MACHINES THAT HEAR AND WRITE.

The propagation of sound in air is excellently illustrated in the ingenious apparatus devised by Professor Tyndall and represented in Fig. 1. A is a stem passing through the upright, B, to which a shock can be sent from a ball, C, through a spring to another ball, thence through another spring to another ball, and so on until at last the shock reaches the last ball, which is projected against the india rubber pad at the end, D, placed there to represent in a rude mechanical way the drum of the ear. When the stem, A, is pressed, the ball, C, only moves to and fro, yet it sends a kind of pulse, *f*, *e*, *e*, *f*, which travels along the line and ultimately causes the last ball to give a smart stroke on the pad, D. That this represents what takes place in air, when sound is propagated through that medium, is shown by the apparatus represented in Fig. 2. A tube 11 feet long and 4 inches wide has its ends closed with thin india rubber. Against the rubber at one end there presses a cork, *a*, with which is connected a hammer, *b*, which is in contact with the bell, *c*. If now a pulse be sent from the other end of the tube, the india rubber will drive away the cork and will cause the hammer to strike the bell. It will thus be evident that, when vibrations are caused in the air of a tube closed by a membrane, that those vibrations will be transmitted to the membrane. In the ear, as we have stated, the auditory nerves take the vibrations from the membrane to

FIG. 1.

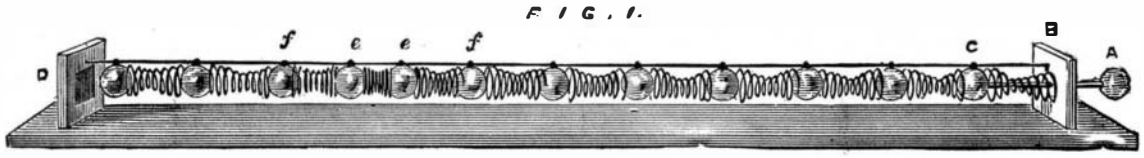
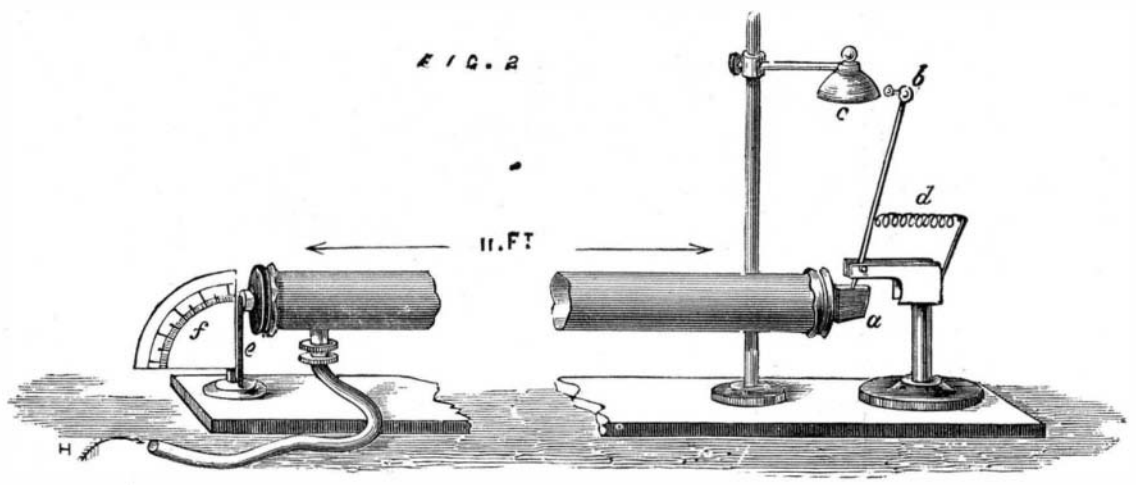
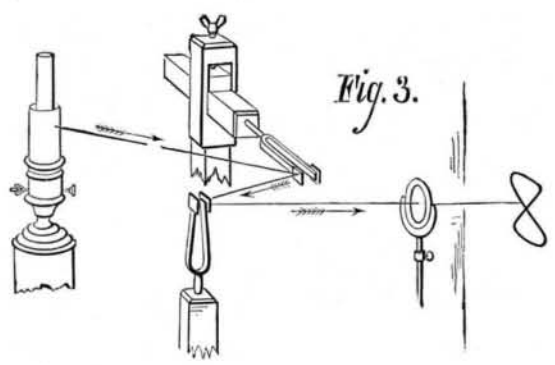
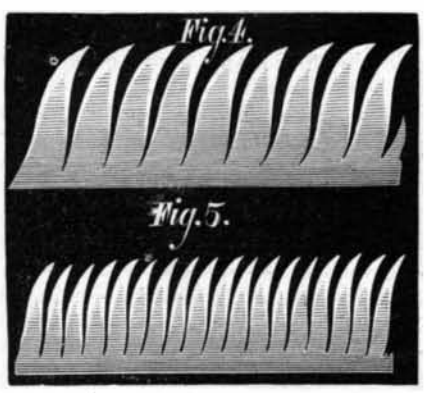


FIG. 2.

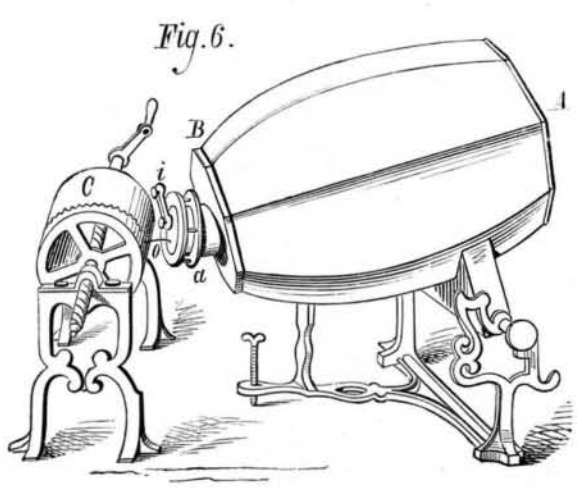




the brain, and the latter influences other nerves and muscles which cause us to write down what we hear. The problem to be solved in the phonograph is to find a mechanical substitute for auditory nerves, brain, and muscles, or, in other words, to connect some device with the body thrown into vibration by the sound, which shall register the movements

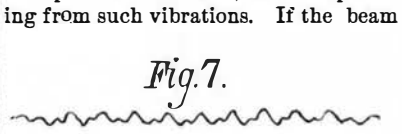


of that body. The simplest and most direct method of recording vibratory movements is by Lissajou's apparatus, by which the vibratory motions of two sounding bodies may be compared without the aid of the ear. This method,

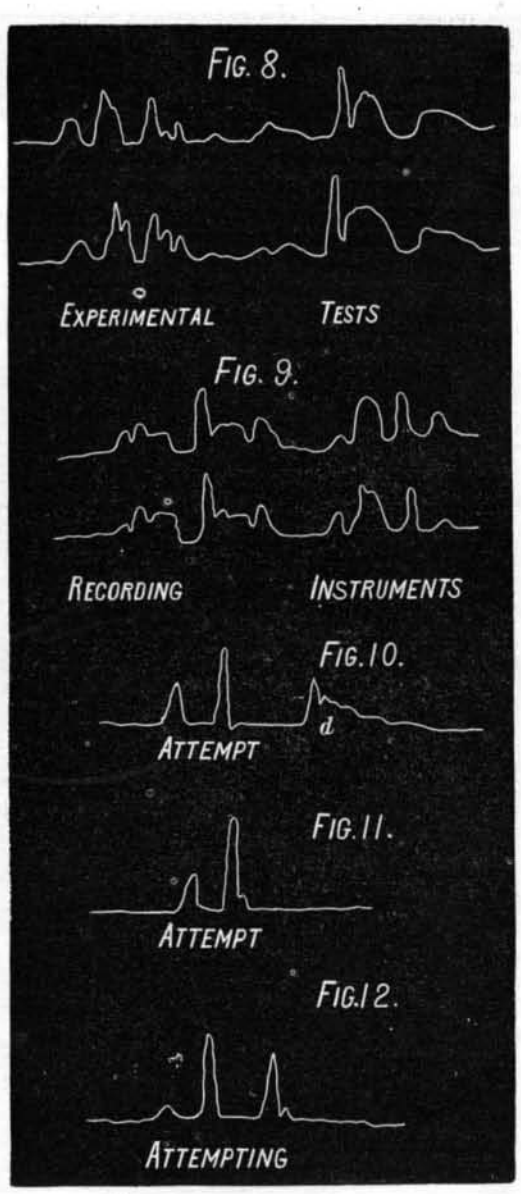


which depends on the persistence of visual sensations on the retina of the eye, consists in fixing a small mirror on the vibrating body, so as to vibrate with it, and to impart to a luminous ray a vibratory motion similar to its own. The bodies used are tuning forks, and in Fig. 3 is represented the optical combination of two rectangular vibratory motions, the figure being projected on a screen. A large number of curves are produced, which are more complex when the ratios or the numbers of vibrations of the bodies are less simple; and as each curve or variation corresponds to a definite condition of the forks (pitch, etc.) it is evident that, while it is a graphic representation of the vibrations which take place in the bodies, it also represents the sound resulting from such vibrations. If the beam of light producing the curves were projected upon a sensitized surface, then the curve would be photographed, and consequently we should have a graphic representation of the sound.

Fig. 7.

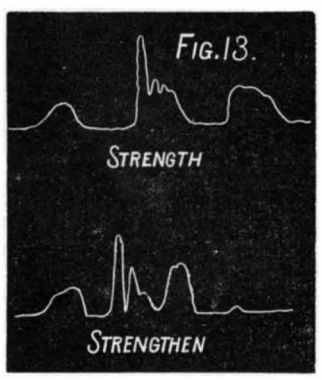


König's manometric flames furnish a very delicate mode of graphically showing the nature of sounds. The apparatus used consists of a metallic capsule divided into two compartments by a thin membrane of rubber. The tube on one side of the capsule connects with a mouthpiece; the space on the other side is connected with a gas burner, the supply pipe of which also enters said space, so that on one side of the membrane is air and on the other gas. When the sound waves enter the capsule by the mouthpiece and tube, the membrane yielding to the condensation and rarefaction of the air waves, the gas in the compartment on the opposite side of the membrane is alternately contracted and expanded, and hence are produced alternations in the length of the flame, which are, however, scarcely perceptible when the flame is observed directly. But to render them distinct they are received on a mirror with four faces, which is rotated on a vertical axis. As long as the flame burns steadily there appears in the mirror, when turned, a continuous band of light. But if the capsule is connected with a sounding tube for example, yielding the fundamental note, the image of the flame takes the form represented in Fig. 4, and that of Fig. 5 if the sound yields the octave. For different sounds produced before the capsule the flame assumes widely differing appearances. It would not be impossible to photograph the representation of the flame in the mirror, and thus permanent graphic records of sounds might be obtained.



We now come to purely mechanical means of registering sound, to which class belong the Edison and other phonographs. In Fig. 6 is represented Leon Scott's phonautograph, which consists of an ellipsoidal cask, A, of plaster of Paris, and about 1½ feet long. The end, A, is open; that at B is closed by a solid bottom having an orifice, in which is a bent brass tube, *a*, which carries a ring on which is affixed a thin membrane. Near the center of the latter is a very light style; and in order that this style may not be at a node, the membrane stretching ring carries a movable piece, *i*, which is termed a subdivide, and which, being made to touch the membrane first at one point and then at another, enables the experimenter to alter the arrangements of the nodal lines at will. It follows that, when a sound is produced near the apparatus, the air in the ellipsoid, the membrane and the style will vibrate in unison with it, and it only remains to trace on a sensitive surface the vibrations of the style and to fix them. For this purpose a rotating copper cylinder, *c* is covered with lampblacked paper and the style is brought in contact with the latter, so that, when the cylinder is rotating and the style vibrating, a sinuous line is produced, the nature of which depends upon the sound. Thus in Fig. 7 is represented the trace of the sound produced jointly by two pipes, whose notes differ by an octave. This arrangement of rotating cylinder is also employed in connection with tuning forks, a style being arranged on one arm of the fork. On a note being sounded in unison with which the fork is tuned, the fork vibrates and consequently a sinuous line showing the nature and velocity of the vibrations is made upon the paper of the cylinder.

In April, 1873, Mr. W. H. Barlow read before the Royal Society a paper on the "Logograph," an invention of his own for recording sound, which consists of a small speaking trumpet about 4 inches long, having an ordinary mouthpiece connected to one end of a tube of ¼ an inch in diameter, whose other end is broadened out so as to form an aperture of 2½ inches diameter, which aperture is stopped by a membrane of goldbeater's skin or thin gutta percha. Against this membrane a spring presses lightly and has connected to it a light arm of aluminum, which carries a marker consisting of a very fine sable hair pencil, projecting from the lower end of a glass tube containing coloring material, the tube and pencil together forming a kind of fountain marker, as the coloring material gradually oozes out and keeps the pencil continually moist and supplied with color. Under this marker a continuous strip of paper is made to pass, in in the same manner as the strip of paper in the register of the Morse telegraph, and the whole is so arranged that when the membrane occupies its normal position the marker makes a simple, straight line, as the strip of paper passes beneath it, but any force acting on the membrane will cause the marker to move, and a crooked line will be the result, the deviation from a straight line depending on the amount of force exerted on the membrane.



To provide for the escape of the air passing through the trumpet a small orifice is made in the side of the tube, so that the pressure exerted upon the membrane and its spring is that due to the difference arising from the quantity of air forced into the trumpet and that which can escape through the orifice in a given time. The pressure of the spring and the size of the orifice have to be so proportioned to each other as to admit of the movement of the marker with the slightest pressure of the breath, and yet it must not move so easily as to pass over the edge of the paper under the greatest pressure which the breath is capable of producing. By

this apparatus, when properly adjusted, the various sounds produced by speaking will act on the membrane, causing it to move the marker correspondingly to the force exerted by the differing tones of the voice, and thus a series of irregular lines will be produced, exhibiting remarkable uniformity when the same phrases are repeated, as is shown by the diagrams in Figs. 8 and 9, made by the instrument when the words under them were pronounced by the same speaker successively.

One of the first peculiarities manifested in using the instrument was the action produced by the silent discharge of air from the mouth after a word was pronounced. This silent discharge appeared to depend on the force required in the last syllable, and was most developed in those syllables terminating with the consonents termed "explodents," whether with or without the silent vowel E after them. This effect is shown in Fig. 10, in which the part marked *d* is the silent discharge, and its appearance in the diagram is under the control of the will, for by holding the breath immediately after pronouncing the word, this part of the diagram can be altered as shown in Fig. 11. If, instead of terminating with an explodent, another syllable be added to the word, making it terminate with a consonant of softer sound, the air which would have been silently discharged is used to form the syllable added, and the subsequent silent discharge is very much diminished, as at Fig. 12.

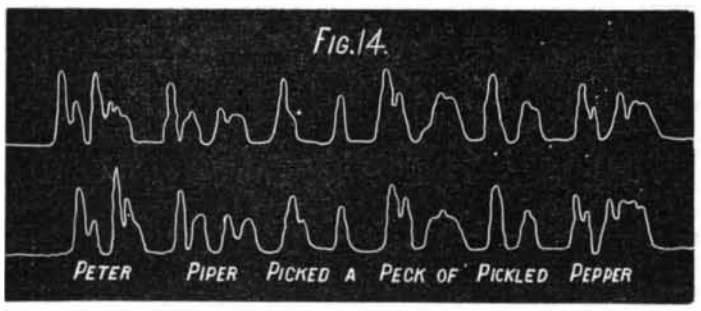
Some words appeared shorter when a syllable was added, as, for instance, the word "strength" and "strengthen," the mark made by sounding the latter being considerably shorter than when the former was spoken, as may be seen by comparing the diagram of the two words in Fig. 13.

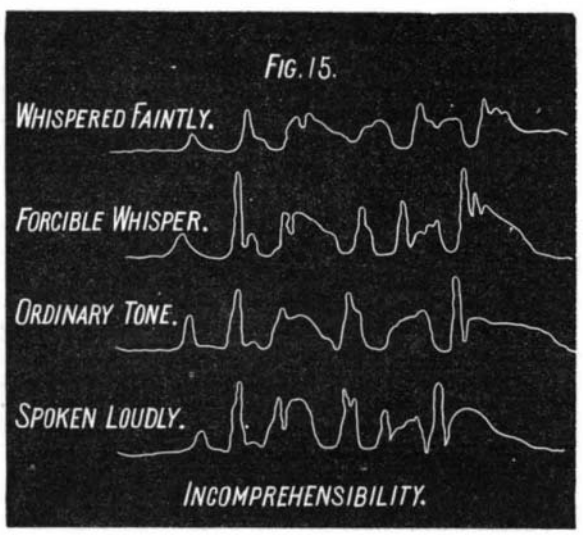
To test the rapidity of the action of the instrument, the old nursery line "Peter Piper picked a peck of pickled pepper" was repeated at the rate of six syllables per second, and the diagram shown in Fig. 14 was the result.

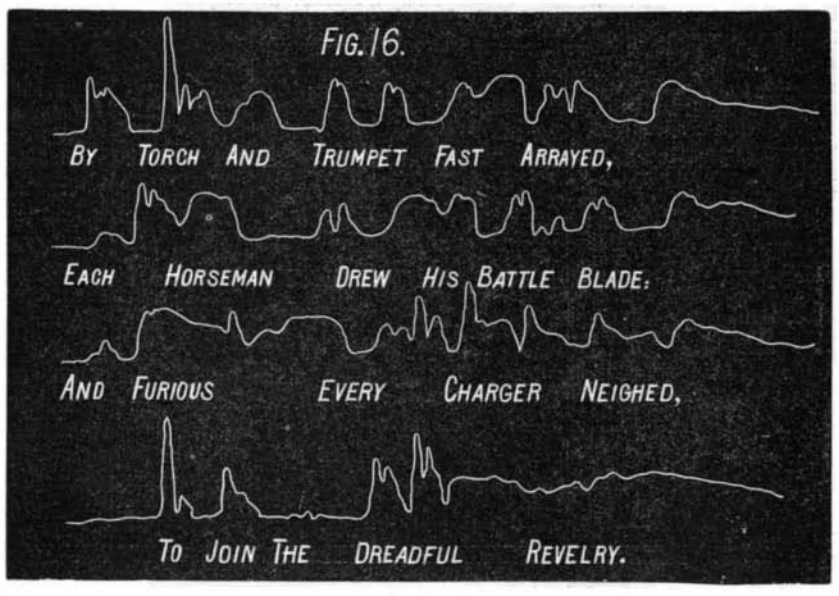
In Fig. 15 may be seen the diagrams made when the word "Incomprehensibility" was spoken in different tones, showing that, although a certain amount of variation due to the energy occurs, yet each sound preserves the same specific character.

Fig. 16 shows the diagrams made by repeating the well-known stanza from "Hohenlinden."

From the above it would appear that sooner or later we may expect to see the desks of our popular preachers provided with reporting instruments something on the same principle as Mr. Barlow's logograph, only much more delicate, so that each discourse may be taken verbatim, as it would seem that it would be comparatively easy to learn to translate the logographic diagrams (or logograms, if we may be allowed to coin a word) into plain English writing. It may be more difficult, however, to report the speakers at a public meeting in this manner, as, so far, we know of no means of separating from the discourse the various noises that indicate the applause or dissatisfaction of the audience, and which would, when operating in conjunction with it, produce a strange jumble of marks that would puzzle not only a Philadelphia lawyer, but a dozen of them, to decipher. If to the various noises produced by the vocal organs of the audience is added the occasional peculiar "swish" of a mal-odorous egg, deftly thrown by one used to the business, we are inclined to think that the deciphering of the extraordinary logograms thus made would require something more than human judgment, and it may therefore sometimes be necessary to press into the service as a translator the spirit of some defunct reporter or compositor, who, when in the flesh, made his living by rendering the late Horace Greeley's hieroglyphics into decent Roman type.







Washing with Silver.

Copper articles can be covered with an almost imponderable layer of silver. Some idea of the thinness of this layer can be imagined when we think that, inclusive of material, labor, capital, etc., the cost of silvering 1 lb. of corset eyelets is only 6¼ cents, while 1 lb. of buttons, suspender buckles, pins, etc., cost from 2 to 3 cents, while a grain of pure silver is worth 5 cents.

The method of washing these articles with pure silver is thus described by Roseleur in the *Metallarbeiter*, p. 316: Any desired amount of granulated silver is dissolved in twice its weight of nitric acid. The solution of nitrate of silver is then diluted with distilled water, and precipitated by a solution of table salt or hydrochloric acid, when a white cheesy precipitate is produced, which soon settles (especially if stirred). It is easy to ascertain whether all the nitrate of silver has been decomposed, which is the case when a drop of the salt solution or acid does not produce turbidity in the clear, supernatant liquid over the precipitate. The liquid is poured off and the precipitate washed by decantation repeatedly with distilled water to remove all free acid. If it is necessary to preserve the chloride of silver some time before using, it must be carefully protected from the light, because under the influence of light it changes rapidly and acquires a bluish color.

The chloride of silver is then intimately mixed with a little water and at least 80 per cent of tartar (bitartrate of potash), and the whole preserved in a stone pot. The composition of the mass is found to be extremely varied, for to the tartar is added a quantity of other substances like sulphate of soda, common salt, quicklime, magnesia, corrosive sublimate, etc., most of which, if not exactly injurious, are at least perfectly useless. We give here a formula somewhat cheaper than when tartar alone is used, which gives very good results: Chloride of silver from 30 grammes silver; pulverized tartar, 2½ kilos.; table salt, 2½ kilos. Some persons employ the salt alone without any tartar, but the silvering is then rather bluish.

When the paste is ready, some water is heated to boiling in a vessel of red copper, and one or two spoonsful of the paste thrown in it, which dissolves more or less. In a bath prepared in this way, the articles to be silvered must either be suspended from hooks or contained in a colander; usually a second vessel, less deep than the first and full of holes, is set against it, resting upon edge of the first, so that the articles in it are covered to a certain depth with the bath. When the silvering is ended it can be removed without wasting any of the solution. The articles are stirred around with a wooden spatula.

In each operation a quantity of paste, proportional to the surface of the articles to be washed, is added.

This silver bath improves by use, and finally acquires a dark green color from the dissolved copper, which takes the place in solution of the precipitated silver.

The silvering is not so perfect as the gilding in gold washes. They generally make use of the useless acids as in coppering. They are polished by means of sawdust, scarcely ever by means of a brush.

The smallest quantity of iron, zinc or tin, in the bath, spoils it, for all brass and copper articles then turn red.

The iron is first removed by means of a magnet. Little splinters of zinc are removed by treating the article with very dilute hydrochloric or sulphuric acids, which do not attack copper when cold. Tin or lead, which, however, are seldom present, must be removed by hand.

If, for any reason, the silvering did not succeed, the articles are subsequently dipped for a few seconds in boiling solution of nitrate of silver, 100 parts; cyanide of potassium, 600 parts: water, 1,000 parts.

This bath, which does not keep long, increases the lustre and the whiteness of the article considerably.

Another mixed process, which stands intermediate between dry and wet silvering, is the "paste process," and is also called thumb silvering, stuffed, or pencil silvering (*Daumen, stopfen*, and *Pinsel*, in German). These methods, whose results possess no considerable permanence, but still are much better than the washing process, frequently serve to repair the small breaks in better silvering, and also to produce on thinly gilded articles a mixture of gold and silver, or gold with so-called oxidized silver. The portions which are to be left unsilvered are simply varnished.

The paste for this process is made by grinding in a mortar, or with a muller upon a plate, excluding the light as far as possible, an intimate mixture of the following substances: Fused nitrate of silver, or, better, chloride of silver, 100 parts; binoxalate of potash, 300 parts; tartar, 300 parts; table salt, 420 parts; sal-ammoniac, 80 parts; water, 100 to 150 parts: or, take chloride of silver, 60 parts; tartar, 200 parts; table salt, 300 parts.

The mixture is ground as fine as possible in the mortar, then ground with a muller upon a thick piece of ground plate glass, until no grains are felt when pressing it between the fingers. This paste is kept in a black bottle, or a jar of opaque material, to protect it from the light, which rapidly decomposes it.

When about to use it, a small quantity is triturated with some water in a glass or porcelain dish, and the mass applied with brush or pencil to an article completely covered with gold, either by dipping or electro-plating, where the gold is so thin that the paste can be decomposed through it by the copper. It is then allowed to dry, and warmed. The dry paste exhibits a pink or perfectly green color, according to the thickness of the gold plate and the consequent strength of the chemical reaction. The latter color indicates that a considerable quantity of the copper is dissolved, and in consequence a corresponding amount of silver has been reduced.

The salt that sticks to the article is removed by washing with cold water. The silvering is then pretty but dull, and its lustre and whiteness is increased by dipping for a few seconds in very dilute sulphuric acid, or. better, a solution of cyanide of potassium.

This silvering will bear brushing and polishing, and can also be oxidized, hence it is easy to see that it is preferable to the washing or boiling with silver first described.

In case the first deposit has not been thick enough to make it sufficiently durable, it can be repeated, after polishing. a second or third time.

By the use of this mixture upon non-gilded copper, the silvering is less white and not so durable as upon the gilded articles.

The different powders and liquids which are met with in commerce under the names of silver water, plate conservator, California liquid, etc., and which are used in restaurants and cafés to repair their worn-off silver plate, are nothing more than some of this paste suspended in pure water or salt water.

In America, silvering solutions are usually some poisonous mercurial compound which forms with the brass or copper a brighter and silver-like amalgam, which lasts just long enough for the guilty pedler to effect a safe retreat before its brightness disappears.

These liquids must not be confounded with others sold under the pompous names of "aurophile" and "argentophile," which latter are intended to freshen up old gilded and silvered articles by dissolving the layer of oxide formed on the surface. These fluids are simply solutions of cyanide of potassium, which was formerly recommended for this purpose. They are most violent poisons, and ought under no circumstances to be tolerated in the kitchen.

American Railway Builders in Brazil.

Mr. Gowen, of Philadelphia, has just received a cable telegram from London announcing the execution of the contract there between the Madeira and Mamoré Railroad Company (Limited), the National Bolivian Navigation Company, and Messrs. P. & T. Collins, contractors, of Philadelphia, by which the latter agree to complete the grading, masonry, and superstructure, and furnish the equipment of the railroad of the first named company. This road is projected from the present head of navigation on the Madeira River, a branch of the Amazon, in Brazil, to Bananeria Falls, on the Mamoré River, on the borders of Bolivia, and is about 180 miles long. embracing the falls and rapids, which now render navigation impracticable. It is designed as a narrow gauge road, with iron rails of 45 pounds per yard, and will be used to transport the products of the Atlantic slopes of the Andes to the navigable waters of the Madeira River and thence down the Amazon. The Philadelphia and Reading Coal and Iron Company will supply all the rails and other ironwork and materials that will be required to construct and equip the road. This is a first and most important opening of trade between this port and Brazil. The equipment will include locomotives, cars, rails, spikes, bolts, chairs, turn-tables, etc., and the total cost of the road is said to be

$5.000,000. The payment to the contractors will be about three quarters in cash, for which the money is now in hand, and the remainder in the debentures of the railway company, guaranteed by the Brazilian Government. The Philadelphia and Reading Coal and Iron Company will receive immediate cash payments on shipment of the materials from the port of Philadelphia.—*Engineering News.*

New Inventions.

A novel Horse Detacher has been patented by Mr. John L. Kellum, of Salem (Maxwell Station P. O.), Tenn., the arrangement of which is such that the animal may be quickly let go. should he become frightened or unmanageable. The device also enables the traces to be conveniently fastened to or loosened from the whiffletree when attaching or detaching the horses.

A new Sun Dial, patented by Mr. Axel W. Anderson, of Bedford, Pa., consists of a ring having circumferential slots, surrounded by a perforated adjustable band, and containing an adjustable dial or scale, formed in an epicycloidal curve. A pencil of light falls upon hour marks engraved on the device, through an aperture in the band. This invention is both curious and ingenious, and as the inventor states it may be made small enough to serve as a charm for a watch chain, it doubtless would be a profitable article to manufacture.

Mrs. Julia Wuerfel, of Sheboygan, Wis., has devised a new Dress Pattern Chart, which is quite simple, and which furnishes a guide for any size or style of cutting. Its use is quickly learned.

A new Photographic Camera, invented by Mr. John C. Moss, of New York city, is adapted for drawings photographs, etc. It consists mainly in a device for suspending the instrument so that it will not be affected by the jarring or vibration of the building in which it is placed, and also in novel mechanism for focusing and adjusting the camera.

Mr. Joseph G. Densmore, of West Dresden, Me., has invented a Ferry Boat, which is impelled across rivers, etc., by the action of the current. The boat is adjusted at an angle with respect to the crossing rope, so that the current will strike directors at an angle which may be increased or diminished at will.

A novel Thill Coupling has been devised by Mr. David R. Silver, of Sidney, Ohio, which is so constructed as to have little wear, to allow of wear being taken up, and which admits of the thills being readily and quickly attached, or they may be detached by removing one bolt from each coupling.

A Surgical Apparatus, patented by Frank Green, of Columbia, S. C., for preparing bandages, spreads the plaster of Paris simultaneously with the winding of the bandage, so as to save time and material. It consists of a box with guide, tension, and winding devices, used in connection with a hopper for the plaster of Paris, having slides to regulate wide and thickness of plaster to be spread, and to cut off the supply when the bandage is nearly covered. The box has also a tank to apply soluble glass to a bandage. It is valuable to surgeons.

A new method of Attaching Shanks to Door Knobs, patented by A. E. Young, of Boston, Mass., consists in pouring into the hollow knob a quantity of melted cement, sufficient to partly fill it, inserting the shank or socket, and inverting it to permit the cement to settle around it.

In a Rein Holder patented by Gregory Jennings, of West Cairo, O., a slotted tube is provided with a hook and spiral spring. The rod is fitted with a screw and crosshead, which fits between the arms of the hook. It holds the reins firmly and prevents their falling to the ground.

In a Bicycle, patented by John Smith and E. T. Thurston, of Rockville Center, N. Y., the driving wheel is provided at the axle with end pinions, which are operated by internally geared wheels loosely pivoted on each side and provided with treadles. It has the merit of simplicity.

G. Keilicks, of Chapin, Ill., has invented a Door Securer. At one end of a slotted bar is a chisel-shaped point at right angles, which fits into the jamb of the door. A thumb screw is fitted to the other end, which works through brackets. It is of use to travelers.

An improved Brush has been patented by B. R. Hill, of Pompton, N. J. After boring the usual holes in the wood, a suitable tool is introduced into them, and interior tapering holes are made larger than the outer hole. The brush is driven in with a small wedge, which expands in the large hole within and firmly holds the bristles.

In a Smoke Ventilator, invented by C. K. Edwards, of Boston, Mass., the strips and openings being all constructed by sixes, three openings will receive the wind, leaving three for the smoke and foul air to escape through. By an ingenious device the strips and openings are so arranged that the wind cannot blow into the main pipe, but must pass out through the openings on the opposite side, carrying the smoke with it and increasing the upward draft of the flue.

A Tucker, patented by Eliza Ann Vance, of Gallipolis, O., consists of two movable parts, both of which are clamped to the cloth plate of the sewing machine. The upper part is movably attached to the lower by flanges, to regulate the distance apart of the tucks, and edges of arms are turned over each other. It is a useful addition to the sewing machine.

An Oil Well Torpedo has been patented by C. A. McCoy, of Edenburg, Pa. It consists of a cylindro-conical vessel adapted to contain nitro-glycerin, and which is provided externally with annular elastic cushions to prevent premature explosions. Percussion cap plungers are secured to a weight and suitably guided and arranged to strike upon anvils fixed inside of the vessel. It is an effective instrument.

JOHN WILLIAM DRAPER.

John William Draper was born at St. Helen's, near Liverpool in 1811. From an early age his attention was devoted to chemistry, natural philosophy, and the higher mathematics. After prosecuting his chemical studies for some time at the University of London, he emigrated to the United States and entered the University of Pennsylvania. He took the degree of M.D. there in 1836, with the rare distinction that his thesis was selected for publication by the medical faculty. For a time he was Professor of the Natural Sciences at Hampden, Sidney College, Va., and in 1839 he was called to the chair of chemistry in the University in the City of New York. Among the first studies to which Dr. Draper directed his attention was the chemical action of light. In 1842 he discovered that not only might the Fraunhofer fixed lines in the spectrum be photographed, but that there exists a vast number of others beyond the violet, which up to that time had been unknown. Of these new lines, which more than doubled in number those already known, he published engravings. He also invented the instrument for measuring the chemical force of light, the chlor-hydrogen photometer. His memoir "On the Production of Light by Heat," published in 1847, was an important contribution to spectrum analysis. It gave the means for determining the solid or gaseous condition of the sun, stars, and nebula. He established experimentally that all solid substances, and probably liquids, become incandescent at the same temperature; that the thermometric point at which such substances are red hot is about 977° Fah; and that the spectrum of an incandescent solid is continuous—it contains neither bright nor dark fixed lines.

Dr. Draper was the first person who succeeded in taking portraits of the human face by photography, and was also the first to take photographs of the moon. His memoir on the Distribution of Heat in the Spectrum showed that the predominance of heat in the less refrangible regions is due to the action of the prism, and would not be observed in a normal spectrum, such as is formed by a grating; and that all the rays of light have intrinsically heating power.

He discovered more than forty years ago the facts in regard to capillary attraction, claimed by Mr. Lippman and which lately excited so much attention in Europe.

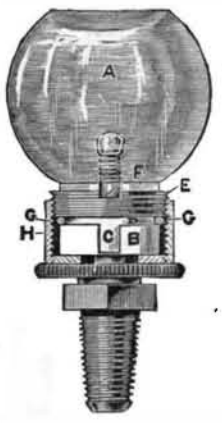
Dr. Draper has published many works on scientific and other subjects, and has made many other important discoveries, too numerous for us to mention here. He stands in the front rank of living scientists. His two sons, Professor J. C. Draper and Professor Henry Draper have also written much and made many important researches, the latter having lately discovered the presence of oxygen in the sun.

The large and elegant likeness we present on our front page was engraved from a recent photograph by the Photo-Engraving Company of 67 Park Place. It shows to what perfection the art of photo-engraving has been brought, and the fineness of the work which it performs. There is no hand work whatever on the block, and yet the lines are deep sharp, and even, and fairly rival the best work of skilled wood engravers. It seems eminently proper that the portrait of one of the first discoverers of photography should thus be beautifully displayed by a further development of his own discovery.

AUTOMATIC SHAFT OILER.

The annexed cut represents a new and simple shaft oiler, by means of which it is claimed that the difficulty experienced in making an air-tight joint between the glass globe and its brass socket, and in regulating the flow of oil, is avoided.

A is a glass globe with grooved neck, B, the end of which is ground smooth to form a tight joint against a cork washer.



A threaded brass ring with a projection, C, to prevent turning, slips over the neck, and is retained by a soft brass ring to the groove above B. The feed is regulated by a hole in slotted screw, D, with air-tight packing, E. The slot in screw is parallel with the hole, and will show the amount of fuel like a cock. A new glass is easily replaced by removing the soft brass ring from the groove, and the feed regulated without removing the cup.

By the use of these cups, waste in oiling machinery is claimed to be avoided, as it is stated that a cupful of oil will keep machinery well lubricated for many months.

For further particulars address F. Lunkenheimer, Cincinnati Brass Works, Cincinnati, Ohio, sole owner and manufacturer.

New Regulation about Boilers.

Supervising and local inspectors of steam vessels are now notified by the Treasury Department Supervising Inspector-General, that some manufacturers of boiler iron are stamping iron of their manufacture at much higher tensile strain than such iron will bear when tested by the Riehle testing machine. In consequence of this practice, injury has resulted to boiler manufacturers, who innocently purchased such iron, and failed to apply the test until after the completion of the boilers, as recently occurred in two cases in the local districts of New York and Philadelphia.

To prevent a practice so unjust and manifestly dangerous, Inspectors are directed to obtain samples from the plates of all boilers about to be constructed in their districts, and subject them to an actual test *before* the boilers are begun, and to represent to boiler manufacturers the importance to themselves of this precaution. Whenever the results of such tests fall below the tensile strength stamped on the iron, Inspectors must report such results to the Supervising Inspector-General.

Inspectors are also directed to carefully ascertain that all samples of boiler plates tested by them have the homogeneousness and toughness required by Revised Statutes, and to be especially careful in that respect where the plates are stamped above 50,000 lbs. tensile strength.

New Mechanical Inventions.

An improved system of Friction Gearing has been patented by Mr. Daniel H. Merritt, of Marquette, Mich., which consists in making a V-shaped groove between the bases of the ribs or teeth, the angle being more acute than that of the latter. As the teeth travel faster at this periphery than at their bases, they are consequently liable to greater wear at the former portion, but by this construction as they are abraded they maintain their original form.

Mr. Greene Chote, of East Saginaw, Mich., has devised a new Pipe Elbow Seaming Machine. The parts of the elbow are passed through collars, so that the seam is closed directly over the edge of a plate. The rear collar is then drawn down, forming one bend of the seam and holding the inner section. The drawing down of the forward collar closes the seam.

A new Breech-Loading Firearm, patented by Mr. Victor Bory, of New York city, is an improvement on the arm patented by same inventor June 5, 1877. The construction is materially simplified, and new devices for hinging the barrel to the breech-piece, working the extractor, etc., are added.

A new Rock Drill has been patented by Mr. Uriah Cummings, of Buffalo. N. Y. The novelty consists in constructing the clutch head with ratchet teeth on its upper end, in combination with a pawl, which is so arranged on the frame of the machine that the drill rod will receive intermittent rotary movement during its ascending strokes.

Mr. Albert S. Todd, of Pultneyville, N. Y., has invented a very ingenious Mechanical Movement, which may be driven either by hand or foot, and by one or more persons, for actuating machines, propelling boats, and carriages. Several correspondents have asked us for a machine of this kind, and their attention is accordingly directed to Mr. Todd's device.

J. R. Vellacott, of Buffalo, N. Y., has patented a Tension Attachment for Scroll Saws. It consists in the combination, with a suitable frame, of two curved levers, connected by a link of flexible material, and drawn upward by spiral springs attached to stirrups, in which are journaled rollers, that travel on the under surface of the curved levers and equalize the strain upon the saw. It is a good device.

A Hinge patented by Benjamin Fahnestock and H. F. Peckham, of Watsonville, Cal., consists in a reversible or right and left butt hinge, which is constructed with a removble solid eye, having secured to it a washer and also pintles, which are designed to enter double barrel eyes formed on one of the leaves. It is a good hinge.

H. Niles Harrington and Mitchel Stoddard, of Stockbridge, N. Y., have invented an improved Washing Machine It consists of a permanent suds box with side uprights or standards. Oscillating upon a cross rod at the top is a slightly convex rub board grooved diagonally on its lower face. A curved lever, suitably attached, serves to press the rubber upon the clothes, which are placed on a series of rollers which are themselves supported on springs, which yield to the varying thickness of material. It will prove a very useful article in the laundry.

George W. Higgins, of Shelbyville, Ind., has invented an improved Saw Frame for Sawing Machines. It is independent of and detachably fastened to the vehicle frame, and can be slid upon the latter, so as to allow the vehicle to turn conveniently among the trees. It can be operated easily by one attendant.

In a Water Meter invented by D. P. Weir, of Salem, Mass., a toggle-jointed spring lever works the valve by the recoil of the spring, which is compressed by the piston of the engine in the forepart of its movement, and escapes after passing the center, and then acts on the valve. It is geared to the valve by a simple and effective device, thus furnishing a reliable meter.

A Cut-off Valve has been patented by Thomas Whittaker, of Passaic, N. J. The top plate of the cylinder has steam ports and induction and eduction channels, and is combined with a balanced side valve with correspondingly tapering cavities, to which longitudinal and transverse motion is imparted for regulating the speed of the engine, so as to secure uniformity of speed. The valve is guided by a transversely reciprocating slide frame connected to the governor. A steam chest is thus dispensed with and a simple slide valve obtained.

An improved Circular Saw patented by C.Y. Wilson, of Macon, Ga., has three teeth in each set, the front one being a base recessed clearer in line with the saw plate, and the other two being cutters vertical on one edge, inclined on the other, and sharpened as well as rounded on the points. It cuts smoothly and quickly.