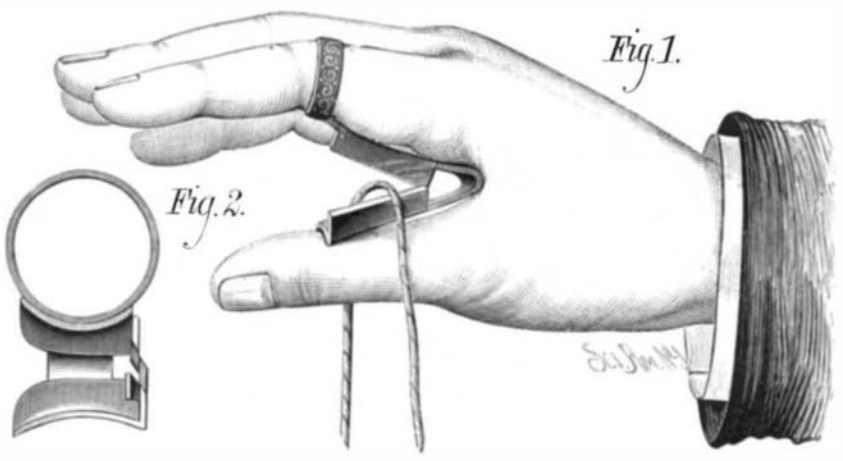
cylinders, and centrally in arched and perforated valve boxes, that are provided with ordinary hinged lift valves, said cylinders having open and cup-shaped bottoms forming suitable seats for ball valves, and having egress ports above the elastic diaphragm, the design being to submerge the pump and operate it by means of a rocking lever to lift and force water.

### NOVEL SCISSORS.

The engraving shows a scissors attachment to the hand for cutting twine, tape, thin fabrics, etc. It is intended as a substitute for the shears or scissors ordinarily employed, and it consists of two short cutting blades attached to a V-shaped spring, one end of which is secured to a ring worn on the index finger. The spring is provided with suitable bearing plates for the thumb and finger, and the device is held as indicated in the engraving.

Scissors of this construction are always ready for use, and are not in the way when out of use.

This novel device is the invention of Mr. O. C. Haward, of Washington, D. C.




SCISSORS ATTACHMENT.

### Hudson River Tunnel.

According to the *Railway News* the Hudson River Tunnel is advancing satisfactorily toward the New York shore at the rate of five feet a day. Two hundred men are employed digging out the dirt and putting in the iron and brick work. The tunnel is finished as they go along, and the work is much safer than under the old plan, which resulted so disastrously. A small tunnel, about six feet in diameter, is run ahead of the larger tunnel, which follows and incloses it; warning is thus given of the nature of the soil. The work is now in the south tunnel, which is now completed 290 feet from the shaft, and will soon be out as far as the north tunnel, which has been cleaned out, but not extended, since the accident. Both tunnels will then be carried along together. A caisson is in course of construction for beginning the work on the New York side.

### NEW TELEPHONE TRANSMITTER.

BY GEO. M. HOPKINS.

The microphone, with pendants, figured and described by the writer in the SCIENTIFIC AMERICAN of Nov. 16, 1878, was among the earliest of telephone transmitters, and although the device was crude in appearance and exceedingly simple in its construction, it contained the germ of a successful instrument, and was favorably noticed in the scientific papers of Europe.

The transmitter shown in the annexed engraving is based upon the same principle, and, so far as the devices for varying the currents go, it is even simpler than the original microphone. Fig. 1 shows the exterior of the instrument, Fig. 2 the interior, Fig. 3 a detail of the transmitter proper, Fig. 4 a sectional view of the receiver, and Fig. 5 is a diagram showing the battery and line connections. Everything, excepting the battery, bell, and receiver, is contained in the box. In the center of the cover is formed the mouthpiece, behind which is placed the diaphragm, consisting of ordinary Russia iron of the thickness commonly used in stovepipe. It is 2¾ inches in diameter, and is held in position in a circular cast iron frame by two springs attached to the frame and pressing the diaphragm. The edge of the diaphragm is bound with soft rubber or felt. This arrangement, however, is not essential to the successful working of this instrument, as equally good results may be obtained when the diaphragm is clamped tightly at the edges between two rings fastened with screws to the front of the box.

To the center of the diaphragm *a* (see Fig. 3) is attached a metal clamp, *b*, which supports, in a horizontal position, a cylindrical pencil of hard electric-light carbon, ¼ inch in diameter and 1 inch long. A disk, C, of battery carbon 1¼ inches in diameter and ¼ inch thick, is grooved around the edge and wound with fine copper wire, which terminates in a flexible spiral connected with the upper hinge of the box. The carbon disk is suspended by a silk thread from a spool formed on the inner end of a screw extending through the box cover, and capable of being turned so as to raise or lower the carbon disk, as may be required. The disk is slightly inclined from the perpendicular, and the line of contact between it and the carbon pencil is a little above the center of gravity of the disk. This arrangement of the two carbons prevents any marked break in the local circuit, as the disk tends to rock on the carbon pencil rather than fly from it when the diaphragm is set in vibration. The carbon disk has been saturated with melted paraffine in some instances with beneficial results.

The clamp which holds the carbon pencil is electrically connected with the lower hinge of the box. From the hinges the connections may be more easily traced in Fig. 5 than in the perspective views.

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

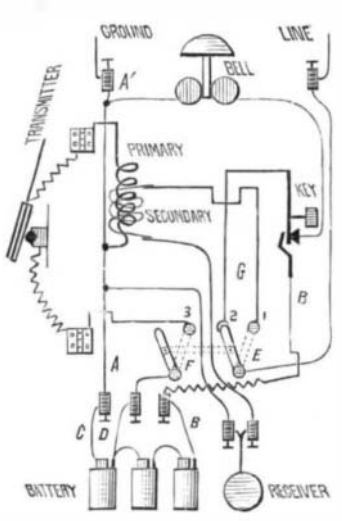



Fig. 5.- Telephone Connections.

The button which moves the switch extends through the side of the box below the hook upon which the receiving instrument is hung. This arrangement insures the readjustment of the switch after talking, as the receiver cannot be hung up until the switch button is pushed in.

Three layers of No. 18 silk covered wire form the primary of the induction coil, and the secondary consists of some ten or twelve layers of No. 36 silk covered wire.

The receiver, shown in section in Fig. 4, has a diaphragm of the usual size mounted in a hard rubber case 2½ inches in internal diameter and 1 inch deep. The bobbin of the usual style is placed on a soft iron core having a large convex head, and held in place by a screw extending through the bottom of the case. A soft rubber button is placed between the casing and the convex end of the core, and eight curved permanent magnets, one-eighth inch thick and one-quarter inch wide, touch the convex end of the bobbin core and are pressed upward into contact with the diaphragm by a rubber ring at the bottom of the case. The diaphragm at its points of contact with the magnets is freed from japan or oxide, and the ends of the magnets are let into notches cut in the case, so that when they press upon the diaphragm the latter is backed by the mouthpiece.

This receiver is very compact and light, and as to efficiency it is all that can be desired.

The transmitter works well, is perfectly simple, requires no particular care in its manufacture, and never gets out of adjustment.

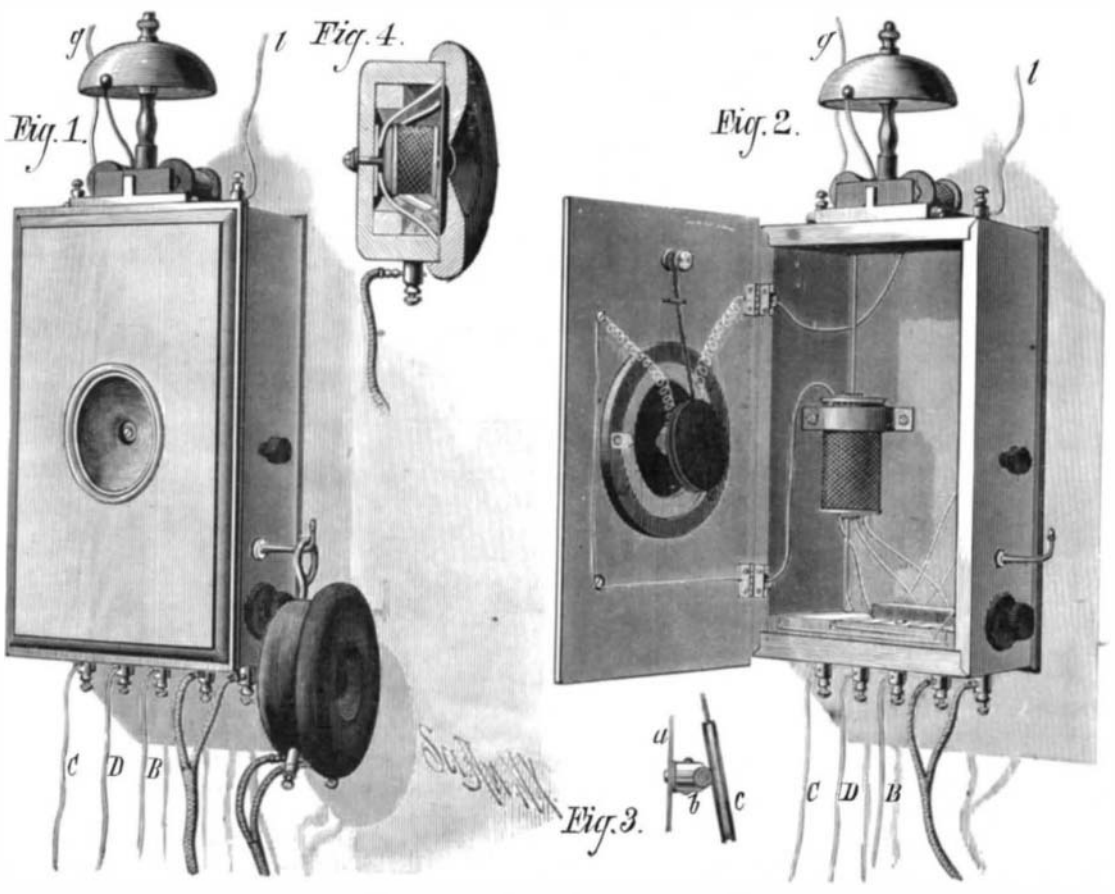
### Telephonic Electric Condensers.

In order to make a condenser sing it is merely needful to connect its armatures with the extremities of the secondary helix of an induction coil, interposing in the primary helix a battery and a microphone analogous to the transmitter of Reiss. If thus arranged the apparatus merely reproduces musical sounds. The author interposed a battery in the secondary helix of the coil; *i. e.*, he connected one extremity of the induced wire with one of the poles of a battery, the other pole communicating with one armature of the condenser, the second armature being attached to the other extremity of the induced wire. Articulate sounds are then reproduced with perfect distinctness. M. Th. du Moncel observed that this fact confirms his ideas on the origin of sounds in the telephone.—*A. Durand.*

### A Reception of Professor Bell.

A grand reception has been recently given by the Mayor and Corporation of Brantford, England, to Professor Bell. The reception was attended by about 300 people. After the presentations the Mayor presented on address to Professor Bell, to which the latter made a suitable reply. An address was then presented by the Board of Trade, to which a reply to the following effect was made:

It might not be uninteresting to them, although not connected specially with trade, if he were to make some remarks upon his recent discovery of the photophone. He described it as at present rather a contribution to science than to the world's utilities, but he looked forward to important practical applications. Among them be specified communication between passing ships at sea, lighthouses and the shore, and in case of war communication with distant places could be received without the necessity of an intervening wire. He then described the apparatus and experiments, and added that he had spoken for a distance of 800 or 900 yards, and had sent the musical sound a mile and a quarter, but he saw no reason to anticipate any difficulty but that of the convexity of the earth in transmitting articulate speech by light to any distance.




SIMPLE TELEPHONE TRANSMITTER.