

(Model.)

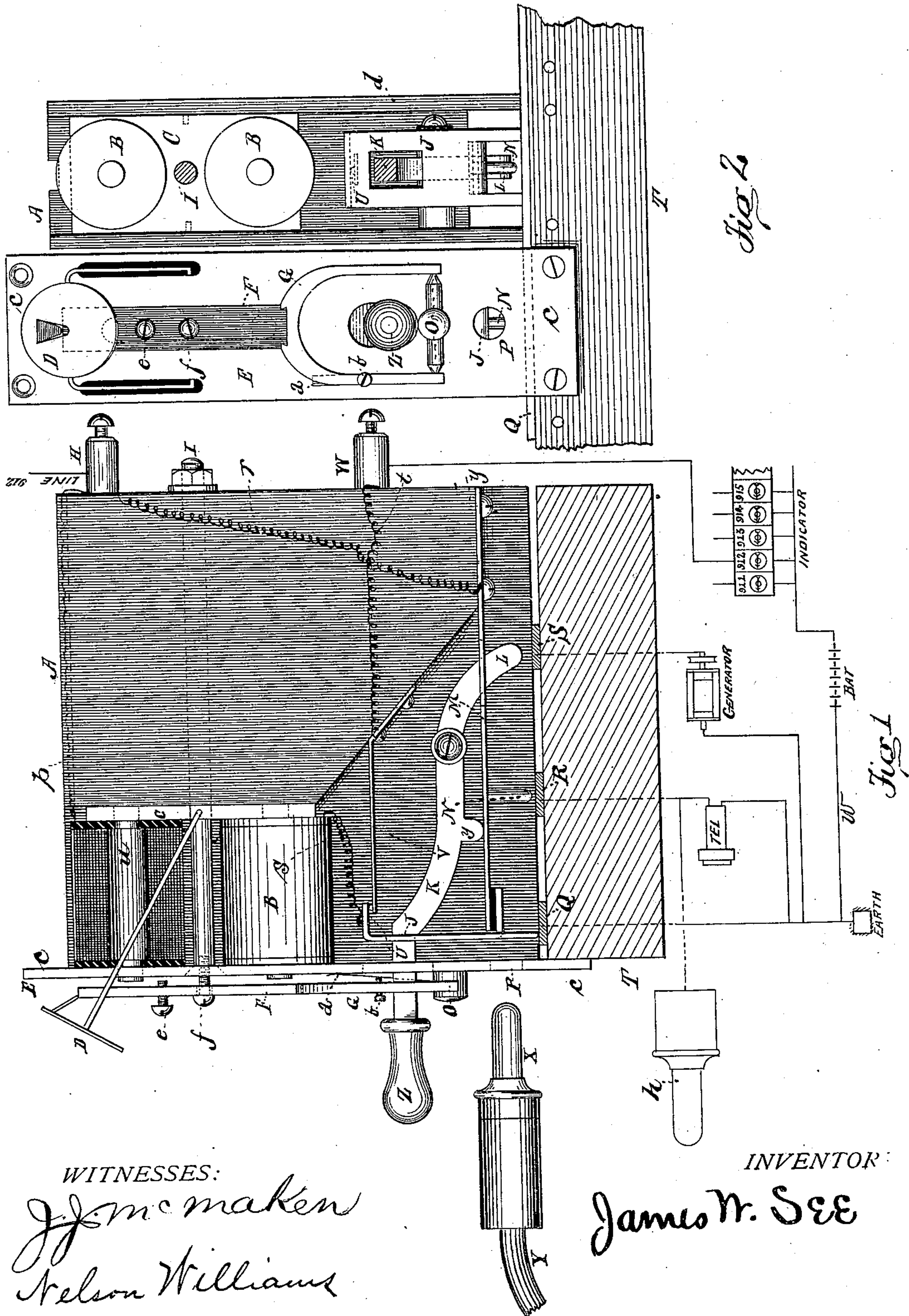
2 Sheets—Sheet 1

J. W. SEE.

Telephone Exchange Apparatus.

No. 235,056.

Patented Nov. 30, 1880.



(Model.)

2 Sheets—Sheet 2.

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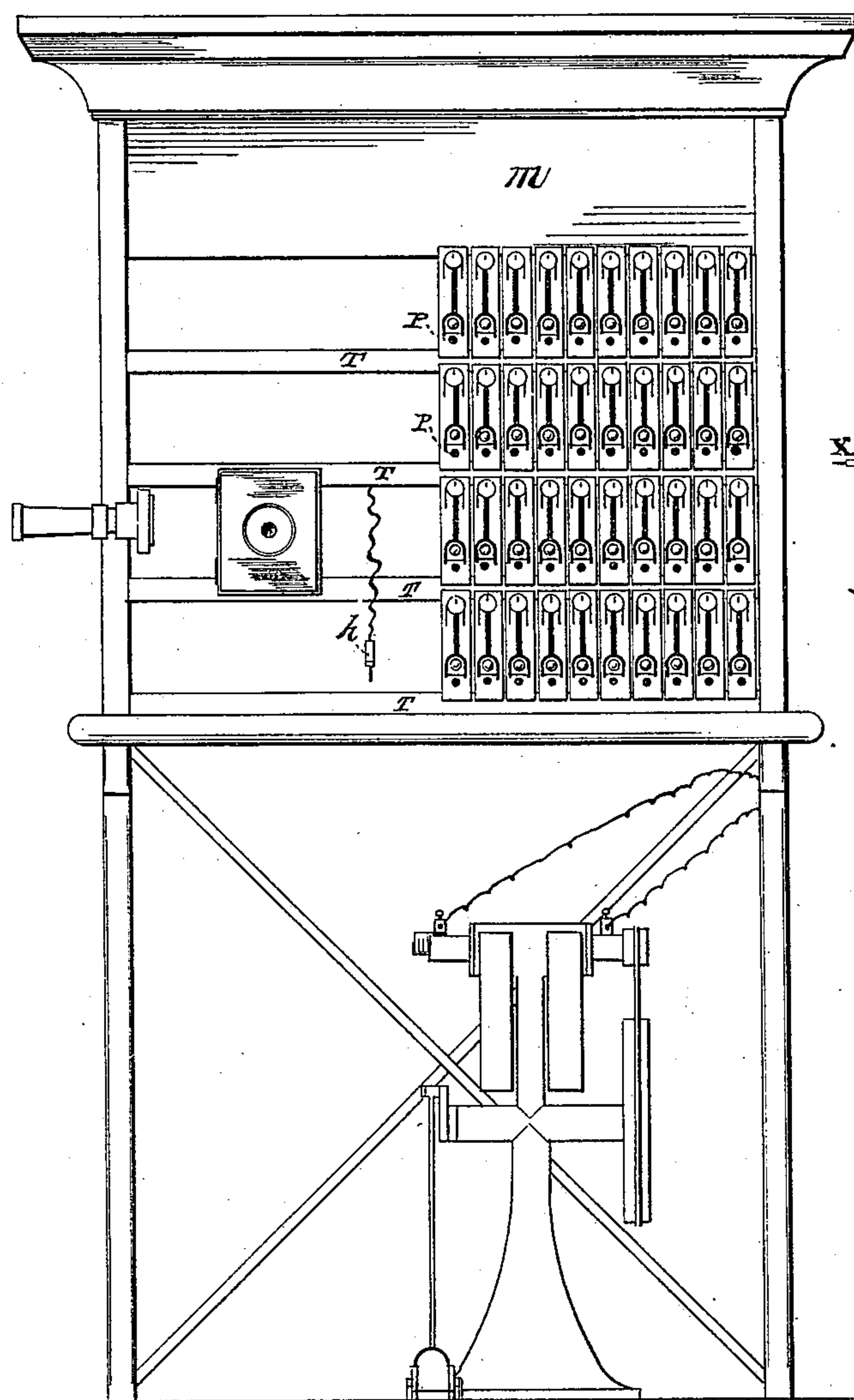
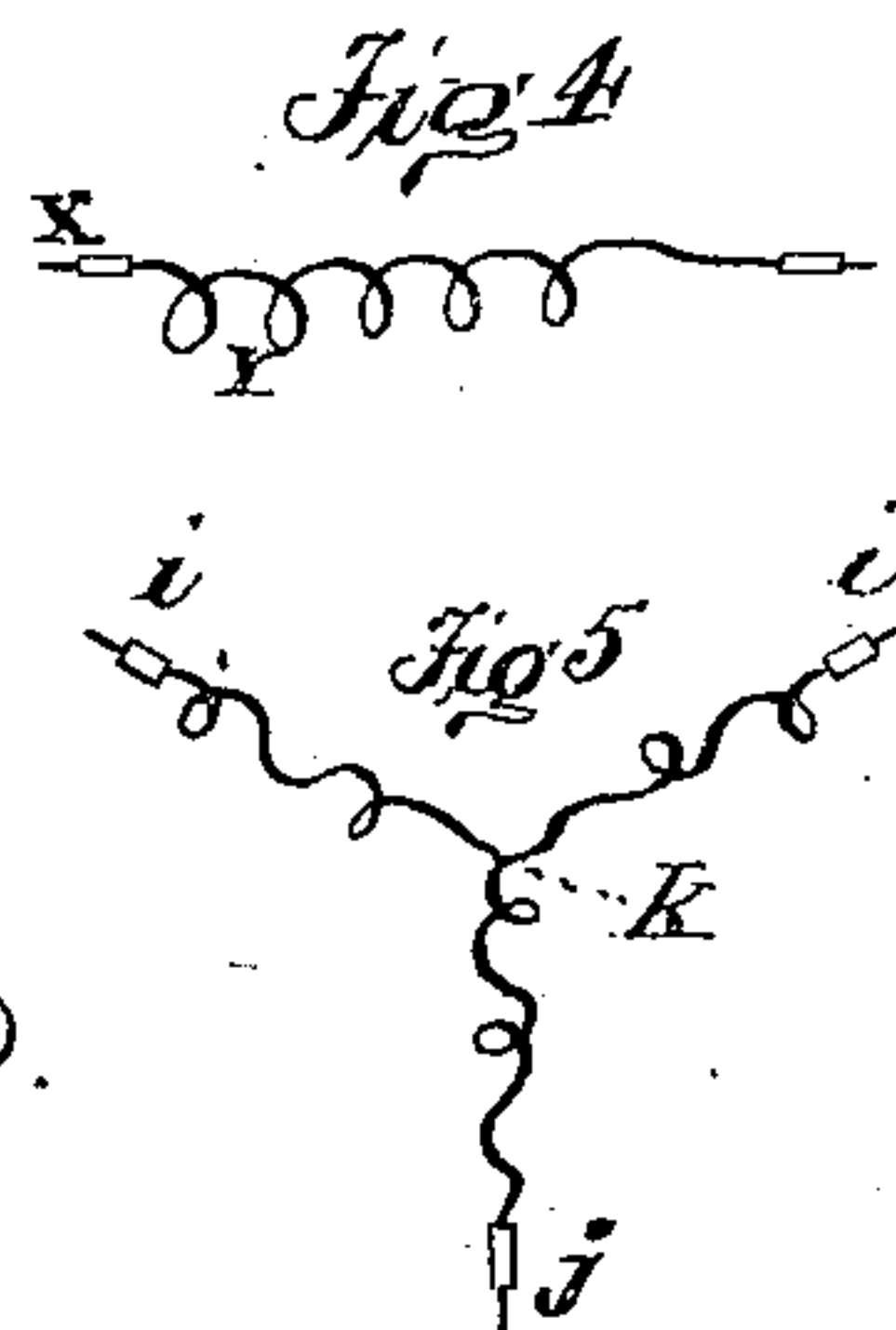


Fig 3



WITNESSES:

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TELEPHONE-EXCHANGE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 235,056, dated November 30, 1880.

Application filed July 12, 1880. (Model.)

To all whom it may concern:

Be it known that I, JAMES W. SEE, of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Telephone-Exchange Apparatus, of which the following is a specification.

My invention relates, mainly, to the drop or signal-receiving device which is placed in the circuit of each incoming line at the exchange or central office. My invention is applicable to almost any of the prevailing systems.

In the accompanying drawings, Figure 1 is a side elevation of a complete drop, with the side plate removed to expose the interior. In this figure the drop is shown as in proper position on the shelf T of an operating-desk. Fig. 2 is a front elevation of two drops, the front work of the right-hand one being removed to expose the interior. Fig. 3 is a front elevation of an operating-desk adapted to receive forty incoming lines. Fig. 4 is illustrative of a common cord-connector; and Fig. 5 is illustrative of my improved radial connecting-cord.

In Fig. 1, T is one of the shelves of an operating-desk. The entire machinery pertaining to each individual incoming line is concentrated into a device which has a front plate and a frame or body. The frame work goes in between the shelves, and the front-plate attaches directly to the front of the shelves. The said device is narrow, and as many of them may be packed side by side between the shelves as are thought best. Upon each shelf several conducting-strips, Q, R, and S, are arranged. These strips are fixed to the top of the shelves, and are properly connected up with such external accessories as the incoming lines are to be temporarily switched to. The line device or machine referred to contains sundry switching devices by which the incoming line may be put to any of the strips shown. By this means a line can be instantly switched to a call-circuit, or to a telephone-circuit, or to ground, and owing to the general structure of the device the entire machine may be removed from its place by simply unscrewing the attaching-screws and drawing the machinery forward from its place. The various required devices in the machine are arranged to properly contact on the strips on the shelves. The

line of one of these machines can thus be put to the operating-desk and instruments, and as a connecting device, as hereinafter shown, is also arranged in each machine, the line may be disconnected from all table apparatus and connected to another similar line.

In Fig. 1, H is the binding-post, to which an incoming line is to be led. From this post the circuit runs through wire *p*, through drop-coils B, through wire *s*, through jack J, to contact on strip Q, which is in communication with the earth, as indicated. The jack J is held down by spring M, insulated where it attaches to the jack. Spring M is connected by wire *r* to the binding-post H.

K is a lever-switch, which normally has no office. Its shank passes through the upper part of the jack-piece J, as shown, so that if the lever-handle be raised the ground-contact at Q will be broken and the line be opened. The rear end, L, of the lever is adapted to contact with the strip S, which is to earth through a generator, as indicated. The generator may be voltaic or magneto.

If the lever-handle be lifted a slight distance the ground-contact will be broken and generator-current will be sent to line in an obvious manner. In this way, by the upward movement of the switch-handle, calls and answers to calls are sent to the subscriber's line. The front plate, E, is pierced at P to receive the end plug, X, of a common flexible connecting-cord, such as is illustrated in Fig. 4, there being a plug at each end. The plug-hole P is so located that a plug inserted in that hole will lift the jack J. The jack J has in its lower end a notch, as shown in Fig. 2. The plug inserted in the hole P impinges on the upper side of this notch and thus lifts the jack clear of the ground-strip Q. This will break the ground-contact at Q, and will divert the circuit to the connecting-cord. By thus plugging with cords two subscribers may be connected.

I find in practice that sometimes three or more persons on different lines wish to confer at once. For this purpose I use what I term a "radial conductor," such as illustrated in Fig. 5. Here are shown three plugs, *i i* and *j*, connected by conducting-cords intersecting at *k*. There may be as many branches or radii

as desired. By means of such a cord three or more subscribers' lines may be connected, the number being limited only by the number of branches of the cord.

5 The jack-spring M has the contact N fixed to it and adapted to touch the strip R if the spring be depressed by a downward movement of the lever K. The strip R is to earth through a telephone, as shown. This tele-
10 phone is the operator's instrument, and a downward pressure on the lever-handle will place him in communication vocally with the subscriber.

It should have been mentioned that the
15 opening at L S is to be so great that plugging the jack up will never make contact at that point.

The mode of operation can be briefly described: Jones calls. Operator lifts lever on
20 Jones' drop and sends response; then depresses lever and halloos. Finding that Jones wants Morton, he leaves Jones' drop entirely and lifts lever on Morton's drop, receives response, and connects the two by conducting-
25 cord. If operator gets no response from Morton he tells Jones so, and has handled no cords in ascertaining the fact. After Jones and Morton are connected a downward pressure on either of their levers will at any time allow
30 the operator to cut in and hear or talk.

It will be noticed that when the contact is made at R the ground-contact at Q, in case no plug is in, is left unopened. This working with three grounds is perfectly satisfactory so
35 long as the resistance of the Q branch is equal to the resistance of a telephone-coil.

It will be noticed that the normal circuit is through drop-coils to earth, while the cutting-in circuit is through wire *r*, through telephone,
40 and to earth. The resistance of the drop-coils exceeds that of the telephone.

It will be noticed that the operator can only converse with a subscriber while the switch-handle is pressed downward. This tiresome
45 feature is a benefit, as tending to reduce such conversation to business-like brevity, and for this reason no locking devices are conveniently fixed to the switch. When lengthy conversation is requisite a cord may be plugged
50 to the subscriber, the other end of the cord being permanently to ground through the telephone. This cord is shown at *h* in Figs. 1 and 3.

When many subscribers are grouped on separate tables connected by suitable transfer-lines
55 it often happens that an operator will make a transfer to another table and will send a ticket indicating the transfer. The line wanted may be in use, and the time of the subscriber and of two operators and a ticket-boy will be somewhat thrown away. To avoid this I make use
60 of a conspicuous indicator or annunciator, of any suitable construction, so connected by electric circuits that if any subscriber's jack be
65 lifted, either by lever or plug, the indicator will show to all the operators in the room that

such line is in use. The calling subscriber may thus be instantly told to call at some future time.

Fig. 1 shows the plan of connecting the indi- 70
cator. The indicator may be either open or closed circuit, but in the drawings is shown as indicating "line idle" by closed circuit, as shown. One indicator-wire, *w*, is brought to ground, and is common for all numbers on the
75 indicator. The other wire of the indicator is carried to the binding-post W of the appropriate drop, thence through wire *t* and spring V to contact U on the jack J, which completes the circuit, while jack is connected to ground. 80
Any lifting of the jack breaks this circuit and operates the appropriately-numbered needle or target, as the case may be, of the indicator.

My invention does not pertain to the construction of the indicator, there being many 85
devices in use which are applicable to the purpose.

In the construction of the drop I use a front plate, E, having bolted to it by the bolt I a
90 recessed block, A, which forms the box for the inside mechanism. The side piece, *d*, may be omitted if desired. The bottom shoulder, *y*, serves as an attaching-place for the jack-spring. The front plate, E, projects above and below
95 the block, as at *c c*, and serves as means for attaching the drop to the shelves. The shelves of the desk are, as shown in Fig. 3, adapted to receive the drops closely and neatly, and the strips on the shelves are, of course, to be properly connected. 100

It will be seen that one drop is in no way dependent on another, and that removing the front screws allows the entire apparatus pertaining to one line to be withdrawn for inspection, &c. 105

Between the body of the block A and the plate E is clamped the drop-coils B, the one bolt I holding all together. The heel-bar C and the front plate, E, are pierced to receive the ends of the magnet-cores *u*. The screwing of
110 the heel-bar to the cores is thus avoided. The front plate is pierced, as shown, to allow the switch-lever to project, and also allow the target-levers to act.

The armature F is adjustable in approach and
115 recession by the screws *e* and *f*, and the spring *a* and screw *b* regulate its retractile force. The armature is polarized and the non-magnetic extension G is carried well downward, so as to well separate the pivot and the lower core of
120 the magnet. The repellent power of the magnet is thus utilized on one side of a simple lever-armature. The ends of the magnet-cores are shouldered, so that the bolt I will not compress the spool-wire. 125

The switch-lever K may be modified in many ways and still fulfill the same functions, and, if desired, the armature may be of the centrally-pivoted class.

Much may be said in favor of the strips permanently fixed to the shelves; but if desired
130 they may be dispensed with and a substitute

found in contact-pieces fixed in the drop-block and properly connected by wire.

I claim as my invention—

1. The combination, with a shelf having longitudinal conducting-strips upon its upper surface, of a signal and switching device having electrical conducting-terminals adapted to contact upon said strips, and also having means for attaching said device to shelf, substantially as set forth.

2. Upon an individual incoming line in a telephone-exchange apparatus, the combination, with a spring-switch by which the line is normally to ground, and which is adapted by one motion to put the line to a signal apparatus and by another motion to put the line to a telephonic apparatus, of a plug-receiver adapted to receive the plug of a connecting-cord in such manner as to open the normal ground-connection and divert the line-circuit to the plug, substantially as set forth.

3. The combination, with an individual line-switch adapted to be moved when such individual line is brought into use, of a circuit including a battery, an individual indicating device, and a switch adapted to be operated by the same force which moves said individual line-switch, substantially as set forth.

4. The combination, with open shelves, of a signal and switching mechanism adapted to enter between said shelves, and a front plate attached to said mechanism and adapted to be

attached to the front edge of said shelves, substantially as set forth.

5. The combination of shouldered magnet-cores, a front plate pierced for the cores, a block adapted to serve as a box or attaching-piece, and a bolt arranged to hold the parts together, substantially as set forth.

6. The combination, with a block having a spring-jack attached thereto, of a front plate attached to the block and pierced for a plug which is adapted to lift said spring-jack, substantially as set forth.

7. The combination, with a front plate having an electro-magnet clamped behind it and pierced to allow the cores of the magnet to extend to the front of the plate, of an armature pivoted to the front of the plate, substantially as set forth.

8. The combination, in a single instrument, of a signal-receiving device, a signal-switch, a telephone or conversation switch, a connection-receiver for a conducting-cord, and a means for attaching said instrument to an operating-desk, substantially as set forth.

9. A flexible conductor formed with three or more branches in metallic connection, combined with terminal connectors for all of said branches, substantially as set forth.

JAMES W. SEE.

Witnesses:

J. J. McMAKEN,
FRANK JONES.