervals of time. The latter facts are of more than local interest, since they give a clue to the rate of growth in old trees:

Of No. 1, an uncommonly beautiful tree, the girth at 5 feet from the ground was, in May, 1858, 13 feet 11 inches; in June, 1864, 14 feet 4 inches; in October, 1880, 15 feet 8 inches.

Of No. 2, the smallest circumference was, in May, 1858, 14 feet 9 inches; in June, 1864, 15 feet 2 inches; in October, 1880, 16 feet 6 inches.

Each of these trees gained 21 inches in girth in 21 years. The trees were probably set out in 1748 or 1749.

Of No. 3, at about 6 feet from the ground, the smallest place, the girth was, in May, 1858, 11 feet 11 inches; in October, 1880, 13 feet 4 inches; an increase of 17 inches in 22 years.

No. 4, a conspicuous elm on Congdon street, near Prospect Terrace, is, by its situation, symmetry, and magnificent Medusa-like head, perhaps the most remarkable tree within the old limits of the city. Its trunk is quite uniformly columnar. In January, 1858, it measured, 4 feet from the ground, 11 feet 8 inches; in October, 1880, 12 feet 10 inches; showing a growth of 14 inches in 22 years.

No. 5, perhaps the oldest tree in Providence, measured, at the smallest part between the ground and the branches, 11 feet and 5 or 6 inches in April, 1858; and 12 feet 9 inches in October, 1880.

No. 6, set out about 1790, measured at its smallest circumference, 3½ feet from the ground, January, 1858, 11 feet; April, 1862, 11 feet 4 inches; in 1863, 11 feet 11 inches; October, 1880, 12 feet 11 inches. For 22 years it has gained a full inch of circumference annually; in its entire growth, the yearly gain has been about 1½ inches.

No. 7 was set out in 1771, and shows signs of decay. The following measurements were made in July, 1858: Girth at the smallest place, 4½ feet up, 11 feet 2 inches; at 1 foot up, 14 feet; from bough-end to bough-end, north to south, 110 feet, or a little more. Subsequent measurements of its girth, at 4½ feet up, were: April, 1862, 11 feet 5 inches; in 1868, 11 feet 11 inches; November, 1880, 12 feet 3 inches.

No. 8, planted in 1786, is probably a century old. Its chief branch, spreading full 40 feet, shows marks of decay. The girth of this tree, at 6 feet up, was, in July, 1858, 9 feet 8 inches; in October, 1880, 10 feet 11 inches; a growth of 15 inches in 22 years.

Disappearance of Medicinal Plants.

At the recent meeting of the American Pharmaceutical Association, at Saratoga, the president, Mr. G. W. Sloan, in his annual address, spoke at some length on the growth and cultivation of medicinal plants in this country. He called attention to the fact that in California many native plants are disappearing before the incursions of herbaceous species introduced from Australia and Africa. He also discussed the effects of the destruction of forests in this country upon the production of native medicinal plants, commenting on the disappearance of many of the smaller herbaceous species and of shrubs, owing to the clearing away of the underbrush and the pasturage of the woodlands. An effort made in Illinois to raise from seed some of the plants used in pharmacy had met with but indifferent success. Yet, in botanical gardens, experience has demonstrated that almost every kind can be cultivated if judicious selection of the ground is made and close attention is paid to the habits of each plant. As the government shows no disposition to experiment in this direction, he thought the matter should be taken in hand by State Pharmaceutical Associations, in conjunction with State Boards of Agriculture, since the destruction of forests demands attention in respect to the extermination of medicinal plants, just as much as in other important particulars.

Where Our Forests are Going.

To make shoe pegs enough for American use consumes annually 100,000 cords of timber, and to make our lucifer matches, 300,000 cubic feet of the best pine are required every year. Lasts and boot-trees take 500,000 cords of birch, beech, and maple, and the handles of tools 500,000 more. The baking of our bricks consumes 2,000,000 cords of wood, or what would cover with forest about 50,000 acres of land. Telegraph poles already up represent 800,000 trees, and their annual repair consumes about 300,000 more. The ties of our railroads consume annually thirty years' growth of 75,000 acres, and to fence all our railroads would cost \$45,000,000, with a yearly expenditure of \$15,000,000 for repairs. These are some of the ways in which American forests are going. There are others; our packing boxes, for instance, cost, in 1874, \$12,000,000, while the timber used each year in making wagons and agricultural implements is valued at more than \$100,000,000.—*Fishkill Standard*.

The Possibilities of American Wheat.

Speaking of our gigantic crops of wheat, the *American Miller* remarks that few people, even in our own country, realize how inexhaustible our resources are for wheat growing. The total area of lands available for wheat culture in the United States is not less than 470,000,000 acres. Our entire wheat crop of the past year, phenomenal though it was, would not supply seed enough to sow so vast an area of wheat land.

Hydrophobia Five Years after Inoculation.

M. Colin related to the Académie de Médecine, at its last meeting, a remarkable instance of prolonged incubation of hydrophobia. The case was that of a man who died a few minutes after being admitted (on August 31) into the hospital, presenting maniacal excitement, expectoration, fear of drinking; and apprehensions, during more lucid moments, least he should injure those about him. The autopsy showed no lesions, but some small cicatrices were noted on the left wrist and in the front of the thorax. Further inquiries showed that the man had been ill two days only. On the first he complained of a severe pain in the hepatic region and extreme thirst, although he could not drink; as soon as he raised the cup to his lips he was seized with shivering and spasm. The next day he complained of severe sense of constriction in the pharynx and a feeling of a wish to bite. The symptoms thus seemed clearly those of hydrophobia. No history could be ascertained of a bite from a dog during the previous five years. On November 2, 1874, however, in Algeria, he had been bitten by a dog, which was attacking a comrade, to whose assistance he went, and who was also bitten. The latter had his wounds cauterized the next day, and died in eight days of hydrophobia. The patient of M. Colin was cauterized half an hour after the receipt of the bite. Some authorities, as Devergie, have maintained that the cases of prolonged incubation are really cases of "nervous hydrophobia;" but the symptomatology of such a case as this seems too precise for the theory that an attack so virulent could result from "nervousness." Hydrophobia is relatively common among the soldiers in Algeria, especially in the interior of the country, at the farms, where there are Arab dogs; and it is still more common among the civil population.

In regard to these prolonged periods of incubation in hydrophobia, of which this case presents an instance most remarkable, if not altogether beyond the reach of criticism, it is worth while to refer to one of the results obtained by M. Pasteur, of which we gave an account last week. It has long been a favorite explanation of these cases to suppose that the virus remained localized in the wound, developed there, and only caused the symptoms when, in consequence of some adventitious circumstance, it passed into the blood. M. Pasteur has shown that this explanation is, as regards some diseases, not a matter of theory but of fact. He has found that in the chronic cases of "cholera of fowls" the poison does develop in certain organs, and not, as in other cases, in the blood, and that when, after a variable period, the organized poison passes into the blood, severe symptoms come on rapidly, and the creature soon dies.—*Lancet*.

The Health of Cities.

Statistics compiled by the National Board of Health show that for the year ending October 31, 1880, the more important cities of the world rank as follows in comparative healthfulness. The death rate shows the number of deaths to each 1,000 persons during the year:

City.	Population.	Death rate.
Chicago.....	503,298	17.9
Philadelphia.....	850,000	18.3
St. Louis.....	333,577	18.6
Boston.....	375,000	20
Baltimore.....	393,796	20.9
London.....	3,354,390	21
Leeds.....	318,921	21.6
Glasgow.....	589,598	21.9
New York.....	1,306,323	23.4
Paris.....	1,988,806	24
Brooklyn.....	556,889	25.8
New Orleans.....	216,359	27.7
Lyons.....	342,815	27.7
Berlin.....	1,006,644	29.3
Dublin.....	314,666	32.9

Antidotes to Arsenic.

In the *American Journal of Pharmacy* for August, 1880, is an excellent method for preparing an antidote to arsenic, which is recommended by Dr. McCaw, a Canadian physician. The following is the formula: R. Tincture of chloride of iron, 5j.; bicarbonate of soda or potash, 5j.; tepid water, a teacupful. Mix.

Dr. McCaw gives a preference for this antidote over all others for two reasons: first, it formed the surest antidote; second, the ingredients are always accessible. That the ingredients are always accessible, the reader will readily see; that it is a sure antidote, I proved by the following experiment: Having prepared the antidote as above described, I let it drain on a filter for a short time, and then mixed a portion of the magma left on the filter with a solution of arsenic containing about half a grain. After stirring the mixture and filtering, the filtered liquid gave no evidence of the presence of arsenic by Marsh's test. This showed the antidote was a sure one.

I was also induced to test the efficacy of another antidote, viz., the freshly prepared sesquioxide of magnesia,* recommended by Bussy. ("U. S. Dispensatory," 14th ed., p. 30.) I dissolved an ounce of sulphate of magnesium in a small quantity of warm water, and added aqua ammonia to saturation, which threw down the proposed antidote. After draining for a short time on a filter, a portion of the magma was mixed with a solution of arsenic, and the mixture stirred and filtered. The filtered liquid gave no evidence of the presence of arsenic by Marsh's test. This would seem to show that the sesquioxide of magnesia is another sure antidote to

* The author probably means the hydrated oxide, MgH_2O_2 , as we know of no sesquioxide of magnesium.—Ed. P.

arsenic, and the fact that the ingredients, Epsom salts and hartshorn, are so often found in the family, gives it an advantage over the antidote recommended by Dr. McCaw.—*Phil. Hojlan, in Pharmacist*.

MECHANICAL INVENTIONS.

Messrs. William G. Wilson and George S. Darling, of Chicago, Ill., have patented improvements in shuttle races for sewing machines. These improvements relate to circular race-ways for oscillating shuttles, and are designed to guide and steady the shuttle as it starts forward and insure its entering the loop of thread.

Mr. William E. Hill, of Big Rapids, Mich., has patented an improved machine for rolling and turning logs upon saw mill carriages and logways, turning the logs upon the head blocks, and pressing them back against the knees. It is simple, convenient, and effective.

An improved support for carriage tops, which can be adjusted forward and backward, as also sidewise, has been patented by Mr. Patrick B. Collins, of South Boston, Mass.

An improvement in bicycles has been patented by Mr. Henry W. Britton, of Stoughton, Mass. The object of this invention is to furnish bicycles so constructed that the rider can adjust his seat to keep it in proper position over the large wheel when riding upon inclined ground.

Mr. Jacob R. Scott, of Nyack, N. Y., has patented an improved machine for sewing boots and shoes, in which the stroke of the needle is automatically varied by the variation in the thickness of the material, so that each stitch will be drawn tight. The invention consists in devices operated by the presser foot to limit the upward stroke of the needle, and in a spring device attached to the horn for retaining the looper in the proper position relative to the needle. The needle bar is hung on a rocking lever supported on a vertical standard which rests at its lower end on a beveled slide block. The slide block is connected by a crank lever with the presser foot, so that the slide block is moved thereby to raise and lower the needle-carrying standard. The horn is fitted with a piece forming the bed and containing the looper.

An improved machine for grinding planer knives has been patented by Mr. Charles J. Le Roy, of Palestine, Texas. This invention relates to an apparatus that may be securely attached to the frame of a wood planing machine for grinding the revolving knives of the planer without removing the knives from its shaft or the shaft from its bearings upon the frame of the machine.

An improved saw-filing machine has been patented by Mr. Philip Bossert, of Lebeck, Mo. The invention consists in pivoting the file holder to a bar adapted to slide horizontally in a swinging frame that is pivoted to a carriage which slides parallel to the saw clamp.

An improved hub for vehicle wheels has been patented by Messrs. Alonzo Gandy and John R. Shugart, of Freeport, O. The object of this invention is to construct a hub for a vehicle wheel so that the box cannot move lengthwise or turn in the hub after the spokes are set, and so that the spoke tenons shall be protected from the contact of the hub or collars.

Mr. Francis Murphy, of New York city, has patented an improved apparatus for forcing exhaust steam from engine into boiler. The invention consists of two vertical cylinders with pistons, each having two suction and two discharge openings. The suction pipes connect with a closed tank, into which the engine exhausts; a check valve prevents the passage of the exhaust steam back to the engine.

Mr. George William Curtis, of Philadelphia, Pa., has patented an improvement in the class of car couplings in which the ordinary closed oval link is employed in connection with a coupling hook, which is pivoted and adapted to slide within a draw head.

Watchmaking in France.

Besançon almost monopolizes the watchmaking of France, all but 2,488 of the 444,798 watches manufactured last year coming from that town. Of the Besançon watches, 149,997 were gold and 292,403 silver, the whole being valued at over \$4,000,000, half of which represents labor. Nearly all these watches are sold in France. The foundation of the watch trade at Besançon dates from the close of the last century, when a number of workmen from the Swiss side of the frontier, persecuted for their political opinions, took refuge there and were induced to remain. Since then this industry has continued to prosper; but it was not until after the conclusion of the treaty of commerce in 1860 that the business assumed anything like its present proportions. There is a school for teaching watchmaking at Besançon; but though liberally endowed by the municipality, it is said not to be well attended.

What Women Invent.

Some one who has taken the trouble to count the patents issued to women finds that the number for the year ending July, 1880, was seventy, or ten more than the average. Most of the inventions of women have to do with household appliances. Among the past year's are a jar lifter, a bag holder, a pillow-sham holder, a dress protector, two dust pans, a washing machine, a fluting iron, a dress chart, a fish boner, a sleeve adjuster, a lap table, a sewing machine treadle, a wash basin, an iron heater, sad irons, a garment stiffener, a folding chair, a wardrobe bed, a weather-strip, a churn, an invalid's bed, a strainer, a milk cooler, a sofa bed, a dipper, a paper dish, and a plaiting device.

DECISIONS RELATING TO PATENTS, TRADE MARKS, ETC.

United States Circuit Court.—Northern District of New York.

BIGNALL vs. HARVEY et al.—PATENT FOR COOLING AND DRYING MEAL.

Blatchford, J.:

This suit is brought on reissued letters patent granted to John Deuchfield, January 16, 1871, for fourteen years from April 20, 1858, for an improvement in cooling and drying meal.

1. A printed publication, in order to defeat a patent, must furnish such clear and definite information as to enable a skilled person, beyond any reasonable doubt, by following them, without aid from anything not known when they were made, to construct an apparatus like that patented.

2. A patent granted to a person of one name and reissued under a different—as granted to Deuchfield and reissued to Deuchfield—is a question of identity merely, and proof is always competent in such a case.

Infringement of the first claim of the reissue is proved and not contested. As the patent has expired, there can be no injunction, but the plaintiff is entitled to the usual decree in other respects in regard to said first claim.

The same decision is made in the cases of the same plaintiff against Thomas Elwood and others, Henry Roder and others, and Sidney R. Brown and others.

United States Circuit Court.—Eastern District of New York.

CLARKE, TRUSTEE, vs. JOHNSON.

Benedict, J.:

This is an action for an account and an injunction to restrain the defendant from making a certain form of disk used for valve seats in steam joints, upon the ground that such manufacture infringes a patent issued to Nathaniel Jenkins, August 3, 1869, known as reissue No. 3,579, and now owned by the plaintiff.

1. Reissued letters patent No. 3,579, granted to Nathaniel Jenkins, August 3, 1869, construed to be for elastic packing composed of four-tenths refractory earthy or stony matter mixed with rubber prepared for vulcanization by using less than twenty-five per cent of sulphur, and then vulcanized, whence results a material composed of forty per cent and over of refractory matter held together by a skeleton of soft rubber.

2. The patent is not infringed by valve seat disks containing sulphur in excess of the above proportion, whereby vulcanite is formed when the compound is subjected to a vulcanizing heat.

3. Although it is known that both rubber and vulcanite become soft at the temperature at which steam packings are used, it does not follow that the employment of vulcanite for rubber as the skeleton of a packing is a mere substitution of material, particularly in view of the different qualities presented by packings made by the two methods.

4. In *Jenkins vs. Walker* (1 O. G., 359) the excess of sulphur united with lead or litharge to form refractory material, and in *Jenkins vs. Johnson*, the excess of sulphur was taken up by the oxides of lead or iron in a similar manner.

Held that the plaintiff has failed to prove infringement, and the bill is dismissed with costs.

United States Circuit Court.—Northern District of Illinois.

ROBERTS vs. SHELTON et al.—TRADE MARK FOR NEEDLES.

Blodgett, J.:

1. The word "Parabola," registered June 27, 1871, by Robert J. Roberts, of New York, as a trade mark for needles, held to be not descriptive, but an arbitrary term adopted by complainant to distinguish his needles from those of other manufacturers, and his right to so select and apply it affirmed.

2. The use of it by another manufacturer, prefixed by the manufacturer's name, would be, in accordance with a former decision of the court, "that any prefix or suffix used with the trade mark would not give others the right to use it in connection with the manufacture of similar goods," an infringement of the exclusive right of the complainant to use that term to designate goods of his manufacture.

I shall order an injunction on the complainant's filing a bond in the penal sum of \$5,000, conditioned for the payment of any damages which the defendant may sustain by reason of the issuing of the injunction, and also require complainant to put in his proof within thirty days after the answer in this case is filed as a condition of the granting of the injunction.

United States Circuit Court.—District of California.

THE GIANT POWDER COMPANY vs. THE CALIFORNIA VIGORIT POWDER COMPANY et al.

Field, J.:

1. Reissued letters patent granted to Alfred Nobel, March 17, 1874, for explosive compounds, declared to be invalid.

2. A reissue can only be had when the original patent is inoperative or invalid from one of two causes—either by reason of a defective or insufficient specification or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new—and even then only where the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention.

3. The power to accept a surrender and issue new letters patent is vested exclusively in the Commissioner of Patents.

He must judge of the sufficiency of the original specification, whether the same is defective in any particular, whether such defect was the result of an unintentional error, and, if so, to what extent a new or additional specification should be allowed to describe correctly the invention claimed.

4. But this does not preclude the examination by the court of the original and reissued patents, to see whether or not they disclose on their face a case in which the Commissioner has no jurisdiction to act, or a case in which, by his determination, he has exceeded his jurisdiction; if so, the reissued letters patent must fall.

5. The record of a judgment of a judicial tribunal may be in all cases examined to see whether such tribunal had jurisdiction of the subject matter and of the person of the defendant, and if such jurisdiction be wanting the judgment is ineffectual for any purpose.

6. Whenever it appears, on a comparison of the two instruments, that the original patent is valid, it is clear that the Commissioner has exceeded his jurisdiction, and the reissue is without authority of law.

7. When it appears, upon comparison, that the specification of the reissue only differs from the original in containing an invention of broader scope, it is clear that the original patent must be valid if the reissue would be.

8. If the original patent is valid to the extent of its claim, a reissue is without authority of law.

9. Where an invention was described in one portion of the specification as compounded of the explosive substance nitro-glycerine and an inexplusive porous substance, and in another portion of the specification a more detailed description of the porous substance was given without mentioning its inexplusive character: *Held*, that the two passages are to be read together, and that the invention is a compound of nitro-glycerine with an inexplusive porous substance of the character described.

10. Where the original patent described a compound consisting of two ingredients, one of which was an inexplusive porous substance, a reissue covering all porous substances, whether explosive or inexplusive, which would form with nitro-glycerine a compound equally safe for handling, is void as for a different invention.

11. Case of *Russell vs. Dodge* (3 Otto, 463) commented on and approved.

The complainant is the holder of a patent bearing date March 17, 1874, for an alleged new explosive compound known as "dynamite or giant powder." For some time since its issue the defendants have been engaged in making, selling, and using an explosive compound averred to be substantially the same as the compound described in the patent. This suit is brought for the alleged infringement, with a prayer that the defendants may be required to account and pay over to the complainant the income and profits obtained by them from this violation of its rights, and be restrained from further infringement.

The compound patented is claimed to be the invention of Alfred Nobel, a distinguished engineer of Sweden. His invention, whatever may have been its extent, was assigned to one Bandmann, in April, 1868, and in May following a patent for the same was issued to him for the term of seven years. Soon afterward Bandmann assigned his interest to the complainant, the Giant Powder Company, a corporation created under the laws of California, and in October, 1873, this company surrendered the patent and obtained reissued letters for the residue of the term. In March, 1874, this reissue was also surrendered and new letters patent were issued, for the infringement of which the present suit is brought.

The bill alleges that the surrender of the original letters, the first reissue, its surrender, and the second reissue were each made for "good and lawful cause," but it does not specify what that cause was. The allegation will, however, be taken to be that the cause was one for which the statute authorized a surrender and a reissue. The bill also alleges that each reissue was for the same invention described in the original patent.

The answer denies both of these allegations and avers that the original letters and the first reissue were not surrendered because they were invalid by reason of a defective and insufficient specification arising from inadvertence, accident, or mistake, without any fraudulent intention on the part of the patentees, and charges that they were surrendered upon false representations with the intent to interpolate and obtain in reissued letters claims and grants for more than was embraced by the invention of Nobel described in the original patent, and that the reissued letters were not for the same invention, but for another and different one. And the defendants insist that for this and other reasons the reissued letters are invalid.

The Commissioner is an officer of limited authority, and whenever it is apparent upon inspection of the patents that he has acted without authority or has exceeded it his judgment must necessarily be regarded as invalid. His action must be restricted to the particular cases mentioned in the statute that only authorizes a reissue when from an unintentional error in the description of the invention the patent is invalid or inoperative, or when the claim of the patentee exceeds his invention. It is not sufficient that the patent does not cover all that the patentee could have claimed if his specifications had come up to his invention. If he has invented or discovered something beyond his original specifications and claim, his course is not to endeavor to cover it by a reissue, but to seek a separate patent for it.

The statute authorizing a reissue was intended to protect against accidents and mistakes, and it is only when thus restricted that it can be regarded as a beneficial statute. If a patentee does not embrace by his specifications and claim all that he might have done, and there has been no clear mistake, inadvertence, or accident in their preparation, the presumption of law is that he has abandoned to the use of the public everything outside of them, or at least has postponed any additional claim for further consideration.

Looking at the original patent and the reissued patent and the specifications annexed to them, we find that the material difference between them is as to the extent of the invention. The original patent covers a compound of nitro-glycerine and an inexplusive porous absorbent which will take up the nitro-glycerine and render it safe for transportation, storage, and use without loss of its explosive power. The reissued patent enlarges the scope of the invention so as to embrace a compound of nitro-glycerine with any porous substance, explosive or inexplusive, which will be equally safe for use, transportation, or storage.

The specifications annexed to the original patent were clear and sufficiently explicit for the compound composed of nitro-glycerine and the inexplusive porous substance mentioned, and the claim was only for a composition of matter made of the ingredients, in the manner, and for the purposes described in them. There was therefore nothing to correct in a reissue, according to the decision in *Russell vs. Dodge* (3 Otto, 463). The claim was as extensive as the invention specified, and there is no pretense that this was not sufficient to cover a compound of nitro-glycerine with inexplusive porous absorbents.

Now, reading the history of the labors of Alfred Nobel to utilize the explosive power of nitro-glycerine and render it safe to transport, handle, and use—the experiments he tried, first, to explode the nitro-glycerine in mass; then in consequence of the dangers attending its use, to prevent its explosion when handled; the patents he obtained in Europe; his experience in the use of gunpowder and other explosives with nitro-glycerine—it is impossible to believe that he intended anything different from the natural meaning of the term he used. He knew well the danger attending the use of nitro-glycerine with explosive absorbents, and in limiting his claim to its use with inexplusive absorbents we must presume that he at that time intended to abandon all claim to compounds of a different character, or at least to leave such claim open for further consideration. If we read his own language in an application made three years afterward for a new patent for a compound with explosive absorbents presented to the Commissioner of Patents by the complainant, and therefore adopted and approved by it, there can be but little doubt on the subject. Soon after the new patent was obtained the application for a reissue was made, evidently that it might reach back to the date of the original patent and cover inventions of other parties during the intermediate period, or that which had gone into public use.

It nowhere appears that he had any knowledge or belief when the first patent was issued that the admixture of nitro-glycerine with explosive substances would produce a safety powder. That was a discovery which he did not make or claim to have made. So when in his specifications he mentions charcoal as an absorbent, he observes that it has the "defect of being itself a combustible material."

To our mind, looking at the history of the invention and reading the specification of the patent in its light, it is clear that the inventor used the word "inexplusive" in its natural and ordinary sense, and that the attempt to limit that meaning is an afterthought of his assignees, desiring to bring within the reach of the patent, compounds in no respect within his contemplation. In other words, the reissued letters cover a compound not claimed by Nobel and not embraced in the original patent.

It follows that, in our judgment, the complainant has no just cause of complaint against the defendants, and its suit must be dismissed with costs; and it is so ordered.

AGRICULTURAL INVENTIONS.

Mr. Abram H. Smith, of Wauseon, O., has patented an improved hay elevator, so constructed that it may be easily operated, and will not allow the loaded fork to settle down or sag while being carried from the barn floor to the mow.

An improved plow truck has been patented by Mr. Henry C. Strong, of Mauston, Wis. The object of this invention is to furnish trucks for moving plows from place to place in manufactories, warehouses, salesrooms, and upon farms. It is so constructed that the plows can be easily moved without danger of breaking, marring, or wearing them.

An improved corn planter has been patented by Mr. Theodore T. Daniels, of Morrison, Ill. This invention relates to an apparatus which may be attached to corn planters of various descriptions for the purpose of opening furrows for the reception of the corn dropped from the seed box.

An improved plow attachment for cultivators has been patented by Mr. Homer J. Potter, of Centralia, Kan. This invention consists in a novel construction, arrangement, and combination of devices connected with a plow beam, whereby provision is made for attaching the plow beam to a cultivator after the cultivator beams have been detached.

A combined cultivator and cotton chopper, so constructed as to scrape, chop, and dirt a row of plants at each passage across the field, has been patented by Mr. James W. Gilbert, of Hoboken, Ala. This machine can be easily controlled by the plowman.

An Improved Glue Dressing for Wounds.

Cabinet makers and wood-workers generally are familiar with the uses of glue in dressing tool cuts and other slight wounds incident to their calling. The glue pot is always handy in their shops, and a glued rag answers as well as the best adhesive plaster.

In a recent paper before the Philadelphia Academy of Surgery, Dr. Hewson recommends the addition of acetic acid to the glue, and a little attar of roses to cover the odor of the glue and the acid. This compound spread on paper or muslin makes, he says, a good substitute for adhesive plaster for surgical use. It is easily and quickly prepared simply by putting into a vessel of boiling water a bottle containing one part of glue to four, by measure, of the acid, and letting the bottle remain in this bath until the glue is fully dissolved and mixed with the acid. Common glue may be used and official acetic acid, to be had at any drug store. The mixture should be kept in a wide-mouthed bottle, well stoppered by a long cork, which can always be removed by heating the neck of the bottle. Care should be taken to keep the mouth of the bottle clean by wiping it well with a cloth dipped in hot water. A bottle of this cheap and easily prepared dressing would be a good thing to have at home as well as at the workshop.

A New Cure for Malaria.

There is at least poetic justice in a story that comes from British India, tending to show the power of locomotives (when properly approached) to drive away the malaria which railways, or rather railway construction operations, have so long been charged with causing.

A poor villager of Kattywar had been afflicted for a long time with remittent fever, and no amount of idol worship and penance availed to arrest the malady. At length a friendly neighbor advised him to approach the "Bhoot" in the newest shape in which the former had seen him recently taking his daily run in that part of the province, chafing and fuming. The fever-stricken villager consequently traveled a distance from home, and at sight of a railway locomotive, fell on his knees, tendered an offering of corn and sweets, and extolled its might. The devil was appeased; the worshipper found himself rid of the malaria.

NOVEL ROAD ENGINE.

We have on several occasions illustrated steam road wagons which promised well, but for one reason or another have failed to come into anything like general use. We now give an engraving of a carriage using neither steam nor solid fuel, consequently avoiding the necessity of carrying water and coal. The fuel, which is at the same time the motive agent, is common illuminating gas, which is mixed with a certain proportion of air, and exploded in the cylinder in the manner common to well known gas engines. The engine is secured to a frame, which is supported at the rear by the axle, and in front by a caster wheel, whose frame is provided with a lever moved by a rack and pinion, the shaft of the pinion being provided with a hand wheel, which is turned one way or the other in the operation of guiding the carriage.

The box upon which the passengers sit contains a weighted bellows filled with gas, which is admitted to the cylinder through a valve working across its forward end. The vehicle is provided with a brake which is within easy reach of the driver.

The engine can be instantly stopped and started, and its speed may be varied by varying the amount of gas admitted to the cylinder. A skilled engineer is not required to operate it, as the management of it is very simple. The inventor prefers to use high wheels similar to velocipede wheels, and to connect the piston of the engine directly with a crank formed in the axle, but he is not confined to this construction.

This novel vehicle was recently patented by Mr. C. H. Warrington, of West Chester, Pa.

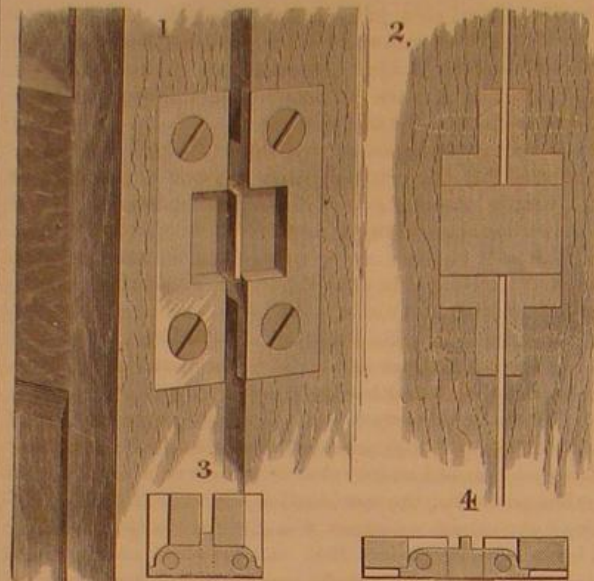
International Exhibition of Electricity.

The *Journal Officiel*, of October 26, publishes a letter from the Minister of Post Offices and Telegraphs to the President of the Republic of France, asking that dignitary's co-operation in organizing an International Electrical Congress, which shall be under the auspices of the government in order to give the enterprise that character of independence which is an essential condition of success. The design of the proposed

exhibition is to bring together from every source every species of apparatus which is designed to develop, transmit, and utilize electricity. It is proposed to hold the exhibition, if it can be organized, in the Palace of the Champs Elysées from the 1st to the 15th of November of 1881.

IMPROVED HINGE.

The hinge shown in the annexed engraving may be set in flush with the door and jamb, thus doing away with the projection so objectionable in the ordinary hinge. Fig. 1 shows the position of the hinge when the door is open. Fig.

**MORGAN'S IMPROVED HINGE.**

2 shows the hinge with the door closed. Fig. 3 is a horizontal section of the hinge closed, and Fig. 4 is a section showing it open.

The two leaves, attached respectively to the door and jamb, have each two flanges, between which a connecting link is hung with joint pins. The link has at its center a vertical flange stop, against which the leaves of the hinge strike when the door is closed; it also has flanges at its ends, against which the leaves strike when the door is opened.

It is a simple matter to apply this hinge, as it is always set in flush with the edge of the door and jamb.

As the door is opened the leaf attached to it turns on the link until the door stands at right angles with the jamb, when the leaf strikes the flange on the side of the link, and both link and leaf move together until the door is open. This hinge can be used to advantage on flat surfaces, such as

the hand. This saves much time, labor, and expense. The new process causes the fruit to dry more readily, and a very slight loss in weight results.

RECENT INVENTIONS.

Mr. John L. Volkel, of Sulphur Springs, Mo., has patented an improvement in breech-loading firearms adapted for rapid firing. The inventor dispenses with a separate device for extracting the shells, and uses a swinging lever carrying the breech block, that is formed to receive the cartridge and retain it while being fired. The cartridge is thrown out by the act of opening the breech.

A churning apparatus, so constructed as to give a very rapid motion to the dasher by a slow movement of the driving power, has been patented by Mr. Charles B. Davidson, of St. Joseph, Mo.

Mr. Lewis A. Fish, of Faribault, Minn., has patented a simple and convenient device especially adapted for use in flouring mills and feed stores and granaries for holding bags open for filling and conveying them, open or closed, from place to another.

A plow so constructed that the share or point will have a rocking movement while drawn through the ground, to cause it to more thoroughly loosen the soil, has been patented by Mr. Henry F. Edey, of Bridgetown, Island of Barbadoes.

A razor, which is provided with detachable blades, which can be easily removed and replaced, has been patented by Messrs. C. J. J. Sadler, of Milford, Pa., and P. C. Sadler, of New York city.

An improved adjustable wrist-pin, which is simple, convenient, and effective, and prevents noise and irregular motion, has been patented by Mr. Lafayette Thomas, of Marshall, Mo. The invention consists in a wrist-pin formed of a cylinder attached to the pitman and fitting into the cap-shaped head of a pin that passes longitudinally through the cylinder, the pin being held in the desired position by a screw nut provided with teeth in which a sliding spring catch takes and prevents the nut from rotating.

A machine for flattening and sharpening plow colters has been patented by Mr. John T. Duff, of Allegheny, Pa. This invention consists in a novel arrangement of flanges for clamping the colter, and rollers for beveling its edge.

Mr. George H. Williams, of Fort Smith, Ark., has patented a machine for making bricks, so constructed as to mould the bricks, press them, and deliver the pressed bricks upon off-bearing belts automatically. It is simple in construction and rapid in operation.

A cheap automatic cut-off, to regulate the flow of water from the roof of a building into a cistern, for the purpose of directing the first washings of the roof from the cistern, has been patented by Mr. Dennis Brady, of New Orleans, La.

A shank support and protector for boots and shoes has been patented by Messrs. Edson P. Hadley, of Shelburne Falls, and Thomas Joyce, of Buckland, Mass. The object of this invention is to prevent the boot or shoe from ripping at the shank, and by protecting the shank to prevent it from being cut or worn by shoveling, spading, or any pedal labor, or from being burned when the wearer rests his foot on the cope of the grate or stove for warming.

Mr. Ira E. Davenport, of Mechanicsville, Vt., has patented a brake for bob sleighs which consists in a novel arrangement of levers and devices connected therewith, whereby the brakes are applied to the front sled by the momentum of the rear sled when the speed of the team is checked or when holding back in going down hill.

Mr. Charles G. James, of Petaluma, Cal., has

patented an improved stock car which is simple in construction, and in which the stock can be housed and fed conveniently.

Frank W. Wardwell, of Cambridge, and Charles E. Lettenmayer, of West Lamerville, Mass., have patented an improved book cover protector, which is simple, cheap, and easily applied.

Messrs. Charlton Patterson and Herman L. Abrahams, of Russell, Kans., have patented a sulky plow in which the adjustable axles can be raised and lowered to regulate the depth at which the plow works in the ground without throwing the wheels out of line, and without affecting the set and gather of the axles.

**WARRINGTON'S ROAD ENGINE.**

piano covers, writing desks, and cabinet furniture. This invention was lately patented by Mr. John T. Morgan, of New Brunswick, N. J., who may be addressed for further particulars.

New Process of Peeling Peaches.

In certain California peach-drying establishments the work of peeling the peaches has been much simplified by the following process: A crate filled with fruit is dropped into a vat containing hot lye, and there shaken. It is then removed to a tank of pure cold water and the lye is washed away. The skins of the fruit by this process become so separated from the pulp that they are drawn off with one motion of

An improved machine for covering telegraph cables and wires with insulating material and with a leaden protecting envelope, has been patented by Edouard E. Berthoud, of Cortailod, and Arnold F. Borel, of Boudry, Neuchatel, Switzerland.

An ellipsograph, so constructed that it may be adjusted to describe ovals of different sizes with parallel curves without disturbing the guide pivots, and to cut ovals with their edges straight or beveled in either direction, as desired, has been patented by Mr. Edward L. Gaylord, of Bridgeport, Conn.

An improved ash sifter, which is simple in construction, and which operates without permitting the dust of the ashes to spread as with the ordinary ash sieve, has been patented by Messrs. Augustus F. Morse and George F. McIntosh, of Hallowell, Me. The invention consists in a box provided with a hinged sieve lid provided with a spring bar for holding the ash pan in the box when the lid is closed. The box is provided with a shaft mounted in a larger box provided with a suitable lid, and with an opening in the bottom through which the ashes can drop into a barrel or other receptacle upon which the large box is placed.

An improved suspended or swinging cradle has been patented by Mr. Robert S. Marshall, of Allegheny, Pa. It consists in combining with a cradle a table and two curved connecting rods.

An improved gag runner for harness has been patented by Mr. William H. Chapman, of Middletown, Conn. The invention consists of an elbow stud projecting at right angles from near the tip of the gag runner loop, and having its free end extended above the loop tip.

An improvement in suspenders has been patented by Mr. M. G. Gunning, of Amesbury, Mass. The invention consists of a pair of suspenders formed of the shoulder straps passing through and crossing each other in a slide made of two diamond shaped pieces of material united at the angles. The slide moves up and down and adjusts itself according to the position of the body.

An improved receipt book holder, which is especially designed for the use of weighers or other persons that must have the receipt book in a handy and convenient place, has been patented by Mr. Robert B. Dickey, of Waco, Texas.

Mr. Henry Dunphy, of New York city, has patented an improved wash board, whose frame is provided with a soap shelf, a series of polygonal rollers, and a series of brushes alternating with the rollers, so that the dirt may be quickly removed from the clothes, and the clothes made to move easily over the wash board.

An improved churn dasher staff, which is simple and convenient, has been patented by Mr. Lloyd T. Reid, of Rockport, Ky. The invention consists in a dasher staff which is flattened so as to be elastic or flexible at or near the middle of its length or is provided with an elastic piece at the point.

An improved ironing machine has been patented by Mr. John Vandercar, of West Troy, N. Y. This machine is designed especially for use in laundries for smoothing and drying collars, cuffs, and other articles. It is so constructed that the articles to be operated upon will be fed automatically into and through the machines.

A simple and automatic apparatus for leaching ores and other substances on a large scale, has been patented by Messrs. Rudolph Schuler and Edward H. Russell, of West Jordan, Utah Territory. The invention consists of a circular frame supporting the filter and moving on a circular track above an inclined circular table, and of three stationary rollers designed to elevate and depress the filter at certain points as it revolves, of a device for feeding the substance to be leached upon the filter; there is a device for applying the leaching solvent, and a precipitating tank for containing the solution passing through the filter.

An improved lantern hanger for carriages and wagons, which is both simple and convenient, has been patented by Mr. Edwin Lufkin, of Monroe, Me. The invention consists in a wire frame held to the dashboard by a spring arm, and provided with hooks for supporting a lantern and reflector.

Mr. Francis J. Crowley, of Gloucester City, N. J., has patented an improved apparatus for stretching, smoothing, and drying printed cloth, so that crimps, wrinkles, or creases are prevented from being formed in the fabric before it passes to the drying cylinders.

A combined wrench and screwdriver, which is simple in its construction and can be conveniently folded to be carried in a pocket, has been patented by Mr. John K. Collins, of Lebanon, N. H.

An improved gate has been patented by Mr. King A. Scott, of New Douglas, Ill. The invention consists in a novel arrangement of levers and devices connected therewith, whereby the gate may be opened and closed by a person on horseback or in a carriage by the manipulation of handles attached to the levers.

Mr. Juan F. N. Macay, of Charapoto, Ecuador, has patented a process of producing at one operation modified hydrated ferric oxide ($\text{Fe}_2\text{O}_3\cdot\text{OH}_2$) and cupric chloride (CuCl_2) by the mutual reaction, in the presence of the air, of cupric oxychloride and solution of ferrous chloride.

SCALLOPS.

BY A. W. ROBERTS.

Scallop shells are best known to those who live far inland, as their beauty of form brings them into use for various kinds of ornamental work. The appearance in the shell is shown in Fig. 3, which represents one of nearly full size. For ornamental purposes much smaller ones are used, as they have the advantage of possessing more brilliant colors when young. To see the animal in all its wonderful



Fig. 3.—Animal in Shell, displaying Eyes and Tentacles.

beauty it should be placed in an aquarium or other vessel of sea water. When all is quiet it will open its shells as far as the connecting "mantle" will allow, and this will be seen to be studded with brilliant blue spots which glow like opals. Whether these brilliant spots are really eyes or not has not been clearly ascertained.

The scallop is capable of changing its position, and does so by the forcible ejection of water from a given point.

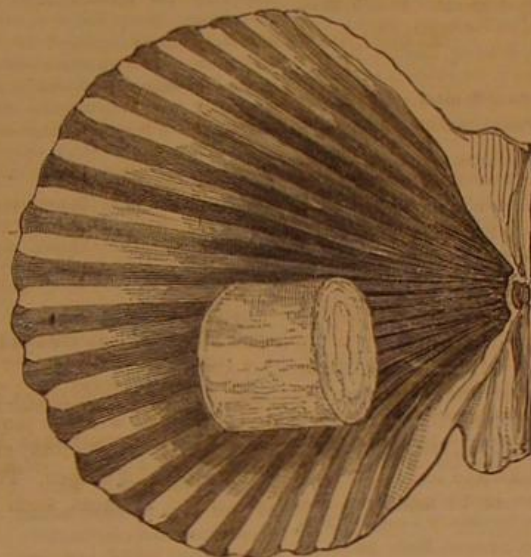


Fig. 2.—Showing Edible Muscle.

This mode of progress is analogous to that employed by the larva of the dragon fly. In Fig. 1 a number of scallops are shown moving about in the water, the drawing of which was taken from a tank at the Aquarium, which was labeled the "dancing scallops," as the scallops were constantly dancing up and down in the water in their peculiar zigzag motions. At one time the scallop shell was worn as a token that the wearers had performed a pilgrimage and paid their devotions to the shrine of St. James of Compostella. The story which connects the scallop shell with St. James is very curious, but too long to be repeated here.

The scallop as seen in the New York market consists of a short creamy white cylinder, and it is a great mystery to many how this can be a shell-fish. This cylinder is the only part of the scallop that can be eaten (the "mantle" or "rims" being very bitter and pungent when cooked, and as far as I know have no other use than that of baiting lobster

and eel pots), and consists of the strong muscle that holds the shells together. This is shown in Fig. 2 in its natural position, the rest of the animal being removed. This muscle corresponds with the eye of the oyster, but is much larger in proportion to the size of the animal, it having a similar fibrous structure. It has a remarkably sweet taste, much like that of the flesh of crabs, and is highly relished by many, though not considered as particularly digestible.

The scallop is found in abundance in many localities on our coast from Cape Cod to Florida, particularly in sheltered muddy places.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the observer to recognize the planets.

M. M.

POSITIONS OF PLANETS FOR JANUARY, 1881.

Mercury.

On January 1 Mercury rises at 6h. 34m. A.M. On January 31 Mercury sets at 5h. 25m. P.M.

Mercury will approach the sun until the morning of the 26th, when it will reach superior conjunction.

Venus.

Venus sets on the 1st about 8 o'clock P.M. Early on the evening of the 3d Venus will be not far from the moon. On January 31 Venus sets soon after 9 P.M.

Mars.

On January 1 Mars rises at 6h. 4m. A.M. On the 31st Mars rises at 5h. 43m. A.M.

Jupiter.

On January 1 Jupiter crosses the meridian about 6 P.M. On January 6, between 9 and 9:30 P.M., the moon passes north of Jupiter about 7" in declination.

On January 31 Jupiter sets at 10h. 29m. P.M.

Making our observing hour between 8 and 10 P.M., we find from the "American Nautical Almanac" that on January 1 the first satellite will be invisible, having disappeared in occultation. On January 2, about 10 P.M., the second satellite will disappear in occultation.

On January 8, at a little before 10 P.M., the first satellite disappears in occultation; on the 9th, between 9 and 9:30 P.M., the first satellite comes off from the face of the planet. On January 10 the third reappears from eclipse about 9 P.M.

On January 11 the second satellite, having disappeared in transit before 8 P.M., is invisible.

On January 16, about 9 P.M., the first will pass on to the face of Jupiter.

On January 17, about 8 P.M., the third satellite reappears from occultation; and a little before 10 P.M. the first reappears from eclipse.

On January 20 the second satellite will be hidden in eclipse until nearly 10 P.M.

On January 24, between 8 and 8:30 P.M., the first satellite disappears in occultation, and at about 9:30 P.M. the third also is occulted.

On January 27 the second satellite is invisible, being behind the planet.

Saturn.

On January 1 Saturn will pass the meridian at about 6:30 P.M. On the 31st Saturn will set at 11h. 10m. P.M.

On the evening of January 7 Saturn will be seen near the moon in right ascension, but nearly 8° south of it in declination.

Uranus.

Uranus rises on January 1 at 9h. 47m. P.M., and on the 31st at 7h. 45m. P.M.

Neptune.

Neptune passes the meridian on January 1 at about 7h. 52m. P.M., and on January 31 at about 5h. 54m. P.M.

A Poisonous Fly Bite.

John Story, a warehouse laborer in this city, recently died of malignant pustule caused by the bite of an insect which looked like a fly.

Story was at work in a tobacco warehouse, and, while handling a bale of Havana tobacco, he felt a sharp pain in the left side of his neck. Instantly he clapped his hand on the spot, and a winged insect, which he took to be a gnat, flew away.

The pain was but temporary, and he paid no attention to it until the following day, when an inflamed pimple had formed on the spot where he had been bitten. This pimple annoyed him considerably, and he tore it open.

The next day the spot was very much inflamed, the inflammation extending in a circle as large as a silver quarter about the wound. The circle quickly enlarged, the inflammation increased, and Story became frightened and called in a physician, who recognized the wound as a malignant pustule, which would undoubtedly prove fatal.

The skin about the wound burst, and the inflammation extended along the neck toward the head, and the lower portion of Story's face was swelled to twice its natural size. Symptoms of blood-poisoning showed themselves, and the patient lingered in great agony for two or three days, when death ended his sufferings.



Fig. 1.—SCALLOPS DANCING.

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.

The genuine Asbestos Steam Pipe and Boiler Coverings are the most durable, effective, and economical non-conducting coverings in use. They can be easily applied by any one at a cost of from 35 to 50 per cent less than is usually charged for inferior coverings. H. W. Johns Mfg. Co., 87 Maiden Lane, patentees and sole manufacturers.

Blake's Belt Studs. The strongest fastening for Rubber and Leather Belts. Greene, Tweed & Co., New York. See Bentel, Margendant & Co's adv., page 413.

The circulation of the blood has been demonstrated by the microscope, and the proof of the circulation of haterbrook's Pens is that they are found everywhere.

The American Electric Co., Proprietors and Manufacturers of the Thomas Houston System of Electric Lighting of the Arc Style. See illus. adv., last or next number.

Hotchkiss' Mechanical Boiler Cleaner, 84 John St., N. Y., prevents foaming, burning, scaling; removes all mud; saves repairs, fuel, and labor. Engineers make ten per cent selling other parties than employers. Send for circular.

Special Tools for Railway Repair Shops. L. B. Flanders Machine Works, Philadelphia, Pa.

The Cider Press manufactured and sold by Messrs. Boomer & Boschert, No. 15 Park Row, New York, is acknowledged far superior to any other in use. It has received the Gold Medal at a number of State Fairs. Farmers and others interested will please send for illustrated circular with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

A Practical Dyer of Turkey Red, and Preparing the Oil, desires a Situation. Address Dyer, Box 672, N. Y.

Cotton Belting for Elevators; Carrying and Driving Belts. Greene, Tweed & Co., 118 Chambers St., N. Y.

6 in. x 6 in. Yacht Engine, in perfect order, for sale. Ward, Stanton & Co., Makers. Address T. H. Worrall, Meredith, N. H.

Steel and Iron Drop Forgings manufactured of every description. Estimates given upon application. Richard Eccles, Mechanic St., Auburn, N. Y.

Astronomical Telescopes, first quality & low prices. Eye Pieces, Micrometers, etc. W. T. Gregg, 75 Fulton St., N. Y.

Notice.—Alden Crushers & Pulverizers manufactured & sold only by patentee, Farrelly Alden, Pittsburg, Pa.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

A perfect Mowing Machine is an absolute necessity to a farmer. The best made is the Eureka. It has the lightest draught, and will cut at least one-third more grass per hour than any other mower. Simple in construction and durable. Prices reasonable. Send for illustrated catalogue to Eureka Mower Co., Towanda, Pa.

Wren's Patent Grate Bar. See adv. page 397.

Exporters of Machinery for Plantations. Sugar Machinery, Coffee Huller and Cleaners. Information and estimates on all classes of American machinery and patented devices. Agricultural Implements and Hardware. Jos. H. Adams & Son, 281 Pearl St., New York.

The Mackinnon Pen or Fluid Pencil. The commercial pen of the age. The only successful reservoir pen in the market. The only pen in the world with a diamond circle around the point. The only reservoir pen supplied with a gravitating valve; others substitute a spring, which soon gets out of order. The only pen accompanied by a written guarantee from the manufacturer. The only pen that will stand the test of time. A history of the Mackinnon Pen; its uses, prices, etc., free. Mackinnon Pen Co. 200 Broadway, New York.

Fragrant Vanity Fair Tobacco and Cigarettes. First Prize Medals—Vienna, 1873; Philadelphia, 1876; Paris, 1878; Sydney, 1879—awarded Wm. S. Kimball & Co., Rochester, N. Y.

Superior Malleable Castings at moderate rates of Richard P. Plm. Wilmington, Del.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 322 Dover St., Boston, Mass.

The Tools, Fixtures, and Patterns of the Tamton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York.

Improved Rock Drills and Air Compressors. Illustrated catalogues and information gladly furnished. Address Ingersoll Rock Drill Co., 14 Park Place, N. Y.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Corrugated Wrought Iron for Tires on Traction Engines, etc. sole mfrs., H. Lloyd, Son & Co., Pittsburg, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Pittsburg, Mass.

Gun Powder Pile Drivers. Thos. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

Best Oak Tanned Leather Belting Wm. F. Forrester, Jr. & Bros., 581 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & H. Holmes, Buffalo, N. Y.

Downer's Cleaning and Polishing Oil for bright metals, is the oldest and best in the market. Highly recommended by the New York, Boston, and other Fire Departments throughout the country. For quickness of cleaning and luster produced it has no equal. Sample five gallon can sent C. O. D. for \$5. A. H. Downer, 17 Peck Slip, New York.

Clark Rubber Wheels adv. See page 381.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Vocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Presses, Dies and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Eclipse Portable Engine. See illustrated adv., p. 382.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna Regie, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

For Yale Mills and Engines, see page 381.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Rollstone Mac. Co.'s Wood Working Mach'y adv. p. 366.

Blake "Lion and Eagle" Imp'd Crusher. See p. 397.

4 to 40 H. P. Steam Engines. See adv. p. 381.

Bracket Woods.—Wm. E. Uptegrove, Saw Mills, 463 East 10th St., New York, offers to the trade a choice stock of these woods. Send for price list.

Saw Mill Machinery. Stearns Mfg. Co. See p. 397.

Peck's Patent Drop Press. See adv., page 413.

Silent Injector, Blower, and Exhauster. See p. 413.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'rs, 234 St., above Race, Phila., Pa.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 34 Columbia St., New York.

Millstone Dressing Machine. See adv., page 237.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Frank's Wood Working Mach'y. See illus. adv., p. 413.

Peerless Colors.—For coloring mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's adv. p. 412.

For Separators, Farm & Vertical Engines, see adv. p. 413.

For Patent Shapers and Planers, see illus. adv. p. 412.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 412.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 413.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 413.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, Agt., 32 Cortlandt St., N. Y.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 413.

A profitable business for a person with a small capital. Buy a Stereopticon or Magic Lantern, and an interesting assortment of views. Travel, and give public exhibitions. For particulars, send stamp for 116 page catalogue, to McAllister, Mfg Optician, 49 Nassau St., N. Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 413.

Catechism of the Locomotive. 625 pages. 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price \$2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 413.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blot Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Penfield (Pulley) Blocks, Lockport, N. Y. See ad. p. 412.

Tyson Vase Engine, small motor, 1-33 H. P.; efficient and non-explosive; price \$50. See illus. adv., page 413.

Lightning Screw Plates and Labor-saving Tools. p. 412.

Use Vacuum Oil Co.'s Lubricating Oil, Rochester, N. Y.

NEW BOOKS AND PUBLICATIONS.

SCIENCE AND REVELATION. By Dr. Philip S. Hocker. Kansas City, Mo.: Ramsey, Millett & Hudson.

Dr. Hocker has given in a very small pamphlet what he considers "a short and concise solution of some of the problems which have, of late years, attracted the attention of our most profound scholars in Europe and America." In other words, he sets right the "mistakes of Darwin and infidel scientists" in the usual style of those who have but a remote hearsay knowledge of scientific facts and theories.

EXAMPLES OF HOUSEHOLD TASTE. By Walter Smith, State Director of Mass. School of Design, New York: R. Worthington. 4to pp. 521. \$6.

Mr. Worthington has had students of industrial art (and all who wish a permanent remembrance of the art wealth displayed at Philadelphia four years ago) under deep obligation by bringing out so handsome an edition of Mr. Smith's "Industrial Art at the International Exhibition." Five or six hundred fine engravings, many of them full page, exhibit as many objects selected for their conspicuous beauty or the technical skill displayed in their construction. The text is a valuable contribution to the literature of industrial art.

HOUSEHOLD SANITATION:

I. HEALTH AND HEALTHY HOMES: A GUIDE TO DOMESTIC HYGIENE. By George Wilson, M.A., M.D. 12mo, pp. 314. \$1.50.

II. DWELLING HOUSES, THEIR SANITARY CONSTRUCTION AND ARRANGEMENTS. By W. H. Corfield, M.A., M.D. 12mo, pp. 112.

III. OUR HOMES. By Henry Hartsborne, A.M., M.D. 16mo pp. 149. 50 cents.

These three volumes from the press of Presley Blakiston, Philadelphia, cover in a more or less popular way the

important field of domestic sanitation, the necessity of maintaining healthy conditions in the homes of the people, and the simpler methods of securing such desirable results. The first on the list discusses the fundamental conditions of healthy living in a manner so admirable in every respect that we should be glad to see it made a text book in every school in the land. There is no branch of vitally useful knowledge so commonly neglected in schools and other institutions of learning, nor any that the community can so ill afford to neglect. Mr. Corfield's book comprises a course of Cantor Lectures before the London Society of Arts. It aims to furnish a short and practical exposition of the means by which dwelling houses may be made and kept wholesome. Though addressed particularly to sanitary engineers and house furnishers, and draws its illustrations of sanitary appliances altogether from British sources, it contains much of direct and suggestive value to American readers. The third book on the list is one of the series of American Health Primers, of whose general excellence we have had occasion to speak in recent issues of this paper. Dr. Hartsborne discusses in a sensible and easily comprehended style the teachings of science and experience with regard to the sanitary influences of situation of houses, their construction, light, warmth, ventilation, water supply, drainage, disinfection, and kindred topics bearing upon the question how to have healthy homes. The publication of works of this nature is an encouraging circumstance. If they could only reach and interest every householder the national sick list and death rate might be cut down to half their present dimensions.

MAGUIRE'S CODE OF CIPHERS: A COMPREHENSIVE SYSTEM OF CRYPTOGRAPHY DESIGNED FOR GENERAL USE. By Charles H. J. Maguire, of the Union Bank of Lower Canada, Quebec. For sale by the author. Price \$2.

A system of secret writing based on a combination of any three letters of the alphabet, the keys to be arranged by the correspondents according to mutual agreement to change one or more of the letters. The system has been arranged in conformity with the regulations respecting secret writing telegrams adopted by the International Convention of Telegraph Companies. The vocabulary contains upwards of 18,000 words. There is given besides a large collection of banking, mercantile, and other words and phrases and sentences in common use, geographical names, etc.

THE STUDENT'S ILLUSTRATED GUIDE TO PRACTICAL DRAUGHTING. By T. P. Pemberton. 12mo, pp. 112. \$1. For sale by the author, 5 Dey street, New York.

The author, a draughtsman of long experience, has sought to lay down the elements of the art of draughting in a manner so clear that any young mechanic or student of mechanics can easily master them. The instruction is practical throughout, and plainly put.

MODERN ARCHITECTURAL DESIGNS AND DETAILS. Part 2. New York: Bicknell & Comstock. \$1.

Plates 9 to 16 show details of store finish, store counters and sections, brackets, gates, and fences, window caps and hoods, architraves, bases and wainscoting, balconies, and two designs for cottages, with front and side elevations, plans, etc.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) M. T. asks: What is best to use in a wooden cylinder for smoothing up small turned wood work? A. It is generally sufficient to tumble the articles together without the addition of anything. You might, however, add hardwood turnings or planer chips to advantage.

(2) J. M. asks: 1. What is the best arrangement to get the greatest amount of heat from a small battery or pile? A. By passing the current through a fine platinum wire. 2. What is the best waterproofing process for cotton cloth, outside of caoutchouc and oil? A. See SCIENTIFIC AMERICAN, Vol. 41, p. 251 (5).

(3) W. R. D. asks whether there is any way of drawing or forcing out escape steam rising from 30 or 40 boiling water tanks which are continually open. The room is about 75x130x35 feet high, with four common ventilators about 4x18 feet high. A. It would relieve your trouble to increase the height of your ventilators to 18 or 20 feet, but if this is not sufficient, a fan blower will do it. 2. Is such steam necessarily injurious to health? A. The vapor of water at the pressure of the atmosphere is not injurious to health.

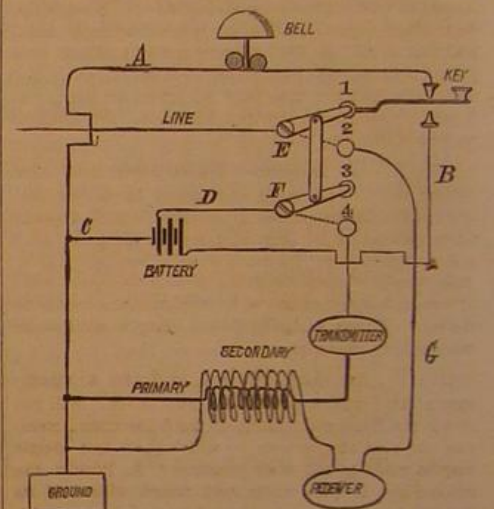
(4) A. H. G. asks: What proportion should the heating surface of a boiler be to the radiating surface in steam coils? I have 13,450 lineal feet of one inch pipe in my building. How many square feet of heating surface should my boiler have to do the work

easily? A. In your climate, a horizontal multitubular boiler of about 600 square feet of surface, properly set and fired, will be enough, say, 16 feet long by 48 inches diameter with from 40 to 50 three inch tubes.

(5) P. B. asks: 1. How many one gallon gravity cells would a physician need for all kinds of cauterizing? A. Use the Grenet or Byrne battery for cauterizing. The gravity is not suited to this work. 2. Can sulphate of copper and bichromate of potash cells be united in one battery? A. Different kinds of batteries cannot be worked well together.

(6) J. C. H. asks: 1. Can a room 180x40x11 be heated quicker and more uniformly by placing say 1,200 feet of one inch steam pipe around the room next to the wall (the wall being brick), than by placing the same number of feet of same size pipe in four radiators, to be placed at equal distances apart, either next to the wall or in the center of the room? A. Yes. 2. How much one inch pipe ought it to take to heat properly a room 180x40x11 feet, by either method, for a person to sit to work? The building is exposed on all sides, built of brick. The room is in third story, under a tin roof, the room being ceiled overhead, windows four feet apart all round the room. The lower part of building is kept warm. Steam pressure of the boiler is 60 lb. A. Not knowing the window surface we cannot say correctly, but would think from the description of your building 2,000 to 2,500 feet of one inch pipe distributed around the walls of the building should be sufficient. If you place the same amount of pipe in four radiators, place them where you will, you cannot warm such a room properly; any one sitting in front of a window will have cold feet.

(7) J. S. and others ask how to make telephone connections for an open circuit line. A. The annexed diagram shows all of the connections for one end of the line, both ends being alike. The connections are shown in condition to call or receive a call. When



a call is received the current passes from the line through the switch, E, button 1, key, top contact of the key, bell-magnet, and ground wire, A, to the ground. When the key is depressed to call a distant station, the key touches the lower contact, on the battery wire, B, sending the current through the button 1, switch, E, and line to the bell and ground of the distant station. The current returns by the ground and wires, A, C, to the battery. After calling, the switch, E, is moved to button 2, and the switch, F, being connected with the switch, E, by an insulating connection is at the same time moved to button 4, as shown in dotted lines. Now the line connection is through the switch, E, button 2, wire, G, receiver, the secondary wire of the induction coil to the ground. The switch, F, when turned as described completes the local circuit, the current passing from one cell of the battery through the wire, D, switch, F, button 4, transmitter, primary of the induction coil ground wire, A, and wire, C. The connections are now correct for talking. Should the transmitter be of the class capable of withstanding a heavy current, the wire, D, will be connected so as to include all of the elements of the battery, and the wire, B, instead of being connected with the battery will be connected with the button 3. The diagram shows the connections adapted to the class of transmitters employing but a single battery element, and to a line requiring several cells of battery to call. If a single cell of battery is sufficient to call, the wire, B, will be connected with button 3.

(8) E. F. F. writes: I want to know the velocity of the "electric telegraph." I have consulted many prominent books, but have never been able to ascertain the fact. A. If you mean velocity of the electric current, it varies according to the conditions from 13,500 to 62,000 miles per second.

(9) A. E. R. asks: 1. Is it best to keep a boiler that is not used but a day or two every three months, full of water or empty? No danger of freezing, as it stands beside others in use. A. Keep it full. 2. Do you consider try cocks in a water column as safe as when tapped into the boiler the old way? A. No.

(10) M. S. writes: I have a portable 10 horse power return line boiler, in which I cannot use water containing organic matter, as it causes foaming. Why is this? A. We think either you have too little steam room, or the circulation is bad. 2. What is the best way to loosen a pump (suction pump) in which the piston is frozen fast, and what is the best preventive of freezing? A. Thaw by the use of hot water. To prevent the freezing open the bottom valve with a hook or other means to let the water out of the pump.

(11) J. A. Y. asks: Where does ice form during the freezing process—upon the surface or the bottom of the stream or vessel? A. Usually on the surface. Anchor ice is an exception.

(12) F. E. K. asks: Will the strings or wires in a well made piano, when tuned ready to send out of factory, stretch enough to lower the pitch, supposing the tuning pin is securely fastened? A. When piano strings are of the best quality of steel, and have been put on a good pianoforte, they are tuned (in first

class establishments) somewhat above concert pitch, and are kept there by repeated tunings, until the piano-forte has settled and the strings have fully stretched, which is known by the instrument remaining at precisely the same pitch for some time. After this the strings will not stretch except by an increase of the temperature, which will lengthen the iron frame on which the strings are stretched, or by hard use, when, under the constant concussion of the hammers upon the strings, the latter will stretch more or less and get out of tune.

(13) G. R. B. asks: 1. Can you inform me if an induction coil is required with the pan telephone described on page 162, No. 11, current series of the SCIENTIFIC AMERICAN? A. Yes. 2. Should the induction coil used in Blake transmitter be the same resistance as coils in each telephone? A. It should have two or three times the resistance of the telephone coil.

(14) R. R. R. writes: In the Faradic battery operated by an open Smee's cell, I believe the primary wire of the induction coil is composed of two layers of No. 16 or No. 14 cotton covered copper wire. I wish to make an induction coil with the core of the same length and same diameter to be operated with a small Grenet cell. 1. Should the primary wire be constructed as in the former case? Or if modified, in what respect? A. Use three layers of No. 18 wire for the primary. 2. With the same sized core how should the primary be constructed to give the best result with a Bunsen and with a large Leclanche respectively? A. The same construction will answer. 3. With core same size as above, and with secondary coil composed of, say, 10 layers of No. 40 telephone wire, what cell should be used, and how should the primary coil be constructed to get the best results? A. Make the primary as above described, and use a single cell of Grenet.

(15) "Honolulu" writes: I saw a notice in SCIENTIFIC AMERICAN some time ago of the application of electricity to growing crops. Will you let me know the best method of applying it? A. It could not be profitably applied. It is an interesting experiment, and that is all. 2. We are very much troubled with droughts here, and would feel obliged to you if you could give me some idea how to overcome them. A. Your only remedy is artificial irrigation. We know of no way of inducing rain.

(16) A. G. N. asks: What style and size battery would be the most economical to run one electric light on the incandescent principle? A. It depends upon the kind of incandescent lamp and on the time you wish to run it. To run a Werdermann or Regnier lamp for a few hours, probably 20 to 25 one quart cells of Bunsen battery, or one of its modifications, would be the best. To run a single Edison lamp would require more battery elements.

(17) W. A. McCa. writes: I have a specimen which I think contains lead and silver. Will you give in the Notes and Queries of the SCIENTIFIC AMERICAN the most simple tests by which these two metals may be made to tell their presence? A. Powder the ore and boil in pure nitric acid mixed with half its weight of water for some time; dilute somewhat with water, and filter. Add to the filtrate a small quantity of sulphuric acid. A precipitate indicates lead. Filter this solution and add to the concentrated filtrate a few drops of pure hydrochloric acid. A white precipitate, insoluble in boiling water, and which changes in color by the action of sunlight, indicates silver. When only very small quantities of the metals are present, unless these tests are performed with great care, the reactions are apt to escape notice altogether. In ores where the silver is in the state of chloride, bromide, etc., this test does not give indications, especially if the silver is present as chloride. The best test for silver in an ore is the fire assay (scorification assay).

(18) F. D. C. asks (1) how to saw petrified wood or other flinty material for sleeve buttons. A. Apply diamond dust moistened with brick oil to the edge of a thin iron disk revolved in the lathe. For full particulars as to stone cutting consult Byrne's "Handbook for the Artisan." 2. How can I make an acid ink to write on oil paper for a stencil to print from? A. Try nitric acid alone.

(19) "Subscriber" asks how to make a black ink suitable for staining leather. A. Use a moderately strong aqueous solution of copperas. The tannin in the leather will develop with it the black color.

(20) V. B. H. asks for a good black paint or something else that will answer to black small castings by dipping them in something that will varnish. A. Dissolve asphaltum in oil of turpentine and add a little lampblack or fine bone black.

(21) L. C. C. asks: 1. Can you inform me where to purchase the ammonia used by the ice-machines (not the common aqua-ammonia), think it is called gaseous ammonia, which is liquefied by pressure? A. Liquefied ammonia is not an article of commerce. It is only prepared as required for use. 2. What is known as a 20 ton ice machine? A. One that produces 20 tons of ice a day.

(22) G. W. L. asks what the difference is between tincrylals and tin salts, as used in dyeing. A. Both refer to stannous chloride or protochloride of tin.

(23) E. A. J. asks how to remove the scale from brass castings, to give a surface on which solder may be flowed with a hot copper. A. Dissolve 6 oz. bichromate of potash in three pints of warm water, when cool, add 6 fluid oz. of sulphuric acid. Rinse the castings well after pickling in this solution.

(24) F. R. G. asks how to paint a smoke stack on a small portable engine. It requires something that will resist the action of heat. I have been advised to use asphaltum dissolved in turpentine. A. Good asphaltum dissolved in oil of turpentine is one of the best varnishes for this purpose.

(25) H. M. A. asks: What is the best "sticker" for labels on boxes, also labels on casks: something to make them stick and not cockle or wash off easily? A. Soften glue in cold water and dissolve it in strong vinegar. Mix with it a quantity of dry

starch about equal to the glue taken, first having boiled it with water sufficient to form a paste. It works better when warm.

(26) W. J. H. asks if there is any preparation for polishing or staining India-rubber. A. We know of no satisfactory way of staining rubber. Hard rubber may be polished with a little pumice stone and oil.

(27) H. F. P. asks how to make gold ink for writing and printing. A. Triturate gold leaf with a little honey in a mortar until the metal is reduced to a fine state of subdivision; dissolve out the honey with warm water, and mix the gold with a little gum water, used for writing and illuminating. In printing the gold is usually applied subsequent to the printing.

(28) H. L. S. asks: 1. Is there any known substance that if a thin piece of it, say like a piece of paper, window glass, or tin, were placed between a permanent magnet and piece of soft iron would prevent the magnet from attracting the iron? A. No. 2. I would like you to give me a simple illustrative explanation of the theory of how electricity is generated by a dynamo-electric machine. A. You will find this information in an article on dynamo electric machines, in SUPPLEMENT No. 161.

(29) W. E. M. asks: Can you inform me of any metal or alloy that will dissolve by the application of some of the acids (such as sulphuric, hydrochloric, or nitric), and at the same time the acid used to be incapable of any action on fatty substances (such as oils)? A. Metallic zinc is attacked and dissolved by dilute sulphuric acid. The dilute acid has little effect on most oils when used cold.

(30) J. E. S. writes: I wish to make a hollow prism to hold carbon bisulphide, but have not found a cement that will resist it. Can you tell me what to cement the glass with? A. The composition of glue and glycerine used in printing ink rollers answers very well. It melts by aid of heat.

(31) J. E. S. asks: Is there any rapid and practical purpose to which bright copper can be made to acquire the dark rich color that is seen on copper coins unused for many years? The oxide formed by heating scales off easily. A. Clean and dip them in a strong aqueous solution of cupric chloride.

(32) T. R. W. asks: What will take aniline violet and aniline black ink stains out of linen and bleached cotton fabrics? The salts of lemon and oxalic acid seem to have but little influence on it. A. Try solution of bleaching powder or javelle water.

(33) A. L. H. asks: What effect does galvanized iron pipes have on drinking water—good or bad? A. Bad, with certain kinds of water, and especially if allowed to stand in the pipes for any length of time, very bad.

(34) J. C. asks: 1. How can I harden plaster of Paris after making a mortar out of it with water? A. After the plaster becomes thoroughly dry, you may soak it in glue size. When this becomes dry the plaster will be quite hard. 2. What chemical or acid is used in taking a transfer from a printed cut and transferring on a plain block of boxwood? A. Caustic potash dissolved in alcohol. 3. Can I make a mould out of plaster of Paris? A. Oil the pattern, mix the plaster quickly into a thick smooth cream with cold water, and pour into the mould at once. When hardened set aside in a warm place to dry. Is there a book in the market that gives instruction in sculpture; if so, where can it be obtained? A. Address the booksellers who advertise in this paper.

(35) M. C. S. asks: What substances are best to absorb the moisture in a refrigerator? Is crude chloride of calcium (bittern) good? Is lime good? A. Fine unslaked lime will answer about as well as anything. Chloride of calcium is an excellent absorbent of moisture.

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

C. S. C.—It consists principally of sulphides of copper, and possibly carries a trace of gold.—J. W. M.—A siliceous kaolin.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

November 30, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. 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.

Accountant instrument, mechanical, H. Johnson 234,875
Aerial apparatus, F. W. Brearey 234,847
Aeriform fluids, apparatus for mixing, J. F. Barker 234,901
Album, etc., clasp, C. Posen 235,016
Annunciator, electrical, T. W. Lane 234,903
Axle box, car, W. P. Wyly 234,901
Bale tie, J. G. Battelle 234,943
Barrel heater, Cook, Chase & Board 234,908
Band cutter, Blehn & Weldauer 234,944
Bath box for chemical and photographic purposes, ventilated, J. C. Macurdy 234,879
Bells with brass, coating stock, O. B. Wilson 234,900

Beit, driving, E. & C. Poullain 235,014
Binder for papers, etc., M. King 234,907
Blotting pad, C. M. Lothrop 234,978
Boiler and other furnaces, W. Ennis 234,972
Boot and shoe sole edger, trimmer, C. H. Helms 234,909
Boot jack and stand, combined, D. W. Gastrell 235,064
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Bracelet, W. P. Dolloff 234,868
Bran machine for cleaning and treating, J. Anshutz 234,843
Brickyard, conveyor for, J. J. Meyers 234,895
Buckle, G. G. Bugbee 234,849
Buckle, C. W. Polen 235,015
Buckle, harness, R. D. Whittemore 235,060
Buckle, trace, J. Lally 234,901
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Butter, process of and apparatus for making, W. S. Hatheway 234,907
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Buttons, machine for manufacturing, Aston & Hames 234,908
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Car, street, Tucker & Williams 235,046
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Chandelier, E. M. Smith 235,006
Cigar mould press, W. A. & A. Osenbrück 235,006
Clock lock work attachment, H. W. Barnes 234,941
Clock, marine, I. Farnsworth 234,963
Clothes drier, C. Palmer 235,008
Clutch, friction, O. S. Presbrey 234,900
Coffee roaster, M. T. Brown 234,952
Cooker, steam, W. G. Flanders 234,865
Copying process, dry, W. H. Spencer 234,927
Corn, machine for picking and husking, W. Spear 235,028
Corpus cooling board, Gregg, Shaw & Felton 234,990
Cover for vessels, W. E. Andrew 234,842
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Croquet wickets, socket for, C. Pense 234,914
Cuff, C. H. Denison 234,866
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Cultivator, wheel, J. T. Payne 235,012
Damp regulator for furnaces, W. D. Dickey 234,970
Dams, canals, etc., device for regulating the head of water in mill, Lick & Bateman 234,926
Distillation of wood, apparatus for purification of the products resulting from, J. A. Mathieu 234,928
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Dress shield, M. Dewey 234,909
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Electrotype and stereotype plates, uniting, C. N. Smith 235,024
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Feed water heater, E. Baines 234,903
Fence bars, device for forming, A. Henley 234,850
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Fireplace heater, Morgan & Morrison 234,921
Fluid meter, D. P. Weir 234,898
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Furnace for roasting quicksilver ores, H. J. Huttner 234,985
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Gas lighting burner, electric, D. Rousseau 235,024
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Grain and cockle separator, E. C. Gage 234,958
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Ham, machine for packing boned, W. Hoefjen 234,983
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Hats and bonnets, manufacture of, W. Comey 234,852
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Lastering jack, C. E. Clark 234,900
Lastering machine, H. P. Fairfield 234,912
Lasts, metallic socket bushing for, W. Miller 235,000
Latch, P. Forg 234,866
Lathes for cutting rubber and other rings, automatic attachment to, J. T. Ridgway 235,022
Leather articles, manufacture of sewed, S. W. Wardwell, Jr. 235,050
Level rod, engineer's, M. L. Lynch 234,997
Lounge, bedstead, L. W. Ott 235,006
Mail bag, S. Strauss 235,009
Measure and register, grain, D. A. Reynolds 234,891
Meats, compound for curing and preserving, W. Archdeacon 234,844
Mechanical movement, W. F. Cochrane 234,906
Microscopic objects, turn table for mounting, J. W. Sidle 235,030
Middlings dressing machine, A. Crabtree 234,908
Milk can, H. Thompson 235,044
Millstone dressing machine, J. Kleckner 234,917
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Nose ring, animal, A. W. Ehle 234,861
Nursery pin, W. B. Clough 234,962
Nut lock, J. A. Sammis 234,894
Nut screw, W. Courtenay 234,907
Oiler, T. C. Chalk 234,909
Pails, safes, etc., non-conducting filling for dinner, O. M. Spiller (r) 9,488
Paper pulp machine for cutting wood fiber for Scott, De Pontee & Wyman 234,860

DESIGNS.

Bell, box, H. Thau 12,047
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Carpet, H. Hunt 12,043
Carpet, T. J. Stearns 12,046
Corset, M. P. Bray 12,040
Fire iron, etc., stand, R. Christensen 12,041
Furniture seat and back, G. W. Rich 12,039
Skirt, J. Schoenhof 12,045
Toy money box, Kyser & Rex 12,044
Wall paper, E. Leissner 12,048

TRADE MARKS.

Crackers, E. W. Albee 8,108
Medical compound for dysmenorrhea, M. J. Fuzard 8,105
Pharmaceutical preparation, certain, G. Evansvitch 8,104
Razors, knives, shears, scissors, and surgical instruments, G. Knecht 8,106
Tobacco and cigarettes, plug and smoking, Oliver & Robinson 8,107

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From November 23 to November 30, 1880, inclusive.

Beverage, A. W. Armstrong New York city.
Celluloid, decorating, A. Hart et al. New York city.
Crayon holder, J. Reckendorfer, New York city.
Electric light apparatus, H. S. Maxim, Brooklyn, N. Y.
Flax breaker, G. Milliken, Philadelphia, Pa.
Furnace, J. Wolfenholme Buffalo, N. Y.
Gas making apparatus, C. F. Dietrich, Baltimore, Md.
Reel stiffeners, S. L. Badley, New York city.
Hoisting machine, T. McCabe, Philadelphia, Pa.
Lamp, W. B. Robins, Cincinnati, Ohio.
Loom, J. Lyall, New York city.
Oil extracting apparatus, J. E. Borne, Brooklyn, N. Y.
Packing, metallic, E. P. Monroe, New York city.
Pliers, J. F. Cranston, Springfield, Mass.
Pumps, ship, J. Edison, Boston, Mass.
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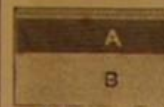
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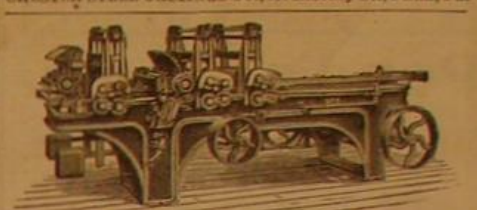
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