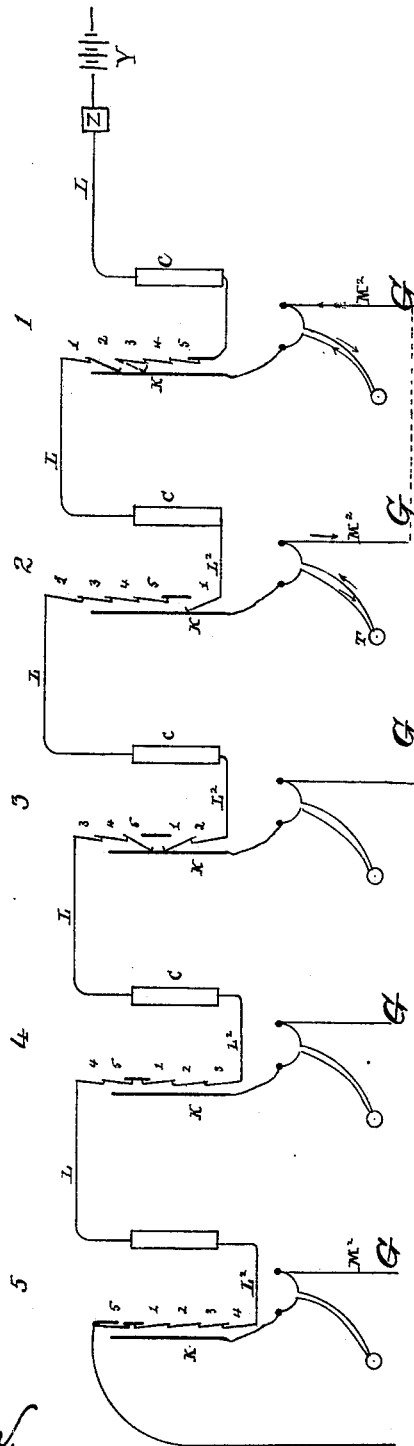


H. A. HOUSE.
Telephone-Switch.

No. 220,717.

Patented Oct. 21, 1879.

Fig. 1.

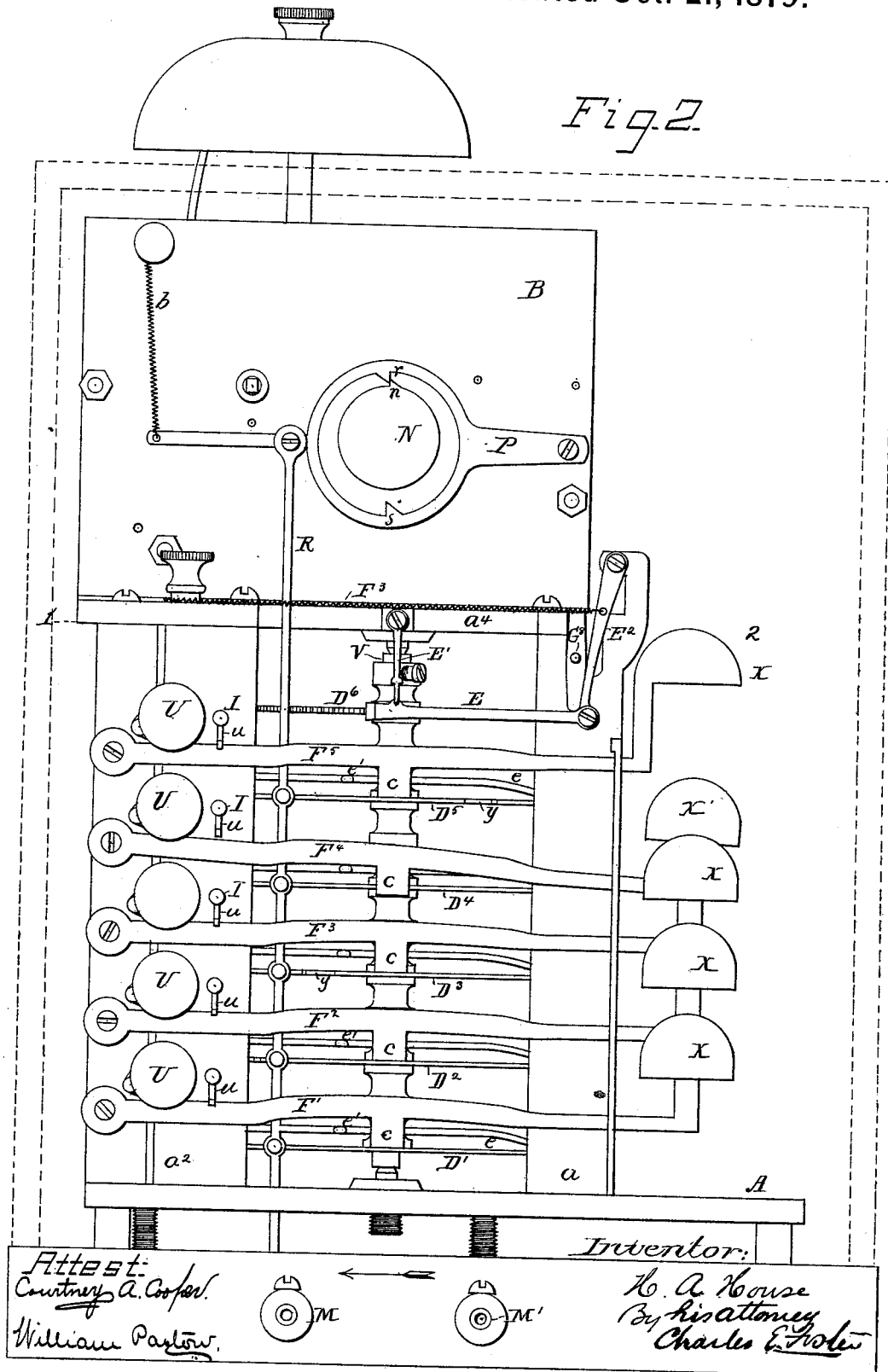


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By his attorney
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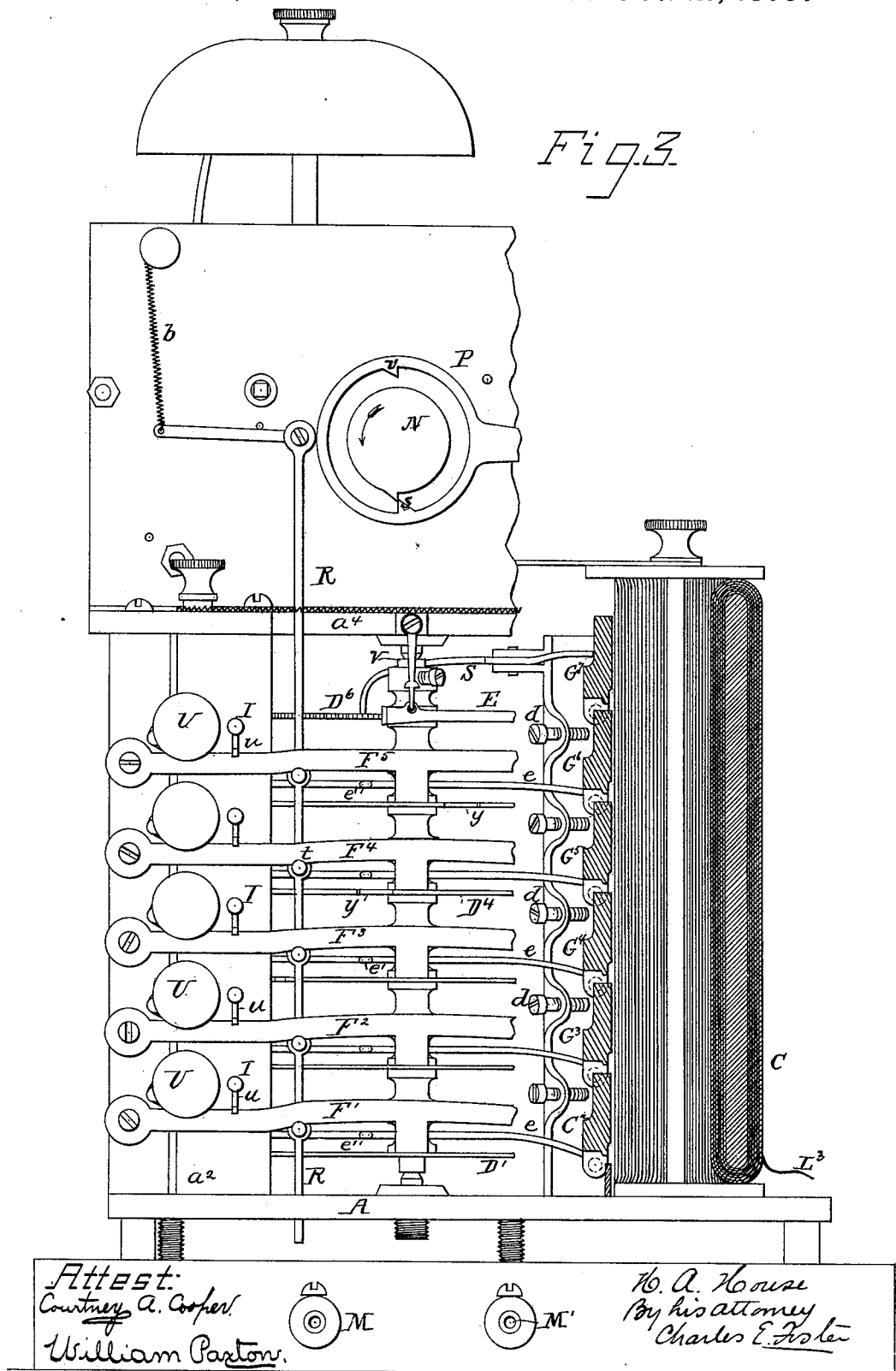
Fig. 2



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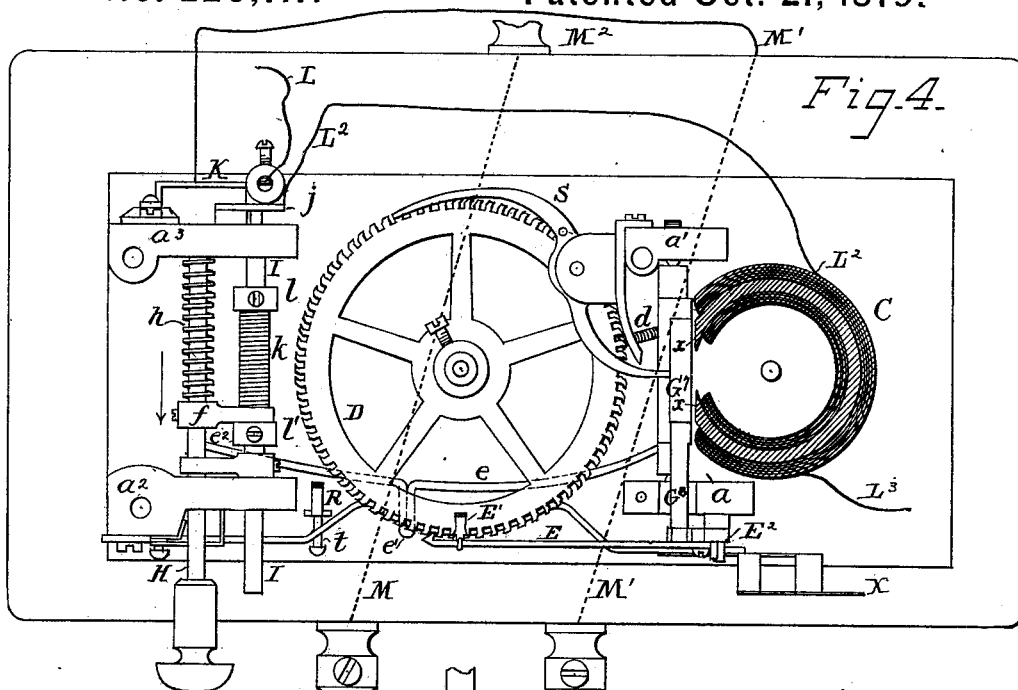


Fig. 4.

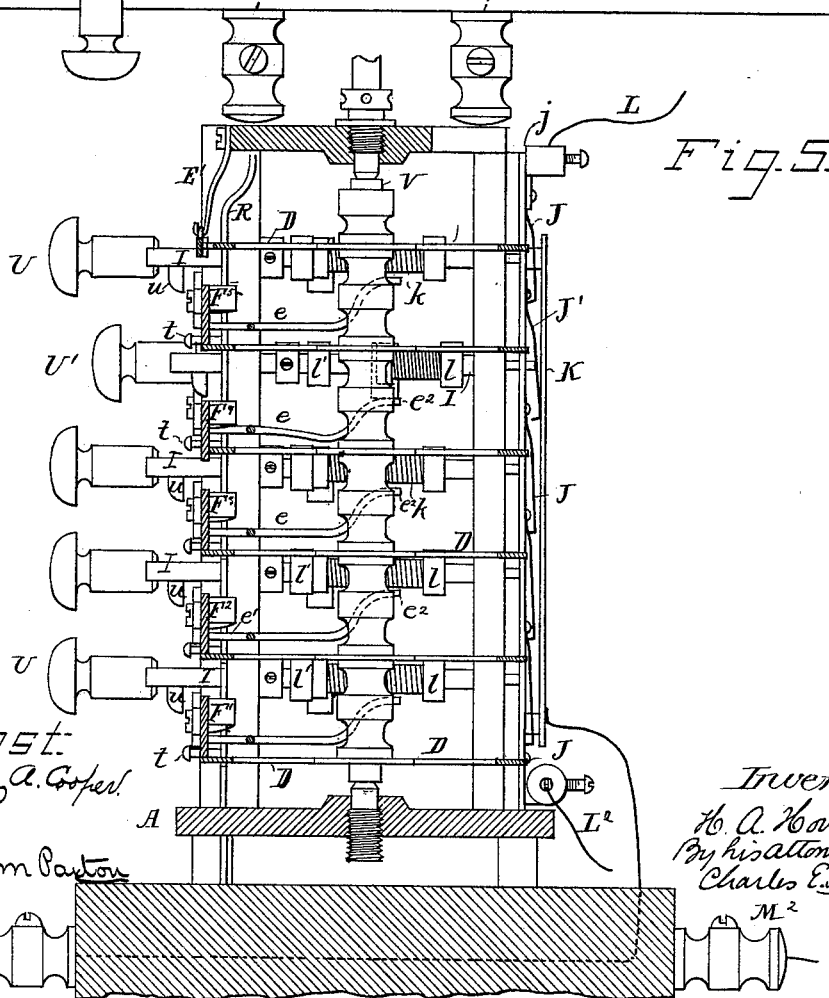


Fig. 5.

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UNITED STATES PATENT OFFICE.

HENRY A. HOUSE, OF BRIDGEPORT, CONNECTICUT.

IMPROVEMENT IN TELEPHONE-SWITCHES.

Specification forming part of Letters Patent No. **220,717**, dated October 21, 1879; application filed July 7, 1879.

To all whom it may concern:

Be it known that I, HENRY A. HOUSE, of Bridgeport, Fairfield county, State of Connecticut, have invented certain new and useful Improvements in Telegraph-Switches, of which the following is a specification.

The object of my invention is an apparatus, constructed as fully described hereinafter, whereby any two persons upon the same telegraphic circuit may at will communicate with each other, while all others on the same circuit are excluded.

In the drawings forming a part of this specification, Figure 1 is a diagram illustrating my invention; Fig. 2, a front elevation of the apparatus, the case being removed. Fig. 3 is an elevation, partly in section. Fig. 4 is a sectional plan on the line 1 2, Fig. 2; Fig. 5, a central transverse vertical section looking in the direction of the arrow, Fig. 1.

A is the base, supporting four standards, a a^1 a^2 a^3 , a plate, a^4 , on which serves as a support for any suitable alarm or sounding apparatus, B. Upon the base, between the up-rights a a^1 , rests an electro-magnet, C, consisting of a hollow soft-iron cylinder cut away at one side to present two parallel longitudinal faces, x , which are exposed, while the body of the cylinder is incased by the coiled wire, as shown.

In suitable bearings turns a central vertical shaft, v , to which are secured a series of parallel disks, D^1 D^2 , in the edge of each of which is a notch, y , so arranged as not to coincide in a vertical line with any of the notches of the other disks. To the shaft above the disk D^5 is secured a ratchet-wheel, D^6 , to the teeth of which is adapted a pawl, E, suspended by links E^1 E^2 , a spring, E^3 , serving to draw the latter inward.

To the standard a^2 are pivoted levers F^1 F^2 F^3 F^4 F^5 , which extend each above one of the disks, D, and past the standard a , and carries an indicating-segment, X, at the outer end. Each lever has at the under side a lug, e , which rests upon the disk below and is adapted to the notch y thereof.

Between the standards a a^1 are pivoted rocking armatures G^1 G^7 , which play between abutment-screws d and the faces x of the magnet, and from the rear of each armature ex-

tends a rod, e , carrying a lug, e^1 , which projects beneath the adjacent lever, F, the end of the rod extending between the standards a^2 a^3 , and being bent laterally to form a terminal arm, e^2 , as shown in Fig. 5. There is one more armature than the number of the disks, this extra armature G^7 having a lateral arm, G^8 , which bears upon the link E^2 .

Through the standards a^2 a^3 , and above each lever F, extend two parallel rods, H I, constituting a key, the former carrying an arm, f , and having an opening, through which the rod I passes loosely. On each rod H is a coiled spring, h , which tends to throw the rod outward in the direction of the arm, Fig. 4, and a coiled spring, k , upon the rod I bears upon a lug, l , and on the arm f , and tends to throw the rod inward, so that another lug, l' , thereon shall be caused to bear against the arm f .

To an insulated plate, j , at the rear of the standard a^3 are secured flexible metallic leaves or switches J, each of which is opposite the inner end of one of the rods I, and bears with its lower end upon the switch beneath. Near one end of each rod I is a lug, u , which, striking the lever F below, limits the inward movement of the rod. Each rod H has a knob, U, at the outer end. Opposite the series of switches J, but a short distance therefrom, is an insulated bar, K.

The upper switch, J, is connected with the main line L, the lower switch with one end of the wire L^2 , coiled around the magnet, the other end, L^3 , of which completes the circuit with the main line, which circuit thus extends through the series of leaves J and through the magnet of each instrument, the relative position of all being indicated in the diagram Fig. 1.

A clock, Z, or any other suitable device by which the current is broken frequently at regular intervals, is also in the main-line circuit, as shown. The two wires of the telephone are connected to wires M M^1 , (dotted lines, Fig. 4,) the former going to the ground or return line at M^2 , and the latter being attached to the insulated bar K, Fig. 4, so that there is no complete circuit with the ground as long as said bar is insulated.

One of the shafts of the alarm mechanism carries a disk, N, having an edge-lug, n , and

this disk revolves within an opening in a lever, P, having lugs r s , arranged so that one of them will be struck by the lug n , according as the lever is raised or lowered. A spring, b , tends to raise the lever P, to which is connected the upper end of a rod, R, and from the latter, below each lever F, extends a pin, t .

The intermissions of the main-line current cause the armatures G to vibrate, so that the pawl E, operated by the upper armature catching upon the teeth of the ratchet-wheel D⁶, imparts a step-by-step rotation to the combination-shaft and its disks. A spring-pawl, S, pivoted to the standard a^1 , is struck by the armature G⁷ as it moves from the magnet, so that its other end is removed from the teeth of the ratchet D⁶, which it locks in position when the armature moves forward to the magnet.

The various instruments on the main line operate in unison, and the plates X are marked to correspond—that is, the lug c of each one of the levers F will be directly above the notch y of the disk below it, at the same time that the lug of the lever in another instrument correspondingly marked is above the notch of its disk.

Thus, in the whole series of instruments, it is not possible for more than two levers, F, to drop at one time, and when said two levers drop then the two instruments containing such levers are in communication. For instance, on reference to Fig. 1, it will be seen that there are five switches and corresponding levers in each instrument. These are numbered or otherwise marked in each instrument, and the disks D are so arranged that when lever No. 2 in instrument No. 1 drops, lever No. 1 in instrument No. 2 will also drop, so that the operator at No. 2 knows, by the falling of lever marked 1, that he is in communication with the operator of instrument No. 1, and the last-named operator is also aware that he has opened communication properly with instrument No. 2.

The number of instruments on the line will not, of course, exceed by more than one the number of levers and disks in each instrument.

As all the armatures vibrate together the lugs e^1 of the arms e , rising beneath the levers F, prevent the latter from descending when the notches y are brought beneath the lugs c of the levers.

When a party desires to communicate with any other instrument he pushes in a button, U, opposite the segment indicating that instrument. Suppose the owner of the instrument shown desires to communicate with the instrument indicated by the plate X', he pushes in the button U', Fig. 5, when the results will be as follows: First, the spring k of the rod I will be compressed, carrying in the rod I until the lugs u of said rod strike the side of the lever F. The arm f will then be above the end e^2 of the rod e , extending from the armature G⁴, so that when the cylinder again becomes magnetized the said arm e of the armature G⁴ is held down

and the lug e^1 prevented from rising to hold up the lever F⁴. When therefore the notch of the disk D⁴ below said lever coincides with the lug c the latter will drop into the notch. The instant the lever drops it is removed from opposite the lug u of the rod I, which can thus pass inward, moved by the spring k , its end striking the switch J' opposite the same, lifting the latter from the switch J below and bringing it against the bar K. The instant the switch J' is moved from the switch J below the main line is broken, the operation of all the instruments at once ceases, the armatures of all the instruments fall away from the magnets, and the lever F of the instrument whose lug c is above one of the notches y drops into said notch.

This instrument, of course, will be the instrument indicated upon the segment X', whose owner presses back the button U' above the fallen lever, when the rods H I move back together, and the switch J', opposite the adjusted rod I, is brought against the bar K.

There are then two instruments, in each of which there is a communication through the line L, switches J J', bar K, line M¹, to the telephone, and back through the line M to the ground or return line, thus forming a telephone-circuit from which all other instruments are cut out.

As in all the other instruments, the levers F are all elevated. There being no notch y corresponding to the lever-lugs, no communication can be formed from them with the ground, as the rods I cannot be pressed back, in consequence of their lugs u striking the elevated levers.

The instant pressure is removed from the knobs the latter are carried out by their springs, the switches J' fall upon the switches below, the main-line circuit is completed, the ground-line broken, and the intermittent currents rotate the combination shaft and disks, as before.

When one of the levers drops it strikes a pin, t , below it, depresses the rod R and lever P, and removes the lug s from the lug u , and releases the striking mechanism, which sounds until the lug n strikes the lug r .

It will be noted that this call is only sounded at the transmitting and receiving instruments, thus relieving the other parties on the same line from the annoyance of hearing different calls.

The lines of communication between the different instruments are indicated in the diagram Fig. 1, in which L is the main line; Z, the clock or other circuit-breaker; Y, the battery, and M² the ground-lines.

The central-station instrument is identical in construction with that above described. The other instruments, Nos. 2 to 5, vary from the first only in the arrangement of switches J. Thus in No. 2 the lower switch is permanently in connection with the main line L, through the wire L² and magnet O, and when this switch is thrown out to the bar K the cir-

circuit runs through the telephone T, ground-lines M² of both instruments, through the telephone of instrument No. 1, its bar K, switch 2, and back to instrument No. 2, through line L.

In instrument No. 3 the two lower switches, corresponding to the instruments 1 & 2 at the right, connect with the line L² in instrument No. 4. The lower three switches corresponding to the three instruments so connect, and in instrument No. 5 all but the upper switch so connect, the upper switch having a connection with the ground, so that when a switch is not thrown out to the bar the communication is with the ground to complete the circuit. In each instrument the upper switches operate with the instruments at the left. Thus in each instrument the circuit is established toward the side at which the communicating instrument is situated. For instance, if No. 3 is to communicate with No. 1, the switch 1 of instrument No. 3 and the switch 3 of instrument No. 1 are pushed out to the bar K, when the circuit will be through the telephone ground-wire, magnet C, and line L² of the instrument 3, and through the ground to instrument 1, through the wire M², telephone, bar K, switch 3, and line L back to instrument No. 3.

It will be seen that the two divisions of switches in each instrument each consists of overlapping bars or leaves J, but that the inner switch of each division bears on a plate, 21, which makes a circuit when any of the switches are not moved out to the bar K. When, however, a switch of the lower division is so moved out, the circuit through the ground will be with the instrument to the right, when the operator of that instrument presses out the corresponding switch, which will be in the upper division.

When a switch in the upper division is pushed out to the bar K, the ground communication will be to the left, when the operator of the instrument at the left pushes out the corresponding switch in the lower division.

One of the main features of my invention is the locking of the keys of all the instruments in communication.

To render it impossible for any other parties than those in communication to fraudulently manipulate their instruments so as to release the keys and ascertain what is being transmitted, I inclose the working parts of each instrument (except the bell, bell-hammer, and knobs of the main circuit-breaking keys) in a case, (shown by dotted lines,) cutting off all access to the mechanism. It will be apparent, however, that by the use of other means—for instance, combinations and locking-bars and various well-known devices—the levers or other combinative mechanism may be locked whenever the main circuit is broken and an instrument is not in communication with another.

I do not confine myself to the use of a battery-magnet, as the same operations may be performed by a current generated from a mag-

neto-electric machine by changing the character of the magnet to suit that of the current.

It will be apparent that my invention, involving a device for intermitting the current, three or more apparatus having combination mechanisms operated by said current, and constructed so that each may be thrown into a circuit with any one of the others to the simultaneous exclusion of the remainder, may be embodied in various forms of mechanism, all constructed to carry out the invention, but capable of being made in various ways. For instance, the breaking of the main-line circuit and establishment of the ground or return circuit may be effected by means of disks on a horizontal shaft and vertical bars resting on their edges, instead of horizontal levers, the bars being lifted automatically by means of any suitable appliances operated from the armatures, or by the action of one or more magnets.

Various other constructions will occur to those skilled in the art, although the construction shown is simple, practicable, and effective. My invention therefore is capable of being carried out by various appliances, and I do not limit myself to those described.

I do not here claim a notched disk operated step by step, and a lever for bringing the alarm into action by dropping into the notch, as this may form the subject of a separate application for Letters Patent.

I do not here claim the idea of breaking the main line and connecting either branch or fragment of said main line at pleasure with an earth branch, whereby communication can be made to one side or the other of the station, but not to both sides simultaneously, whereby only the earth branches, when the main line is broken, can be in circuit; but

I claim—

1. The combination, in a telegraphic circuit or line, of three or more instruments operated automatically by intermittent currents, and devices whereby each instrument is brought to coincide successively with like devices in each of the other instruments, said devices being constructed to bring any two mechanisms to like position to permit ground communication between the same to the exclusion of all others on the operator of either instrument adjusting the switch corresponding to the other instruments, substantially as described.

2. The combination, with the main line, of a series of instruments, each provided with a ground-line with keys and switches, and with appliances operated by intermitting currents of the main line, and constructed to simultaneously release the switch-operating devices when the key is adjusted, and thereby, when the main current is broken, establish a connection through the ground between any two of the instruments to the exclusion of the others whose parts coincide on the breaking of the current, substantially as set forth.

3. The combination, with the main-line circuit-breaking keys, of appliances, substan-

tially as described, constructed to release the keys of any two instruments in simultaneous position to permit communication on the establishment of the ground-circuit, but to lock all the other keys, substantially as specified.

4. The combination of the series of circuit-breaking keys and a locking device, whereby but one key can be operated at one time, for the purpose set forth.

5. The combination, with the series of disks and levers, arranged to be operated successively when corresponding in position with those of other instruments, of an alarm mechanism constructed to be operated on the movement of any one of said levers, substantially as set forth.

6. The combination of the shaft, its disks and levers, or their equivalents, series of armatures vibrated by the action of one or more magnets, devices whereby the levers are maintained from connection with the disks during the vibration of the corresponding armatures, and keys by which the movement of any one of the armatures may be arrested, substantially as set forth.

7. The combination, with the switches and operating - keys, of mechanism whereby each switch is placed under control of its key only when a corresponding switch in another instrument is capable of like adjustment, substantially as set forth.

8. The combination of the vibrating armatures, their rods *e*, the shaft, and disks, and lever *f*, arranged to be lifted by the rods, substantially as set forth.

9. The combination, with the magnet, com-

bination-shaft, armatures, and devices for rotating said shaft therefrom, and pawl, *S*, operated from one of said armatures, substantially as specified.

10. The combination of the series of combination-levers, alarm apparatus, and device for releasing the same on the movement of any one of said levers.

11. The combination, with the circuit-breaking keys, of a series of overlapping switches connected to the main line and adjacent bar connected to the ground-line, substantially as set forth.

12. The combination, with the series of switches *J*, of spring-rods *I*, having projections *u*, and combination - levers arranged to obstruct the movement of the said rods *I* until they pass from opposite said projections, as specified.

13. The within-described construction and arrangement of the series of instruments having switches for establishing connection with the main or ground lines, the switches of each instrument being in two divisions, one division connecting with the instruments to one side through a ground-circuit, and the other division to the instruments to the other side through the main line, as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY A. HOUSE.

Witnesses:

HARRY A. HOUSE, Jr.,
GEORGE C. BISHOP.