

Dec. 25, 1923.

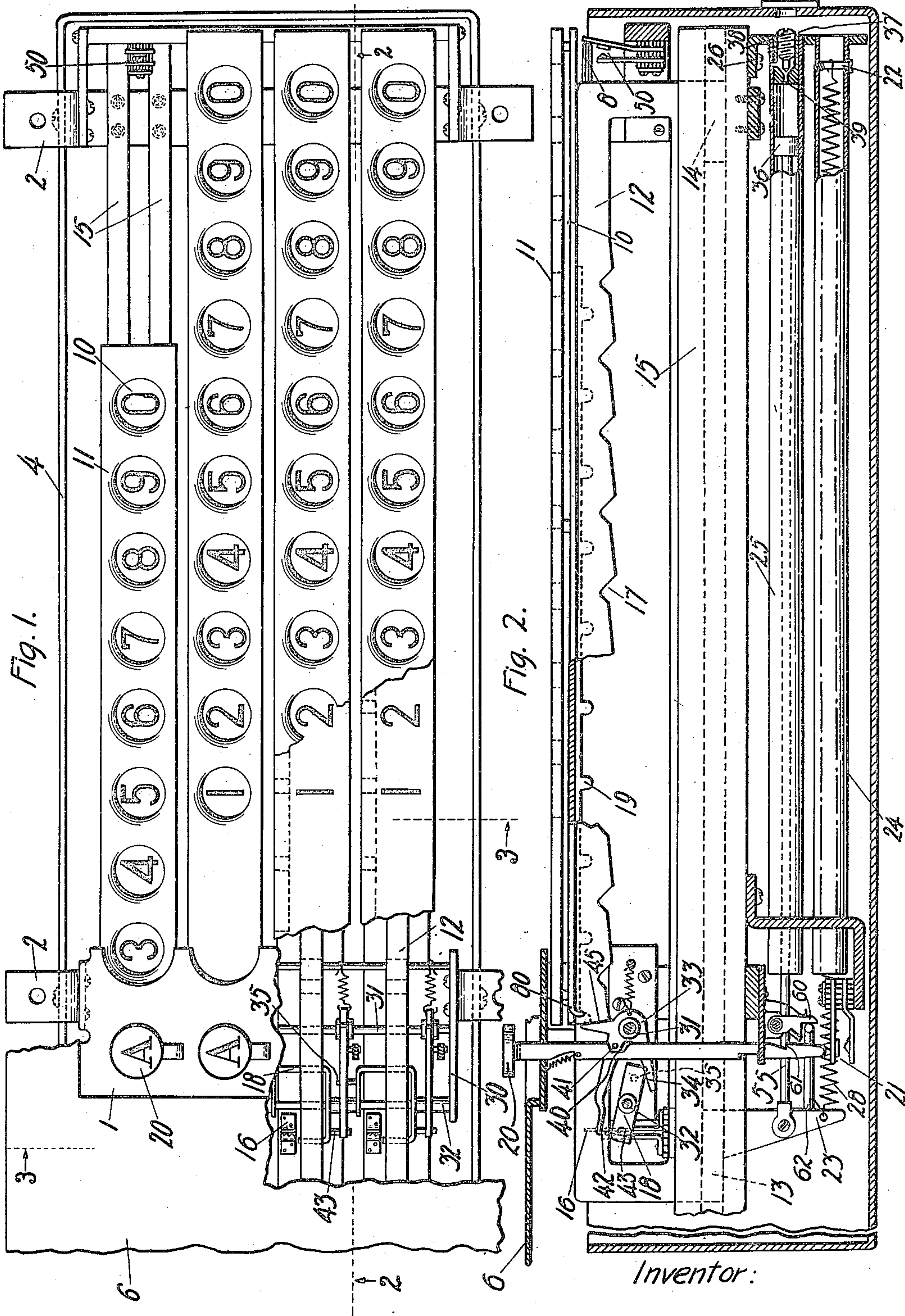
1,478,419

R. S. BAILEY

MACHINE SWITCHING TELEPHONE EXCHANGE SYSTEM

Filed Feb. 20, 1920

2 Sheets-Sheet 1



Inventor:

Rand S. Bailey.

by

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Atty.

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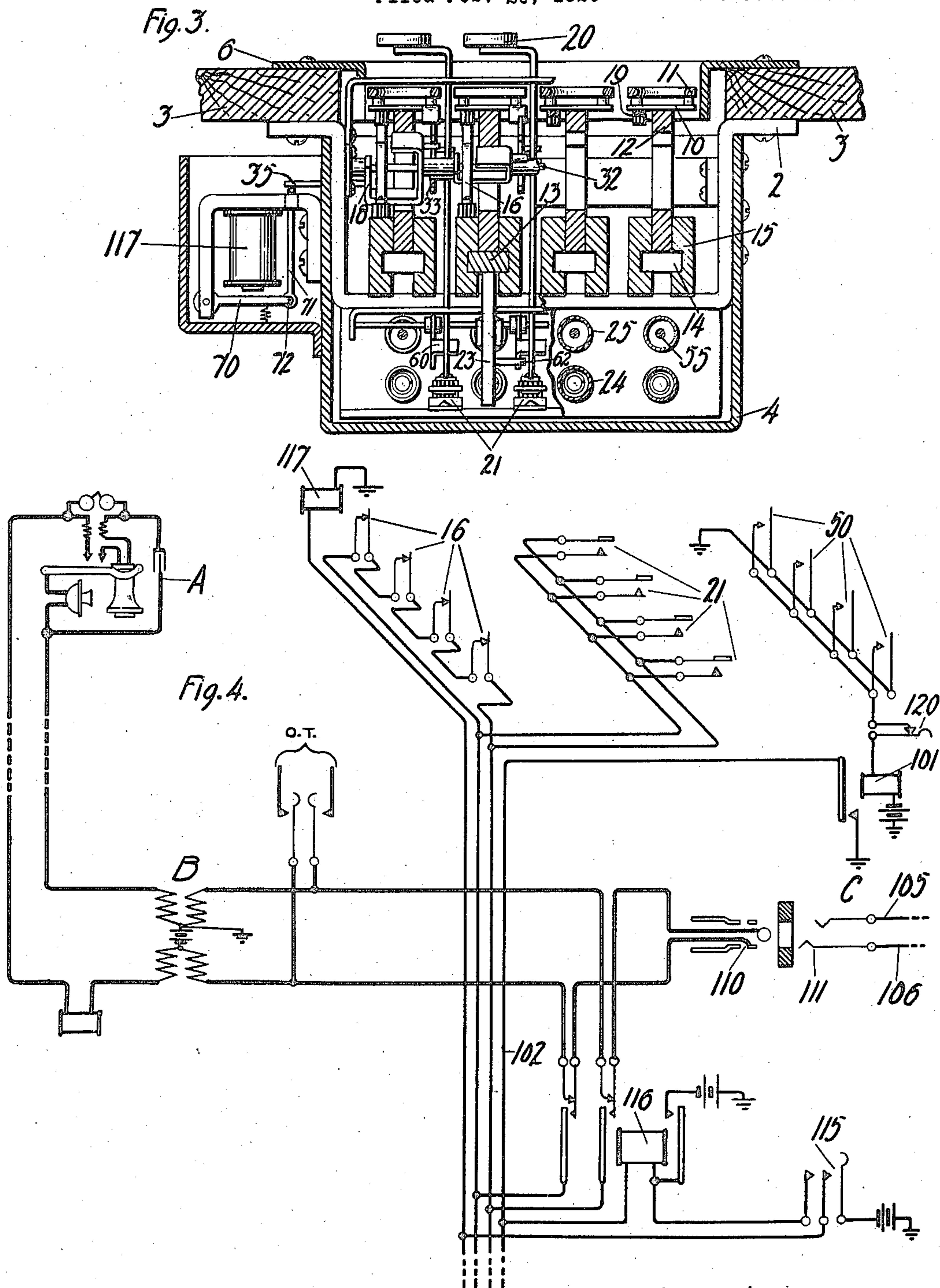
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2 Sheets-Sheet 2



Inventor:

Rand S. Bailey.

by

g r y o r e Att'y.

Patented Dec. 25, 1923.

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UNITED STATES PATENT OFFICE.

RAND S. BAILEY, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

MACHINE-SWITCHING TELEPHONE-EXCHANGE SYSTEM.

Application filed February 20, 1920. Serial No. 360,210.

To all whom it may concern:

Be it known that I, RAND S. BAILEY, residing at Montclair, in the county of Essex and State of New Jersey, have invented certain Improvements in Machine-Switching Telephone-Exchange Systems, of which the following is a specification.

This invention relates to machine switching telephone exchange systems.

10 A feature of the invention is the provision of an improved and simplified impulse sender of the type in which the desired number is first set up by a plurality of setting members, said setting members being then released to send out a set of series of impulses in accordance with the number set up.

15 In accordance with this feature of the invention, a plurality of longitudinally movable members are arranged adjacent to each other, and are adapted to be manually independently set to a predetermined position depending on the number that it is desired to set up. Operation of a key connects the impulse sender to a cord or trunk circuit and causes the members to be successively released so as to send out impulses in accordance with the number set up on the sender. After the members are returned to normal position the impulse sender is automatically disconnected from the cord or trunk circuit.

20 A further feature in a sender of this type is the provision of means whereby, after a number has been set up and the sender associated with the cord or trunk circuit, the movable members of the sender may be independently reset to change such number without sending false impulses over the connected circuit.

25 A still further feature is the provision of means controlled by the operator, for transferring the sender after the number has been set up from a connecting circuit with which it has been connected to another connecting circuit.

30 In the drawings an impulse sender is represented in connection with a cord circuit at a manual operator's position in which the operator may control the setting of selector switches (not shown) at an automatic exchange, only as much being shown of the circuit arrangement as is necessary for an understanding of the invention. It will be apparent however that the impulse sender forming the subject matter of this invention may readily be adapted for use in systems of

widely varying character such as electric signaling systems, etc.

Fig. 1 is a partial view of the impulse sender with parts broken to show a portion of the interior mechanism of the device; Fig. 2 represents a sectional view along the line 2—2 of Fig. 1, Fig. 3 shows a sectional view along the line 3—3 of Fig. 1, and Fig. 4 represents diagrammatically the connections of the calling device when used in connection with a cord circuit.

Similar letters of reference are used to designate the same parts wherever shown in the drawings.

The impulse sender as shown in Figs. 1 to 3, comprises four longitudinally movable members arranged adjacent to each other. These members are independently movable to and from their normal position. Three of the members are shown in their normal position while the top member is shown moved to a position such that on its return to normal three actuations of the pulsing contacts associated therewith would occur. Each member comprises a slidable member 12 having a pair of shoes on each end such as 13 and 14 adapted to ride in a supporting member 15. The supporting members 15 are suitably secured to U-shaped straps 2 which are screwed to an operator's keyboard 3. A casing 4 screwed to the straps 2 protects the sender from injury and dust. A mask 6, a partial view of which is shown, is screwed to the keyboard 3, and covers the movable members when in their off-normal position. Rigidly fixed to the slidable member 12 is a number plate 10 having the numbers 1 to 9, inclusive, and 0 appearing thereon at suitable intervals apart. Above the number plate 10, and fixed thereto is a finger hold plate 11. Rigidly fixed to each number plate 12 is a toothed member 19, the teeth on the member being placed the same distance apart as the numerals on the number plate. The teeth of member 19 cooperate with a pair of pulsing springs 16 individual thereto to interrupt a circuit upon the return to normal of the movable member. The pulsing springs 16 are suitably mounted upon the supporting member 15.

Associated with the longitudinally movable members and individual thereto are counter weighted dogs 18 which are rotatably mounted upon a shaft 32 secured to a support 30. The left-hand portion of these

dogs engage notches such as 17 in the upper under portion of member 12 and serve to hold the longitudinally movable members in a set position until released by the operator.

5 There are also levers 33 individual to each longitudinally movable member which are rotatably secured to a shaft 31 fixed to the support 30. Each lever 33 is provided with an arm 45 which is adapted to engage a tripping finger 80 on the number plate 10. 10 When a movable member 12 returns to normal position, engagement of the tripping finger 80 with the arm 45 rotates the lever 33 about its axis thereby causing arm 34 of said lever to engage a pin 35 fixed to the dog 18 associated with the next movable member, thus rotating and causing the re- 15 lease of said movable member.

Associated with each movable member 12 20 is an adjusting key 20 by means of which a number may be reset. Operation of the key causes a pair of contacts 21 to be operated to short circuit the conductors leading to the pulsing contacts 16 and thus prevent 25 impulses from being sent and, at the same time, by means of a notch 40 in the shank of key 20 and a pin 41 on the lever 33, an arm 42 of lever 33 is caused to engage a pin 43 on its associated counter weighted dog 18, 30 thereby rotating the dog out of engagement with the notch 17 of the movable member 12 and permitting the movable member to return to normal position. A pawl 60 may be provided for engaging notch 61 in the 35 lower part of the shank of key 20, in order to hold the key 20 in the depressed position until the movable member reaches normal position, when a pin 62 secured to the arm 23 disengages the pawl and releases the key. 40 The operator can then readjust the sliding member as desired without sending false impulses over the line. The parts 60, 61 and 62 may be omitted, however, in which case the operator, where a slide has been pulled out 45 too far, may reset this slide by tapping the key 20 to restore the slide step by step to the desired position. This will in some instances be quicker than to restore the slide to its initial position and again withdraw 50 it, as is necessary when parts 60, 61 and 62 are provided.

Individual to each movable member is a regulating device for governing the speed of the return to normal. This device is here 55 shown as a dashpot. A tube 25 is suitably secured to an angle iron 26 which is in turn suitably secured to supporting member 15. A rod 55 is fastened at one end to the arm 23 of its associated movable member and at 60 the other end to a piston 36 which rides in the tube 25. By means of a set screw 38, the amount of air passing through an aperture 39 in the end of the tube 25 can be adjusted, thereby regulating the return speed 65 of the returning dial.

Other details of the mechanism will more fully appear from the following description of the operation of the calling device.

The operator desiring to send out a series of impulses engages with her finger the 70 finger hold 11 representing the number desired and moves the movable member until the stop device 1 is reached. In Fig. 1 of the drawing only one movable member is shown moved from normal position and 75 this member would be for the thousands digit of the number. In case, for example, it is desired to call the number 3 4 5 6, the remaining members would be successively moved to a position in accordance with the 80 digits of the number desired. Appearing then in a vertical row at the right end of the stop would be the number 3 4 5 6. The retractile springs 28, fastened at one end to the arm 23 of the movable member 12 and 85 at the other end to a pin 22 and inclosed in a tube 24, will be prevented from restoring the movable member to normal by the counter weighted dog 18 which will be engaged in a notch 17 in a sliding member 12. 90 Operation of non-locking key 115 shown in Fig. 4 causes energization of magnet 117. Upon energization of magnet 117, armature 70 is attracted, thereby causing the arm 71, which is pivotally fixed thereto by a pin 72, 95 to move the pin 35, secured to the dog 18, upwardly. The dog 18 is thereupon rotated about its axis and is disengaged from the notch 17 of the movable member 12, thereby permitting said member to return to nor- 100 mal under the pressure of spring 28. As the movable member returns to normal, three teeth will engage the pulsing contacts 16 which causes three interruptions of the circuit. The pulsing contacts 16 are 105 suitably spaced normally from the first tooth of the movable member so that during the latter part of the travel of the return movement of the movable member all the pulsing teeth will have passed the pulsing 110 contacts which creates a time interval necessary to complete the operation of the selective switch in the automatic exchange.

Just prior to the return of the first slide to normal position, the tripping finger 80 115 will engage the arm 45 and rotate lever 33 about its axis thereby causing the arm 34 to release the dog 18 associated with the next movable member. The second movable member will then be returned to normal and 120 in a like manner will engage the pulsing contacts so as to interrupt the circuit four times. In a like manner the third and fourth members will be returned to normal and impulses will be sent in accordance with 125 the number set up. It will be noted that, suitably fastened to the member 12, there is a pin 8 which cooperates with a pair of contacts 50 when the member 12 is in normal position. These contacts are normally open 130

whereas, when the members 12 are in a set position the contacts are closed.

Referring to Fig. 4 of the drawings, a trunk circuit C comprising conductors 105 and 106 may extend from a manual to an automatic exchange. There is provided a cord circuit B for establishing connections between the telephone line A and trunk circuit C.

10 The operator, having been advised that a connection is desired between the line A (which may be connected with the cord circuit B in any desired well known manner) and a subscriber in an automatic exchange
15 (not shown) connection with which must be established by way of the trunk circuit C extending from the manual to automatic exchange, inserts plug 110 of the cord circuit B in to jack 111 of the trunk circuit C.
20 The longitudinally movable members of Fig. 1 are then set in accordance with the number desired as heretofore described. As soon as any movable member has been moved from its normal position, the contacts 50 individual thereto, are closed. This causes energization of relay 101, which at its front contact and armature places ground on the conductor 102 which is common to all the cord circuits of a position. The operator
25 then depresses a non-locking key 115 which closes a circuit for relay 116 over the following path: grounded battery, contacts of key 115, winding of relay 116, conductor 102, armature and front contact of relay
30 101, to ground. Upon energization, relay 116 locks up over a circuit including its front contact and right-hand armature, and grounded battery and, at its left-hand armatures interrupts the continuity of the talking conductors of the cord circuit and connects the impulse sender to the cord circuit. When non-locking key 115 was actuated to energize relay 116, magnet 117 was also energized. Magnet 117 upon energiza-
35 tion attracts its armature 70, thus releasing the first movable member. Upon return of the first movable member to normal position, the remaining members will be successively released and returned to normal in the manner heretofore described.

In case it is desired for any reason to delay the transmission of impulses, the first movable member can be prevented from releasing when the dialing key 115 is operated by holding the movable member in place when actuating key 115. The member can then be released by subsequent operation of key 115. Should it be found desirable to release the slides mechanically instead of electromagnetically, the releasing magnet 117 can be omitted and a releasing key can be provided to perform the same function as is electromagnetically performed by magnet 117.
60

65 When all movable members have returned

to normal contacts 50 will be opened and the ground from relay 101 will be removed thereby causing its deenergization. The locking circuit for relay 116 is thus interrupted at the front contact and the armature of relay 101, causing deenergization of relay 116 thereby disconnecting the impulse sender from the cord circuit and restoring the continuity of the cord circuit.

By the provision of a master release key 75 120, means are provided for the transferring of the impulse sender from one cord circuit to another after a number has been set up. Operation of key 120 opens a circuit for relay 101 which in turn opens the circuit for relay 116. Operation of key 115 which is individual to each cord circuit will then connect the impulse sender to that particular cord circuit and release the impulse sending mechanism.
85

A mechanism capable of sending numbers containing up to four digits has been shown and described. The invention is not, however, limited to such a construction, as it is evident that units containing the same parts for each digit could be added without introducing undue mechanical complications, thereby producing structures capable of sending numbers containing any number of digits.
95

What is claimed is:—

1. In a telephone system, a connecting circuit, an impulse sender for transmitting a plurality of series of impulses over said circuit comprising a plurality of longitudinally movable members each provided with finger holds so that they may be variably set, manual means for releasing one of the members, and means actuated under control of said member for causing the successive release of the remaining members.
100

2. In a telephone system, an impulse sender comprising a plurality of longitudinally movable members having a normal relationship to each other and independently movable therefrom, means by which any one of said members may be variably moved from its normal position, individual springs arranged to return said members to normal position, and contact making devices operated by the movable members.
115

3. In a telephone system, an impulse sender comprising a plurality of sliding members each of which is provided with finger holds, means for variably setting said members independently, a series of teeth on each member, a set of contacts for each member, means by which said teeth actuate said contact sets upon the return of a member to its normal position, individual springs for returning said members to normal position, and regulating means for governing the speed of the return to normal of said members.
125

4. In a telephone system, an impulse
130

sender comprising a plurality of manually slidable members each of which is independently movable from and back to normal position, individual springs for returning
5 said members, means by which such return movement will actuate a set of electrical contacts, and means for consecutively returning said members to normal position.

5. In a telephone system, a connecting
10 circuit, means for transmitting a plurality of series of impulses over said circuit, said means comprising a plurality of longitudinally movable contact actuating members adapted to be moved from normal position
15 to a predetermined position representing the impulses desired to be sent, means for locking said members in the set position, a key in said connecting circuit, and circuit connections whereby actuation of said key as-
20 sociates said impulse transmitting means with said circuit and releases said members to send out impulses.

6. In a telephone system, a connecting circuit, an impulse sender comprising a plu-
25 rality of longitudinally movable members, means for setting said members, means for locking said members in their set positions, means whereby any member may be reset without affecting the remaining members,
30 and means for releasing said members.

7. In a telephone system, a plurality of connecting circuits, an impulse sender adapted to be set and locked, switching
35 means individual to each connecting circuit for connecting said sender to any of said circuits and for releasing said sender to transmit a set of series of impulses over said circuit.

8. In a telephone system, a plurality of
40 connecting circuits, an impulse sender adapted to be set and locked, a relay and a key individual to each of said connecting circuits for associating said sender with any of said circuits and releasing said sender to transmit
45 a plurality of series of impulses over said circuit.

9. In a telephone system, a plurality of connecting circuits, an impulse sender adapt-
50 ed to be set and locked, switching means individual to each connecting circuit, multiple leads from said sender to each switching means whereby the actuation of any switch-
ing means connects the sender to the corre-
sponding connecting circuit and releases the
55 sender to produce a number of sets of im-
pulses in the said connecting circuit.

10. In a telephone system, a plurality of

connecting circuits, an impulse sender adapt-
ed to be set and locked, means for connecting
said sender to any of said connecting circuits,
60 means for restoring said sender, means for automatically disconnecting said sender from said connecting circuit upon the restoration
of the sender, and manual means for inde-
pendently disconnecting said sender from
65 said connecting circuit.

11. In a telephone system a plurality of connecting circuits, an impulse sender adapt-
ed to be set and locked, means for connect-
ing said sender to any of said connecting
70 circuits, and means for transferring said sender from the circuit to which it has been connected to any other of said plurality of
connecting circuits, without releasing the
sender. 75

12. In a calling device, a plurality of lon-
gitudinally movable members one for each
digit place of a number to be called, means
for manually moving said members to a po-
sition corresponding to the number to be
80 called, means for locking said members, means for releasing one of said members, and automatically operated means controlled by
the first member released for releasing con-
secutively the other members. 85

13. In a calling device, a plurality of lon-
gitudinally movable members one for each
digit place of a number to be called, means
for manually moving said members to a po-
sition corresponding to the number to be
90 called, means for locking said members, means for releasing one of said members, automatically operated means controlled by
the first member released for releasing con-
secutively the other members, and a set of
95 contacts actuated by each member during its release.

14. In a calling device, a plurality of lon-
gitudinally movable members one for each
digit place of a number to be called, means
100 for manually moving said members to a position corresponding to the number to be called, means for locking said members, means for releasing one of said members, automatically operated means controlled by
105 the first member released for releasing consecutively the other members, and means for resetting any member without releasing the remaining members.

In testimony whereof I have signed my
name to this specification this 19th day of
February, 1920. 110

RAND S. BAILEY.