Tenn., consists of a right-angled tube having slotted sides, and provided with sliding doors for closing its outer ends. The device may be applied to a fruit house, and is effective in ventilating the interior of fruit piled up around it.

In an Airtight Paint-Mixing Can invented by Isaac Banister, of Newark, N. J., a shaft running through the center is fitted with a crank on the outside. Radial knives and a spiral knife are arranged on three sides of the shaft, leaving the fourth side free. By turning the crank the radial knives cut the sediment to pieces, and the spiral knife scrapes the sides. When not in use, the paint is situated in the free side of the can, leaving the knives clean outside.

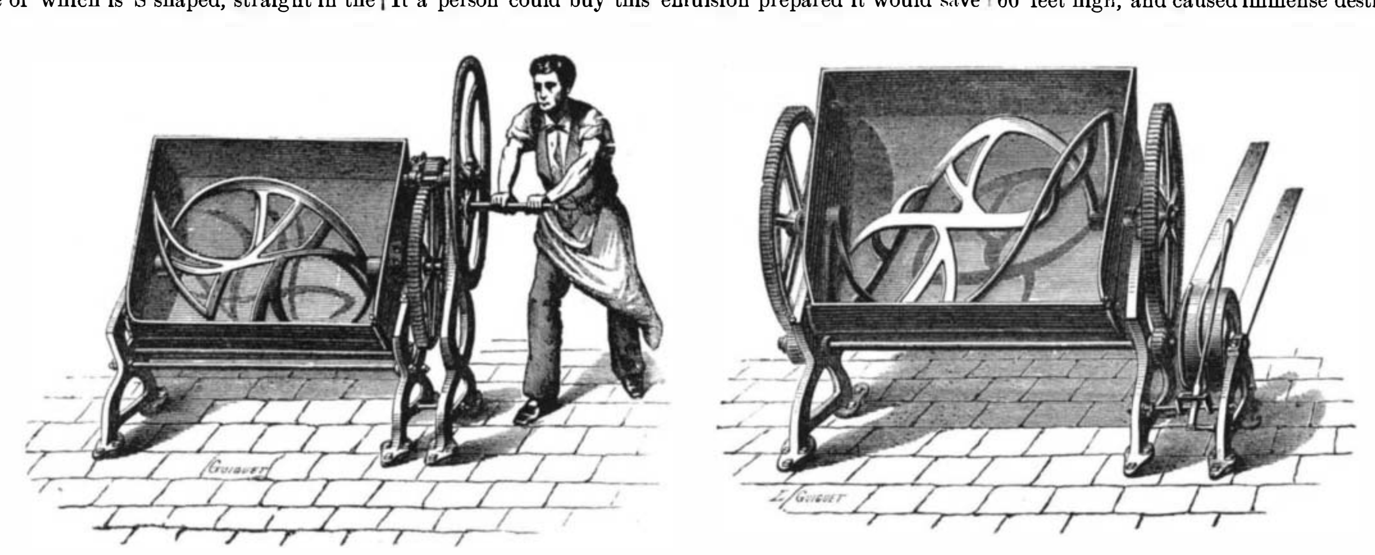
Messrs. John M. Ludlow and Sanford C. Pruitt, of Hall, Ind., have devised a new Circular Toothed Pulverizer and Cultivator, which destroys weeds, cuts cornstalks and rubbish in pieces, ridges the soil, and may also be used for marking the ground.

A new Platform Wagon patented by Mr. E. H. Booth, of West Colesville, N. Y., is so constructed that the draft may be applied directly to the axle, while the rolling of the latter is prevented. A reach may be used, and the horses may be hitched much nearer to the load than is usually the case.

Mr. Alvin T. Dora, of Chariton, Iowa, has devised an improved Hay Rake and Loader, which may be attached to the rear end of a hay rack, or to the rear axle of a wagon, and which is so constructed as to collect the hay and deposit it upon the hay rack without allowing it to be scattered by the wind. The hay is collected by a rake and carried up by and between bands and an endless apron.

BOLAND'S IMPROVED KNEADING MACHINE.

The annexed engravings represent an improved kneading machine largely used by bakers throughout France and Belgium. It is adapted for any employment where soft masses are required to be thoroughly mixed. The new feature is the mixer or kneader, which is formed of three arms or blades, the central one of which is S shaped, straight in the middle, and in line with the axis of the shafts, while the ends are curved spirally to the extremities of radial arms that extend one from each shaft but in relatively opposite directions. The other two blades extend from the extremities of the arms to the inner but opposite ends of the shafts. Their middle curved parts run along the inner surface of the receptacle, while the outer ends are curved spirally but in opposite directions to their respective terminal points. Suitable braces are provided, and the kneader may be operated by either hand or power, as indicated in our engravings.



BOLAND'S IMPROVED KNEADING MACHINE.

It is claimed that this machine thoroughly mixes the dough, without cutting it, saves labor, and produces better bread. It is used in all the Government bakeries in France, in the Paris hospitals, and in Philadelphia, New Orleans, and other localities in this country.

Patented through the Scientific American Patent Agency November 27, 1877, by Mr. O. Boland, of Paris, France. For further information address E. L. Touret, agent for the United States, 226 West 22d street, New York city.

Mineral Negatives.

BY PROFESSOR J. S. ST. JOHN.

On account of the expense of grinding thin sections of fossils and the difficulty of duplicating many varieties, I was led to try photography as a means to copy these sections on glass for use in projection, and with your permission I will present my results for consideration.

I found that in photographing with a camera by transmitted light the sections were too opaque to produce an image on the ground glass of sufficient intensity to tell when the fine lines were in focus, and that with such fossils as sponges and corals much of the detail was lost. In attempts at projection by using the section in the lantern I met with the same difficulty. By using a microscopic objective, not enough of the fossil could be brought in the field.

For some time I have been preparing transparencies for class work by using dry plates and printing from negatives by contact, and have obtained good results; consequently I resolved to try photographing sections with dry plates, using the section as a negative.

The trial was made, and to me the result is very satisfactory. We shall soon see some of these photographs projected on the screen.

I will now give a description of how the dry plates may be prepared and of the process of photographing the sections.

TO PREPARE THE PLATES.

In selecting the glass, only those pieces should be used that are free from blisters and other defects. It may be cut in pieces 3¼x4¼ inches, which is a convenient size for the lantern. After washing the glass it is albumenized. The albumen may be prepared by taking the white of one egg, 300 c. c. of water and 12 drops of carbolic acid. Shake thoroughly and filter through a sponge.

For the silver bath, use 30 grammes of nitrate of silver for every 300 c. c. of pure water. The bath should be acid, and in the best condition. If the dry plates are to be used for negatives, use any good collodion, as Anthony's. If for positives, it should be made thin by adding equal quantities of ether and alcohol. Kelsey's Banner collodion works well by using three quarters of the iodizer that comes with each bottle. Flow the plate with the collodion and place it in the silver bath, as in the wet process. When it comes from the bath it is held under the tap and washed thoroughly on both sides until all signs of greasiness disappear, when the plate is flowed not less than three times with a preservative, allowing it to flow from the plate into the sink each time. I have tried many of the preservatives that are used with dry plates, and have found none so simple as what is called the coffee preservative, which may be prepared as follows: H_2O, 300 cub. cen.; Java coffee, 30 grammes; rock candy (white), 18 grammes. Boil the whole 15 minutes and filter.

After the plate has been flowed with the preservative, it is placed in a rack to drain. When the desired number have been prepared, they are placed in a dark box to dry. I have found that when the plates are allowed to dry slowly, in this way, they are much better than when dried quickly. Plates made in the afternoon are ready for use the next morning. If a large number of plates are to be dried, it would be well to place them in different boxes, so that if the door of one was left open through carelessness only the plates in that box would be spoiled. I have kept plates a year before using. If tannin instead of coffee is used, they will keep for years. I made some of Newton's emulsion and tried it with the coffee preservative with good results. If a person could buy this emulsion prepared it would save one half of the work in preparing the dry plates, and would secure more uniform results; for, by using it, the silver bath is dispensed with, as the silver is placed in the collodion. But perhaps for beginners the emulsion process would be too difficult. We will now consider how these dry plates are used in photographing the rock section.

The section, with the dry plate in contact, is placed in a photographic printing frame and exposed to diffused light from four to forty seconds, according to its intensity, the kind of dry plates used, and the character of the section. A coffee plate is more sensitive than a beer plate, and the Newton emulsion more sensitive than either. The exposure may be made at night, to gas or lamp light. Many of my best prints have been made in this way. There are important advantages gained by working by artificial light; for e. g.—the intensity of the light is nearly constant, while the intensity of sunlight varies every hour of the day, making it more difficult to determine the proper length of time necessary for exposure. If we find that 40 seconds is the time required for an exposure by lamp light, we know that all prints from that negative, or others of like intensity, will require the same time.

After the plate is exposed, it is taken to the dark room and developed. This is accomplished by taking the plate as it comes from the printing frame and holding it under the tap for a short time, until the film is thoroughly wet, and then flowing it with the following developer: Pyrogallic acid, 2·5 grammes; citric acid, 3·5 grammes; Pure H_2O, 284 cub. cen.

For a 4¼x3¼ inch plate pour into a small graduate or beaker about 10 c. c. of the developer and add two drops of $Ag NO_3$, the same as that used in the bath.

As the developer is poured on the plate it is allowed to flow back into the beaker again, and this is repeated until the picture is distinctly seen on the surface of the glass by reflected light, when it is washed and fixed as in the wet process. Cyanide of potassium or the hyposulphite of soda may be used. The hypo. is best.

It will now be found that the picture is not so distinctly seen, and a beginner would be tempted to throw it aside as worthless; but, on application of a fresh quantity of the developer, the picture soon grows to the desired intensity, when the plate is washed and placed in the rack to drain. If the tone of the print is too brown, which is often the case when the coffee preservative is used, a weak solution of potassic sulphide may be poured over the surface of the plate, which will not only change the tone but will clear the picture. In using this pyro. developer, it will be found to turn to a wine color after it has been flowed over the plate a few times; just as long as it remains this color it will not fog the plate, but if it begins to turn black or muddy, it should be thrown out and a fresh supply taken. The plate that is now developed may be used in the lantern, or prints from this may be made by using it as a negative and proceeding as with the rock section. To protect the photograph from injury, it should be varnished and covered with a thin piece of glass.

I think many minerals could be photographed in this way; of course only those presenting detail could be worked. Many of the agates would work well; if they were colored, the prints on the glass could be tinted to imitate them.—*Anthony's Photographic Bulletin.*

Recent American Earthquakes.

Professor C. G. Rockwood, Jr., contributes to the American *Journal of Science and Arts* a record of the earthquakes which have occurred on the American continents from May 10, 1876, to November 18, 1877. These aggregate about 65 distinct shocks, the distribution of which is approximately as follows: California, 13; Territories, 9; Canada and Eastern States, 9; Southern States, 8; Western States, 7; Middle States, 4; Central America, 3; South America, 7; West Indies, 3, and Sandwich Islands, 2.

The severest earthquakes reported are those which occurred on May 19 and November 4, 1877. The first was a series of severe shocks lasting four or five minutes and followed by a destructive tidal wave along the coast of Peru and Chili. On the Peruvian coast the wave was from 20 to 60 feet high, and caused immense destruction in the harbors. It is supposed to have originated near Iquique, and its average rate of progress was to Callao 228 miles per hour, to San Francisco 348 miles, to Honolulu 408 miles, and to Australia 378 miles.

The earthquake which occurred on November 4 was felt throughout a large part of Canada, New York, and New England. In some places it lasted for 20 seconds; reports from others fix its duration at four or five minutes. In the valley of the St. Lawrence river the vibration was sufficient to overturn crockery, crack ceilings, and in a few cases to throw down chimneys.

New Method for Mapping.

A new method of orography, or mountain representation, whereby the outline of a horizon is given by an automatic operation, has lately been brought to notice by M. Schrader. Considering the horizon as a cylinder, in whose axis the observer is placed, this cylinder is transformed into a circular plane. A telescope attached to a sleeve on a vertical support rising from the middle of a circular disk covered with paper is directed to follow the outlines of the hills, etc., and the movements of a lever connected with it are transmitted by means of an arc and a horizontal rack to a pencil or style, which transforms them into out and in movements on the paper. If the telescope describes a circle round the horizon the style gives a corresponding circle on the paper, and if it rises or descends the trace of the pencil is further from or nearer to the central axis. The telescope being brought to a horizontal position by means of a spirit level, a circle is described round the central axis, and this affords a means of measuring the profiles of the hills. It is easy to transform such orographic circles into a map, and M. Schrader showed the French Academy a geographical map of Mont Perdu, obtained with his instrument.

Tanning Woods.

In general it may be said that plants whose wood endures in wet soils, experiencing only a slow alteration, contain, in the wood itself, tannin, whether associated with resinous matters or otherwise. Among such woods may be noticed the Quebracho, a tree belonging to the family of the Apocineæ, specimens of which were displayed by various South American States at the Vienna Exhibition. In Paraguay the wood of the tree has long been in use for dyeing brown shades, though the employment of the wood as a tanning and dyeing agent is of more recent date. It contains a colorable compound, which, under the influence of light and air, is transformed into an orange yellow dye, and it is also possible to obtain from the same wood a very beautiful yellow coloring compound.—*M. J. Arnaudon.*

The Story of an Invention.

It may not be generally known that an important invention in connection with the manufacture of carpets originated as follows: An operative weaver, in one of the largest establishments in this country, was engaged in weaving a carpet that in its finished stage would appear as a velvet pile. At that period this description of carpet was woven much in the manner of Brussels, the loops being afterward cut by hand—a slow and costly process. These loops are formed by the insertion of wires of the requisite thickness to form the loop; they are then withdrawn. This weaver—whether by cogitation or as the result of a bright thought—came to the conclusion that if these wires were so constructed as, on being withdrawn, to cut the loops, thus instantly completing the formation of the pile, it would be a great saving of labor and time, and a great economy. Taking one of the rods, he changed its form to the required shape, ground a knife edge upon it, took it to his looms, and inserted it into the web—all the while maintaining strict secrecy—and with some degree of excitement watched its weaving down until the moment for its withdrawal. This came, the rod was drawn out, the loops were cut, and the experiment was a perfect success, the pile being cut with great evenness.

The weaver, with a shrewdness often wanting in inventors, doubled up the rod and hid it away, wove down the line of cut loops upon the roll, then "knocked off," or stopped his loom, and proceeded to the office of the mill, where he demanded to see the principal. The clerk demurred to this, asking if he himself could not do all that was required; but no, the weaver persisted. Then the manager tried, but with the same result; only the principal would suit the weaver. The employer was informed of the operative's persistence in determining to see him; so he at once ordered him to be admitted. This was done, and the weaver stepped into the well furnished and handsomely carpeted office of the manufacturer. His employer addressed him: "Well, John" (for so we will call him), "what is it you want?" "Well, maister, I've getten summut yo mun hev," replied John. "Wodn't yo like a way ut makkin t' loom cut th' velvet piles?" continued the weaver. "Yes! that I would!" replied the employer; "and I will reward any man handsomely who brings me a plan of doing it," added he. "Awm yore mon, then," said the operative. "Wod'll yo gi' me?" he further asked. After some further conversation a bargain was struck, and a sum agreed upon, which the weaver should be entitled to claim in the event of his plan for automatically cutting the pile of the carpet being a success. Arrangements were made for its trial; the weaver made his preparations; the master, the manager, and one or two confidential employés gathered around the loom upon which the experiment had to be made, all others being sent outside the range of observation. The new form of wires were inserted, woven down, and withdrawn, leaving a well cut pile upon the face of the carpet. The weaver had won his reward, for it was honorably paid. An annuity of £100 was settled upon him, which he continued to enjoy until within a recent date, and for anything we know to the contrary may be enjoying yet. He retired from the weaving shed, determined to spend the rest of his days in ease and comfort. His employer secured by patent the benefits of his invention, it being one, among several others, which contributed to place that manufacturing establishment in the foremost rank in the trade, while its owners attained wealth and social eminence as the reward of their prudent enterprise.—*Textile Manufacturer.*

Engineering Progress.

In a recent address on the "Status and Prospects of Engineers," delivered before the Liverpool Engineering Society, the President, Wm. Graham Smith, said that the scientific progression of the profession had been gradual and ceaseless, though the ancients had executed works of greater magnitude than those undertaken at the present day. Among the familiar examples of ancient prowess are Lake Moeris, an irrigation reservoir 150 square miles in extent; the pyramids of Gizeh, constructed 5,000 years ago. Tubal Cain was a worker in metals, and to show the ancient lineage of the profession, George Smith has ascertained from an ancient tablet that the title "Master of Works" existed in Assyria 700 B. C. The remains of works are to be found in Egypt, China, and indeed all over the world, clearly denoting that the ancients possessed great engineers. Among the ancient titles known are those of "Lord of Canals" and "Establisher of Irrigation Works." Vast as are the works of the ancients, they by no means exhibit skill equal to that shown at the present day. The Suez Canal and Mt. Cenis Tunnel, through nature's barriers to national intercommunication, have been opened by the skill of men now living. The blowing up of the mass of rocks in the Hell Gate, the deepening of the Mississippi river, the construction of the East River Bridge, New York, and the great underground railways of London, are all instances of the scientific progress of engineering, and will long remain to immortalize the names of their builders.

THE "Illustrated Annual of Rural Affairs," for 1878. Luther Tucker & Sons, publishers. Albany, N. Y. Price 30 cents. A valuable little work.

THE REPRODUCTION OF MUSICAL TONES BY ELECTRO-MAGNETISM.

The following observations on the subject of the reproduction of musical tones through the agency of electro-magnetism have recently been presented by Philip Reis, at the Free Institute at Frankfort-on-the-Main, and we find them translated into the *Journal of the Telegraph*: The problem is to produce by the action of the voltaic current audible signals or tones instead of visible signs. In the process of reproducing tones by electro-magnetism an artificial imitation of the mechanism of the human ear is employed, consisting of a stretched membrane corresponding to the tympanum, which by its vibrations opens and closes an electric circuit extended to a distant station by a metallic conductor.

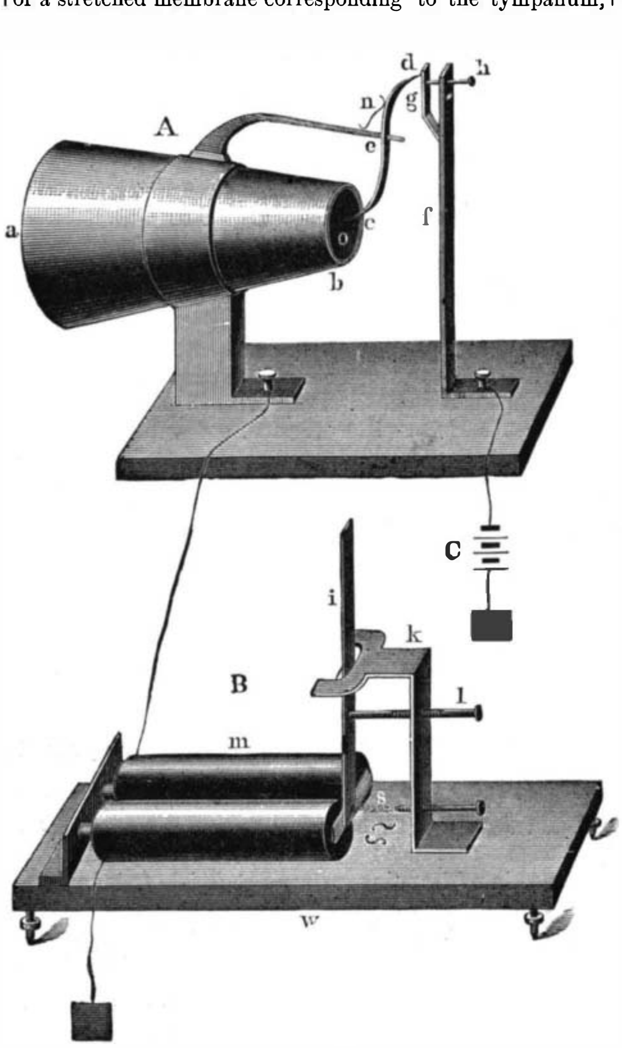
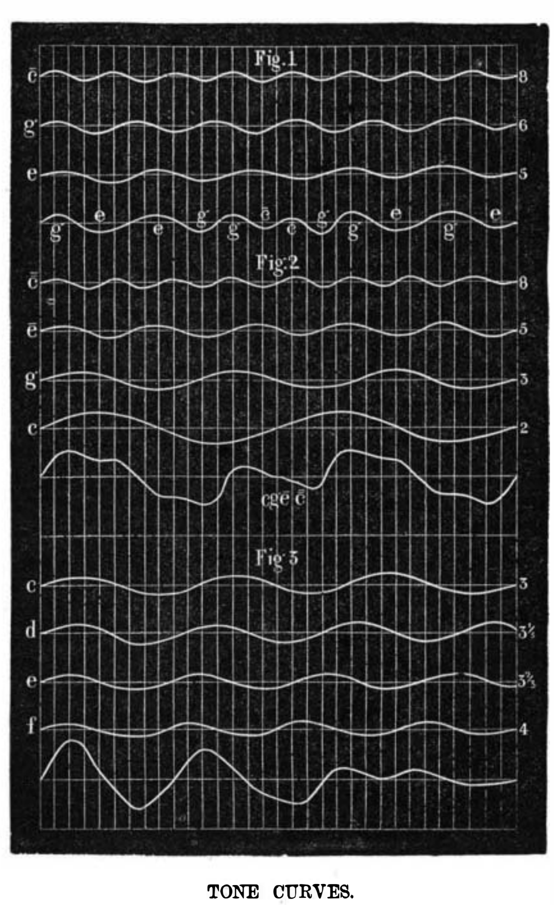


Fig. 4.—REIS' MUSICAL TELEPHONE.

If we analyze the process by which the ear distinguishes a simple sound, we find that a tone results from the alternate expansion and condensation of an elastic medium. If this process takes place in the medium in which the ear is situated, namely, the atmosphere, then at each recurring condensation the elastic membrane or tympanum will be pressed inward, and these vibrations will be transmitted, by the mechanism above referred to, to the auricular nerves. The greater the degree of condensation of the elastic medium in a given time, the greater is the amplitude of the movement of the tympanum, and consequently of the mechanism which acts upon the nerves. A series of vibrations, a definite number of which are produced in a given time, and of which we thus become cognizant, is called a tone. If several simple tones are produced simultaneously, the sound conducting medium is subjected to a force which is the resultant of several simultaneously existing forces acting upon each other according to the ordinary laws of mechanics. In accordance with this principle we may construct from the condensation curves representing several simultaneous tones a single resultant curve which will correctly represent the effect produced upon the ear.



TONE CURVES.

Fig. 1 shows a curve representing a composite tone formed by the combination of three simple tones, in which all the relations of the components return successively.

Fig. 2 represents such a curve formed of more than three tones, in which the relations do not appear so distinctly, but a musical expert will readily recognize them, even when it would be difficult in practice for him to distinguish the simple tones in such a chord. We can understand by reference to Fig. 3 why it is that the ear is so disagreeably affected by a discord.

The apparatus of Professor Reis is so constructed as to respond to these sonorous vibrations, however complex, while the application of the electric current thereto renders it possible to reproduce similar vibrations at any required distance. In this manner musical tones may be telegraphically transmitted from one point to another.

Referring to Fig. 4, A is the transmitting and B the receiving apparatus, which are supposed to be situated at different stations. For the sake of clearness, the appliances by which the apparatus is arranged for reciprocal transmission in one direction or the other have been omitted. The tone-transmitter, A, Fig. 4, is on the one hand connected by a metallic conductor with the tone receiver, B, at the distant station, and on the other with the battery, C, and the earth, or the return conductor. It consists of a conical tube, *a b*, about 6 inches in length, and having a diameter of 4 inches at the larger and 1½ inch at the smaller end. It has been found by experiment that the material of which the tube is constructed has no influence upon the action of the apparatus, and the same is true as to its length. An increase in the diameter of the tube is found to impair the effect. The inner surface of the tube should be made as smooth as possible. The smaller or rear end of the tube is closed.

In order to prevent the interference occasioned by the action of the sonorous vibrations of the atmosphere upon the back side of the membrane, when making use of the apparatus, it is advisable to place a disk about 20 inches in diameter upon the tube, *a b*, in the form of a collar or flange, at right angles to its longitudinal axis.

The tone receiver, B, Fig. 4, consists of an electro-magnet, *m*, mounted upon a sounding box or resonator, *w*, and included in the circuit of the electrical conductor from the transmitting station. Facing the poles of the electro-magnet is an armature which is attached to a broad but thin and light plate, *i*, which should be made as long as possible. The lever and armature are suspended from the upright support, *k*, in the manner of a pendulum, its motion being regulated by the adjusting screw, *l*, and the spring, *s*.

In order to increase the volume of sound, the tone receiver may be placed at one of the focal points of an elliptical chamber of suitable size, while the ear of the listener is placed at the other focal point.

The operation of the apparatus is as follows: When the different parts are in a state of rest, the electric circuit is closed. If an alternate condensation and rarefaction of the air in the tube, *a b*, is produced, by speaking, singing, or playing upon a musical instrument, a corresponding motion is communicated to the membrane, and from thence to the lever, *c d*, by which means the electric circuit is alternately opened and closed at *d g*, each condensation of the air in the tube causing the circuit to be broken, and each rarefaction in like manner causing it to be closed. Thus the electro-magnet, *m m*, of the apparatus at B becomes demagnetized or magnetized, according to the alternate condensations and rarefactions of the body of air contained in the tube, *a b*, and consequently the armature of the electro-magnet is thrown into vibrations corresponding to those of the membrane in the transmitting apparatus. The plate, *i*, to which the armature is attached, transmits the vibrations of the latter to the surrounding atmosphere, which in turn conveys them to the ear of the listener.

It will be seen, therefore, that the result produced by this apparatus is not the veritable transmission of sound by means of the electric current, but is simply a reproduction of the tones at some other point, by setting in action at this point a similar cause, and thereby producing a similar effect. It must, however, be admitted, that while the apparatus which has been described reproduces the original vibrations with perfect fidelity so far as their number and interval are concerned, their intensity or amplitude cannot as yet be transmitted. The accomplishment of this latter result, therefore, must await the further development of the invention.

It is in consequence of this defect in the apparatus that the more inconsiderable differences of the original vibrations are distinguished with great difficulty, that is to say, the vowel sounds are heard with more or less indistinctness, for the reason that the character of each tone depends not merely