J. G. BLESSING.

IMPULSE TRANSMITTING DEVICE.

APPLICATION FILED JAN. 9, 1913.

1,209,253.

Patented Dec. 19, 1916.

4 SHEETS—SHEET 1.

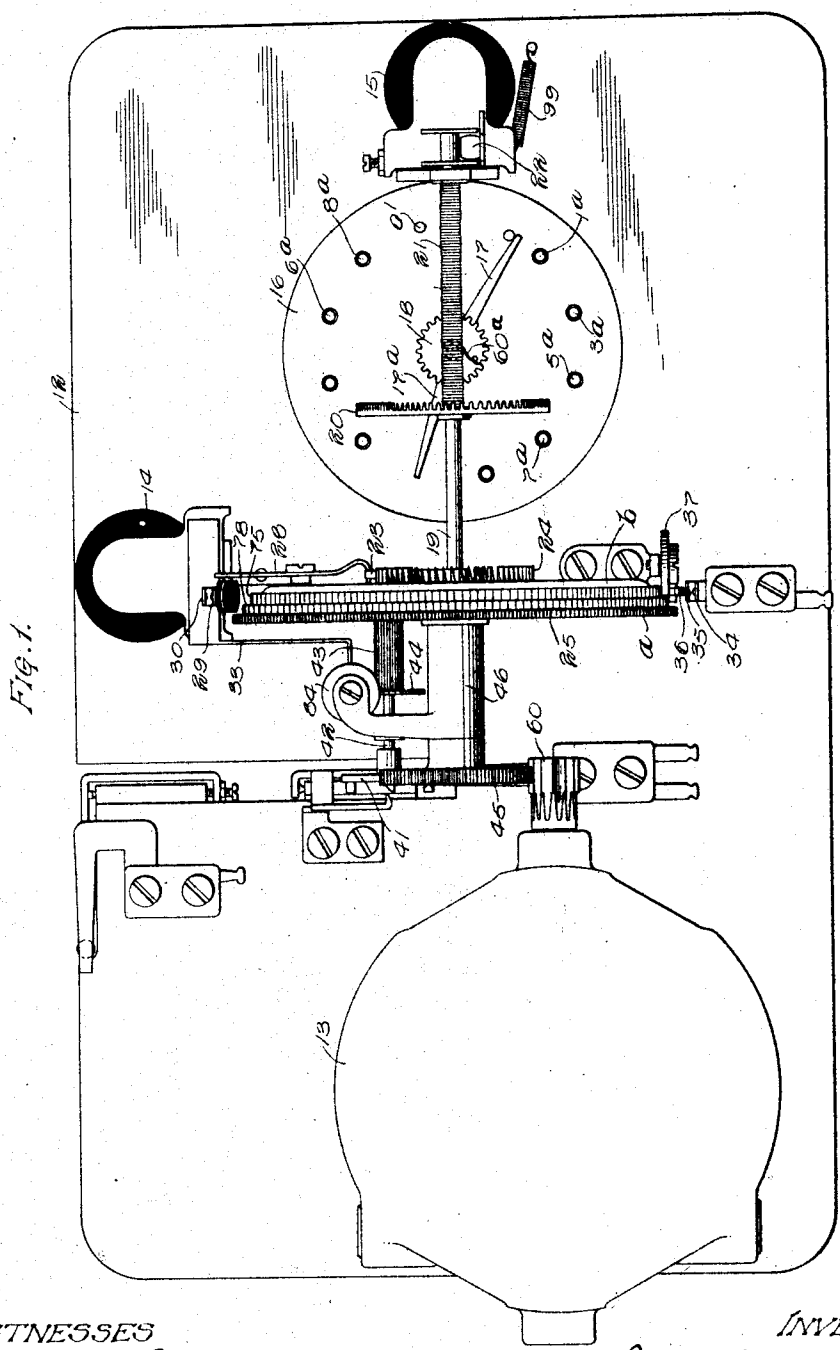


FIG. 1.

WITNESSES

Arthur J. Ray.

A. Anderson.

INVENTOR:

John G. Blessing

By Bulkley & Dunand

ATTORNEYS,

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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4 SHEETS—SHEET 2.

FIG. 2.

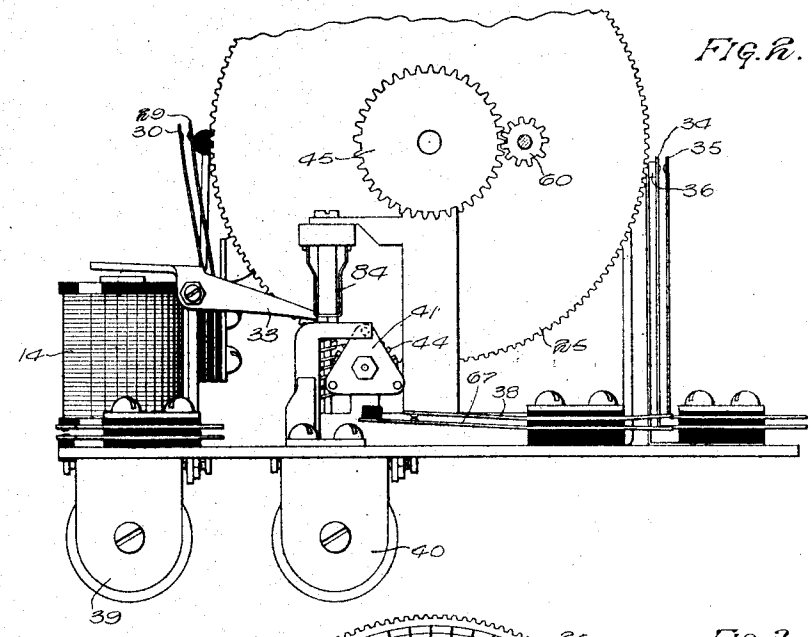
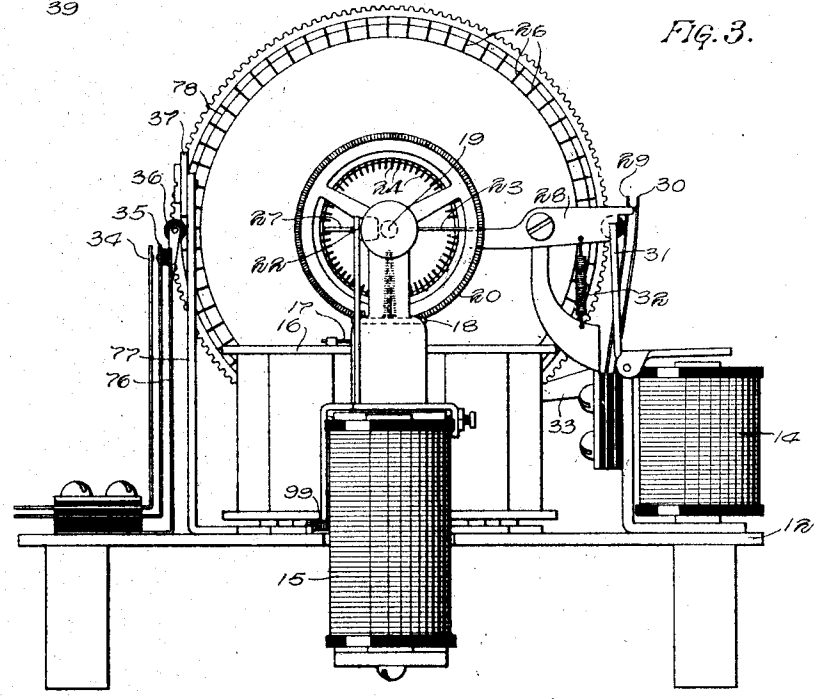


FIG. 3.



WITNESSES

Arthur J. Ray.

A. Andersen.

INVENTOR:

John G. Blessing

By Bulkley & Durand

ATTORNEYS.

THE NORR'S PETERS CO., PHOTO LITHO., WASHINGTON, D. C.

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4 SHEETS—SHEET 3.

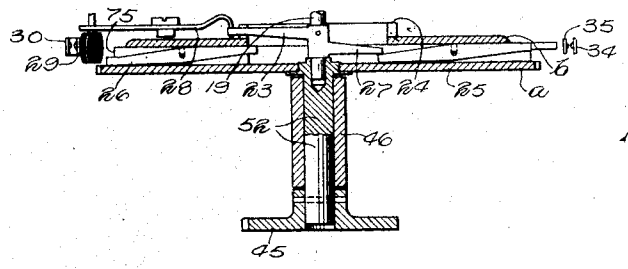


FIG. 7.

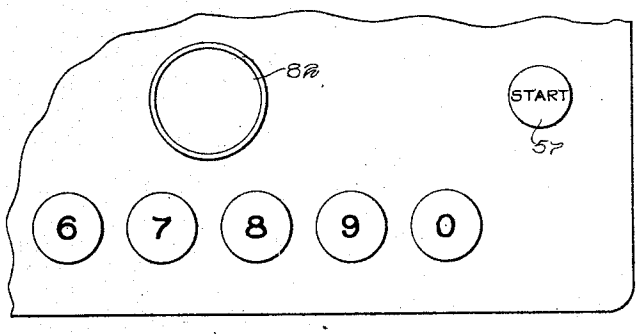


FIG. 6.

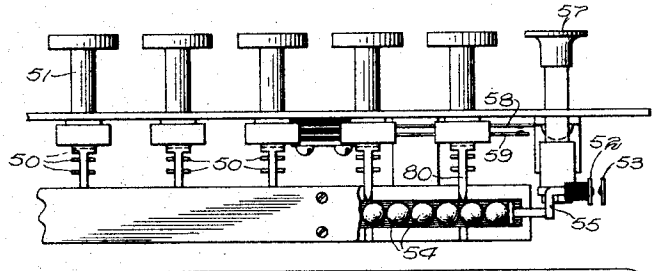


FIG. 5.

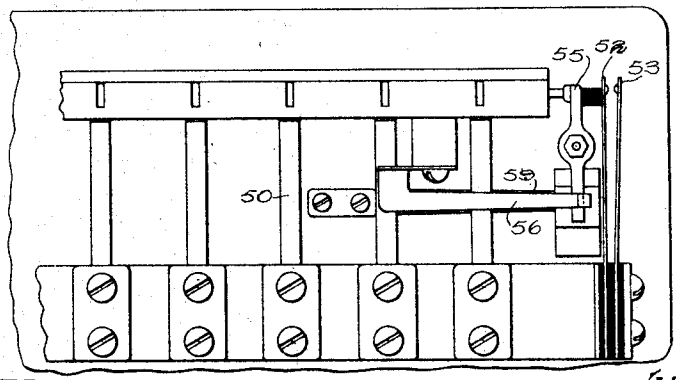


FIG. 4.

WITNESSES

Arthur J. Ray.

A. Andersen.

INVENTOR:

John G. Blessing

By Bulkley & Simard

ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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4 SHEETS—SHEET 4.

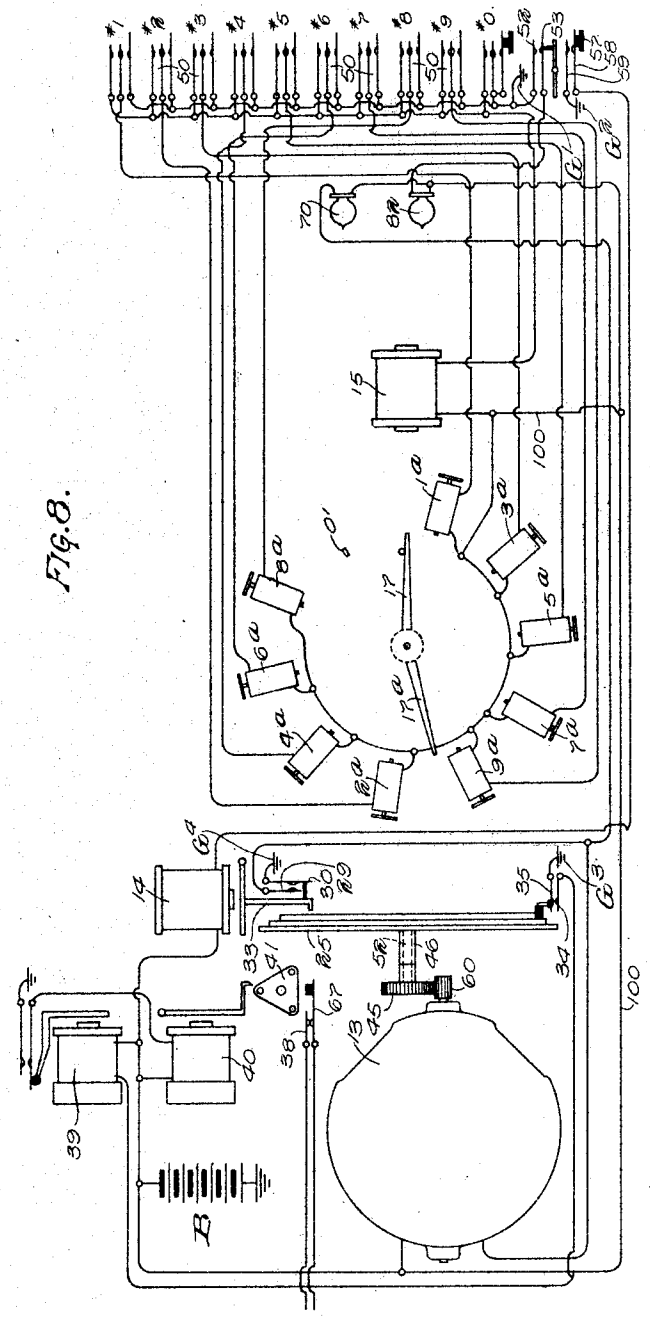


FIG. 8.

WITNESSES

Arthur J Ray

A. Andersen.

INVENTOR:

John G. Blessing

By Bullock & Durand

ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN G. BLESSING, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

IMPULSE-TRANSMITTING DEVICE.

1,209,253. Specification of Letters Patent. Patented Dec. 19, 1916.

Application filed January 9, 1913. Serial No. 740,953.

To all whom it may concern:

Be it known that I, JOHN G. BLESSING, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Impulse-Transmitting Devices, of which the following is a specification.

My invention relates to improvements in impulse-transmitting devices, and it relates particularly to an impulse-transmitting device for use in connection with automatic telephone systems in which a plurality of groups of impulses are transmitted over a line circuit for the purpose of operating automatic selecting switches.

Among the objects of my invention are to provide an improved construction of such a calling device, and to provide a simplified structure in which one or more keys are first operated to set up the apparatus, and then the apparatus is set in motion to transmit at a uniform speed a plurality of series of impulses.

My invention is in the nature of an improvement upon the transmitting devices shown in my previous application Serial No. 586,530, filed October 11th, 1910. The transmitting device of this application, however, differs from the previous one in that, instead of having a number of electrical contact makers, which are movable past a number of relatively stationary adjustable controlling members, the contact makers are stationary and the adjustable controlling members are movable past them. This avoids the necessity of using wiping contacts and enables the structure to be made more compact and likewise renders the operation more efficient.

These and other features of my invention will be more readily understood by referring to the accompanying drawings, in which I have illustrated one embodiment of my invention.

In the drawings Figures 1 to 8, inclusive, represent the mechanical construction and circuits of the apparatus embodying the principles of my invention. Fig. 1 shows a plan view; Figs. 2 and 3 are end elevations with the motor removed; Figs. 4, 5 and 6 represent springs and push buttons for the initiation of calls; Fig. 7 represents a sectional view of the mechanism used for the purpose of arresting the impulses and dividing them into series, according to the digits of the number called; and Fig. 8 shows diagrammatically the circuits of the calling device.

Referring to Fig. 1, there is mounted on a suitable base plate 12 a motor 13, electromagnets 14 and 15 and a dial arrangement 16 provided with a pair of arms 17 and 17^a which are secured to a spindle passing through the center of said dial. These arms are arranged to rotate at a given time on the dial 16 until stopped by one of the plungers of the solenoids 1^a—9^a (Fig. 8), which solenoids are situated beneath said dial, in accordance with the digits of the number being called. The tenth stop O′ for the arm 17^a is permanently raised on the dial 16, for it is not necessary that this one should sink to the level of said dial for the reason that neither the arms 17 and 17^a have to wipe over it. Therefore a tenth solenoid is not necessary. For the purpose of rotating the arms 17 and 17^a there is provided a rotatable shaft 19 on which is secured a gear wheel 20 fastened to a spiral spring 21; and upon the energization of the magnet 15 the armature 22 operates to bring said gear wheel 20 into mesh with another gear wheel 18 that is mounted on the same spindle as the arms 17 and 17^a. Normally the shaft 19 is held in position against the tension of the spring 21 by an arm 23 which is attached to said shaft and which engages with the teeth 24. So it is seen that immediately upon the shaft 19 being moved toward the magnet 15, the wheels 20 and 18 come into mesh and are both rotated under the influence of the spring 21.

Attached to a shaft 52 (Fig. 7) there is a wheel 25, shown in section to illustrate the manner of assembling the same. Pivoted between plates *a* and *b* of the wheel 25, and midway between the circumference and center, are a number of levers 26, the ends of which are shown in Fig. 3. The ends of the levers which are near the center of the wheel 25 are situated in a circle inside the circle of teeth 24 (Figs. 3 and 7), and are arranged so as to be tilted by a shorter arm 27 mounted on the shaft 19 and pointing in the opposite direction to that of the arm 23.

Associated with the magnet 14 there is a lever 28, together with two contact springs 29 and 30, the function of which is to close

the circuit of the motor 13 upon the energization of said magnet 14. Normally the lever 28 is locked in the position indicated in Fig. 3 by the arm 23 being in engagement with said lever, and the contact between the springs 29 and 30 is broken. When a call is initiated, the arm 23 is removed from engagement with the lever 28, so that when the magnet 14 is energized, said lever is, under the influence of the spring 32, allowed to engage with the armature 31 in such a manner as to keep the contact of the springs 29 and 30 closed until the arm 23 is rotated back with the wheel 25 to its normal position. Secured to the armature of the magnet 14 there is a lever 33 which prevents the governor 84 from revolving unless the said magnet is energized. For convenience we will call this magnet the starting magnet, for it energizes in response to the operator depressing the start key 57 shown in Figs. 5, 6 and 8. On the opposite side of the wheel 25 to that on which the magnet 14 is situated (Fig. 3) are two contact springs 34 and 35, together with a small roller 36 and a larger roller 37. The roller 36 is carried on the end of a flexible spring 76 and rolls on the circumference 75 of the wheel 25, as is shown most clearly in Figs. 1 and 7. When a projection on said circumference 75 passes under the roller 36, the spring 76 is forced outward and forces the spring 35 into engagement with the spring 34. The larger roller 37 is carried on a stiff support 77 and rolls on the surface 78. The purpose of this roller is to restore the levers 26 to their normal positions, as they are carried past said roller by the rotation of the wheel 25. In Figs. 2 and 8 there are shown two impulse springs 67 and 38 which are connected to the line, and a device 41 for making and breaking the contact of said impulse springs, which device is secured on a shaft 42 (Fig. 1) with a pinion 43 that is in mesh with the teeth in the periphery of the wheel 25. It is seen then that during the rotation of the wheel 25 impulses are sent over the line, said impulses operating the switches in the central office in the usual manner. The function of the heretofore-mentioned governor 84 is to keep the speed of the machine uniform and operates directly in connection with a gear wheel 44 which is also mounted on the shaft 42. The gear wheel 45 is rigid on the shaft 52 (Figs. 7 and 8), which passes through a journal 46 of the wheel 25.

Referring to Figs. 4, 5 and 6, there is there illustrated a section of the keyboard, together with the assembly of the contact springs to close the necessary circuits in initiating a call. Fig. 4 is a view of the under side of the keyboard showing the contact springs 50, which are in groups of three. The ends of these springs are shown in Fig. 5 and are pressed together when their corresponding key 51 is depressed. The springs 52 and 53 are closed by the depression of any one of the keys 51 in the following manner: Upon the depression of one of the keys 51 a projection 80 attached to said key is forced between two steel balls (Fig. 5), forcing them apart and acting on a lever 55 which in turn forces together the springs 52 and 53. These springs remain locked in their operated positions by means of a detent arrangement on the end of the spring 56 (Fig. 4) until the start key 57 is depressed, when it moves said spring 56 out of engagement with the lever 55, which lever releases and allows the contact springs 52 and 53 to separate. At the same time the start key 57 closes the circuit of the relay 14 by pressing together the contact springs 58 and 59. Fig. 6 is a plan view of some of the keys, together with a signal lamp 82 and the start key.

Having given a description of the component parts of my invention, I will now describe the operation and circuits of the mechanism while a connection is being established.

We will assume that the operator wishes to obtain connection with a subscriber whose number is six hundred and seventy eight. She therefore depresses the keys 6, 7 and 8 in quick sucession, which return, each one, to their normal positions immediately upon the removal of her finger by the tension of the contact springs 50, which are momentarily pressed together. Upon the digit key 6 being depressed three circuits are closed, one through the corresponding solenoid 6^a (Fig. 8) from ground G′ through the springs of the key 6 and said solenoid to the battery lead 100; another from ground G′ through the same springs to the magnet 15; and the third circuit from ground G′ through the contact springs 52 and 53 and through the supervisory lamp 82 to battery. The latter circuit is a supervisory circuit, and is to indicate that one or more of the calling keys have been depressed, but not the start key, for we have already seen that when the start key 57 is depressed the contact springs 52 and 53 are released. The magnet 15 and the solenoid 6^a are energized simultaneously. The former operates to bring the wheel 20 into mesh with the wheel 18, and at the same time to clear the arm 23, which is attached to the shaft 19, of the teeth 24, leaving the wheels 20 and 18 to be swung around until one of the arms (in this case the arm 17^a) is stopped by the plunger of the solenoid 6^a projecting above the surface of the dial 16. It will be seen, of course, that the arm 23, upon being freed from the teeth 24, also rotates with the shaft 19. This arm is carried over as many teeth as are indicated by the digit just called, and

upon the deënergization of the magnet 15, recedes back under the influence of the spring 99 to its newly found position. The shaft 19 is prevented from being further rotated under the influence of the spring 21 when out of engagement with the pinion 18, on account of the arm 23 engaging with the teeth 24 just before the gear wheels 18 and 20 break away. When the shaft 19 is in its normal position, the arms 17 and 17ª spin back under the influence of a spiral spring 60ª. As has been explained heretofore, there is also an arm 27 secured to the shaft 19 which is made to engage with the inner ends of the levers 26, so as to tilt the outer ends forward on the wheel 25 (Figs. 1 and 7). Each time the magnet 15 energizes to operate the shaft 19, the smaller arm 27 is rotated in the same manner as the larger arm 23, and is the means of causing a new projection to appear on the circumference 75 of the wheel 25 by tilting forward a new one of the levers 26 when the shaft 19 slides back to its normal position. When the operator depresses the keys 6—7—8 in succession, three of these levers 26 are tilted, causing three projections to be made on the circumference 75 of the wheel 25, said projections being separated by a distance corresponding to the digits called. For instance, upon depressing the key 6 the arms 23 and 27 are swung around six places in a manner heretofore explained, and the arm 23 is then carried by the shaft 19 into engagement with the teeth 24, opposite which the arm 23 has been rotated. At the same time the arm 27 is rotated past five of the levers 26 and is then carried into engagement with the inner end of the sixth lever, causing its outer end to be tilted forward on the circumference 75. In like manner, when the button 7 is pressed the arm 27 passes over six more levers and then depresses the inner end of the seventh lever from the one last depressed. When the button 8 is pressed seven more levers are skipped over and the eighth depressed.

After depressing the calling keys 6—7—8 in succession, the operator depresses the start key 57, which releases the contact springs 52 and 53 (Figs. 4 and 5) and presses together the contact springs 58 and 59, whereupon a circuit is closed from ground G^2 (Fig. 8) through the relay 14 to the battery lead 100. Upon the relay 14 energizing a circuit is closed through the motor 13, which immediately operates to rotate the wheel 25 in a clockwise direction (Fig. 3) through the medium of the pinion 60 and the gear wheel 45. The device 41 being on the same shaft as the pinion 43, which is in mesh with the wheel 25, immediately begins to turn to make and break the contact of the impulse springs 67 and 38 a number of times, corresponding to the digit called (in this instance it being six). Since the arm 27 was moved six places away from its normal resting place—that is, opposite the roller 36 (Fig. 1)—by the depression of the first or No. 6 button, and as each division in the wheel 25 represents one impulse, it will be seen that six impulses will be sent over the line before the projection, due to one of the levers 26 being tilted, comes in contact with the roller 36, which presses together momentarily the contact springs 34 and 35, closing a circuit from ground G^3 through the relay 39 to the battery lead 100.

The relay 39 is a slow acting relay—that is, slow to deënergize after the circuit has been broken, and upon energizing closes the circuit of a slow acting magnet 40, which attracts its armature to arrest the progress of the impulse device 41 and necessarily the rotation of the wheel 25. After the momentary closing of the contact springs 34 and 35 the relay 39 and the magnet 40 remain energized for a time to stop the rotation of the wheel 25 long enough to give the central office switches sufficient time in which to operate after each series of impulses. When the armatures of the relay 39 and the magnet 40 fall back, the impulse device 41 is released and the wheel 25 resumes its rotation to send over the line seven impulses in response to the second digit key 7, when the springs 34 and 35 again make contact, closing the circuits of the relay 39 and the magnet 40 to hold up the operations in the above-mentioned manner. After a short interval the impulse device 41 is again released to transmit eight more impulses, being the third series, at the end of which time the arm 23 will have been rotated back to its normal position, coming into contact with the lever 28, at which time said lever is tilted to release the springs 29 and 30, thus breaking the circuit of the motor 13. After each of the operated levers 26 have passed the roller 36 (Fig. 1) they are forced back to their normal positions by coming into contact with the larger roller 37.

While the calling device is operating, a circuit is closed through a lamp 70 extending from ground G^4 through said lamp to the battery lead, and is broken upon the completion of a call, when the springs 29 and 30 are released.

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

What I claim as my invention is:

1. An impulse-transmitting device comprising a pair of contact springs, a controlling member carrying a plurality of actuating devices normally in inoperative position and normally at rest, means for moving certain of said devices into operative position,

and means for then setting said controlling member in motion, whereby said springs are caused to operate to transmit a plurality of series of impulses.

2. An impulse-transmitting device comprising a pair of contact springs, means for intermittently actuating said springs, means for setting said actuating means in motion, and a movable controlling mechanism carrying a plurality of adjustable devices, whereby said actuating means is automatically stopped for an interval to thereby cause said contact springs to be given a plurality of series of operations.

3. An impulse-transmitting device comprising a pair of contact springs, means for intermittently operating said springs, a controlling mechanism adapted to be moved at a predetermined speed, adjustable arms carried by said controlling mechanism, and means for operating certain of said arms, whereby they are brought into position to bring said operating means to a stop at predetermined intervals.

4. In an impulse-transmitting device, a set of contact springs, controlling mechanism therefor normally at rest, said mechanism comprising a rotary member carrying a plurality of arms, means for operating said contact springs, and means for operating certain of said arms to variably control the extent of operation of said contact springs.

5. An impulse-transmitting device consisting of a pair of contact springs, means for intermittently operating said springs, and means for controlling said operation, said controlling means consisting of a rotary member containing a plurality of adjustable controlling arms.

6. An impulse-transmitting device consisting of a pair of contact springs, means for intermittently operating said springs, means for controlling said operation, said controlling means consisting of a rotary member comprising a plurality of controlling arms normally in inoperative position, and means for placing certain of said arms in operative position.

7. An impulse-transmitting device consisting of a pair of contact springs, means for intermittently operating said springs, means for controlling said operation, said controlling means consisting of a rotary member comprising a plurality of controlling arms normally in inoperative position, means for placing certain of said arms in operative position, and means controlled by said arms in operative position for stopping the contact spring operating means.

8. An impulse-transmitting device consisting of a pair of contact springs, means for intermittently operating said springs, means for controlling said operation, said controlling means consisting of a rotary member containing a plurality of adjustable controlling arms, said controlling means comprising a rotary member carrying a plurality of pivoted arms normally in inoperative position, means for operating certain of said arms to throw the same into operative position, and means controlled by said operated arms for controlling the operation of said contact springs.

9. An impulse-transmitting device consisting of a pair of contact springs, means for intermittently operating said springs, means for controlling said operation, said controlling means consisting of a rotary member containing a plurality of adjustable controlling arms, said controlling means comprising a rotary member carrying a plurality of pivoted arms normally in inoperative position, means for operating certain of said arms to throw the same into operative position, an electric circuit closed by said operated arms, and means controlled by the closure of said circuit for stopping said contact spring operating means.

10. In an impulse-transmitting device, a pair of contact springs, means for operating said springs, a controlling mechanism comprising a rotary member carrying a plurality of actuating devices, a plurality of keys for variably operating said actuating devices, dependent upon the keys operated, and means controlled by said actuating devices for controlling said contact spring operating mechanism.

11. In an impulse-transmitting device, a pair of impulse springs, means for operating said springs, a plurality of operating keys for controlling the operation of said springs, a signal, means for displaying said signal when said device is operating, a second signal, and means for displaying said signal when one of said keys is operated and for extinguishing said signal when said impulse-transmitting device starts operating.

12. An impulse-transmitting device having operable contacts, means for operating said contacts to divide the impulses into groups, a normally at rest adjustable operating member, and means controlled by said operating member for operating said contacts to cause them to send a plurality of series of impulses while said member is in motion and for limiting the operation of said impulse-transmitting means.

13. An impulse-transmitting device having operable contacts, a normally at rest adjustable operating member, and means controlled by said operating member for operating said contacts to cause them to send a plurality of series of impulses while said member is in motion and for periodically stopping the transmission of said impulses to thereby divide said impulses into a plurality of groups.

14. An impulse transmitting device hav-

ing operable contacts, a normally at rest adjustable operating member, means for variably adjusting said member, and for moving the same to operate said contacts to cause them to send a plurality of series of impulses and means for causing said member to pause between each series.

Signed by me at Chicago, Cook county, Illinois, this 4th day of January, 1913.

JOHN G. BLESSING.

Witnesses:
ARTHUR J. RAY,
ALEX E. WALKER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."