

A. E. KEITH.
IMPULSE TRANSMITTING DEVICE.
APPLICATION FILED MAR. 3, 1913.

1,209,304.

Patented Dec. 19, 1916.
2 SHEETS—SHEET 1.

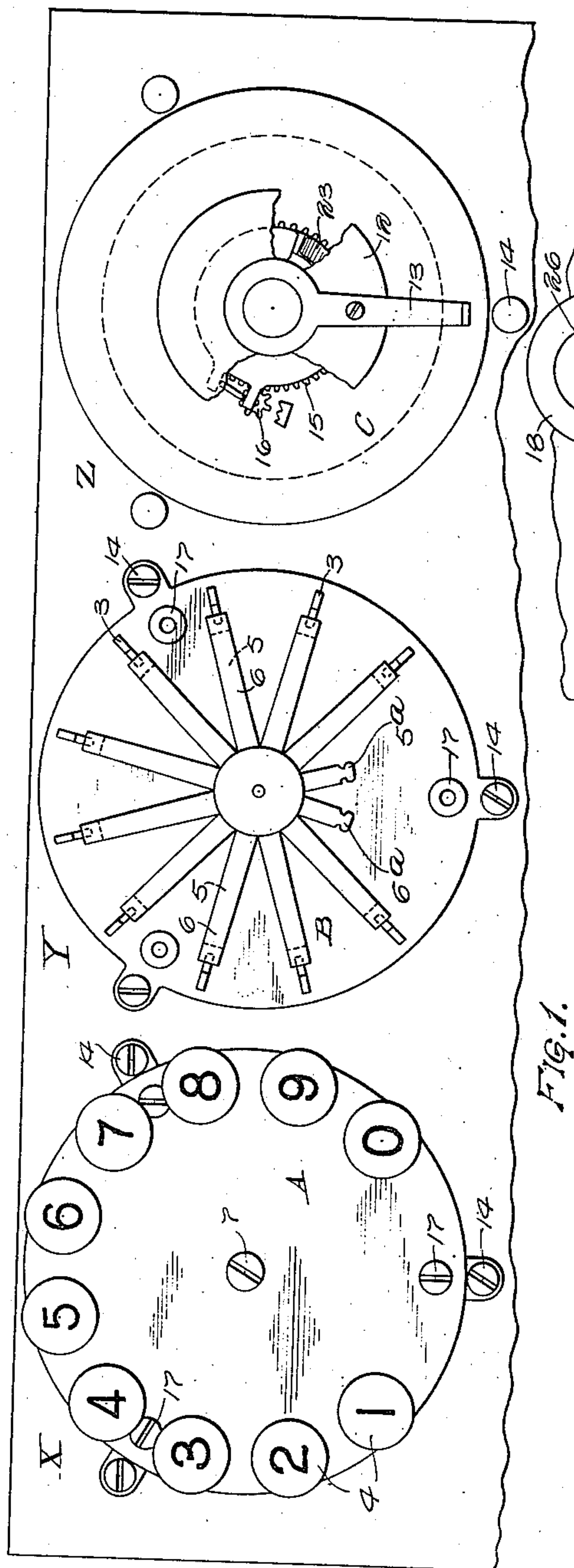


FIG. 1.

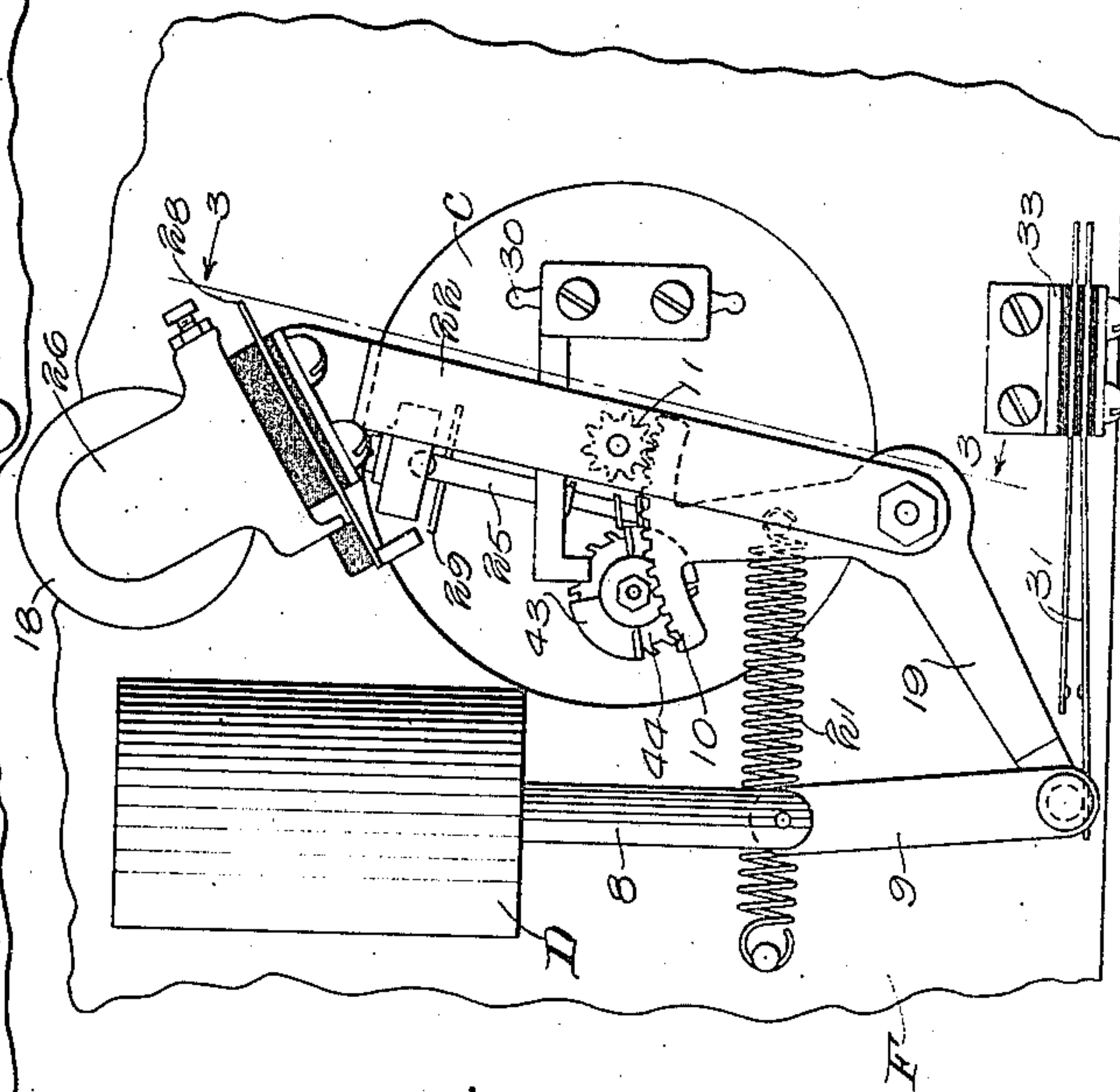


FIG. 2.

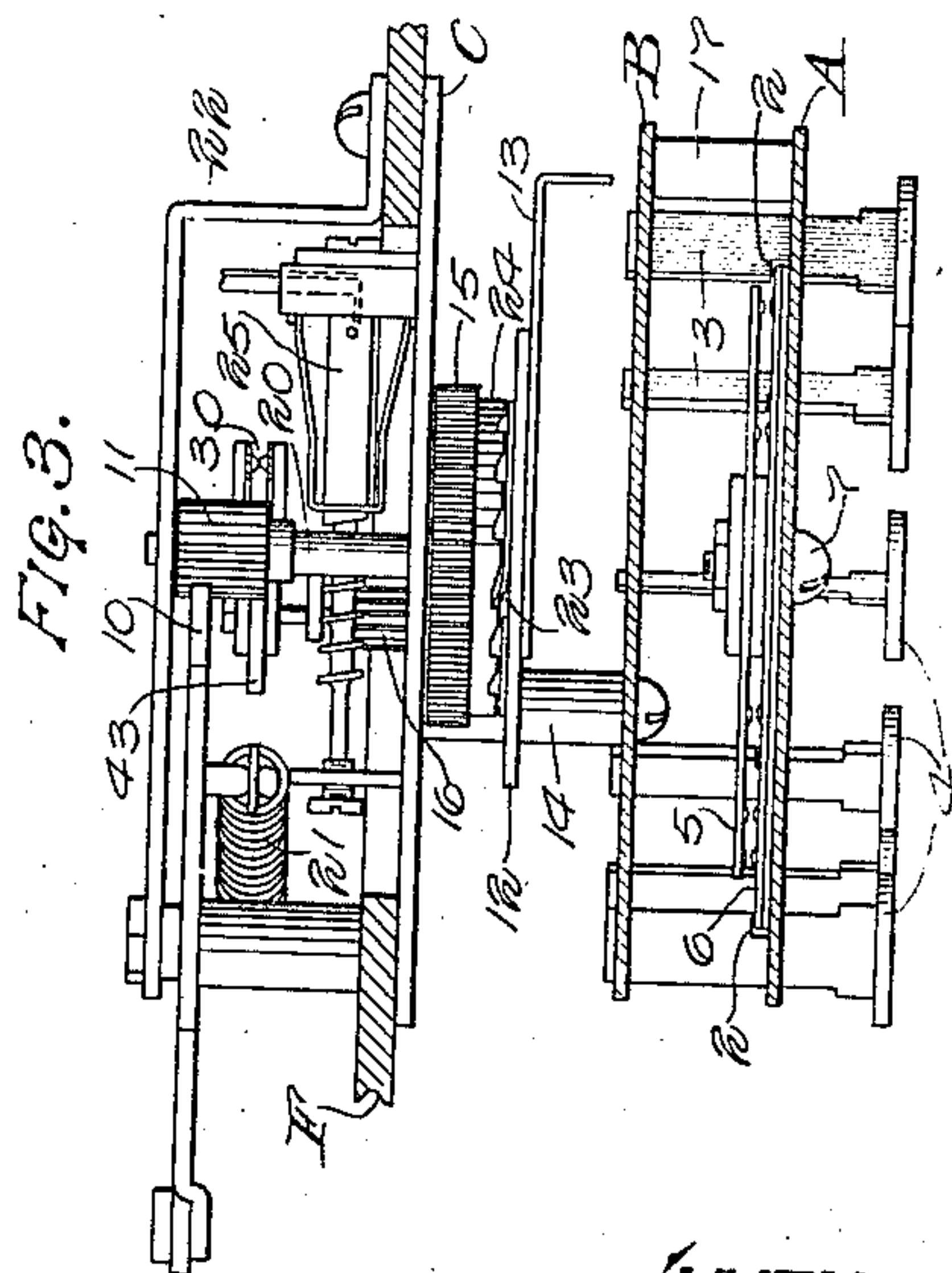


FIG. 3.

WITNESSES
H. Knudson
J. Norby

INVENTOR.
Alexander E. Keith
By Bulkeley & Edmund
ATTORNEYS

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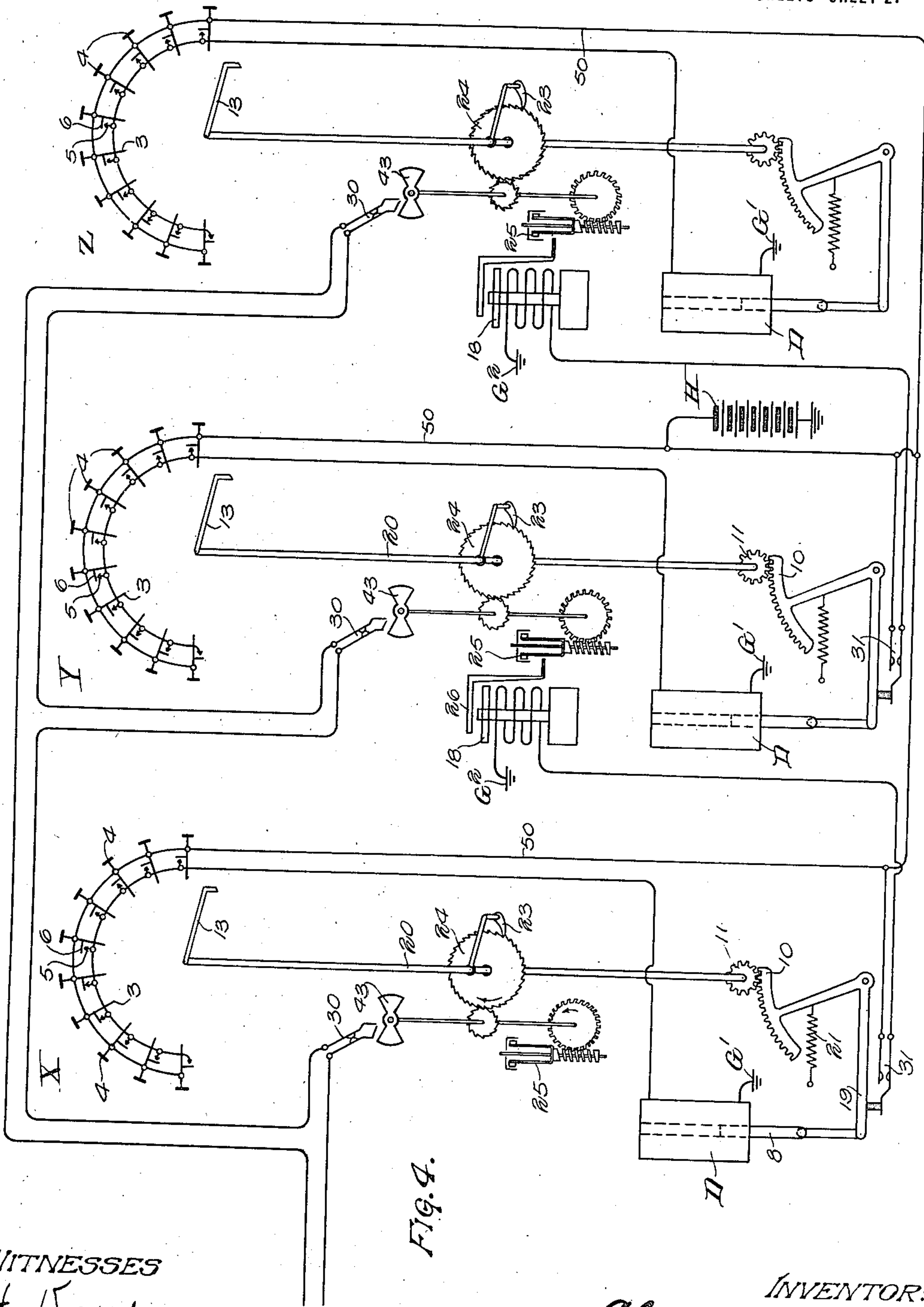


Fig. 4.

WITNESSES

H. Hudson
J. Norby

INVENTOR:

Alexander E. Keith
By Bulkley & Howard
ATTORNEYS.

UNITED STATES PATENT OFFICE.

ALEXANDER E. KEITH, OF HINSDALE, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

IMPULSE-TRANSMITTING DEVICE.

1,209,304.

Specification of Letters Patent.

Patented Dec. 19, 1916.

Application filed March 3, 1913. Serial No. 751,873.

To all whom it may concern:

Be it known that I, ALEXANDER E. KEITH, a citizen of the United States of America, and resident of Hinsdale, Dupage county, Illinois, have invented certain new and useful Improvements in Impulse-Transmitting Devices, of which the following is a specification.

My invention relates to impulse-transmitting devices, and relates more particularly to an impulse-transmitting device for use by an operator in a semi-automatic telephone system, although, of course, if desired this impulse-transmitting device can be employed at a substation in an automatic or semi-automatic telephone system.

Among the objects of my invention are to provide an impulse-transmitting device which enables an operator to set up the call as rapidly as possible, and to provide means whereby the impulses are transmitted at a uniform speed and are properly spaced.

More specific objects of my invention are the provision of a plurality of impulse senders, preferably one for each digit of the called number, and a plurality of keys associated with each of said impulse senders, which keys variably operate said impulse senders in accordance with the digit of the called number.

Further objects are the provision of means to prevent the second impulse sender from operating until after the impulses from the first sender have been transmitted, and to likewise provide means for properly spacing apart the impulses from the first and second senders.

These and other objects of my invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 represents a front side view of an impulse-transmitting device embodying the features of my invention, showing certain parts removed so as to more clearly show the interior construction and showing three calling devices X, Y and Z. Fig. 2 is a back view of a portion of the same. Fig. 3 is a section taken on line 3—3 in Fig. 2. Fig. 4 is a diagrammatic circuit view of the whole device.

The calling device X is shown as it appears complete, with a circular plate A and a plurality of push buttons or keys 4, the shafts 3 (Fig. 3) of which protrude through the plate A. A plurality of pairs of contact springs 5 and 6 corresponding to the keys of the calling device are mounted on the under side of the plate A and are secured thereto by means of a screw 7. The keys 4, after having been depressed, may be restored in any suitable manner, as, for example, by the provision of a coil spring underneath each key, or by the springs 5 and 6 themselves. The second calling device Y is shown with the plate A removed, but with the springs 5 and 6 showing against another plate B, which plate is fastened to the plate A by means of screws and posts 17. The third calling device is illustrated with both the plates A and B removed, showing a third plate C through which projects a shaft 20, to the end of which shaft there are secured a disk 12 and an arm 13. These calling devices are mounted on a base plate F, and Fig. 2 shows the assembly of one of the calling devices at the back of said base plate, together with a solenoid D which, when energized, attracts its plunger 8, and by means of a link 9 operates the lever 19 against the tension of the spring 21. On the end of the lever 19 is the segment of a gear wheel 10 in mesh with a gear wheel 11. The gear wheel 11 is attached to the shaft 20, to which the disk 12 is secured in front of the plate C. The shaft 20 is journaled at one end in a bridge-piece 22 and at the other end in the plate C. To the under side of the disk 12 is attached a pawl 23, its function being to engage with the ratchet wheel 24 which is attached to the gear wheel 15. This gear wheel is loosely mounted on the shaft 20 and is in mesh with a smaller wheel 16 which is on the same shaft as the impulse cam 43 and the wheel 44 that operate in connection with the governor 25. To each of the second and third calling devices there is assigned a magnet 18 mounted on the rear of the keyboard. Each of these magnets is provided with an armature 26 and spring 28, the end of which latter is turned up in such a manner as to arrest the revolving of

the governor 25 when the magnet 18 is energized. This is accomplished by the end of the spring 28 coming into the path of the pin 29 which passes through the shaft of the governor. Associated with each of the first and second calling devices there is a pair of springs 31 fastened to the base plate by means of a bracket 33 and insulated from each other and from the frame by suitable pieces of fiber. Normally these springs are forced apart by the pressure of the link 9 and make contact only when the solenoid D is energized.

Having given a detailed description of the component parts, I will now describe the mechanical operation, referring more particularly to the diagrammatic showing in Fig. 4. As has been stated heretofore, there is mounted on one base plate a plurality of calling devices. There are preferably as many of these calling devices as there are digits in the telephone numbers in the system in which the keyboard is to be used. In the accompanying drawings there are shown three such devices. The impulse springs 30 of the three calling devices are connected in series, as shown in Fig. 4. We will assume that the operator wishes to call the number 678. She therefore pushes the keys No. 6 of the device X, No. 7 of the device Y and No. 8 of the device Z in quick succession. This operation presses together one of the pairs of springs 5 and 6 of each calling device and energizes their respective solenoids D over circuits extending from ground G' through said solenoids D and through the springs 5 and 6, corresponding to the keys pressed, to the non-grounded terminal of the battery H. Upon the energization of the solenoids the plungers are pulled up, revolving the shafts 20 until they are stopped by the arms 13 coming into contact with the shafts 3 of the keys just depressed, whereby the ratchet 23 of each calling device will be advanced past a number of notches in the wheel 24, corresponding to the button pressed. The keys 4 are provided with a long stroke and after they have been pressed to the full length of their stroke are restored by the tension of the springs 5 and 6, as before pointed out. The springs 5 and 6 are arranged to make contact on the initial downward movement of the key and to break on the return of the key to normal, just before the extension 3 is removed from the path of the arm 13. Therefore, when the key is pressed the solenoid D is energized at once, and being quick acting in pulling up has sufficient time to rotate the arm 13 into contact with the extension 3 before the key has been pressed to the limit of its stroke and released. The circuit of the solenoid is broken by the springs 5 and 6 just before the extension 3 is removed from

the path of the arm 13, thereby preventing the further rotation of the same. The solenoid of the calling device which was operated for the first digit, upon deenergizing, immediately commences to return to its normal position. As the plunger 8 returns to its normal position, said ratchet 23 engages with the notch in the ratchet wheel 24 to which said ratchet was advanced by the energization of the solenoid and forces the wheel 24 to rotate back with the shaft 20. Through the medium of the spur teeth 15 and pinion 16 this rotation is transmitted to the shaft on which is fastened the impulse cam 43. The cam 43 revolves to open and close the springs 30 six times, sending that number of impulses over the line to operate the central office apparatus. As heretofore stated, there is a wheel 44 on the same shaft as the cam 43 which is in connection with the governor 25 to keep the movement at an even speed.

As soon as the solenoid of the first calling device is energized, the springs 31 make contact to close the circuit of the magnet 18 in the second calling device, which magnet energizes to prevent the second series of impulses being sent through until after the central office apparatus has had time to respond to the first series. The circuits for the magnet 18 extend from ground G² through said magnet and springs 31 to battery H. When the plunger of the solenoid of the first calling device reaches its normal position it separates the springs 31, opening the circuit of the magnet 18 of the succeeding calling device. The magnets 18 are preferably slow acting—that is, slow to deenergize—so as to cause an appreciable interval of time to elapse between the completion of the operation of one calling device and the beginning of the operation of the next one. This interval is usually necessary in order to give the central office apparatus sufficient time to perform certain operations, such as selecting idle trunk lines, etc., after operating in response to the numerical impulses for each digit. Upon the deenergization of the magnet 18 of the second calling device, its solenoid D and the shaft 20 are permitted to return to normal position, during which operation the cam 43 separates the springs 30 seven times to transmit the seven impulses for the second digit over the line. When the plunger of the solenoid of the second calling device reaches its normal position it breaks the circuit of the magnet 18 of the third calling device, which releases the mechanism and allows it to restore to normal position, whereby the eight impulses for the last digit are transmitted over the line.

It will thus be seen that I have provided a very efficient form of calling or impulse

transmitting device in which the operator can set up the call by operating the various keys of the separate calling devices, but the impulses transmitted over the wire are at all times so controlled that they are transmitted at a uniform speed and are properly spaced apart so as to secure the proper operation of the automatic switches with which this calling device will be associated.

10 While I have illustrated and described one embodiment of my invention, it is to be understood that I do not wish to be limited to the exact construction shown and described.

15 What I claim as my invention is:—

1. In an impulse-transmitting device, a plurality of impulse senders, electro-mechanical means for operating said impulse senders, and a plurality of keys associated with each sender for variably placing said operating means in condition to variably operate the respective impulse senders, depending upon the key operated, whereby said impulse sender may transmit a variable number of impulses.

2. In an impulse-transmitting device, a plurality of impulse senders, electro-mechanical means for operating said impulse senders, a plurality of keys associated with each sender for variably placing said operating means in condition to variably operate the respective impulse senders, depending upon the key operated, whereby each impulse sender may transmit a variable number of impulses, and means for preventing more than one of said impulse senders from operating at a time.

3. In an impulse-transmitting device, a plurality of impulse senders, means for operating said impulse senders, a plurality of keys associated with each sender for variably placing said operating means in condition to variably operate the respective impulse senders, depending upon the key operated, whereby each impulse sender may transmit a variable number of impulses, and means for preventing the second of said impulse senders from operating until a predetermined time after said first impulse sender has completed its operation.

4. An impulse-transmitting device comprising a series of impulse senders, means for operating said impulse senders, a series of keys associated with each of said senders for variably placing said operating means in condition to variably operate said impulse senders whereby each sender may transmit a variable number of impulses, and means permitting simultaneous operation of said keys but preventing simultaneous operation of said impulse senders.

5. An impulse-transmitting device comprising a plurality of impulse senders, means for operating said impulse senders, a plu-

65 rality of keys associated with each of said senders, means controlled by said keys for variably placing said operating means in condition to operate said senders, whereby each sender may transmit a variable number of impulses, and means for preventing simultaneous operation of two of said impulse senders.

6. In an impulse-transmitting device, a plurality of impulse senders, each of said impulse senders including a pair of impulse springs, a ratchet mechanism for operating said springs, a pawl adapted to be rotated around said ratchet in one direction without operating said ratchet, and adapted to operate said ratchet upon the return movement of said pawl, a magnet for controlling the first movement of said pawl, a spring for controlling the return movement, a plurality of keys for variably operating said magnet to control the extent of operation of said pawl, and means for preventing more than one of said impulse senders from operating at the same time.

7. In an impulse-transmitting device, a plurality of impulse senders, each of said impulse senders including a pair of impulse springs, a ratchet mechanism for operating said springs, a pawl adapted to be rotated around said ratchet in one direction without operating said ratchet, and adapted to operate said ratchet upon the return movement of said pawl, a magnet for controlling the first movement of said pawl, a spring for controlling the return movement, a plurality of keys for variably operating said magnet to control the extent of operation of said pawl, and means for locking the pawl of the second impulse sender against return movement until after the previous impulse sender has completed its operation.

8. In an impulse-transmitting device, a plurality of impulse senders, each of said impulse senders including a pair of impulse springs, a ratchet mechanism for operating said springs, a pawl adapted to be rotated around said ratchet in one direction without operating said ratchet, and adapted to operate said ratchet upon the return movement of said pawl, a magnet for controlling the first movement of said pawl, a spring for controlling the return movement, a plurality of keys for variably operating said magnet to control the extent of operation of said pawl, and means including a slow acting relay for locking the pawl of the second impulse sender until after the first impulse sender has completed its operation.

9. In an impulse-transmitting device, a series of sets of keys, an impulse controller for each set, an automatically movable member for each controller, means associated with each set for moving the movable member of its controller a variable distance to

determine how many impulses will be transmitted before said impulses are transmitted, each impulse controller having means to lock the next one in the series, and means
5 for unlocking the locked controller when the one locking it has completed its operation.

Signed by me at Chicago, Cook county,
Illinois, this 24th day of February, 1913.
ALEXANDER E. KEITH.

Witnesses:

H. KNUDSON,
J. NORBY.