W. M. BRUCE, Jr.

INDIVIDUAL SELECTIVE LOCKOUT DEVICE FOR PARTY LINE TELEPHONE SYSTEMS.

APPLICATION FILED SEPT. 1, 1904.

Patented June 6, 1911.

994,371.

3 SHEETS—SHEET 1.

Fig 1

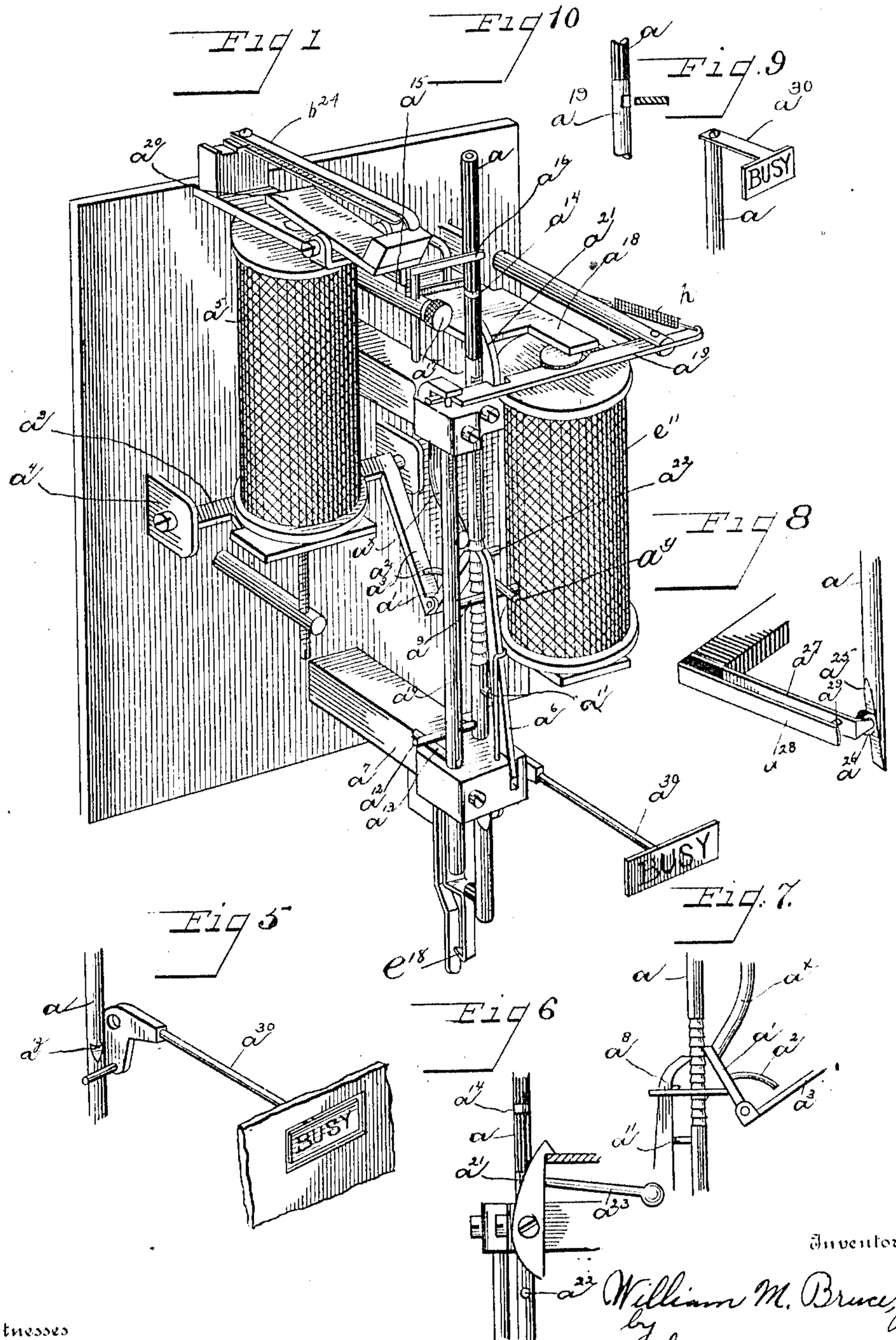

Fig 10

Fig 9

Fig 8

Fig 5

Fig 7.

Fig 6

Witnesses

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3 SHEETS—SHEET 2.

Fig 3.

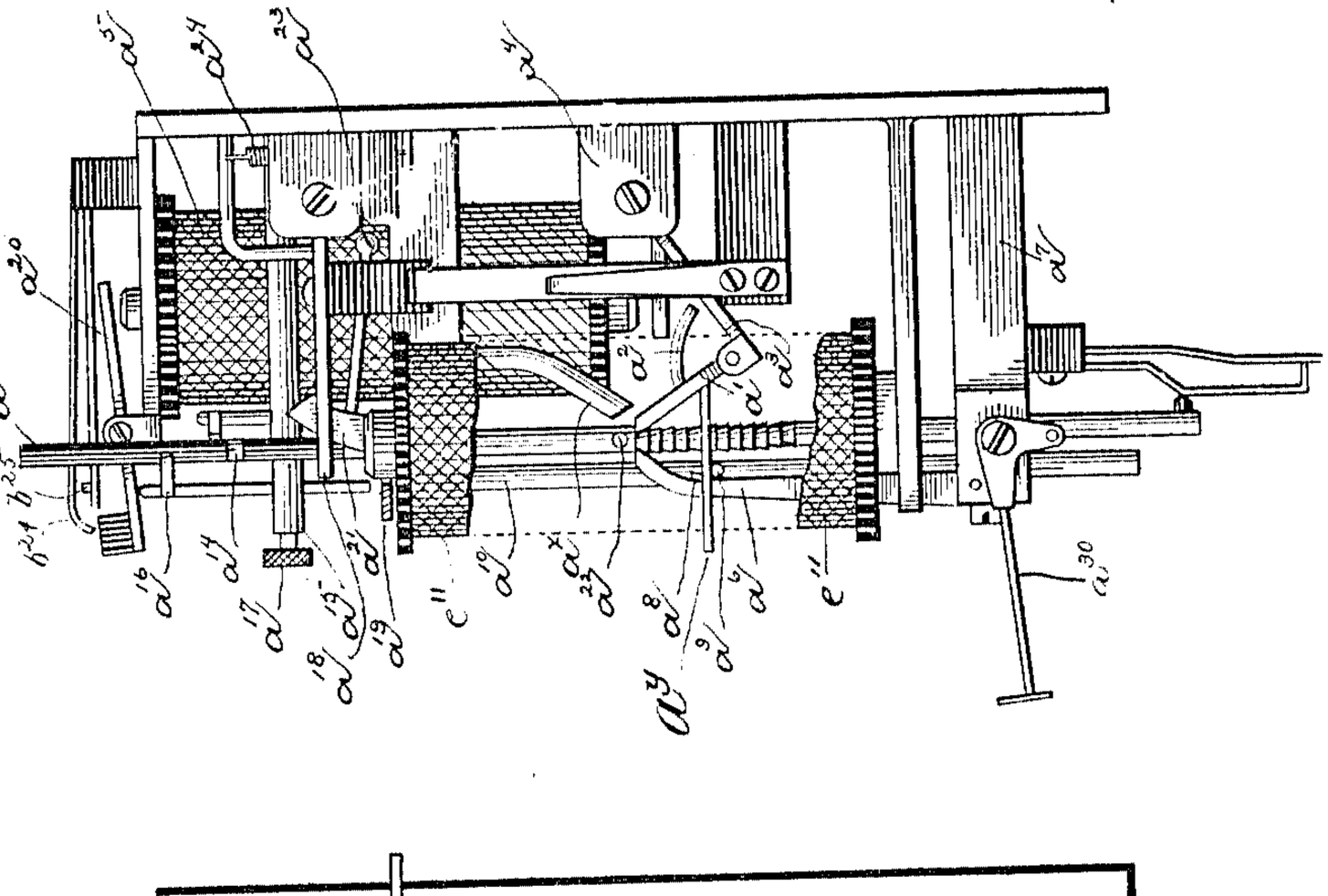
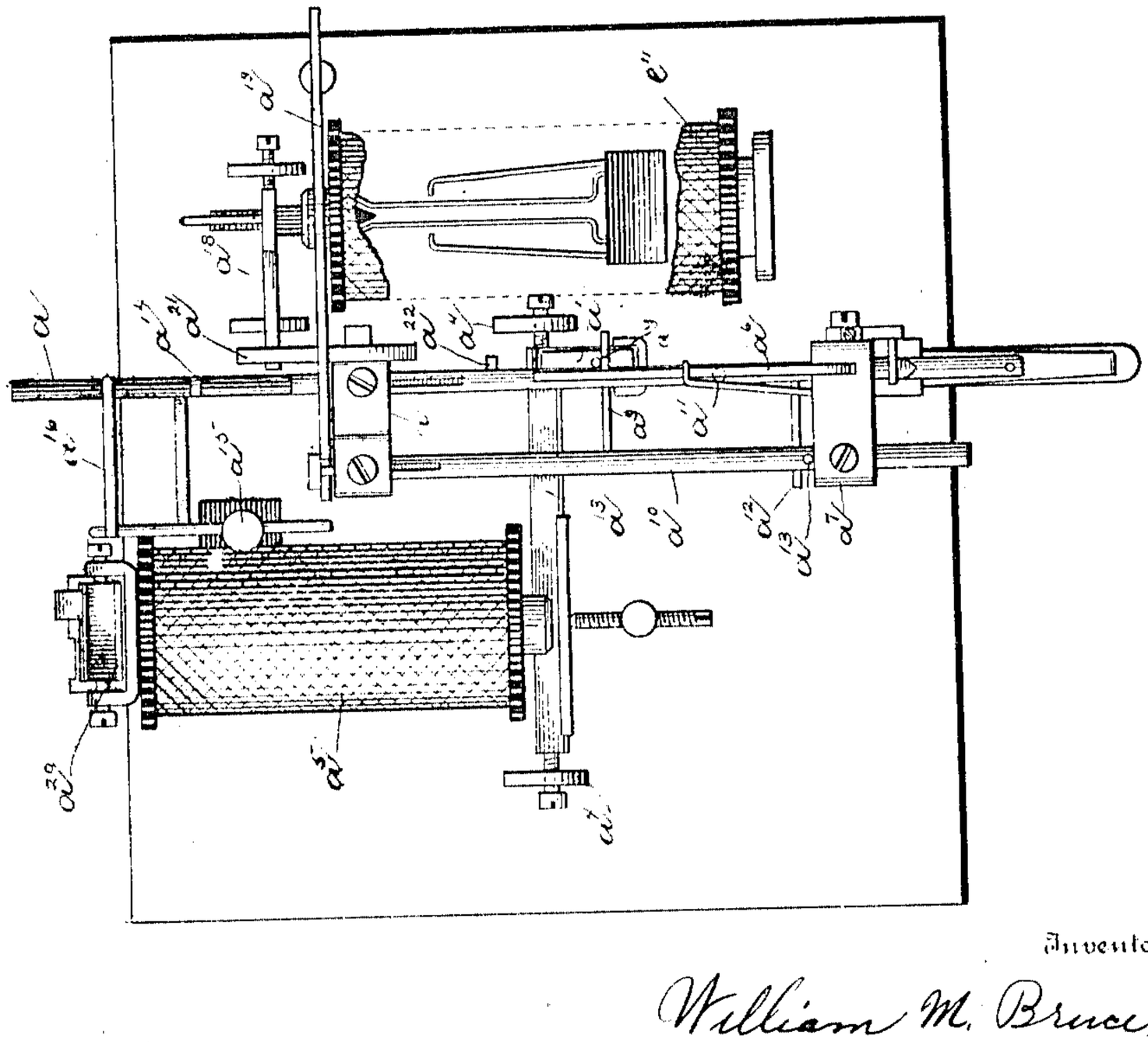


Fig 2.



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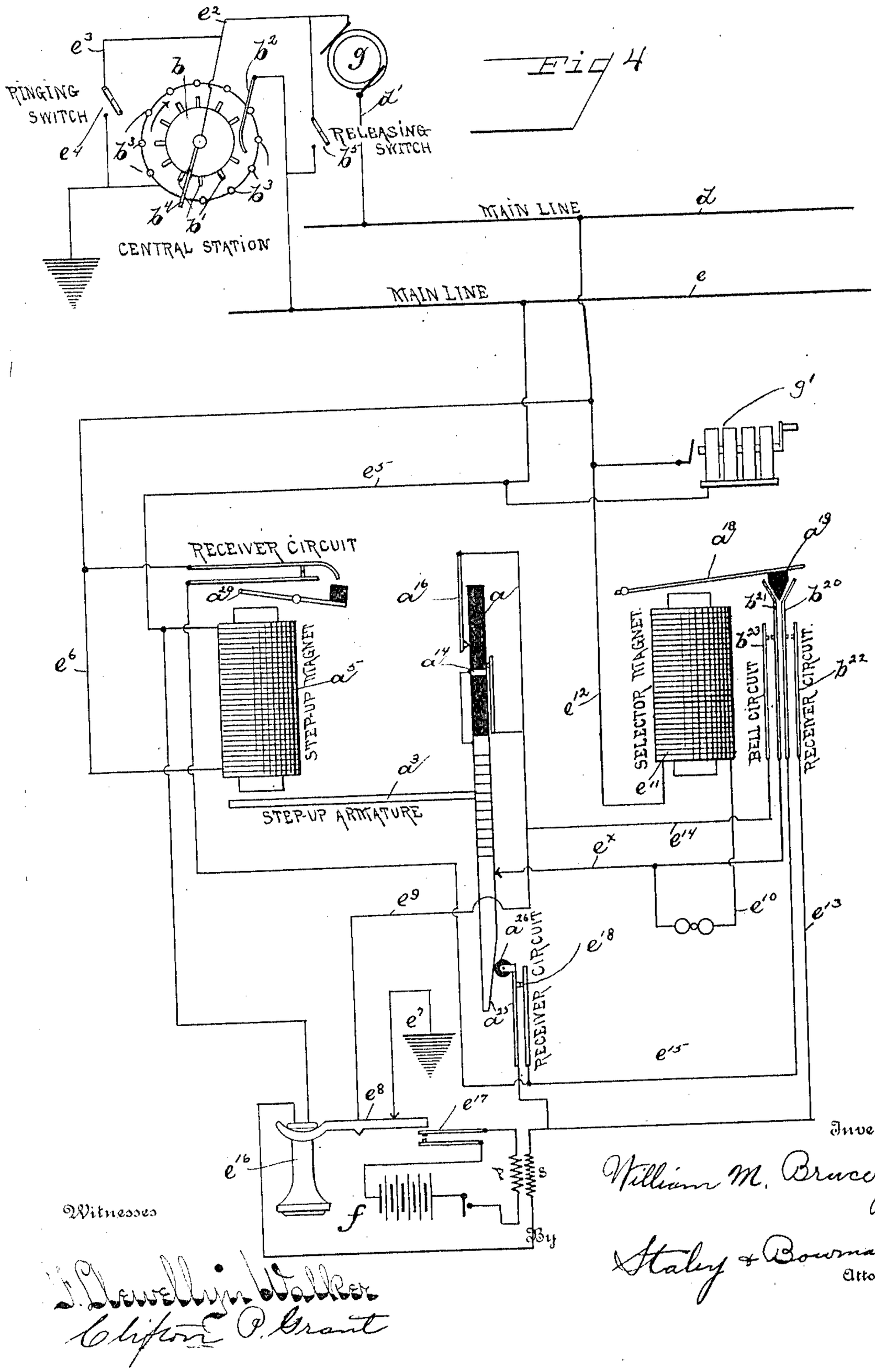
3 SHEETS—SHEET 3.

Fig 4



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UNITED STATES PATENT OFFICE.

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INDIVIDUAL SELECTIVE LOCK-OUT DEVICE FOR PARTY-LINE TELEPHONE SYSTEMS.

994,371. Specification of Letters Patent. Patented June 6, 1911.

Application filed September 1, 1904. Serial No. 223,042.

To all whom it may concern:

Be it known that I, WILLIAM M. BRUCE, JR., citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Individual Selective Lock-Out Devices for Party-Line Telephone Systems, of which the following is a specification.

My invention relates to individual selective lock-out devices for party line telephone systems.

The object of my invention is to provide an improvement in selective systems for party-line telephone use which will be simple and effective in operation, and one which is particularly adapted to use with the ordinary ringing or alternating current in general use in telephone exchanges for operating the step-up device.

A further object of the invention is to provide a selective device, the motor power for operating which shall be wholly electrical, and which shall be under the direct control of a central operator.

A further object of the invention is to provide a selective device which shall be operated electrically in one direction, and adapted to return to its normal position by gravity, the operation of moving the selective device and the release of same to permit it to return to ground being obtained through the agency of a single electro-magnet.

A further object of the invention is to provide means by which any one or more stations on the party-line can be called or released by the central operator, the device being under the control of the operator independent of the ordinary subscriber's outfit, so that it will be impossible for one subscriber to hold the line against the wishes of the operator at the central station.

I attain these general objects, and others which will appear from the specification and claims hereto attached, by the circuits and mechanisms set forth in the accompanying drawings, in which—

Figure 1 is a perspective view of my improved selective device. Fig. 2 is a front elevation of the same with the selector magnet broken away to better illustrate some of the connections. Fig. 3 is a side elevation, looking from the right hand side of Fig. 2, also showing the selector magnet broken away to better illustrate the step-up device. Fig. 4 is a diagrammatic view, showing the various circuits and connections of the system, including the central exchange device. Fig. 5 is a detail view of the indicating device for indicating to the subscriber when the line is in use. Figs. 6, 7, 8 and 10 are detail views of the various parts hereinafter referred to. Fig. 9 is a detail view showing a modification of the indicating device, or "busy" sign.

Like parts are indicated by similar letters of reference throughout the different views.

In carrying out my invention, I preferably inclose the various operating parts to be used at each subscriber's station in a casing having connections in such a way that it can be connected to any ordinary subscriber's outfit without any change therein, and to also act with the usual central exchange apparatus it being necessary to supply only a calling device for each party line. Any number of stations may be employed on the line. The construction which I have illustrated is adapted for eleven such stations or subscribers.

The general operation of the device is to send a series of impulses over the main line, preferably from the ordinary alternating current or ringing generator at the central station. These impulses are adapted to operate a step-up device at each subscriber's station, all the instruments being exactly alike except for the adjustment of the selector connection which is adapted to establish a local circuit in the instrument, these connections being arranged in the different instruments so that in the different subscriber's devices they will be closed on different steps, No. 1 subscriber being closed on the first step, No. 2 on the second, etc.

The step-up device consists preferably of a vertically movable rod, a, having a series of notches or steps preferably cylindrical, said rod being adapted to be operated by an operating pawl a^1. This operating pawl is connected to the armature of the step-up magnet, preferably pivoted directly to the armature lever a^2, which armature lever is also preferably pivoted to suitable projections a^4 on the main frame in any suitable

manner, and adjacent to the step-up magnet, a^5, the construction being such that whenever the step-up magnet a^5 is energized, the step-up rod will be raised one step. Adjacent to the step-up rod is a holding pawl, a^6, supported on a suitable projection, a^7, the holding pawl being adapted to hold the rod at each step until it is further advanced or released, which will take place whenever the rod has been operated to the full number of steps; as before stated, the apparatus described herein is adapted for eleven subscribers, but twelve steps are shown. The central exchange device will be arranged to produce only eleven impulses, so that each instrument on the line will be operated the full number necessary to call any subscriber, auxiliary means being provided for giving an additional impulse to raise the rod an additional step which will release all the rods and permit them to fall by gravity, thus returning all the instruments to their normal positions, as will be more fully described hereinafter.

Adjacent to the step-up rod, and also to the operating pawl, a^4, is a stationary stop, a^x, adapted as the pawl is moved by the armature lever, a^3, to force the said pawl into the notch with which it is engaged, and thus form a stop for the rod and also a stop for the pawl, and prevent any vibration of the pawl which would be caused by the alternations of the current pasing through the armature when the alternating current is used, so that no matter how long the current is passing through the armature, but one step of the rod can take place until the current is broken and the holding pawl allowed to drop away from the rod and away from this stationary stop.

For releasing the step-up rod, a, upon the final step, a release rod, a^{10}, is employed which is preferably slidingly mounted in bearings adjacent to and parallel with the step-up rod, a. This rod, a^{10} has an extended arm, a^9, adapted to contact with a cam projection, a^8, on the holding pawl, a^6, and also with a projection a^y on the operating pawl, a^4, the release rod, a^{10} is adapted to be moved by a pin or projection, a^{11}, on the step-up rod, a, when the step-up rod is given its final movement or step, thus raising the holding pawl, and allowing the step-up rod to fall by gravity as soon as the operating pawl is released by breaking the current through the step-up magnet, which also allows the projection, a^y, on said operating pawl to contact with the arm a^9; the said pawls being held in this position by the arm a^9 until the step-up rod has dropped to its normal position, when said release rod will be returned by a projection a^{12} on said rod, which strikes a pin or projection a^{13}, on the release rod, a^{10}. This returns said release rod to its normal position, and permits the holding pawl to again engage with the step-up rod, ready for the next operation.

To provide for making the proper selection, I supply the step-up rod with a contact device, the form shown herein being that of a metallic ring, a^{14}, which is in electrical contact with the rod, and is adapted at a predetermined point to make electrical contact with a selector terminal, a^{16}, which is adjustably mounted on a suitable support, a^{15}, this selector terminal being adapted to be held in any desired position by a set-screw, a^{17}. The selector terminals, a^{16}, in the different instruments will be adjusted to the different steps representing the different stations. That is to say, the first station will have its selector terminal adjusted to contact with the ring, a^{14}, on the first step, the second on the second step, etc. This selector terminal, a^{16}, is connected in the manner hereinafter described with the selector magnet, e^{11}, whose armature, a^{18}, is adapted, when the selector magnet is energized to be moved into position to operate switches, b^{20} and b^{21}, to close circuits leading to the subscriber's instrument, and constitute the ringing and talking circuits in a manner hereinafter more fully described. When the selector magnet is operated, and its armature drawn to the position for operating said switches, said aramture will be held in its position by a catch, a^{21}, thus locking said armature until it is released which takes place upon the final step of the step-up rod before described. For this purpose a projection, a^{22}, on the step-up rod, a, is adapted to engage the lower end of said armature lock when the step-up rod, a, reaches its extreme upward position. (See Fig. 6.) The armature lock will thus be pressed out of engagement with the selector armature, which will be permitted to return to its normal position at the same time the step-up rod falls by gravity to its normal position. For operating the switches b^{20} and b^{21}, I have shown a wedge-shaped block, a^{19}, which engages between the wedge-shaped ends of said switches. These switches are preferably in the form of springs which, when the release armature is released, press the armature away from the magnet, and at the same time break the circuits through the same.

For establishing the circuit normally to the subscriber's instrument, I employ a switch, or circuit breaker, e^{18}, which is adapted to be operated by the movement of the step-up rod, preferably by a cam roller, a^{26}, contacting with a cam surface, a^{25}, on said rod. When the step-up rod, a, is in its normal position the roller, a^{26}, engaging on the cam-surface closes the circuit breaker, e^{18}, and thus establishes the normal subscriber's connection with the central station in the manner hereinafter more

fully described. When the step-up rod is moved, however, in the act of calling a subscriber, the cam-roller leaves the cam-shaped portion of the rod, and allows the circuit breaker to open, thus breaking the subscriber's circuit as soon as a call is started, which circuit, in each instrument remains broken until the instrument returns to zero, thus effectually locking out all subscribers excepting the one to be selected, in the manner hereinafter more fully described.

The preferable form of circuit breaker above described is shown in Figs. 4 and 8. In Figs. 1, 2 and 3 a slightly different form is shown, a cam-projection on the step-up rod being adapted to engage a cam-surface on the switch for opening and closing the same by the movement of said rod.

For indicating to each subscriber when the line is in use, I employ an indicator, a^{30}, adapted to be operated by the step-up rod when it reaches its calling position, that is to say, the next to the last step, this indicator being adapted to show the word "busy," or some similar sign, through a suitable opening in the inclosing casing, to indicate that the line is in use. In Fig. 5, I have shown this "busy" sign pivoted adjacent to the rod, and having a projection which normally engages in a notch, a^2, on said rod, in which position it will drop away from the opening as the rod is moved, however, the notch being cam-shaped, raises the sign into its indicating position. In Fig. 9, I have shown a modification in the "busy" sign being attached directly to the end of the rod, and when the rod reaches its calling position, or the next to last step, the sign will be brought opposite the opening in the casing. Various forms of indicator connections may be used for this purpose.

The circuits and connections for the different parts will, probably, be best understood from the diagrammatic view, Fig. 4, where the main telephone line is shown at d and e. The step-up magnet, a^5, is bridged across this line, as indicated by the circuit connection e^5 and e^6. In addition to the step-up armature, the step-up magnet is provided with an auxiliary armature, a^{20}, which may be arranged at the opposite end thereof, and which is adapted to operate a circuit breaker, in the subscriber's talking circuit, when the step-up magnet is energized, for the purpose hereinafter more fully set forth. The subscriber's talking outfit is also normally bridged across the line by branch circuits extending from the circuits, e^5 and e^6, and passing through the circuit breaker operated by the armature, a^{20}, and the circuit breaker, e^{18}, operated by the cam, a^{25}, through the receiver, e^{16} in the usual way, so that when the receiver, e^{16} is removed from the hook, e^8, and the local battery circuit, f, being closed at e^{17} in the subscriber's instrument the subscriber can talk direct to the central station with the instruments in their normal position, any suitable calling device, such as g^1, being employed for signaling the central station. The selector magnet, e^{11}, however, is located in a grounded circuit from one side, d, of the main line only, which circuit can be traced from ground at e^7, through the hook, e^8, line, e^9, selector terminal, a^{18}, rod, a, line e^x, line e^{10}, selector magnet, e^{11}, line, e^{12} to d. The receiver or talking circuit is also branched from the switch, e^{18}, through line, e^{15}, and switch, b^{22}, and line e^{13}, so that when the circuit breaker, e^{18}, is open, the receiver or talking circuit is opened until closed by the switch, b^{22}, at the operation of the selector armature, a^{18}.

At the central station I employ a movable contact device having as many contacts as there are subscribers on the line, and this contact device is placed in circuit with the ordinary ringing generator, g, at the central station. I have shown a rotary device which may be adapted to be rotated in any suitable manner by clock work, or otherwise, and started and stopped in any well known manner. This rotating contact device has contacting projections, b^1, which as the device rotates, come successively in contact with a spring b^2, so that at each successive contact an impulse is sent through the main line and through each of the step-up magnets, thus raising each step-up rod one step for each contact.

In addition to the movable contacts, b^1, there are a series of contact points, b^3, one for each subscriber, and so formed in connection with the calling device that the operator by the employment of plugs or switches may select one contact point with which a movable contacting arm, b^4, will form an electrical connection during the movement of the exchange device. In the construction shown, a spring arm, b^4, rotates with the disk which carries the movable contacting parts, and during its revolution it is adapted to contact with one of the contacting points, b^3, simultaneously with the connection between one of the movable points, b^1 and the spring b^2. The contact point, b^3, is grounded, while the arm, b^4, is connected through the generator to that side d of the main line from which the branch circuit leads to the selector magnet, therefore when a contact is made between the arm, b^4, and the projection, b^3, the selector magnet in that station whose selector terminal corresponds to the step opposite to which the projection, b^3, is placed, will be operated, closing the switches, b^{20} and b^{21}, which switches will be locked in this position by the armature lock, a^{21}. The step-up device, however, will continue in

each of the instruments until they are stepped up to the next to the last step, only one instrument, however, will be selected as all the selector circuits will be opened when the impulse passes from ground through the contact, b^3, except that one one whose terminal selector is on the ring, a^{14}, and inasmuch as all the talking circuits are broken at the switch, e^{18}, on the first movement of the step-up rod, all subscribers will be locked out except the one whose selector magnet has been operated.

The step-up device in the subscriber's station having been operated, the one selected may be called by the central office by the switch, e^4, which is placed in the grounded connection with the generator, g, the circuit being traced at the ground from the central station through the generator, main line, d, selector magnet, line e^{10}, subscriber's bell, switch b^{23}, line e^{14}, line e^9, and to ground at e^7, this connection being broken when the subscriber removes his telephone from the hook to establish the local battery through switch e^{17}, battery, f, and transmitter in the usual way.

For releasing the line and returning all the instruments to normal position, means are provided for giving each of the step-up devices an additional step, and this is accomplished by sending an additional impulse through the step-up magnet. This may be accomplished by a separate switch, as shown at b^5, adapted to close a circuit from the generator through the main line and the step-up magnet, as before described. This switch may be a part of the regular step-up mechanism adapted to be closed by the operation which releases the line, or it may be manually operated to give an additional impulse after the regular calling device has made its complete circuit. In any event, the additional impulse passing through the step-up magnet will produce an additional step in the rod which will operate the rod, a^{10}, and disengage the operating and holding pawls for the step-up rod and the catch for the selector armature, in the manner heretofore described, permitting all the parts to return to their normal position.

When the subscriber has been selected by the operation of the selective mechanism, his receiver is bridged across the main line and in position for communication with central or other subscribers to whom he may be connected. Two paths are open for the current, and as that of the receiver circuit may be of less resistance than that of the step-up magnet, sufficient current might not be secured through the step-up magnet to produce the necessary movement of said magnet to release the line. To obviate any difficulty of this kind, the circuit breaker operated by the armature, a^{20}, on the step-up magnet is introduced into the receiver circuit, as shown in Fig. 4, and as heretofore referred to. This armature will be operated by a very slight amount of electric energy in the step-up magnet, and sufficient current will always pass through the step-up magnet to operate said armature, although it might not be of sufficient strength to operate the step-up armature and the step-up rod. The first electrical impulse passing through the step-up magnet will operate the auxiliary armature, and thus break the receiver circuit; the receiver circuit being broken the only path for the current is through the step-up magnet which thus gets the entire amount of current passing from the central station, and operates the step-up armature with sufficient force to move the step-up device, and releases the line, thus making it possible to release the line under any conditions and against the will of the subscriber, if such becomes necessary.

It will be seen by the above construction that I produce a selective lock-out system which is capable of operation from the central station, electrical in its operation and capable of operation under various influences and conditions which apply to telephone exchanges.

It will be understood that ordinarily an alternating current could not be satisfactorily used to operate a step-up device, since the alternations of the current would be of too great frequency to be depended on for that purpose, but by having means for controlling the operating pawl and holding it against the influence of the alternating current until such current is broken, I am enabled to use the alternating current in such a manner that the pawl can only operate the step-up rod one step at a time, the extent of movement of the operating pawl while the step-up magnet is under the influence of the alternating current being positively controlled.

While I have described this device as especially adapted to the use of the alternating current for operating the step-up device, it is obvious that its use is not confined to an alternating current as it is equally adapted to the use of a direct current.

Having thus described my invention, I claim:—

1. In a selective device for telephone systems, a step-up contacting device consisting of a cylindrical supporting rod having a series of circumferential notches and a circular or circumferential contacting element, a step-up magnet and a reciprocating pawl operated by the magnet to engage in said notches to move the rod upwardly, a circuit closer adjacent to and adapted to contact with the contacting element on the said rod in combination with a selector magnet in circuit with said circuit closer, a holding

pawl for said rod, and means for disengaging said pawl to permit said rod to return by gravity to its normal position.

2. In a selective system, a main telephone line, a step-up magnet bridged across said line, and a telephone outfit and a circuit breaker through which said telephone outfit is normally closed to said line, a vertically moving cylindrical step-up rod operated by said step-up magnet to control said circuit breaker and open said subscriber's circuit, said rod being supported in bearings so as to be free to turn as well as to move longitudinally, a selector magnet in a normally open circuit and an adjustable circuit closer adjacent to said rod and a circular contacting element on said rod adapted to engage said circuit closer and close the circuit through said selector magnet and means connected with the selector magnet for closing said telephone circuit.

3. In a selective instrument for party line telephones, a vertical moving cylindrical step-up rod having circumferential notches, a step-up magnet and pawl pivoted to the armature of said magnet to engage said notches, a telephone circuit normally closed to line by means controlled by said rod, a selector magnet and a circuit therefor including an adjustable circuit closer, and circular contact element on said step-up rod to engage said circuit closer to close the circuit of said selector magnet and means for successively energizing said step-up magnet.

4. In a selective instrument for telephones, a vertically moving step-up rod having a series of circumferential notches a magnet whose armature is adapted to move said rod at each impulse in said magnet, means for holding said rod against return movement, and a releasing device adapted to be operated by a separate impulse to permit it to return to its normal position by gravity, a circumferential contact on said rod and an auxiliary circuit adapted to be closed thereby at a predetermined movement of said rod said rod being supported in bearings which permit of a rotary as well as longitudinal movements whereby it is free to move and to effect its contact operation in any position of rotary adjustment.

5. In a selective instrument, the combination with a vertically moving step-up rod having a series of notches, a magnet adjacent to said rod, a reciprocating pawl moved by said magnet to engage said notches and impart a step-by-step movement to said rod, a holding pawl for said rod, a subscriber's talking circuit closed by means operated by said rod which is adapted to be broken by the first movement thereof, a selective device adapted by a predetermined movement of said rod to reëstablish said talking circuit, a busy signal operated by said rod when said rod has reached the normal limit of its upward movement, and means independent of said magnet for releasing each of said pawls to permit said rod to drop by gravity to reëstablish said talking circuit and cancel said busy signal.

6. In a selective instrument for telephones, a vertically moving step-up rod having a series of notches, a step-up magnet adapted to operate said rod, and a subscriber's telephone outfit normally closed to line by a circuit breaker operated by the first movement of said step-up rod, a selector magnet adapted to be brought into circuit by a predetermined movement of said rod, and means connected to said selector magnet for closing said telephone circuit when the same is operated, and a circuit breaker operated by said step-up magnet also adapted to break said telephone circuit when said magnet is operated, substantially as specified.

7. In a selective telephone system, the combination of a source of alternating current, a main line, a magnet bridged across said main line, a step-up device operated by said magnet, means for controlling the extent of movement of said step-up device while under the influence of said magnet, a receiver circuit normally bridged across said main line, and means for automatically opening said receiver circuit to increase the flow of current through said magnet, substantially as specified.

8. In a selective telephone system, the combination of a main line, a magnet permanently bridged across said line, a step-up device operated by said magnet, a receiver circuit adapted to be bridged across said main line upon a predetermined movement of said step-up device, and means controlled by said step-up device for automatically breaking the receiver circuit at each electrical impulse through said magnet, substantially as specified.

In testimony whereof, I have hereunto set my hand this 17th day of August A. D. 1904.

WILLIAM M. BRUCE, Jr.

Witnesses:
CHAS. I. WELCH,
CLIFTON P. GRANT.