

(Model.)

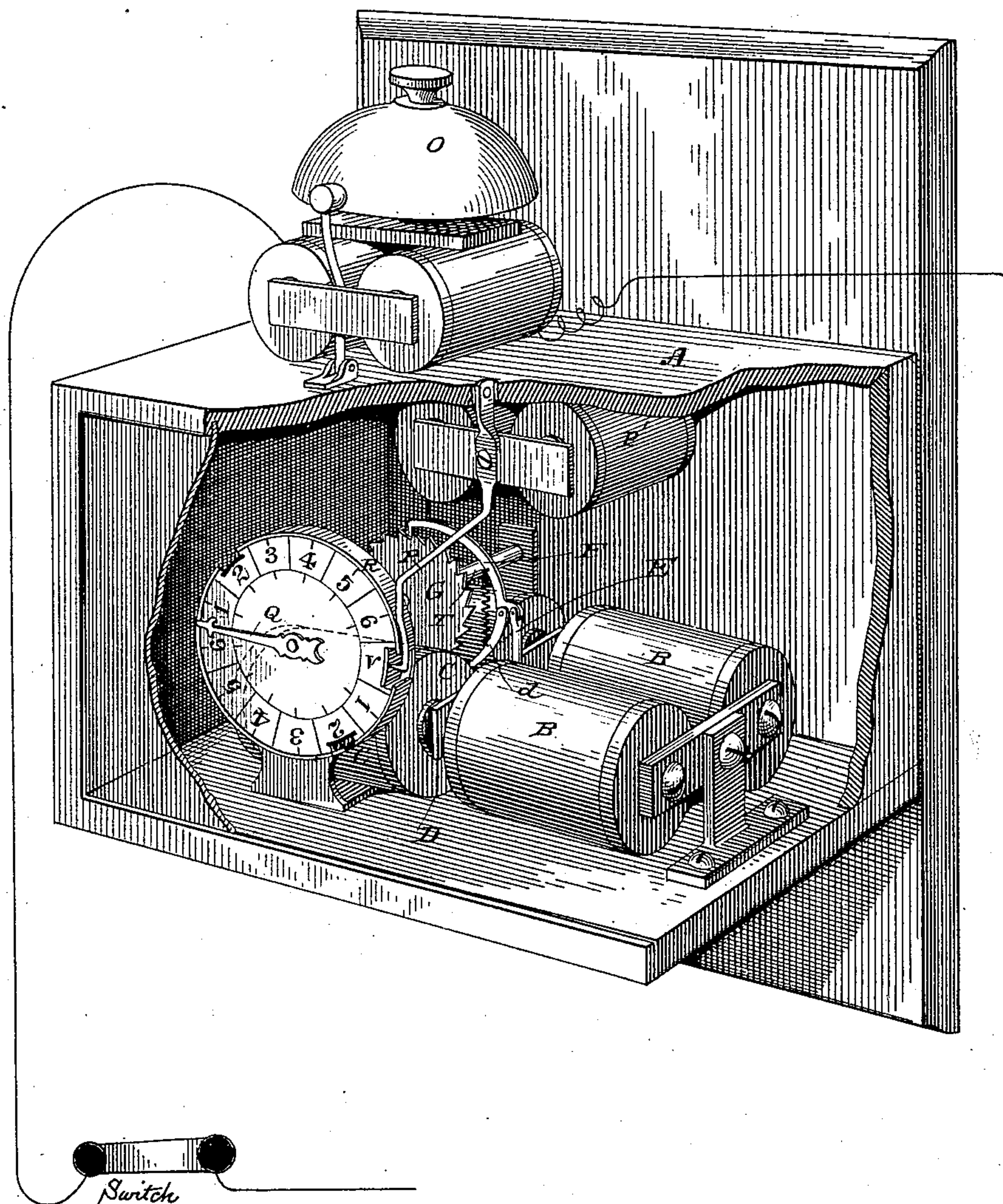
2 Sheets—Sheet 1.

J. P. STABLER.  
Call Apparatus for Telegraph Lines.

No. 235,058.

Patented Nov. 30, 1880.

Fig. 1.



Attest:

R. G. Barnes,  
Atty. Jordan

Inventor:

James P. Stabler  
By his atty.  
R. D. Smith



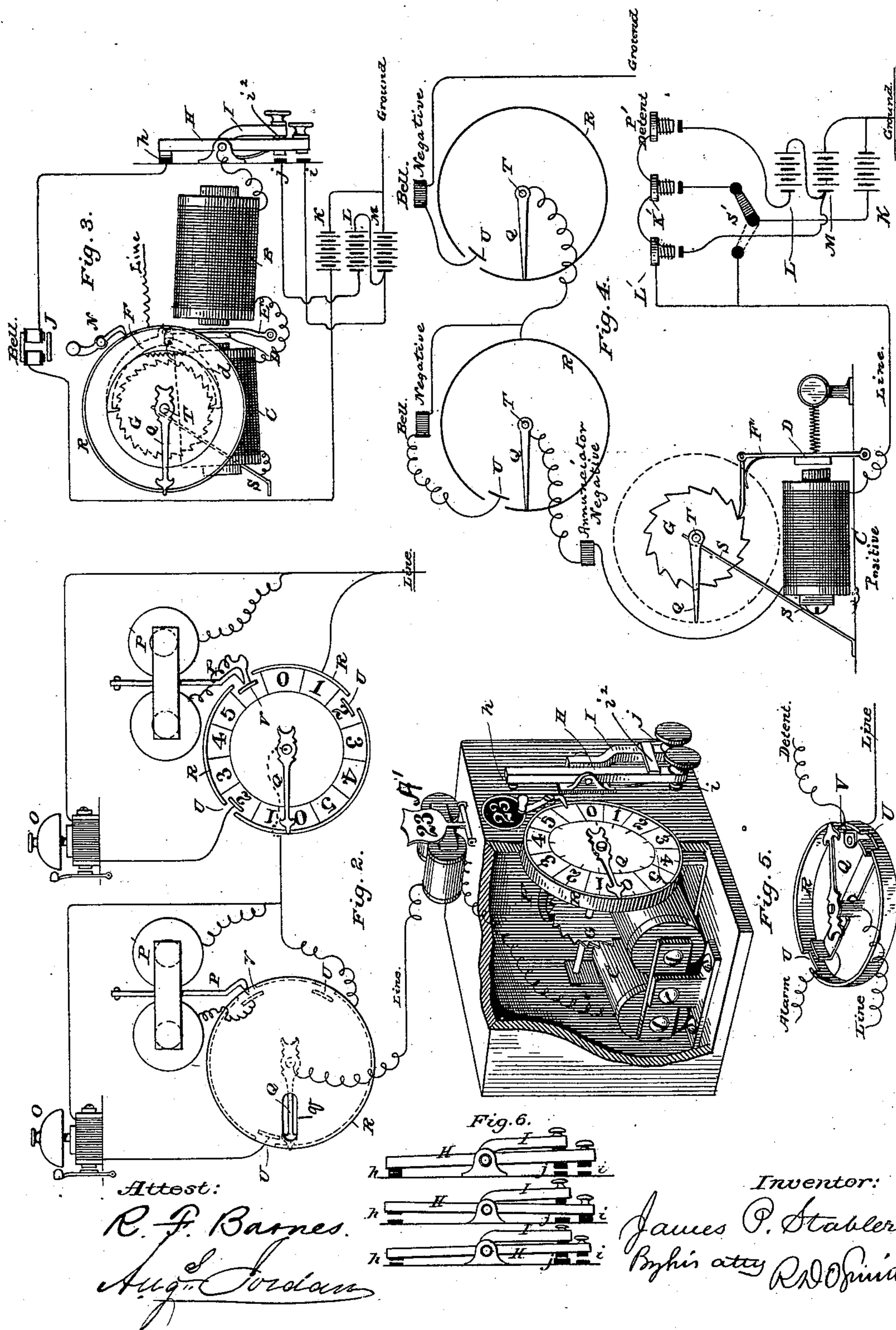
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# UNITED STATES PATENT OFFICE.

JAMES P. STABLER, OF SANDY SPRING, MARYLAND.

## CALL APPARATUS FOR TELEGRAPH-LINES.

SPECIFICATION forming part of Letters Patent No. 235,058, dated November 30, 1880.

Application filed May 26, 1880. (Model.)

*To all whom it may concern:*

Be it known that I, JAMES P. STABLER, of Sandy Spring, Montgomery county, in the State of Maryland, have invented new and useful Improvements in a System of Local Call-Alarms for Telegraphic Purposes, and particularly adapted to telephone-lines, of which the following is a specification.

The object of my improvement is to enable the operator to call any particular station on the line without sounding a call at any other station on that line. This, I am aware, has been done heretofore, but by a mode of operation different from that herein described.

By my invention every movement of the call apparatus is made positively and exclusively under the control of the operator at the central office, and all mechanism at the several stations operated otherwise than by electrical impulses from the central office and controlled by the operator there are eliminated; and it consists, first, in a system of keys and batteries of opposite polarity, whereby by the operation of one key a battery of either polarity may be put on the line, and by the operation of the other key a re-enforce battery may be put in circuit; second, in a station-dial and index moved over the same by a push-and-pull pawl mounted upon a vibrating arm equidistant from its center of motion and a polarized armature common to two electro-magnets of opposite polarity; third and fourth, in an index-dial having two or more duplicate sets of station-numbers and a station-shunt for each set, a unison-shunt and a rotating index in the circuit and in contact with said rim and shunts; fifth, in push-and-pull pawls which are jointed to each other and provided with a connection to the vibrating arm common to both; sixth, in a series of unison-shunts and detent-magnets, whereby all the indexes may be restored to unison, if at any time they are disarranged from any cause whatever; seventh, in an elastic coupler for the push-and-pull pawls independent of the vibrating support for said pawls; eighth, in a system of two keys, whereby two of the batteries may be put on the line alternately, and one of them re-enforced when a stronger current is desired.

That others may fully understand my invention, I will particularly describe it, having ref-

erence to the accompanying drawings, wherein—

Figure 1 is a perspective view of my local-station instrument. Fig. 2 is a perspective view of my central-station instrument with diagrams of local-station connections. Fig. 3 shows the central-station-instrument connections. Fig. 4 represents a modification. Fig. 5 is a perspective of dial-ring and shunts. Fig. 6 represents the keys H and I in their several positions.

A is the box or inclosing-case, which may be made in any desired form or of any proper material. It is desirable that its parts shall be as compactly arranged as possible, and usually the inclosing-case will be of wood.

The instrument at the central office will comprise two electro-magnets, B C, of opposite polarity, so made by opposite winding. They are set opposite each other with a polarized armature, D, mounted on a vibrating arm, E, pivoted at one end, so that the armature may swing from one magnet to the other according to the polarity of said magnets. Said vibrating arm carries at its free end a pawl, F *d*, which engages with a ratchet-wheel, G, and causes the same to revolve as said arm vibrates. By adding a pawl, *d*, to the pawl F, as shown, the wheel G is caused to move with each movement of the armature D, being moved by pull and push alternately.

It is important that the pawls F *d* shall be mounted upon the lever E at points equally distant from the center of motion of said lever, so that the electrical impulses in either direction will be capable of exerting equal force upon the ratchet-wheel G, and to this end I find it convenient to joint the pawl *d* to the arm of pawl F, as shown, and maintain their engagement with said ratchet by a spring which draws said pawls toward each other.

At the end of the shaft, or otherwise properly attached to said ratchet, there is an index or hand, Q, which sweeps over and in constant contact with a dial-rim, R, in front of which the numbers of the several stations are inscribed. The index Q is in the line-circuit, the current being directed thereto by connection through the arm E and pawls F *d*, or through a spring, S, which rubs against the ratchet-shaft T, all these parts being necessa-



rily properly insulated. The dial-rim R is also a part of the line-circuit, connection being closed by contact between the index Q and said dial-rim. It is therefore easy to arrange any desired number of shunts by cutting away the contact-surface of the dial-rim and substituting therefor a surface having a diverted connection joined to the line again farther on. The instrument at the central office does not, however, require any shunts. Attached to the box there are also two keys, H I, which control the contact-points  $h i j$ , and there is also an electrical annunciator, A', which indicates when any station in the same circuit wishes to communicate with central office.

At a convenient place there are three batteries, K L M, which may be of about equal strength. One of them, K, has its positive pole run to the ground, and another, M, has its negative pole grounded, and therefore the alternate use of the batteries produces a to-and-fro current over the line, and the polarity of the electro-magnets in that line will be according to the polarity of the battery whereby they are excited. It is immaterial which pole of K is grounded, so that the corresponding pole of L M is connected with the line. By a proper arrangement of contacts either battery may be put on the line at will. The third battery, L, may be coupled to the second, M, at will, to increase the current intensity for the purpose of operating the bell or detent by a re-enforcement of a comparatively weak current. There is also attached, for convenience only, a stop, N, which can be brought into position where it will act as a detent for the index and arrest it at a certain point during the will of the operator. The use of this is to aid the operator in bringing all the indexes of the local stations on that line to the same position or into unison. These are the features of the instrument at the central office. The annunciator A' may be simply an armature held against gravity by an electro-magnet in the normal line. The momentary breaking of the circuit at any point along the line will cause the armature to fall and announce to the operator that at some station on that line a person desires to communicate.

At each local station along the line there is an instrument comprising two electro-magnets, a vibrating polarized armature, carrying a pawl, a ratchet, index, and dial similar to the dial at the central station. In place of the annunciator, however, or in connection therewith, there is a bell, O, arranged to be rung by an electro-magnet with a single stroke or repeated strokes, as desired, and a detent, P, which may be employed to arrest the indexes and bring them all into unison. The dial R is provided with shunts U U and V. The shunts U U turn the current through the bell-magnet O, and the others direct it through the detent-magnet P. The shunts U for the bell-magnets have each an individual position for

each particular station, so that no two indexes will rest upon the bell-shunts of their stations at the same time. The shunts V of the detent-magnet are, however, all in the same relative location, so that the indexes, when brought around to their detents, will then all rest in the same position, and will be in unison when simultaneously released.

It is to be understood that the telephonic transmitter and receiver are connected with the line in the usual manner for oral communication.

It will also be understood that the batteries K M have sufficient electro-motive force to excite the magnets B and C sufficiently for the purpose of moving the armature D and actuating the index Q, as described; but the electro-motive force of said batteries is not sufficient to overcome the resistance of the armature-spring of the bell or detent magnets, and therefore, by the alternate use of batteries K M, the index Q may be moved round until stopped by the detent without sounding an alarm; but when the index, by being moved as above stated, is about to pass upon the bell-shunt U the re-enforce battery L may be brought into action by depressing the key I, which engages the key H by means of the little arm or lug  $i^2$  and breaks contact at  $h$ , while the key I closes contact at  $j$ . It is preferable that the contacts at  $i$  shall be adjusted so as not to be closed when the key I is depressed, and the electro-motive force is then ample to overcome the resistance of the bell-armature spring and sound the alarm. By a proper structure of the bell and its attachment, as is well known in the art, said bell may be given a single stroke, or may be made to strike continuously, and for this purpose the current of the combined battery L M may be either passed through the bell-magnets or used to close the circuit of a local battery.

Having described the general features of construction of my apparatus, I will now set forth the mode of operation.

The operator at the central office, having been called by temporarily breaking the circuit, and thus causing the annunciator to fall, and having been requested to put the caller in communication with a certain station on another circuit, proceeds to call the required station without sounding any alarm at the other stations on that line. To do this he employs the key H, whereby the batteries K M of opposite polarity are alternately placed in line. Supposing the negative battery K to be normally in circuit, the depression of the key breaks that circuit at  $h$  and closes contact at  $i$  with the positive battery M. As is well known, either of the poles of an electro-magnet become N or S, according to the direction of the electric current passing around them, and that of two magnets in the same circuit, but with helices wound in opposite directions, the corresponding poles will be of opposite polarity. So it is with the magnets B and C



in this circuit, and the vibrating armature D, being polarized, is only attracted when the electro-magnets present opposite polarity to said armature. This will take place alternately as the batteries K M are alternately put in circuit.

The vibration of the armature D and its pivoted lever E moves the pawl F and actuates the ratchet-wheel G to move the index Q. I employ a double pawl, F d, as shown, and thereby obtain a movement of the ratchet for each motion of the armature instead of each alternate motion, as would be the case with a single pawl. When the double pawl is employed the ratchet is provided with twice the number of teeth that there are stations.

As it is important that while any line is in use for oral communication the fact shall be plainly indicated at each local station upon it, so that conversation may not be interrupted, the operator at central office will, when the line is out of use, place the indexes at a certain point upon their dials, which may be designated as zero. If deemed advisable, the dials may be hidden by a screen partially cut away, as at g, so as to show the index only when at zero-point.

As hereinbefore stated, the polarized armatures are actuated by the negative or positive battery, so that by the use of the comparatively weak currents from said batteries the indexes of all the stations on one line are moved synchronously with the index at the central station; but the current which actuates the indexes is insufficient to overcome the armature-springs to operate the bells, and therefore the indexes may be passed over either of the shunts U U without sounding the alarm. When, however, the index is about to pass on to the shunt of the station to be called, the lever I is depressed, and the current then becomes re-enforced by the battery L, the index is moved into the shunt, the bell-magnet is actuated by the re-enforced current, and the alarm is sounded. As all the other indexes at that particular moment are off their bell-shunts, it follows that only the one bell on the line will be sounded.

I arrange duplicate numbers on the dial, so that in one revolution the index will pass each station more than once, and in excess of the number of stations there must be one space on the dial for the unison-shunt, as shown.

If two magnets, B C, are employed, the zero-points may be between the stations, as the index rests between stations; but if only one magnet is employed, then the dial must have divisions for the required zero-points as well as for the station-numbers and for the detent, and the ratchet must be provided with a corresponding number of teeth.

It has been generally found advantageous to limit the number of stations on a telephone-line to five or six for the mutual convenience of the users; but there is nothing in the principles or mechanism involved which renders

such limitation necessary. Neither is there anything, except convenience, which determines the number of divisions on the dial, whether it shall be equal to or a multiple of the number of stations.

In Fig. 4 I represent a modification which does not vary the principles of operation already set forth, but has some practical advantages. In this modification the armatures are all polarized and their polarities adjusted so that the index-armatures and the detent-armatures may be all attracted, say, when the battery of positive polarity is in the line, and all the bell-armatures attracted when, say, the battery of negative polarity is in the line. In this way the indexes may be moved by a current from one battery and the bells be rung by a current from a battery of opposite polarity. In Fig. 4 I have illustrated this modification. K L M are the batteries. As hereinbefore described, the negative battery K may be normally closed on the line. The switch S' serves to open the circuit and bring the negative-current key K' into use. The positive-current key L' is located conveniently near to the key K', so that they may be operated by the first and second fingers. At each depression of the key L' the positive magnets along the line will be excited and their polarized armatures attracted, so that all of the indexes will be synchronously moved, and by repeated depressions of the key L' these movements will be continued until the index of the station to be called has been brought upon its station-shunt. The negative key K' will then be depressed, and the negative current will cause the bell of that station to ring; but all of the other bells, being at that moment cut out, will be silent.

The annunciator-armature must be attracted when the normal current is on, so that the temporary breaking of said circuit will cause a fall of said armature. The position of the annunciator during the time when the operator at the central office is occupied with that line is immaterial.

The detent-armature must be attracted when the positive current is on, and is only made to yield when said current is re-enforced by the battery L, because it is necessary that the detent should be withdrawn by the same impulse which moves the index. The re-enforcing current from battery L is put on the line by means of the button or key P'.

Having now described my invention, what I claim as new is—

1. The negative and positive batteries K L M, as described, combined with the keys H I, arranged so that the former may alternately close the batteries K M on the line, and the latter may alternately close battery K on one side and batteries L M on the other, substantially as set forth.

2. A dial divided into spaces indicating station-numbers, &c., an index, and an actuating-ratchet provided with teeth twice as numerous



as the divisions of the dial, combined with a double or push-and-pull pawl, F *d*, attached to a vibrating arm, E, at equal distances from the axis of the same, which arm also bears a polarized armature, D, and the electro-magnets B C, substantially as set forth.

3. An indicator-dial provided with a conductor-rim, R, and two or more station-shunts, and a unison-shunt interposed therein, substantially as shown, and corresponding sets of station-numbers, combined with a rotating index, which forms a part of the circuit and traverses said rim and shunts and delivers the electrical currents accordingly.

4. In an electrical station-indicator, the following instrumentalities, combined in a single operative instrument, to wit: a station-dial provided with a conductor-rim, R, having three or more portions cut away, with shunts for two or more stations, and one unison-detent located in front of or in said cut-away portions, a rotating index, also in the line, which slides upon said rim and upon said shunts, delivering its current over the rim or shunt, as the case may be, a ratchet-wheel, G, upon the spindle or axis of the index, pawls F *d* in engagement therewith, mounted upon the arm E, a polarized armature, D, also upon the arm E, and electro-magnets B C, wound in opposite directions, substantially as set forth.

5. In a telegraphic circuit, two electro-magnets of opposite polarity in the same line, and a polarized armature capable of vibrating said magnets, combined with pawls F and *d*, jointed to the vibrating standard of said magnet at equal distances from its axis of motion, and retained in engagement with the

ratchet G by a single spring, arranged to be brought into action, respectively, by said electro-magnets and polarized armature, whereby said ratchet G is moved one tooth at each movement of said armature, substantially as set forth.

6. The station-dial having the conductor-rim R, provided with a shunt, V, rotating index Q, and a detent-arm, P, mounted upon the vibrating armature of an electro-magnet brought into the line by said shunt, whereby the index may be arrested when not in unison with other indexes on the line, and released by an electrical discharge sufficient to depress said armature and detent and liberate said index.

7. The electro-magnets B C, of opposite polarity, and the vibrating arm E, with its polarized armature D, combined with the pawl F, jointed to said arm, and the pawl *d*, jointed to the shank of said pawl F, and a spring to draw said pawls toward each other, whereby the ratchet-wheel G is moved with equal force by vibration of the arm E in either direction.

8. The batteries K L M, substantially as described, combined with the key H, arranged to close and break contact alternately with said batteries K M, and the key I, provided with an arm or lug, *i*<sup>2</sup>, to engage with key H, whereby said key H may be caused to break contact with battery K, while key I closes contact with battery L, as set forth.

JAMES P. STABLER.

Witnesses:

R. D. O. SMITH,

L. H. MARSHALL.

Correction of Letters Patent No. 235,058.

It is hereby certified that in Letters Patent No. 235,058, granted to James P. Stabler, November 30, 1880, for an improvement in Call Apparatus for Telegraph Lines, the word "between" was erroneously omitted after the word "vibrating" in line 33, page 4, of the printed specification and claims attached to and forming a part of said Letters Patent; that the proper corrections have been made in the files and records of the Patent Office, and are hereby made in said Letters Patent.

Signed, countersigned, and sealed this 28th day of January, A. D. 1881.

[SEAL.]

Countersigned:

E. M. MARBLE,  
*Commissioner of Patents.*

A. BELL,

*Acting Secretary of the Interior.*