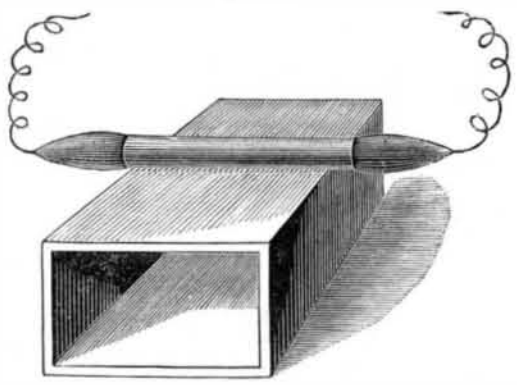
Alexander Brothers, Philadelphia, Pa., Leather Belting.
Geiser Manufacturing Co., Waynesboro, Pa., Grain Separators.
Jno. Dickinson, New York, Diamonds for Drills.
J. A. Brown & Co., Providence, R. I., Watch Cases.
Chickering & Co., New York and Boston, Piano Fortes.
L. Postawka & Co., Cambridgeport, Mass., Piano Stools.
Horace Waters & Co., New York, Piano Fortes.
Fairbanks & Co., New York, Weighing Scales.
Marvin Safe & Scale Co., New York.
H. W. Collender, New York, Billiard Tables.
Simpson, Hall & Co., New York, Electro Plated Wares.
H. L. Judd, New York, Hardware.
Stout, Mills & Temple, Dayton, O., Turbines.
J. F. Frueauff, Columbia, Pa., Hydraulic rams.
A. H. Watkins, Boston, Mass., Portable Gas Lights.
Stearns Manuf. Co., Erie, Pa., Circular Saw Mills.
First & Pryibil, New York, Wood Working Machinery.
Bradley & Currier, New York, Doors, Windows, etc.
C. B. Rogers & Co., New York, Wood Working Mach'y.
Stanley Rule and Level Company, New York.
Parker Brothers, Meriden, Conn., Firearms.
Carr & Hobson, New York, Agricultural Implements.
E. Gillet, New York, Ice Machines.
A. M. Lesley, New York, Refrigerators.
B. K. Bliss & Sons, New York, Seedsmen.
Beach, Son & Co., New York, Seedsmen.
W. H. Schieffelin & Co., New York, Druggists.
Geo. Mather's Sons, New York, Printing Inks.
Golding & Co., Boston, Mass., Printing Presses.
Francis & Loutrel, New York, Stationers.
Wilkinson Brothers & Co., New York, Paper-makers.
Photo Engraving Co., New York, Relief Plates.
Macgowan & Slipper, New York, Printers.
J. W. Fiske, New York, Ornamental Iron and Zinc Manfr.
Thompson & Bedford, New York, Lubricating Oils.
W. J. Wilcox & Co., New York, Pure Lard and Oils.

THE CARBON TELEPHONE.

Professor Huxley, on May 9th, read before the Royal Institution a communication received the day previous from Professor Hughes, of Kentucky, the well known inventor of the type printing telegraph, now resident abroad, in which is described, as the original discovery by the author, a new telephone, remarkable for its simplicity and its astonishing power of magnifying and so rendering audible the faintest sounds. Professor Hughes claims to have discovered that certain non-homogeneous conducting substances, placed in circuit with a battery, possess the property of converting sonorous vibrations into undulating currents of electricity, by which not only can articulate speech be transmitted to a distant Bell telephone, but the sound is very greatly magnified. It is well known that when contact is made and broken between a battery and a telephone a loud, dull tick is produced. If, however, the resistance of the circuit or of the battery is suddenly changed a sound is made in the telephone, but it is of different nature. If, for example, the conducting wire is torn asunder, there is heard a grating noise; the same is audible if the wire be bent, and it would appear that this is owing to the fibers, which constitute the wire, beginning to give way or

Fig. 1.



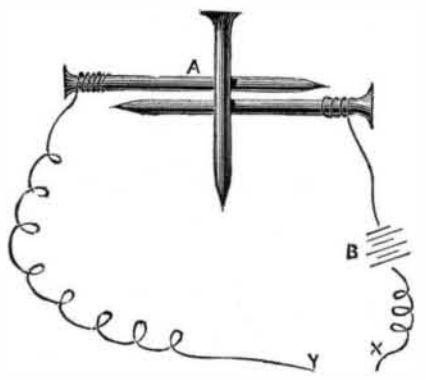
dragging over one another, producing a variation of resistance.

Filling a glass tube with a powder of zinc and tin, Professor Hughes closed the extremities with plugs of gas carbon, which slightly compressed the contents. To these plugs the battery wires were attached, and a galvanometer was placed in circuit. On grasping this tube by the ends, and pulling it so as to subject it to tensile strain, the galvanometer needle was deflected in one direction; on compressing the tube endwise, the needle moved the other way. The particles being separated, in the first instance, and forced together in the second, the resistance of the circuit was varied, increasing the current in the former case, and decreasing it in the latter.

The only disposition of the tube to fit it for the purposes of a telephone was to attach it to the top of a small box which served as a resonator, as shown in Fig. 1. Professor Hughes claims to have found that even a piece of vegetable charcoal impregnated with mercury, or with platinum perchloride, answers nearly as well as the tube, and ordinary mechanical structures which contain a good many joints, such as a small machine or a chain made into a little heap, act almost as well as the substances referred to.

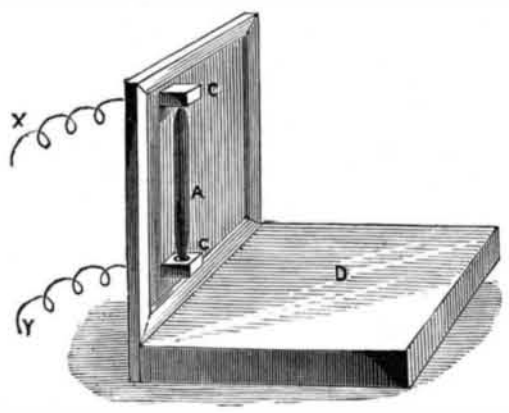
The simplest form of such a structure is shown in Fig. 2, in which two common French nails, A, are fastened down to a horizontal board about a millimeter apart. Wires, X and Y, are attached to them leading to a battery, B, and a telephone, in such a manner that the nails form the only break in the circuit, which can be closed by laying any conducting material across them. When a third French nail is laid across the other two it is clear that (as a cylinder can only touch another cylinder whose axis is not parallel with it in a single point) the electric circuit has a very imperfect connection at the points of contact between the nails, and it is to this faulty connection that the sensitiveness of this arrangement is due. This exceedingly simple device transmits sounds with wonderful distinctness and power. The most sensitive contrivance, however, yet devised by Pro-

Fig. 2.



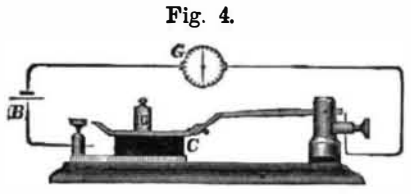
fessor Hughes, is represented in Fig. 3. It consists of a little pencil of gas carbon, A, held in small carbon blocks, C, which are attached to a thin sounding board, secured to a more solid base board, D. The blocks are connected by wires to the battery and line wire leading to the telephone. This little apparatus not only takes up and transmits articulate speech to a distant station with great power and distinctness, but "it detects and converts into loud noises the minutest possible vibrations." Professor Hughes states that "the tip of a soft camel's hair pencil gently stroked along the table on which the instrument is placed is faithfully recorded as a loud rustling sound," and that "the very footfalls of a little common house fly as it walks along the board are heard with unmistakable distinctness by a person whose ear is at the distant telephone, which may be miles away."

Fig. 3.



The discovery on which all this is based seems to us closely similar to that made over a year ago by Edison. He found that, when properly prepared, carbon possesses the remarkable property of changing its resistance with pressure, and that the ratios of these changes, moreover, correspond exactly with the pressure. His device for showing the decrease in resistance is represented in Fig. 4. This consists of a carbon disk, two or three cells of battery, and a galvanometer. The carbon is placed between metal plates, through which and the carbon the current passes. When a given weight is placed upon the upper plate the carbon is subjected to a definite amount of pressure, which is shown by the deflection of the galvanometer needle. The greater the weight, the greater the deflection. Compare this device with Professor Hughes' apparatus for the same purpose, represented in Fig. 5. Here the substance to be tested is placed between the jaws at D, and pressure can be increased or diminished by

Fig. 4.

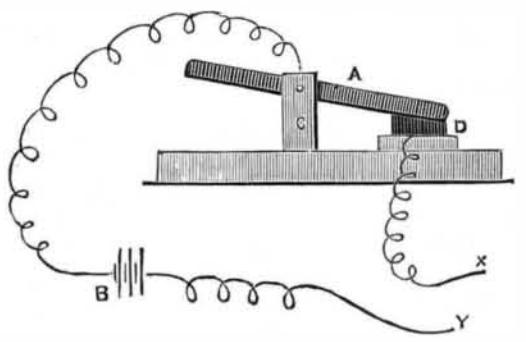


placing small weights on the bar, A, on one side or the other of its pivoted center. The bar is attached through C to the battery, B, and the lower jaw is connected with the telephone and battery by the wires, X and Y. With this instrument Professor Hughes tested powders and various substances in similar manner to Edison, a telephone being used, and the ticking of a clock observed instead of the deflection of a galvanometer needle. It is hardly necessary to point out to the intelligent reader that the two devices are exceedingly alike, and although Professor Hughes in his communication makes reference to Edison's work, he does not seem to have fully apprehended its close bearing upon or possible anticipation of his own. He seems, in fact, to have been oblivious to the various descriptions of Mr. Edison's discovery that have been published here. For example, it would not appear that he had read the description of Mr. Edison's Carbon Telephone, published in the SCIENTIFIC AMERICAN of July 28, 1877.

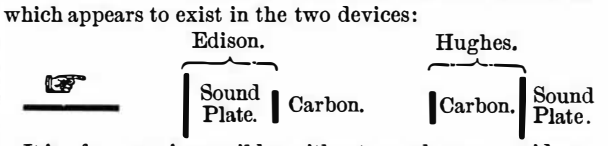
It was of course but a step onward for Mr. Edison to substitute a diaphragm for the weight in his trial apparatus, and to cause the diaphragm to vibrate with varying degrees of pressure against the carbon by the vocal waves. The variations in the current would then cause it to possess all the characteristics of the vocal waves, and by its reaction through the medium of an electro-magnet, might then transfer them to another disk, causing the latter to vibrate, and thus reproduce audible speech.

Edison's telephone, constructed on this principle, is represented in Fig. 6, in which E is the carbon disk, A the diaphragm, and D and G platinum plates which hold the disk, and which are connected in the battery circuit. In a later device Mr. Edison does away with the vibrating diaphragm altogether, and uses simply a rigid plate of metal to "concentrate a considerable portion of the sonorous waves upon the small carbon disk or button."

Fig. 5.

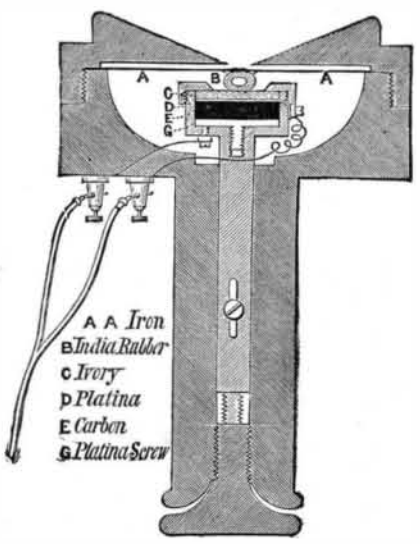


The annexed diagram, in which the hand denotes the direction of the sound waves, will show the small difference which appears to exist in the two devices:



It is of course impossible, without much more evidence than is before us relative to Professor Hughes' experiments, to reach any certain judgment as between him and Mr. Edison, but a *prima facie* case in favor of the priority of the latter seems to us pretty clearly made out. As to the transmission of minute sounds, Mr. Edison some time ago informed us of his having achieved that possibility, which, he said, extended to the registration of minute heat waves. Both inventors, however, are American, both are highly distinguished, and both are equally capable of making so important and creditable a discovery, so that the question we have raised will in no wise, in popular estimation, affect the surpassing value of their work. We are indebted to *Engineering* and to Mr. George B. Prescott's book on the "Telephone" for our engravings. Professor Hughes' communication to the Royal Society, as read by Professor Huxley, will be found in full in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, together with an account of certain practical experiments with some of Mr. Edison's devices.

Fig. 6.



Progress of the Great Tunnel.

A recent report of the inspector of the great St. Gothard tunnel through the Alps states that the irregular character of the formations pierced by the tunnel has entirely ceased, and that the work is now progressing through uniformly regular strata. On the south side the boring progresses at the rate of 10 feet daily through gneiss. The rate is somewhat less on the north side, where the tunnel is not yet out of the serpentine. The thickness of this stratum of serpentine now being pierced is already double that estimated by geologists from the surface indications.

Invention of the Iron Frame for Pianos.

In our recent paragraph entitled "A Hundred Years' Progress in Piano Making," we ought to have added the interesting fact that the inventor of the iron frame, now used in all pianos, is still living, in vigorous old age, and is still following his original business of piano manufacturing; we allude to Mr. Conrad Meyer, of Philadelphia, Pa. He is now in the 86th year of his age, and is the senior member of the well known firm of Conrad Meyer & Sons, whose instruments have attained a world wide reputation for excellence.

The iron frame was invented by Mr. Meyer in the year 1832, and in the following year, 1833, he exhibited a piano containing this style of frame at the regular exhibition of the Franklin Institute in Philadelphia. This is fully attested by the records of the Institute, by the makers of the instrument, and by the purchaser of this first piano, Mr. John M. Hood, of Philadelphia. After many years of use this piano finally came back into the hands of the original inventor, and was by him exhibited at the late Centennial Exhibition.

Probable Discovery of a New Element.

MM. Marignac and Delafontaine announced some time ago the opinion that gadolinite contained something more as bases than yttria and the oxides of erbium and terbium. Recently M. Soret has found in the ultra violet spectrum of this substance lines which belong to the spectrum of no known metal, and it seems probable that a new element will before long be thus brought to light.

THE BUFFALO FORGE.

We illustrate herewith a new portable forge, the advantages claimed for which are lightness, strength, compactness, a strong blast, and ease in operating the same, the standard aimed at being the old-fashioned bellows in efficiency without the bulk. Another important feature is the facility of operation by means of the swivel handle arrangement below described, in connection with a combination of ratchet and gear. As shown in the illustrations, the ratchet and gear wheel is revolved by means of a long wooden lever, which is made to swing horizontally as well as perpendicularly on the upright arm which projects from the hearth; this lever is connected by an iron rod with a swinging bar, which hangs on the same shaft as the gear, and which holds two pawls. A downward pressure on the wooden handle moves this bar forward, engages the pawls with the ratchet, and causes the wheel to revolve forward; the return stroke releases the pawls. The proportions of the large and small gear wheels and the large and small pulleys being as 1 to 144, and one man, we are informed, being capable of making, easily, 40 strokes per minute, each causing the gear wheel to make from 1½ to 2 revolutions, an idea of speed obtained can be easily formed.

The machinery is all attached to the hearth, and not to the legs, which makes it very compact. The legs are wrought iron pipe, and are screwed firmly into cast iron sockets projecting from the hearth. The working parts being entirely under the hearth, they are not liable to get wet if exposed to the rain or snow when used in the open air. There is no dead center to overcome when starting up, and it is impossible to revolve the fan backward. The journals are all Babbitted. It is not necessary to fill the hearth with fire clay to prevent the working parts from getting hot, but it can be

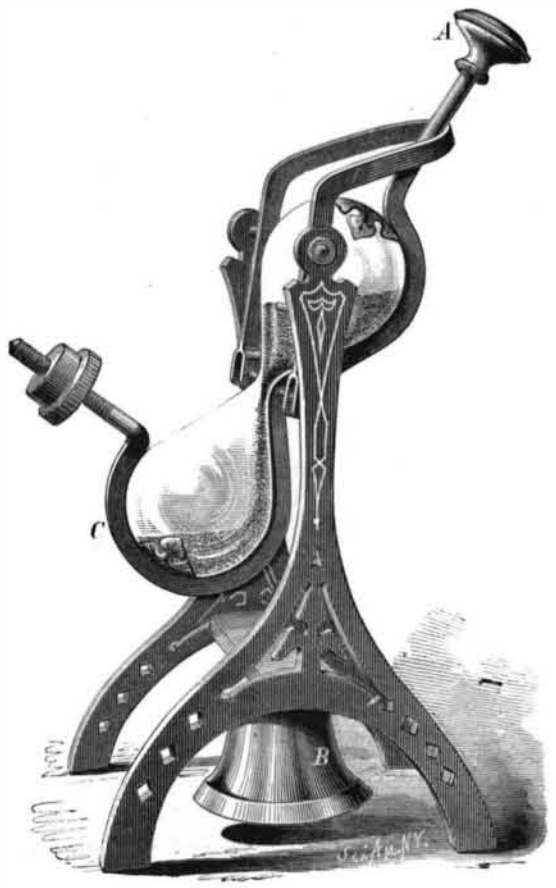
THE BUFFALO FORGE.

done if desired. Each forge has four drop handles attached to the legs, also an oil can shelf. The long wooden handle has an easy motion, which makes the work of operating very light. It also allows the operator to move about his fire on a radius of six feet or more without interrupting the blast. As to its efficiency, the manufacturers state that they have heated a bar of 2¼ inch round iron to a welding heat in 5 minutes. To keep a slow fire it is only required to turn the lid of the ash box, which is attached to the fan case for the purpose of removing the dust and ashes falling through the tuyere, and a sufficient draught is obtained to keep the fire always ready for use during working hours.

For further information address the Buffalo Forge Company, 78 and 80 Washington street, Buffalo, N. Y.

IMPROVED SIGNAL EGG BOILER.

We illustrate herewith an ingenious device for giving an audible signal as soon as the sand in a sand glass has run out, the object being to give warning when eggs are cooked and to save the necessity of watching the glass. The glass is fixed in a wire frame, as shown, and is provided with a horizontal bar or axis, which passes just behind the middle of the glass, and enters bearings in a swinging frame. Upon these bearings the glass and wire frame revolve freely. The swinging frame is suspended between two standards, as shown, and its object is to render the action of the glass more delicate and also equally reliable, whether the surface upon which the pedestal stands is exactly horizontal or not.



The upper part of the frame is bent back and curved to serve as a support for the glass at a suitable inclination. The movement of the swinging frame is limited by stops on the standards. From the bulb of the glass an extension of the wire frame projects, and this terminates in the hammerhead, A, for striking the bell or other alarm, B, which is hung between the lower ends of the standards. On the arm, C, which is screw threaded, is placed a nut, which serves to regulate the amount of sand that must run out, and consequently the time that must elapse before the upper end of the sand glass will overbalance the other, and thus cause the glass to invert itself.

The action of the glass is as follows: The bulb containing the sand is turned upward and rests against the frame, as shown. In this position the weight of the hammer head brings the center of gravity of the glass above its center of oscillation, and it is consequently topheavy. When sufficient sand has run into the other bulb to bring the glass into a vertical position, it overbalances and becomes inverted. The hammer then strikes and sounds the bell, and the glass remaining in this position, the sand runs back into the first bulb in readiness for use again.

Patented January 22, 1878. For further particulars relative to purchase of patents for the United States, address the inventor, Mr. Joaquim A. de Macedo, Headingly, Leeds, England.

Trade with Brazil.

The cargo of the pioneer steamship Rio de Janeiro, of the new line to Brazil, was decidedly miscellaneous in character, although its value was not great, only about $170,000. Many manufacturing trades were represented. It comprised printing presses, books, and other printed matter, printers' ink and type, straw paper, cards, cotton drills, wool hats, rice machinery, iron machinery, sewing machines, hardware, axes, iron tubes, pig and bar iron, mule shoes, shoemakers' implements, surgical and dental instruments, surveyors' instruments, boots and shoes, rifles and pistols, clocks and watches, ventilators, wheelbarrows, pump fixtures, belting, copper paint, slate ware, furniture, locomotive engine tender, ivory buttons, drugs and medicines, perfumery, beer, cider, starch, flour, butter, oil, canned meats, lard, and other articles.

Bed Bugs in Swallows' Nests.

During a late trip to the Western territories, Professor Leidy, while watching some cliff swallows passing in and out of their mud built nests, was told that these nests swarmed with bed bugs, and that people would not usually allow the birds to build in such places, because they introduce bed bugs into the houses. He collected a number of the bugs from the swallows' nests as well as from the houses. The latter were found to be the true bed bug; the former, the *Cimex hirundinis*. The bugs infesting the bat and pigeon have likewise been recognized as a peculiar species, with the name of *C. pipistrelli* and *C. columbarius*. The habit of *C. hirundinis* was found to be similar to that of *C. lectularius*, the bed bug, in the fact that the bugs during the day time would secrete themselves in the crevices of the boards, away from the nests. After sunset he had observed the bugs leave their hiding places and make their way to the nests. From these observations it would appear as if the bugs peculiar to these animals (swallows and men) did not reciprocally infest their hosts.

THE BROWNIAN MOVEMENT.

It has been known for many years that minute particles of undoubted inorganic origin were found in the field of the microscope to be endowed with a constant movement, lifelike in its nature. Many early physiologists, such as Buffon, Needham, Gleichen, Müller, Spallangani, and others had doubtless been misled by these dancing particles into a belief that a sort of union existed between the inorganic world. John Bywater was the first to publish a statement respecting this phenomenon in 1819, but Robert Brown made it more widely known, and as his papers attracted considerable attention, the behavior of these particles became known as the "Brownian movement." In recent years little attention has been paid to this subject. Microscopists have continually had the phenomenon under their eyes, and it has been often noticed and referred to as one the solution of which might lead to important results.

When writers on the microscope speak of it they say the particles leap and swarm about with an incessant quivering motion, so rapid as to make it difficult to follow the course of a single particle, which probably changes its direction 15 to 20 times in a second.

Professor Jevons, who has devoted many years of study to this matter, has recently published a paper recording his views respecting the cause of this remarkable motion.

By some it has been attributed to rays of light or heat falling upon the liquid, but this idea has been easily and completely disproved. Dr. Carpenter thought it was due to some calorical change continually taking place in the fluid, or to some obscure chemical action, between the solid particles and the fluids, promoted indirectly by heat. Professor Tyndall quite recently attributed this motion of particles to "surface tension."

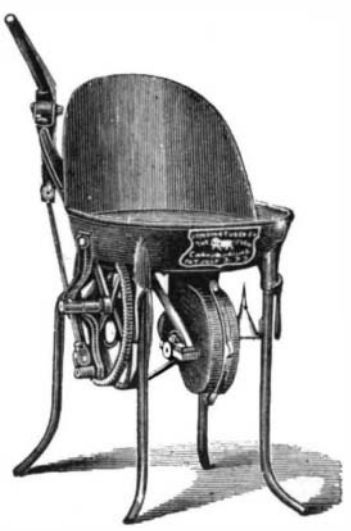
One peculiarity about this motion is its power of continuing without exhausting, for experiments showed that it went on for years, and leaves no doubt that the sediment in many fluids is in perpetual motion, until it finally settles down or attaches itself to the glass.

Almost all substances will show this movement under the proper conditions, but not to the same degree. Professor W. Stanley Jevons, LL.D., M.A., F.R.S., has invented a new name for this movement, and styles it "*pedesis*," from the Greek word πηδησις, leaping, which gives the advantage of the adjective "*pedetic*," from the Greek πηδητις.

To be brief, it may be stated that an extended series of experiments results in the belief that "pedesis" is an electrical phenomenon, and various reasons have been advanced for regarding this conclusion as probable, and as the true solution of this strange movement.

American Association for the Advancement of Science.

The twenty-seventh meeting of the Association will be held at St. Louis, beginning on Wednesday, August 21. The arrangements being made are calculated to render the gathering unusually interesting. Professor Marsh, of New Haven,



THE BUFFALO FORGE.

will preside, and the permanent sub-sections of chemistry and microscopy will be under the chairmanship of Professor Clark, of Cincinnati, and Dr. Blackie, of Nashville, respectively. The annual meeting of the Entomological Club of the Association will be held in St. Louis on the day preceding the general meeting.

DR. G. F. WATERS, of Boston, has found in the juice of the milkweed a remedy for suppurating wounds. The time of healing varied from 24 to 36 hours; but in each instance new skin formed completely across. The Doctor states that the only essential point is to dry the wounded surface gently and thoroughly with blotting paper before applying the milkweed juice. After the juice is applied, and while the healing is in progress, a piece of blotting paper is used to cover the surface.