stem, receives the pressure. The upper pin cast solid with slide receives but a very slight wear, as it only has to resist the up and down pressure due to angle of rod, and simply has the weight of the slide to pull back and forth. The oscillation of the lower point is very small, an average of about three-eighths of an inch. This correcting device may be attached to any engine or valve motion.

ALL MAY HAVE TELEPHONES.

(*Continued from first page.*)

rection. The space in the center of the magnet between the pole piece and distance piece is filled with a strip, *g*, of wood.

The cylindrical end of the distance piece which extends beyond the magnet is bored and tapped to receive the screw by which the magnet is held in place in the handle. The cylindrical projecting end of the pole piece extends to within 1-100 or 2-100 of an inch of the diaphragm. In other words, it is placed as near the diaphragm as possible without being touched by the diaphragm when the latter vibrates.

On the pole piece, *c*, is placed a wooden spool, *e*, on which is wound No. 34 (Am. W. G.) silk-covered copper wire. The wire fills the spool, and its ends are allowed to project one or two inches. The wire may be wound on the spool in either direction, and it is immaterial which pole of the compound magnet adjoins the diaphragm.

The resistance of the winding varies from 70 ohms as a minimum to 200 as a maximum. When the instrument is to be used both as transmitter and receiver, and especially when it is on long lines, the resistance should be 100 ohms or more. No. 36 wire is used for the winding where the resistance is great. Of No. 34 wire, 263 feet will be required for 70 ohms resistance. For 100 ohms, 373 feet are required. For 150 ohms, 343 feet of No. 36 are required.

In the end of the handle are inserted two binding posts to which are attached insulated wires (No. 18), which extend toward the diaphragm, their free ends being soldered to the terminals of the fine wire on the spool, so that when the telephone is connected up in circuit with other telephones the current will pass from one of the binding posts through one of the coarse wires, through the fine wire coil, through the other coarse wire to the other binding post.

The Bell telephone has a disk of flexible rubber slipped over the pole piece and over the ends of the coarse wires as a guard against short circuiting. A screw eye is inserted in the end of the telephone handle for suspending the instrument when not in use.

This telephone, when used in the manner suggested, requires neither battery nor induction coil. It is therefore easily connected up for use by electrically connecting the binding posts of one instrument with the binding posts of another. When a number of telephones are connected in the same line, the matter is not quite so simple. There are many ways of arranging the circuit; we give diagrams of two, one for one line wire with ground connections, the other for a metallic circuit, with a separate circuit for calling.

In the single wire circuit each instrument on the line is provided with a double switch cut into the line as shown in Fig. 2, the pivots of the switch arm, *a a'*, being connected with the line wire. The switch arms are pivotally connected with a bar of insulating material, so that they will move together. The arms, *a a'*, may be brought into contact with the points, *d d'*, *e e'*, and *f*. A magneto call box is connected with the points, *d d'*, and the arms, *a a'*, are left normally on these points, as shown in dotted lines, so that when any magneto in the line is operated the others will ring. All on the circuit have a special call.

The one called will know whether the signal comes from the east, west, north, or south. Suppose it to come from the east, the switch is placed in the position shown in full lines. This cuts out the magnetos, grounds the western section of the line through the point, *e*, and connects the eastern section with one end of the telephone cord through the point, *e'*, the other telephone connection being grounded through the points, *f e*, and ground wire. If the call is from the west, the switch arms, *a a'*, are brought into contact with the points, *e' f*. The arms, *a a'*, are always left on the points, *d d'*. Outside the terminal stations the line is connected with the ground or arranged as shown in Fig. 3, with the line grounded through the magneto or telephone.

In the metallic circuit shown in Fig. 4, the terminal telephones are connected with the ends of the line wires. Intermediate telephones are cut into the line by means of a double switch, as shown in the cut, in which *g* shows the intermediate telephone cut out, *h* shows it connected with the east and *i* with the west.

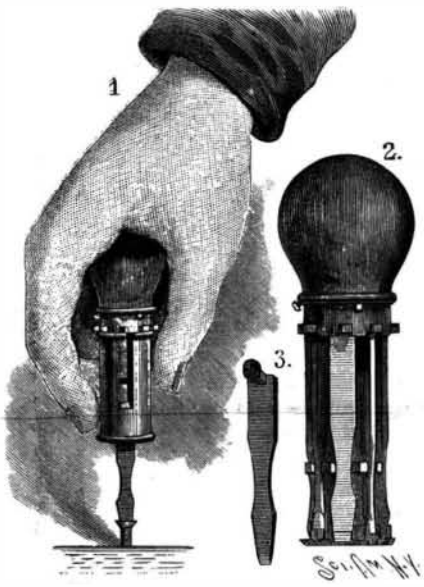
A third wire grounded at the ends, and including a magneto for each telephone, runs parallel with the metallic circuit. In this case all of the bells ring at once, and individual signals must be agreed upon.

It is obvious that the information here given in regard to the construction of the telephone may be departed from in minor points, such as the construction of the handle and mouthpiece, but everything relating to the magnet, the coil, and the relation of the magnet and diaphragm, should be strictly followed.

In a following issue we will publish a full description of a magneto call for use in connection with telephone lines.

A TOOL HOLDER WITH A VARIETY OF TOOLS.

This holder, patented by Mr. Henry Shogren, is arranged to carry a number of tools, such as screwdrivers, awls, small chisels, etc., each of which may be readily projected from the handle in position for use, as shown in Fig. 1. The tools are supported by a central cylinder having a split lower end and outer annular flanges with registering slots, each tool being guided in two of these slots, and the tools being held in place on the central cylinder by an exterior cylindrical shell, which has a lengthwise slot with side notches. The slot and the notches are engaged by a lug on each of the tools, as shown in Fig. 3. Fig. 2 showing the position of the tools with the shell removed. The upper end of the slot registers with one of a series of notches in a ring turning loosely in the upper end of the cylinder, each of the notches receiving the lug of the corresponding tool when the several tools are in their innermost position. In the top of the ring turns the lower end of a handle, centrally in the top of which is a nut, in which screws the threaded end of a bolt extending down centrally through the tool, the ring engaging and turning the bolt, and there being on the lower end of the bolt a conical head fitting a correspondingly shaped recess in the split lower end of the inner cylinder. By the turning of the ring the tools are moved around in the shell, whereby any desired tool may be brought into position to be projected from the handle,



SHOGREN'S TOOL HOLDER.

the lug of the tool then registering with the vertical slot in the shell, when the tool may be pushed out, and the knob on the lug made to engage one of the side notches. The operator, by then holding the shell and turning the handle, screws up the central bolt, and causes its conical head to expand the split lower end of the tool-holding cylinder, bringing its flange to bear upon the shell, and locking the cylinder and the several tools in place. Further information relative to this improvement may be obtained of Mr. N. J. Blagen, Portland, Oregon.

A New Antidote for Morphine.

Dr. William Moor, a specialist on therapeutics, and a member of the staff of the West Side German Clinic, in West Forty-second Street, this city, has discovered that permanganate of potassium is an antidote for morphine poisoning, and that it will counteract the effects of any of the alkaloids of opium within a reasonable lapse of time.

Dr. Moor, in the presence of twelve members of the clinic who assembled on January 9, swallowed three grains of morphine, which is ordinarily a fatal dose, and a positively fatal one in his case, as he is supersensitive to the effect of narcotics. Immediately after taking the morphine, he drank a solution of four grains of permanganate of potassium in four ounces of water.

The physicians had Dr. Moor under their eyes for five hours after the experiment, but, as far as they could discover by every sort of test, he might as well have swallowed the water alone. The antidote had done its work well, for the effect of the morphine had been entirely neutralized.

It has long been known that the new antidote is a destroyer of organic matter. The reason that it has not been used until now as an antidote for morphine is that it has generally been regarded as certain to be deoxidized and thus rendered powerless by contact with the organic matter of the stomach. But Dr. Moor's discovery is that the permanganate will select a soluble salt of morphine from the albumen peptone and other contents of the stomach with astonishing rapidity. It will, in fact, decompose a morphine salt several hundred times quicker than it will decompose albumen. The discovery of this property of selection of the permanganate's affinity for the morphine salt gave Dr. Moor his cue.

The antidote acts upon the poison at which it is aimed long before the other contents of the stomach have had time to destroy its antidotal powers.

In cases where preparations of opium other than the sulphate of morphine have been taken internally, Dr. Moor has found that the antidote should be acidulated with vinegar in the proportion of one to five, and then it proves efficacious at once.

The lapse of an hour or two will not, it is thought, make the new antidote useless, though the counteraction must necessarily be slower and less satisfactory in such cases.

Fortunately, opium and its alkaloids are slow poisons, and death seldom ensues for some hours. It is this that leads to the hope that the scope of the new discovery may be far greater than can as yet be seen. Of its importance in the treatment of the morphine and opium habits, it is too early to speak authoritatively, but, if Dr. Moor's opinion is correct, its usefulness in this direction will prove incalculable.

Aluminum Boron Bronze.

Mr. H. N. Warren, of Liverpool, England, has been experimenting lately with aluminum bronzes, and has found that the presence of a very small admixture of boron makes a denser and more durable alloy. This aluminum boron bronze casts and melts well, and is free from some drawbacks met with in working with the ordinary aluminum bronze. Producers of that alloy often complain of the difficulty experienced in obtaining a uniform mixture; for a difficultly fusible alloy sometimes forms on the surface of the molten portion, and being accompanied by surface oxidation, refuses to alloy with the remainder. The aluminum boron alloy forms at a lower temperature than when pure aluminum is used. In preparing this bronze Mr. Warren first makes ingots of aluminum containing boron in the same state in which graphite exists in cast iron. These ingots are made by introducing aluminum into a molten mixture of fluorspar and vitrified boric anhydride, which has been heated in an oxy-hydrogen furnace until fumes of boron fluoride appear. The boron is immediately reduced and it dissolves in the aluminum, and the aluminum is rendered crystalline and brittle thereby. When added to copper in the proportion of 5 to 10 per cent, it forms the aluminum boron bronze in question, which is not brittle. The effect of boron on this bronze would appear to be quite different from that of silicon, which generally ruins all bronzes when present even in minute quantities.

Novel Barometer.

A description appears in the *Rivista Scientifica Industriale* of a new barometer of high sensibility and of special service in coal mines. The apparatus consists of a vertical tube twenty mm. in interior diameter and about one m. in length, the bottom of which is curved in the ordinary manner—the opening at the top, however, being furnished with a steel peg screwed in an iron collar attached to the tube. A long capillary tube, one mm. in diameter, is fixed at right angles on the large tube, a little above the curved part, and terminating in an open receptacle.

The quantity of mercury is regulated so that the meniscus of mercury presents itself in the middle of the capillary tube. The slightest difference of atmospheric pressure will cause the mercury to rise and act on the capillary column, and a fall of pressure is indicated by the inverse movement of the column. In this way the increase or decrease of the mercury in the large tube is augmented according to the section of the tubes, and in this case as 400 is to one, so that a variation of 1-400 of a millimeter can thus be noted. If the variation in pressure become great enough to cause the meniscus to leave the capillary tube, that may be remedied by screwing or unscrewing the upper peg.

IN a paper recently read before the American Society of Civil Engineers, by Mr. James D. Schuyler, M. Am. Soc. C.E., the author stated that 16 miles of 30 inch wooden conduit have been used in the water supply of Denver, Col., and there was a considerable length of 44 inch wooden pipe. The timber used was Californian redwood, and the 30 inch pipe was built for a head of 185 feet. It cost about 5s. 8d. per lineal foot as laid; the laying and trenching account for 2s. of this amount. The pipes in question were composed of staves, dressed very smooth to cylindrical sides and radial edges, and were held to form by hoops of mild steel placed 17 inches or less apart, depending on the head. The pipe was framed in the trench, and all handling of full size sections avoided. The use of these wooden pipes is claimed to have resulted in a saving of about 200,000*l.*