

NOTES ON THE TELEPHONE.

BY I. L. DUERDEN.

When an iron armature approaches the poles of a permanent magnet on which insulated wire is wound, a current of electricity is thereby induced, and flows in one direction through the insulated wire; and when the armature is moved from the poles of the magnet a similar current flows through the wire, but in a reverse direction; and conversely, if the currents thus produced be passed through insulated wire wound on another permanent magnet, the armature of the second magnet will move in the same time as the first, but not necessarily in the same relative direction, as that will depend on the relative polarity of the magnets.

In the Bell telephone, the iron diaphragm which serves as an armature is caused to move directly to and from its permanent magnet, by minute concussions of air, from the speaker's throat. As these concussions are necessarily limited in their ability to move the diaphragm, it follows that if the slight movement thus produced could be used to properly control a power (in the same manner as the slight movement of the slide valve of a steam engine controls the admission of steam to its cylinder), instead of directly producing it, a much more powerful telephonic result could be obtained.

With this object in view, after several experiments, I constructed a transmitter on the principle shown in the engraving, in which A represents a metal speaking tube, having a membrane, B, of gold beater's skin, in the center of which the sewing needle, C (metallically connected to the fine wire, D, which is soldered, at D', to the speaking tube, A), is secured by sealing wax. The end, C', of the needle is hooked, so as to clip the short piece of very fine platinum wire, E. One pole of the galvanic cell, S, is connected with the metallic post, A', to which the speaking tube, A, is soldered, whereby the end, C', of the needle becomes the negative terminal of the battery, S; and the positive pole, P, has two wires, F and K, connected with it; the wire, F, leading through the telephone, M, to one end of the platinum wire, E, and the wire, K, leading through the telephone, N, to the other end of the wire, E.

By this arrangement there are two courses open to the galvanic current from the end, C', of the needle to the positive pole of the battery, S; and when the resistance of each course is the same, the current divides itself equally between the two; but as the platinum wire, E, has great resistance to the current, the least movement, in either direction of its arrow, of the end, C', of the needle, will make the course towards which it moves the one of the least resistance, and the same movement increases the resistance of the other course; so that the relative difference in the resistance of the courses appears to be in proportion to the square of the resistance that is thus produced by the movement of the hooked end, C', of the needle.

Now the voice of the person who is speaking at the mouth of the tube, A, causes the membrane, B, to move to and fro in either direction of its arrow, and the length and speed of these movements differ as different words are uttered; and as the needle, C, is rigidly secured to the membrane, B, by sealing wax, its end, C', copies the length and speed of the movements of the membrane, and by like movements in either direction of its arrow directs a current to the wires, F or K, which corresponds in power to the varying length of these movements. The wire, E, should be stretched, and the hooked end, C', must have an upward tendency, so as to keep it in uniform contact with the wire, E.

The instrument as above described serves simply as a transmitter, and by careful adjustment at C', and speaking in an undertone, the sounds through the telephones, M N, were almost articulate. Singing in an ordinary tone would break contact at C'; but the results obtained were sufficient to encourage the construction of another instrument, and if better results are obtained I shall be happy to describe it.

Two Remarkable Accidents.

In the transactions of the Medical Society of New Jersey, for 1877, Dr. Ryerson reports the case of a child which lived four weeks with over an inch of No. 1 sewing needle in the heart. Search for the needle before death was unsuccessful. At the autopsy it was found to have passed partially through the cartilage of the fourth rib, into the wall of the right ventricle. Pus welled up through the perforated cartilage, and loose in an abscess holding an ounce or more of

pus, in the muscular substance, lay the needle. It was supposed that until loosened by suppuration the broken end of the needle remained fixed in the rib, thus pinning the heart to the chest wall.

A still more remarkable accident, with recovery, is reported in the Transactions of the Medical Society of Pennsylvania, for the same year. In this case a boy of fourteen was impaled on the end of a carriage shaft, the point of the shaft entering one inch below the left nipple and coming out at the back. The victim was swung three times into the air by the rearing of the horses, then pushed himself off, and walked home with some assistance. No cough or hemoptysis followed and apparently little shock. Effusion into the pleura occurred with discharge of pus, front and back. This gradually lessened, and finally both wounds closed, the one in the breast last. The boy has recovered robust health.

New Mechanical Inventions.

An improved Link Motion has been patented by Mr. S. Hamblin, of Greenville, Pa. The arrangement permits adjusting the link of a reversible engine by means of a cord, and also clamping the link in any desired position, so that the engine may be run with the operating valve at less than a full stroke.

Mr. S. M. Moore, of Canastota, N. Y., has patented an improved system of Manufacturing Knife Blades, by means of trip or drop hammers, driven by any power, from rod

An improved Adding Machine has been invented by Mr. W. W. Hopkins, of Thorntown, Ind. The elements of the machine are, first, two series of notched wheels bearing numbers on their periphery; second, a corresponding series of endless chains mounted on the wheels; third, a box having the nine digits and the cipher inscribed in parallel rows on one of its sides, which is designated the counting table. The chains travel over the counting table on lines coincident with the rows of digits. The several chains and rows of digits correspond to the units, hundreds, and thousands columns of the figures to be added or subtracted, etc. The machine is operated by moving the chains successively downward the length of the distance of each number to be added, etc.

Mr. C. E. Patterson, of Wellsboro, Pa., has invented an improved Machine for Calculating Interest, difference between dates, price of articles measured by pound or yard, and performing various other mathematical problems. The machine is compact, being a circular box about four inches in diameter and two inches in depth. The movable parts are an annular plate and a traveling apron which winds on or off two rollers.

Mr. P. C. Close, of Augusta, Ga., has invented a Burglar-Proof Blind Hinge, which he claims can only be turned from the inside by a system of worm wheel gearing operated by a crank, the mechanical devices being original and efficient.

In a Stone Sawing Machine invented by Mr. W. Tuggey, of West Rutland, Vt., the patentee provides improved means for

operating all the grippers simultaneously, for the purpose of releasing them from their bite on the guide rods, so as to enable the gang of saws to be raised quickly when their work is done.

Mr. P. Langlois, of Port Henry, N. Y., has patented a Sewing Machine having an improved set of feeding devices adapted to secure a more positive and uniform feed, and to permit the better turning of the work. A swiveling feed step is located upon a peculiarly constructed four-motivated feed having positive movement in every direction.

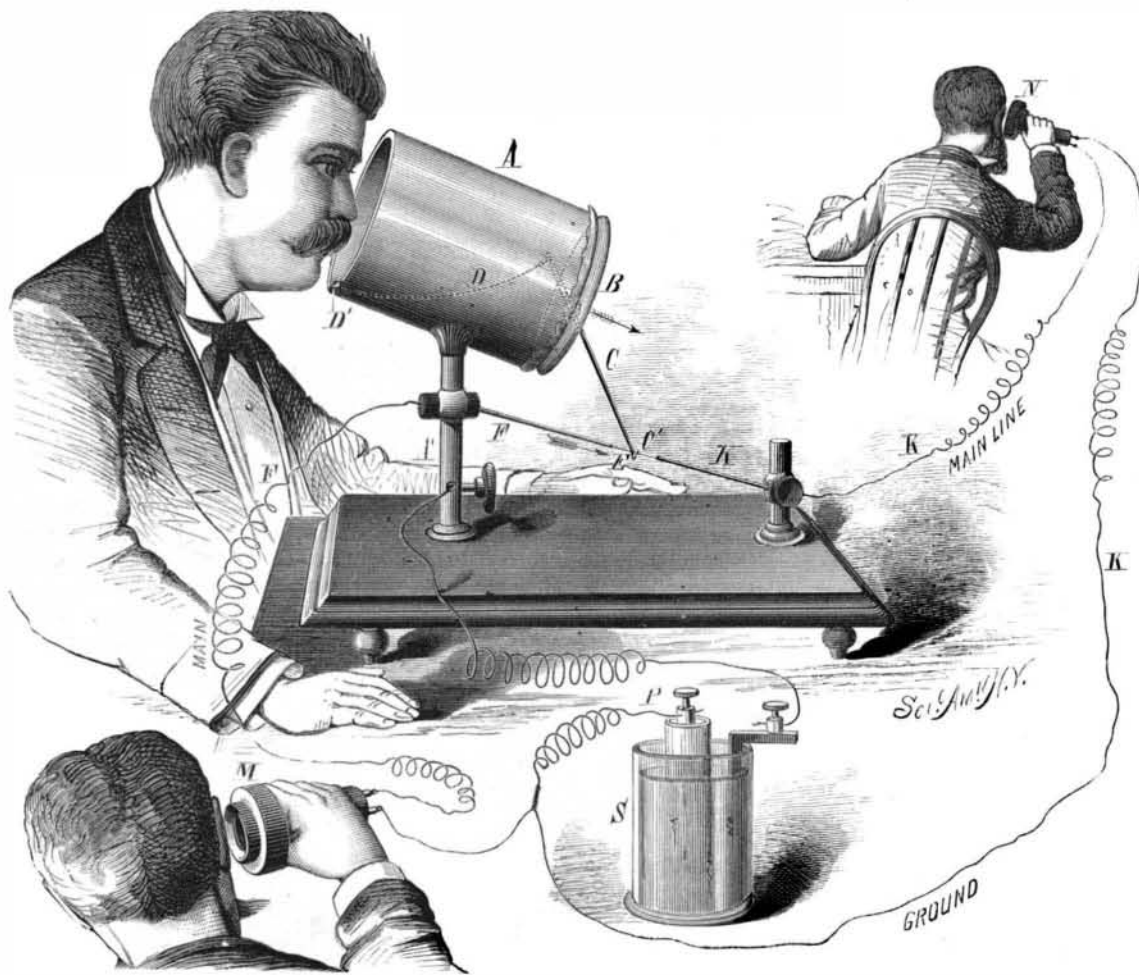
A simple Horse Power, invented by Mr. C. E. Macarthy, of Forsyth, Ga., is made by arranging upon the vertical king post, to which the sweep is attached, a large horizontal grooved pulley, and in combining with the same an endless rope or belt, which is wrapped once around the horizontal pulley, and is then passed around a vertical speed pulley upon one side of the king post, and then around a vertical tension pulley upon the other side.

Mr. J. Grubs, of Lickingville, Pa., has invented an improved Drill Bit for drilling oil, salt, and artesian wells. In drilling such wells

the usual practice has been to first run down a small bit (termed a "center bit"), and then enlarge the hole by means of a reamer. This drill enables the same result to be produced at one operation, and therefore combines the functions of both bit and reamer. The drill has acute angled points or side cutters and a concave cutting edge extending transversely between said points.

How America Crowds England.

In giving his impressions of America in a leading English periodical, a recent English visitor remarks that the Russo-Turkish war ought to have shown the American manufacturers that they have little reason to fear the English. So far as he had been able to learn not a single cartridge had been made in Birmingham for either Russia or Turkey; but when he was in Bridgeport, the cartridge factories had been running day and night for months, and he saw a Russian and a Turkish commissioner in the same works. The fact was the Americans had made the rifles as well as the cartridges for both combatants. As further evidence of the threatened supremacy of American manufacturers he noted the fact that Lowell was sending cotton cloths to Manchester, and that in our retail stores cotton goods were marked at a lower price than that at which goods of the same quality could be sold at Liverpool or London. "It is the same," he said, "with the other manufacturing industries of America. The manufacturers of hardware are beating us in market after market from Hamburg to Melbourne. In Birmingham itself the merchants are importing from the United States such articles as axes, hay forks, and agricultural implements of nearly every description, sash pulleys, and small castings of very many kinds, although it is estimated that freight and other expenses add 17 or 18 per cent to the cost of the goods."



NEW DETAILS OF TELEPHONE ARRANGEMENT.

steel, and in such a manner that the grain of the steel, it is claimed, will not be injured at the junction of the blade and tang, thus remedying a defect common in knives produced by hand forging. A series of peculiarly shaped dies and hammer heads is employed to accomplish this.

An improvement in Mill Stone Drivers, made by Mr. D. T. Staples, of Galt's Mills, Va., consists in connecting the driver with the stone by a collar having seats for the driver, which collar is located in a frame rigidly fixed in the top of the stone, and is supported upon diametrical lugs, which enter recesses in the frame and cause the stone to turn with the driver. These lugs allow the collar to oscillate slightly, to cause both ends of the driver to bear against the same.

Mr. R. D. Messman, of Bristol, N. H., has invented an improved Machine for making Wood Pulp for Paper. It has a grindstone in whose face there are diagonal grooves filled with corundum, the stone being mounted on a vertical shaft and inclosed in a curb. In opposite sides of the latter are adjustable pockets for containing the wooden blocks from which the paper pulp is made.

A novel Steam Engine, invented by Mr. T. A. Henderson, of Natchez, Miss., is of that class of engines in which the function of the steam cylinder is performed by a bellows-shaped expansible and collapsible vessel. In Mr. Henderson's engine there are two such vessels, provided with a slide valve and suitable connecting and operating mechanism.

A convenient machine for Turning and Eyeletting Cases for umbrellas, fishing rods, etc., has been patented by Mr. W. Harnah, of New York city. A hollow cone, heated by a warm water circulation so as to soften the material, receives the cases, wrong side out. It has a round tenon at its smaller end, to receive the eyelet, which is applied by a hollow follower operated by a lever. The end of the case being tied, the case is readily turned, and the operation completed.