

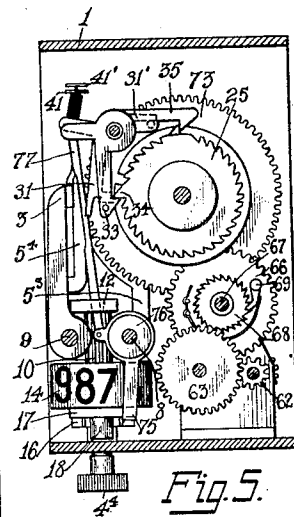
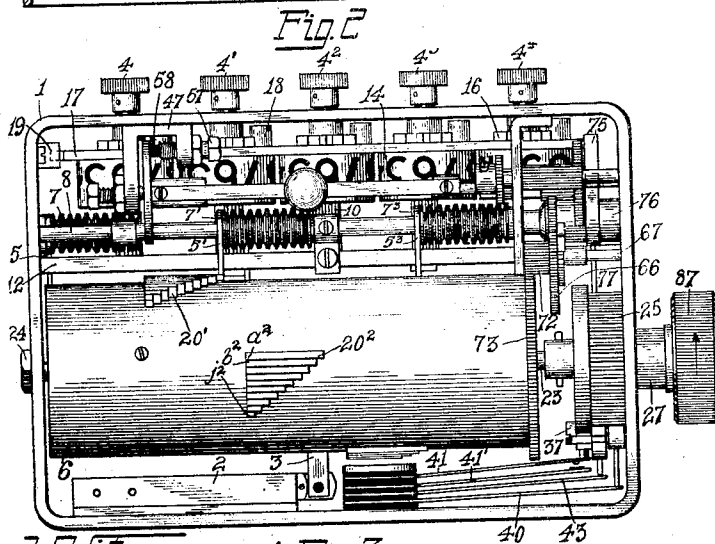
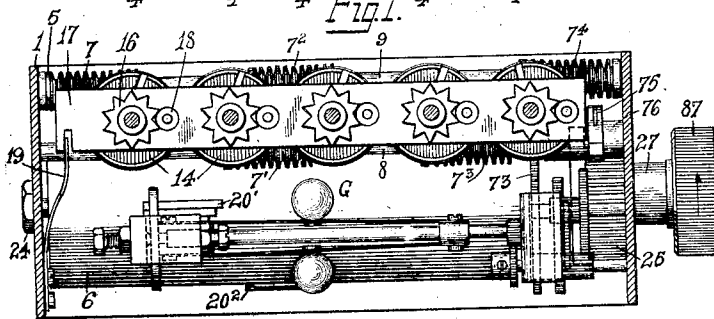
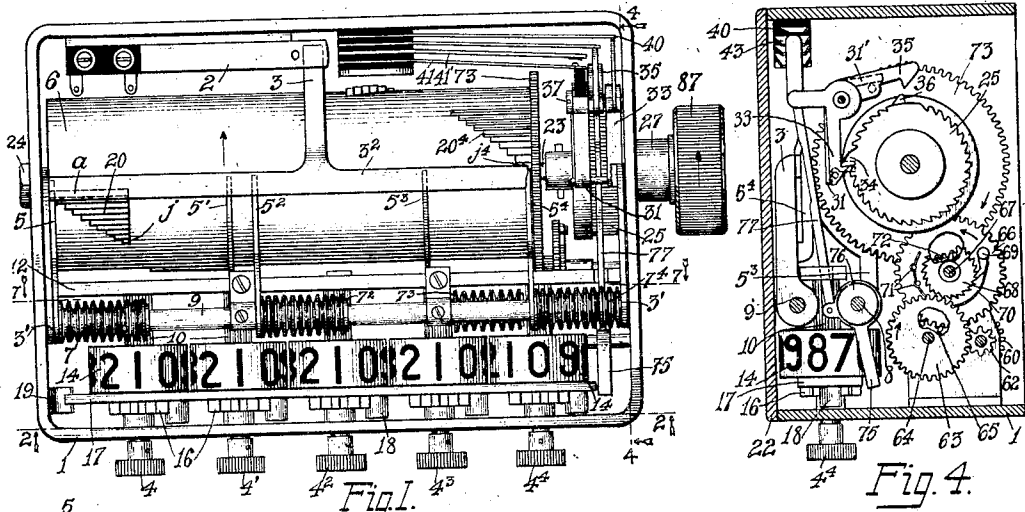
W. KAISLING.
CALLING DEVICE.

APPLICATION FILED APR. 26, 1911.

Patented May 26, 1914.

2 SHEETS—SHEET 1.

1,097,644.



Witnesses: Fig. 3.

George E. Mueller
Wm. Berghahn

Inventor:

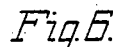
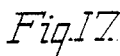
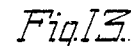
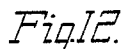
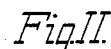
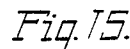
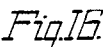
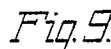
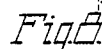
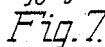
William Kaisling

By Curtis Beauf
Attorney.

APPLICATION FILED APR. 26. 1911.

Patented May 26, 1914.

2 SHEETS--SHEET 2.



George E. Mueller
Wm. Berghahn

Inventor.
William Kaisinger
By Curtis Blaup.
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM KAISLING, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CALLING DEVICE

1,097,644.

Specification of Letters Patent.

Patented May 26, 1914.

Application filed April 26, 1911. Serial No. 623,420.

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States of America, residing in Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Calling Devices, of which the following is a specification.

My invention relates to calling devices, or impulse transmitters as they are sometimes called, and particularly to that type in which a set of impulses comprising several series of impulses are to be transmitted, and to such a device in which the number representing a set of series of impulses in corresponding digit values, is first set up by a plurality of setting members and in which the adjusted impulse mechanism is thereafter released for operation.

My invention is preferably adaptable for use in connection with so-called two-wire or metallic line telephone systems, in which the metallic circuit is interrupted by the impulse springs of the calling device according to its adjustment.

An object of my invention is to provide such a calling device, as above outlined, which is more simple of construction, cheaper to manufacture, more efficient in operation, and more compact.

It is well known that in two-wire or metallic line telephone systems in which automatic switches are operated responsive to interruptions of the metallic circuit and especially where slow-acting relays are effected by these operations, that it is a great advantage to have a calling device which, after being set up for adjustment and released for transmitting impulses, is incapable of being interfered with by the operator while the impulse springs are operating or until the mechanism thereof has been restored to normal.

Another object of my invention is to provide such a device in which the impulse mechanism, after being adjusted and released by the operator for transmitting impulses, may not be interfered with or readjusted until after the resulting impulse transmission has been effected.

Referring to the accompanying drawings for a more full understanding of my invention, Figure 1 is a face view of the calling device of my invention with its face plate removed showing the interior mechanism. Fig. 2 is a longitudinal sectional view

along the line 2-2 of Fig. 1, looking in the direction of the arrow in connection therewith. Fig. 3 is a bottom view of the device of Fig. 1, Fig. 4 is a cross section along line 4-4 of Fig. 1 viewed in the direction of the arrow in connection therewith and the showing of the parts at normal. Fig. 5 is a view similar to Fig. 4 but with some of the mechanism shown off normal as it appears during the operation of the device. Fig. 6 is an end view of the impulse cylinder showing particularly the impulse teeth and cooperating impulse arms. Fig. 7 is a longitudinal section along the line 7-7 of Fig. 1 viewed in the direction of the arrow indicated thereon. Fig. 8 illustrates part of one of the setting members partly shown in section. Fig. 9 is a sectional view along line 9-9 of Fig. 8 viewed in the direction of the arrow indicated thereon. Fig. 10 illustrates in perspective a pawl and disk arrangement for normally locking the device against actuation and for controlling the releasing and stopping of the mechanism. Fig. 11 is a perspective view of the off-normal locking pawl for locking the winding member against further forward movement during the operation of the impulse mechanism. Fig. 12 shows the same ratchet as illustrated in Fig. 11, together with a cooperating check pawl, the parts illustrated in the three Figs. 10, 11 and 12 being shown in a normal position. Fig. 13 is a sectional view of the spring motor winding member. Fig. 14 illustrates a portion of the sliding locking bar 17 showing particularly the longitudinal openings therein and locking rollers. Fig. 15 illustrates the preferred arrangement of impulse springs. Fig. 16 is a face view of the calling device showing the openings, which are disposed above the numerals on the indicators carried by the setting members. Fig. 17 is a diagrammatically illustrated circuit arrangement of a well known substation telephone with the calling device of my invention connected therewith.

Generally speaking the calling device of my invention comprises preferably a frame 1, which supports the mechanism, a set of impulse springs 2, a pivoted member 3 which acts upon the impulse springs 2, a plurality of setting members 4, 4', etc., a corresponding number of adjustable impulse arms 5, 5', etc., which are adjustable by their corre-

sponding setting member, the said impulse arms being adapted to be operated or reciprocated by their corresponding impulse teeth *a*, *b*, *c*, etc., which are carried on the impulse cylinder 6. A spring winding knob 87 is provided which is adapted to be rotated after the setting members are adjusted, for the purpose of winding of the spring motor for operating the impulse mechanism.

- 10 To operate the device when used in connection with an automatic telephone system for directively controlling the switches in a well known manner, assuming substation 11110 is to be called, the setting members 4, 4', etc., are adjusted so that the indicator numbers carried thereby correspond to the digits of the called number as illustrated in Fig. 16. Thereafter the knob 87 is given one complete turn, thereby winding up the power storing spring, and upon the complete revolution of the said knob 87 the impulse mechanism is automatically released for operation, whereby the set of impulses, corresponding in number to the different digit values of the numbers set up on the device, are transmitted. For instance with the device set for number 11110, this mechanism is in position as illustrated in the drawings and upon the operator winding the spring motor by means of winding member 30, the impulse mechanism is automatically released and causes first a single operation of the impulse springs followed by three more single operations for the other three digits 1, and finally ten operations of the impulse springs representing the units digit 0.

Referring now to the calling device more in detail, the mechanism thereof comprises 40 a main casing or frame 1 to which is insulatingly secured the impulse springs 2. The said impulse springs are actuated by a common member 3 pivoted at points 3', the said member 3 being free to be reciprocated on its bearings. The pivoted member 3, which acts as a common impulse spring actuating member, is partly broken away at its right end in Fig. 1 to more clearly illustrate the mechanism beneath. A plurality 50 of individual impulse arms 5, 5', etc., are arranged preferably to engage the portion 3² of member 3 as illustrated in Fig. 1. Each of the arms 5 is securely staked to its corresponding rack 7, 7', etc., the said racks being longitudinally movable and rotatable upon their shafts 8 and 9. The racks 7, 7² and 7⁴ are loose upon the shaft 9, and the racks 7' and 7³ are loose upon the shaft 8. The said shafts 8 and 9 are secured at their ends to the casing 1 in a suitable manner being securely held free from rotation. The racks 7 with their impulse arms 5 are longitudinally adjusted on their shafts 8 and 9 preferably by means of an associated pinion 10, which is part of the setting member

4. Each setting member 4, 4', etc., is arranged to be adjusted or rotated by the operator, and comprises a shaft 11 rotatably mounted in suitable bearings in the casing 1 and a rigidly fastened plate 12. At the outer end of shaft 11 a knurled knob 13 is fastened preferably by means of a pin, while at the other end of shaft 11 the teeth of pinion 10 are cut. Also carried by the shaft 11 is an indicator consisting of a cylinder 14 secured to said shaft 11 preferably by means of a pin 15 driven into shaft 11 and adapted to fit into slot 14' cut into the cylinder 14. To the periphery of cylinder 14 a flexible band preferably of paper is suitably secured, the said band having printed thereon the ten digits comprising 0 to 9 inclusive. A star wheel 16 is also carried to shaft 11, being preferably pinned thereto.

A plate 17, common to all of the setting members, is slidably supported by the shafts 11, the said plate 17 having longitudinal openings therein fitting the shaft 11 as illustrated in Fig. 14. Plate 17 carries a plurality of rollers 18, one for each of the star wheels 16, the said rollers being held against their corresponding star wheels 16, as illustrated in Fig. 2, due to the tension of spring 19 which acts upon the plate 17, tending to hold the rollers against the teeth of the wheels 16. The plate 17 with its rollers 18 serves to prevent rotating any of the setting members except to a definite position so as to secure a positive adjustment of the setting members and their associated impulse arms 5, as it will be seen that in moving a setting member unless it is moved to a position so that its roller is between the teeth as illustrated, the said roller presses against the side of a tooth and rotates the setting member until the roller rests in a position as illustrated in Fig. 2. The plate 17, with its rollers 18, also serves as a lock to prevent rotating the setting members 4, while the impulse mechanism is operating as will be more fully explained.

To reciprocate the impulse arms 5 for the purpose of operating the impulse springs 2, a plurality of sets 20 of impulse teeth *a*, *b*, *c*, etc., are provided, one for each of the impulse arms, the said impulse teeth being suitably disposed upon the surface of the cylinder 6. Each set 20 of impulse teeth *a*, *b*, *c*, etc., comprises ten teeth arranged as most clearly illustrated in Figs. 3 and 6, there being five such sets, 20 to 20⁴.

The impulse teeth *a*, *b*, *c*, etc., are so constructed with relation to their corresponding arms 5 that when the cylinder 6 is rotated, the teeth *a*, *b*, etc., cooperate with the ends 21 of the arms 5, thereby rocking the said arms 5 about their pivot and causing the said arms 5 to reciprocate the pivoted member 3 and operating impulse springs 2.

Referring to the setting member 4 at the

extreme left of Fig. 1, it will be noted that its corresponding impulse arm 5 is adjusted to a position in relation to its impulse teeth 20 so that when cylinder 6 is revolved, only the tooth a will engage arm 5, thereby operating pivoted member 3 and impulse springs 2 but a single time. It will be noted that the indicator of setting member 4 has its numeral 1 in a position whereby it would show below its opening in face plate 22, as in Fig. 16, thus indicating that but a single operation of impulse springs 2 will be effected responsive to its adjustment. When arm 5 is moved to its extreme right end position (Fig. 1) by setting member 4, it will be in a position directly above tooth i and the indicator 14 will have its numeral 0 showing beneath its corresponding opening in face plate 22, and the rack 7 and its pinion 10 is so proportioned in relation to indicator 14 that when setting member 4 is adjusted its corresponding impulse arm 5 will assume a position in relation to its impulse teeth 20 so as to operate impulse springs 2 a number of times, corresponding to the numeral on indicator 14 showing through its opening in the face plate.

Cylinder 6 when released for operation rotates in the direction of the arrow indicated thereon in Fig. 1, making one complete revolution only for each operation of the calling device, and it will be noted that the sets of impulse teeth 20 are so disposed upon the cylinder 6 that set 20 operates arm 5 first, then set 20' operates arm 5', etc., until set 20⁴ has operated when the cylinder is automatically stopped.

With the device adjusted as illustrated in Fig. 1, the impulse springs 2 would be operated to transmit a set of impulses, each series of the set corresponding respectively in digit values to the numbers 11110, that is, the first four series of impulses of the set would be a single operation of the impulse springs, corresponding to the digit 1, while the last series of the set would consist of ten impulses, corresponding to the digit 0.

It will be noted that racks 7, 7² and 7⁴ are above their pinions 10, as illustrated in Fig. 1, while the racks 7' and 7³ are below their corresponding pinions, so that when setting members 4, 4² and 4⁴ are rotated in a clockwise direction, their corresponding racks 7 and impulse arms 5 are moved from left to right, while when the setting members 4' and 4³ are rotated in a clockwise direction, their corresponding racks 7 are moved from right to left, but it will also be noticed that the sets of impulse teeth 20 are disposed upon the cylinder 6 to take care of this, that is, the impulse sets 20, 20² and 20⁴ are disposed upon the cylinder 6 longitudinally opposite to that of the impulse teeth 20' and 20³.

Cylinder 6 is rigidly secured to the shaft

23, the said shaft being suitably journaled at one end in the bearing 24, preferably a nut 24, threaded into the casing 1. The other end of the shaft 23 is journaled in the ratchet wheel 25, said shaft 23 being free to rotate within its bearings.

To furnish power for operating the calling device a coiled spring 26 is provided, the said spring 26 being placed within the ratchet wheel 25, as illustrated in Fig. 13, the outer end of spring 26 being suitably fastened to the ratchet wheel 25, the other end thereof being suitably fastened to shaft 23. The spring 26 is so coiled that its tendency is to pull or rotate cylinder 6 in the direction of the arrow indicated thereon. The ratchet wheel 25 has an extension 25' thereon, the said extension 25' being journaled within the bearing 27, the said bearing 27 being rigidly secured to the casing 1 in a suitable manner. The winding knob 87 is fastened to the end of shaft 25' by means of the slotted nut 28 which passes through the knob 87 and threads on to the end of shaft 25'. A shoulder is cut upon the shaft 25' and disposed between this shoulder and knob 87 is a washer 29, the said washer being clamped between the shoulder on shaft 25' and the knob 87. The ratchet wheel 25 and shaft 25' are free to be rotated in sleeve 27 by knob 87. As previously stated, spring 26 is so coiled that its tendency is to pull cylinder 6 in the direction of the arrow indicated thereon, and the pull upon the winding mechanism 30 is of course in an opposite direction. To normally lock said cylinder 6 against rotation by spring 26, a normal locking pawl 31 is provided, normally engaging a slot in disk 32, said disk being pinned to the shaft of cylinder 6. To normally lock the winding member 30 against back rotation by spring 26, a check pawl 33 is provided normally engaging a locking tooth 34 upon ratchet wheel 25.

The calling device is preferably arranged so that but a single revolution of winding member 30 is required to cause an operation thereof, and to prevent an operator from rotating the winding member 30 more than a single revolution, for each operation of the impulse mechanism, an off normal locking pawl 35 is provided, the said pawl being adapted to cooperate with an off normal locking tooth 36 upon ratchet wheel 25 to prevent any further forward movement of the winding member 30 until after the impulse mechanism has operated. The said pawls 31, 35 and 33 are pivotally mounted upon the inner surface of the casing 1 by means of a screw stud 37, said pawls being loose upon said stud 37 and independently free to rotate thereon. A pin 39 is carried by pawl 33, projecting beneath an end of locking pawl 31, as illustrated in Fig. 10.

The check pawl 33 serves to prevent back rotation of winding member 30 when it is moved forward during the winding operation of the spring motor, by engaging the successive teeth of ratchet wheel 25 when the winding member 30 is rotated, the said pawl being held against the teeth of ratchet wheel 25 by a flat tension spring 40. Normal locking pawl 31 is held against the disk 32 due to the tension of shunt spring 41 which acts upon pawl 31 to hold it in such operative relation. Off normal locking pawl 35 is provided with pin 42 which is driven into said pawl 35 and projects beneath the flat extension 31' of normal locking pawl 31, as illustrated by dotted lines in Fig. 10, the said pin 42 engaging the lower surface of this extension 31'. A flat tension spring 43 is provided to act upon off normal locking pawl 35, the tendency of said spring 43 being to press the end 35', as illustrated in Fig. 11 downward, thereby tending to hold the toothed end of pawl 35 out of engagement with tooth 36 and pressing pin 42 against the lower surface of arm 31'.

The shunt springs 41, 41' and the tension springs 43 and 40 are insulatively mounted upon the inner surface of the casing 1, suitable terminals being provided for the shunt springs 41, 41', but there is no electrical connection established with the tension springs 43 and 40. The shunt springs 31 and 41' are adapted to hold their contact closed while the normal locking pawl 31 is riding upon the periphery of the disk 32, as shown in Fig. 5, which is during the time the impulse mechanism is operating and upon the return of disk 32 to normal pawl 31 again drops into the slot in disk 32, thereby allowing the shunt springs 41, 41' to again open their contact.

To wind the power spring 26 and automatically release the calling device for operation, the winding knob 87 is rotated by the operator in the direction of the arrow indicated thereon, the pawls being so arranged as to allow but a single revolution of the winding member 30 for each operation of the device as previously stated. As to the winding operation, while knob 87 is being rotated thereby also rotating the ratchet wheel 25 of course, back rotation of the winding member 30 is prevented, due to the engaging of the teeth on ratchet wheel 25 by the check pawl 33. As the winding member 30 nears the completion of its single revolution, the beveled surface of tooth 34 on the ratchet wheel 25 engages the beveled surface of the tooth of check pawl 33 and as the movement of setting member is continued, check pawl 33 is moved outward, thereby causing its pin 39 to lift the locking tooth of pawl 31 out of the slot of disk 32, of course rotating the said pawl 31 on its pivot, and moving its arm 31' toward disk

32. This downward movement of arm 31' of pawl 31 causes it to engage pin 42, moving the said pin 42 toward the disk 32, thereby moving off normal locking pawl 35 into the position indicated by the dotted lines in Fig. 11, directly in the path of tooth 36, and preventing any further advance of the winding member 30. As the tooth 36 of ratchet wheel 25 engages the off normal locking pawl 35, check pawl 33 moves into locking engagement with tooth 34 as in Fig. 12, thereby preventing any back rotation of the setting member 30. As just stated, the pin 39 was moved into engagement with the pawl 31 and the movement of pin 39 was enough to lift pawl 31 out of the slot in disk 32, thereby releasing the cylinder 6 to allow of a single revolution thereof by the spring motor.

It will be noted that while cylinder 6 is revolving, pawl 31 is riding upon the periphery of disk 32, shown in Fig. 5, thereby holding shunt springs 41, 41', closed and as the cylinder 6 completes its revolution spring 41 again forces pawl 31 into locking engagement with the slot in disk 32, and stopping the movement of the impulse mechanism. It will also be noted that during this revolution of cylinder 6 off normal locking pawl 35 is held in its off normal position, due to the arm 31' of pawl 31 being in engagement with pin 42, holding pawl 35 in its dotted position and preventing the operator from moving the winding member forward, while check pawl 33, being in engagement with tooth 34, prevents any back rotation of setting member 30, thereby locking the said setting member 30 against actuation during the revolution of cylinder 6 or operation of the impulse mechanism. Upon normal locking pawl 31 dropping into engagement with the slot in disk 32, arm 31' moves upward, allowing off normal locking pawl 35 to be again restored to normal by the tension spring 43, thus unlocking winding member 30. It will be noted that when pawl 33 is forced outward by tooth 34, pin 39 lifts pawl 31 out of locking engagement with disk 32 and the arm 31' of pawl 31 at the same time engages pin 42 of pawl 35 moving the pawl 35 into its locking engagement, and when pawl 31 again drops into the slot of disk 32, its arm 31' allows off normal locking pawl 35 to again move out of locking engagement, thus securing practically simultaneous operation of pawls 31 and 35 and these pawls 31 and 35 so far as the operation just described might be a single member but for the following reasons they are made separate. Assuming an operator rotates setting member 30 a single revolution and continues his hold upon knob 87, pressing it forward so that tooth 36 is pressed firmly against the tooth of pawl 35, with the present construction, upon complete revolution

of cylinder 6 the normal locking pawl 31 is free to again move into locking engagement with the slot of disk 32, but the pawl 35 is held in its off normal position due to the tooth 36 being firmly pressed against said pawl 35 by the operator as above stated, thus preventing its restoration to normal until the operator releases his hold upon the knob 87, thereby relieving this pressure and allowing pawl 35 to restore. It will be seen that if pawls 31 and 35 were a single member the cylinder 6 would continue to be rotated by the spring motor until the spring 26 was unwound, as the locking pawl 31 would be held out of operative relation with disk 32 if the operator continues this said forward pressure upon the winding member 30. While this condition just described is an abnormal one, it is one of the points which is a great advantage to guard against.

To prevent an operator from interfering with the adjustment of the setting members 4 while the impulse mechanism is operating, locking mechanism is provided comprising a pivoted locking arm 75 shown in a normal position in Fig. 4. The said member 75 is securely fastened to a hub 76 which is loosely mounted upon shaft 8. Arm 75 is connected to off normal locking pawl 35 by means of a link 77, the said link being pivoted at one end to pawl 35 and at its other end to locking arm 75. The off normal locking pawl 35 being held in locking engagement with ratchet wheel 25 during the time the impulse mechanism is operating, it follows that locking arm 75 is also held in an off normal position, due to this connection with said pawl 35 by link 77, the said locking arm 75 being shown in its off normal or locking position in Fig. 5, adjacent to the ends of sliding bar 17. Thus it will be seen that while the locking arm 75 is in an off normal position bar 17 is held locked in the position illustrated in Fig. 2 and due to the rollers 18 engaging the teeth of star wheels 16 it will be seen that all of the setting members 4 are locked against actuation until pawl 35 is restored to normal and restoring locking arm 75 to a normal position as shown in Fig. 4, again allowing movement of bar 17.

I have referred to the mechanism employed in winding the power spring and releasing the impulse cylinder for operation and I will now describe the governor mechanism for retarding the rotation of the cylinder 6, that a predetermined uniform speed thereof may be maintained. To control the speed of this cylinder 6 I preferably employ a well known form of governor G which is suitably geared to the cylinder 6. The shaft 45 of governor G is suitably journaled at one end by means of a pivot screw 46 which is threaded into the bracket 47, the said bracket 47 being rigidly fastened to

the casing 1. A lock nut 48 is provided for locking the pivot screw 46 when adjusted. The other end of shaft 45 is journaled in the bracket 49, the said bracket 49 also being rigidly fastened to the casing 1. A friction disk 50 is provided and loose upon the shaft 45, the said disk 50 being preferably integral with its hub 51. A collar 52 preferably integral with shaft 45 is provided and a pair of leaf springs 53 are also provided for connecting the friction disk 50 and said shaft 45, one end of the springs being secured to collar 52 by means of screws 54, the other end of said springs 53 being secured to the disk 50 by means of screws 55. Attached to spring 53 are the weighted members 56. An adjustable screw 57 is threaded into bracket 47, the said screw 57 carrying a rubber friction tip 58 adapted to rub against a surface of the disk 50 when the governor G is rotated. The action of governor G is well known, the said governor when rotated at a predetermined speed causes the weighted members 56 to tend to move outward, caused by the centrifugal force, thus moving disk 50 longitudinally upon shaft 45 to rub against the friction tip 58 and retarding the speed of the device in a well known manner. The gearing connecting governor G with cylinder 6 comprises a pinion 59 cut upon the shaft of governor G, said pinion being in mesh with an idler gear 60. Gear 60 is fastened to shaft 61, the said shaft also having the teeth of a pinion 62 cut thereon. Pinion 62 is in mesh with gear 63, the said gear 63 being securely fastened to its shaft 64, which also carries an integral pinion 65 which is in mesh with the gear 66. Gear 66 is loose upon its shaft 67, the said shaft 67 having a ratchet wheel 68 rigidly secured thereto. Pivoted to gear 66 is a pawl 69 which is held in engagement with the teeth of ratchet wheel 67 by the action of spring 70. Spring 70 is pinned to gear 66, the said spring 70 having two ears extending therefrom and pinned into openings in said gear 66 by means of the pins 71. A pinion 72 is cut upon the shaft 67, the said pinion 72 being in mesh with the gear 73, said gear 73 being suitably secured to an end of cylinder 6.

When the winding member 30 is rotated and the mechanism released for rotation, the gears rotate in the direction indicated by the arrows thereon, and it will be noted that as the mechanism restores to normal after the complete revolution of the device locking pawl 31 engaging the disk 32 causes the cylinder 6 to come to an abrupt stop and but for the provision of the ratchet and pawl mechanism upon shaft 67, the governor and gearing would also come to an abrupt stop, but due to this said ratchet and pawl arrangement, the governor G rotates of its own momentum for a short period and gear 66

is carried along by the governor, its pawl 69 moving over the teeth of ratchet wheel 68 which is now at rest, due to the locking of cylinder 6.

Fig. 17 represents diagrammatically a substation telephone with the calling device of my invention, which is also shown diagrammatically, connected thereto. In the said Fig. 17, 80 represents an ordinary switch hook in its normal position with a receiver 81 hung thereon. A call bell 82 and condenser 83 are connected in bridge of the telephone line, being normally closed through the normal contacts of switch hook 80. An impedance coil 84 and transmitter 85 are provided being adapted to be connected in circuit when the receiver is removed, whereby the call bell 82 is disconnected. The telephone circuit is a well known arrangement and further explanation thereof is deemed unnecessary. Connected in shunt of the substation apparatus are the shunt springs 41 and 41' normally opened and adapted when closed to shunt or short circuit the substation apparatus. Impulse springs 2 are connected in circuit with the telephone line, the said springs 2 being adapted to have their contact interrupted by the operation of cylinder 6 and the intermediate members 5, 5', etc., and 3 as previously described.

Having described in general a preferred arrangement of the calling device of my invention, a description of its operation will be now entered into. Assuming the calling device is connected in circuit with a substation telephone as illustrated in Fig. 17, and assuming further that it is desired to connect by means of central office automatic equipment with another subscriber whose telephone number is 11110, the setting members 4, 4', etc., are adjusted to the position indicated in Fig. 1. With this adjustment impulse arm 5 is adjusted to be operated by impulse tooth *a* only, thus operating impulse springs 2 a single time. Impulse arm 5' is adjusted so that it will be operated by impulse tooth *a'* only, thereby operating impulse springs 2 a single time. Impulse arms 5² and 5³ are also adjusted so that they will be operated only by their corresponding impulse tooth *a*² and *a*³ thereby operating impulse springs 2 but a single time, while impulse arm 5⁴ is adjusted to be operated by all of its corresponding impulse teeth *a*⁴ to *j*⁴, thereby operating impulse springs 2 ten times. Thus it will be seen that when cylinder 6 is revolved, impulse arm 5 is the first arm actuated followed by impulse arms 5', 5², 5³, and 5⁴ successively, and due to the angular spacing of the sets of impulse teeth upon cylinder 6 as shown in Fig. 6, it will be noted that there is a period between each set of teeth in which no operation of the impulse springs is effected, thus allow-

ing time for the automatic selection of a trunk as is well known or the operation of relays or other purposes. Having adjusted the setting members 4 so that the indicating numbers indicate 11110, the operator then rotates winding member 30 a complete revolution, causing tooth 34 on ratchet wheel 25 to lift check pawl 33 so that its pin 39 engages normal locking pawl 31, lifting said pawl 31 out of the slot in disk 32 the arm 31' thereby acting upon pin 42 and moving off normal locking pawl 35 into its locking position to prevent further forward motion of winding member 30. Upon normal locking pawl 31 being lifted out of the slot in disk 32, the spring motor is free to act upon cylinder 6 which immediately starts its rotation and the operator now releasing his hold upon winding member 30 it is held against back rotation, due to check pawl 33 being engaged by tooth 34 as illustrated in Fig. 12. The cylinder 6 having immediately started its rotation upon being released by pawl 31, the said pawl rides upon the periphery of disk 32, thereby holding the shunt springs 41, 41' closed. Off normal locking pawl 35 having been moved into its locking position as indicated by the dotted lines in Fig. 11, locking arm 75 was thereby moved into its locking position as indicated in Fig. 5, locking plate 17 and preventing any actuation of the setting members 4 until the impulse mechanism has operated. The winding member 30 is now also locked against actuation, the off normal locking pawl 35 preventing forward movement thereof and check pawl 33 preventing backward movement thereof, thus effectively locking the winding member 30 against any movement during the operation of the impulse mechanism. Cylinder 6 having started its rotation as stated, arm 5 is the first impulse arm operated, the said operation being effected in this instance by its corresponding impulse tooth *a*, and operating impulse springs 2 a single time. Cylinder 6 continues in its rotation, being retarded by the action of the governor G as previously described, this rotation continuing until impulse arm 5' is operated, this operation in this instance being effected by its corresponding impulse tooth *a'*, thereby again actuating impulse springs 2 a single time. Impulse arm 5² is next operated a single time by its corresponding impulse tooth *a*² followed by a single operation of impulse arm 5³ by its corresponding impulse tooth *a*³. Impulse arm 5⁴, the last arm to be operated, is in this instance, effected by its corresponding teeth *a*⁴ to *j*⁴, thereby causing ten operations of impulse springs 2. After the last tooth *j*⁴ has passed its impulse arm 5⁴, disk 32 is in a position whereby normal locking pawl 31 is moved into locking engagement with the slot therein, 130

due to the action of shunt spring 41 which is pressing upon said pawl 31, thus stopping the movement of the cylinder 6 and also allowing the shunt springs 41, 41' to open their contact. The restoration of locking pawl 31 to normal of course allows off normal locking pawl 35 to be moved to its normal position as indicated in Fig. 11, due to arm 31' moving upward allowing pawl 35 to follow, thus releasing the winding member 30. The restoration of pawl 35 also moves locking arm 75 into its normal position as indicated in Fig. 4, thereby freeing plate 17 and allowing adjustment of setting members 4, whereby a different set of impulses may be set up if desired.

Should the subscriber desire to repeat the same call, that is, transmit the same set of impulses which were last sent, it is only necessary to again rotate winding member 30 as before, thereby causing another operation of the impulse mechanism of the calling device. Although as previously stated, when the cylinder 6 makes a complete revolution, it comes to an abrupt stop when pawl 31 re-engages the slot in disk 32, but the governor G which had been rotating at a relatively high speed does not come to an abrupt stop, due to the ratchet and pawl arrangement upon shaft 67 and the said governor continues rotating under its own momentum for a short period when it comes to a stop.

While I have illustrated a preferred arrangement of the calling device of my invention, it is to be understood that many changes and modifications thereof may be made, and while I have described and illustrated my invention as operating in connection with a substation telephone and particularly in such a telephone in which the metallic circuit is interrupted, I do not desire to be limited to such an arrangement but aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

I claim:

1. A calling device comprising adjustable impulse mechanism, an independently manually operable adjusting member for said impulse mechanism, a spring motor device adapted for operating said mechanism, a manually operated winding member for said motor device, mechanism operated responsive to the winding operation of said winding member for releasing said impulse mechanism for operation by said motor device, and means for locking said winding member against actuation during operation of said impulse mechanism.

2. A calling device comprising adjustable impulse mechanism, a spring motor device adapted for operating said mechanism, a manually operated winding member for said motor device, mechanism operated responsive to the winding operation of said winding

member for releasing said impulse mechanism for operation by said motor device, and means for locking said impulse mechanism against adjustment during said winding operation.

3. A calling device comprising a manually operated setting member, impulse mechanism adjusted responsive to said member, a manually wound spring motor device adapted for operating said mechanism, an independently operable winding member, mechanism operated responsive to the winding operation of said spring motor device for releasing said impulse mechanism for operation thereby, and means for locking said setting member against actuation and to prevent interference with said mechanism during operation of said impulse mechanism.

4. A calling device comprising a manually operated setting member, impulse mechanism adjusted responsive to said member, a manually wound spring motor device adapted for operating said mechanism, an independently operable winding member, mechanism operated responsive to the winding operation of said spring motor device for releasing said impulse mechanism for operation thereby, and means to prevent winding of said spring motor device during said operation of the impulse mechanism.

5. A calling device comprising a manually operated setting member, impulse mechanism adjusted responsive to said member, a manually wound spring motor device adapted for operating said mechanism, an independently operable winding member, mechanism operated responsive to the winding operation of said spring motor device for releasing said impulse mechanism for operation thereby, and mechanisms to prevent actuation of said setting member or winding of said spring motor device during said operation of the impulse mechanism.

6. A calling device comprising a manually operated setting member, impulse mechanism adjusted responsive to said member, a spring motor device adapted for operating said impulse mechanism, a manually operated winding member for winding said motor device, means operated responsive to the winding operation of said winding member for releasing said impulse mechanism for operation by said spring motor device, and means to prevent actuation of said setting and winding members during said operation of the impulse mechanism.

7. In a calling device the combination with a plurality of setting members, of impulse mechanism adjustable by said members, motor mechanism for operating said impulse mechanism, and means for preventing a setting operation of said setting members during operation of the impulse mechanism.

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8. In a calling device the combination with a plurality of setting members, of impulse mechanism adjustable by said members, spring motor mechanism for operating said impulse mechanism, a winding member adapted to be operated for winding said motor mechanism, and means for preventing operation of said setting and winding members during operation of said impulse mechanism.
9. In a calling device the combination with a plurality of setting members, of impulse mechanism adjustable by said members, motor mechanism for operating said impulse mechanism, a movable plate common to said setting members and carrying devices adapted for locking cooperation with said setting members, and means for preventing movement of said plate during operation of the impulse mechanism, whereby said setting members are locked by said devices.
10. A calling device comprising a rotatable member, impulse teeth of varying lengths, carried by said member, motor mechanism for rotating said member, an impulse arm adapted to be reciprocated by said teeth when said member is rotated, and means for adjusting said arm with relation to said teeth whereby said arm is reciprocated by a number of said teeth depending upon its relative adjustment.
11. A calling device comprising a cylinder, impulse teeth of varying lengths, upon the periphery of said cylinder, motor mechanism for rotating said cylinder, an impulse arm adapted to be reciprocated by said teeth when said cylinder is rotated, and means for longitudinally adjusting said arm with relation to said teeth whereby said arm is reciprocated by a number of said teeth depending upon its relative longitudinal adjustment.
12. A calling device comprising a cylinder, sets of impulse teeth carried upon the periphery of said cylinder, each set comprising teeth of varying lengths, motor mechanism for rotating said cylinder, an impulse arm for each set of teeth adapted to be reciprocated thereby when said cylinder is rotated, and means for longitudinally adjusting each arm with relation to its corresponding set of teeth whereby an arm is reciprocated by a number of its corresponding teeth depending upon its relative longitudinal adjustment, said sets of teeth being so disposed upon said cylinder with relation to their corresponding arms, that no two of said arms are reciprocated at the same time during rotation of the cylinder.
13. A calling device comprising a cylinder, sets of impulse teeth carried upon the periphery of said cylinder, each set comprising teeth of varying lengths, motor mechanism for rotating said cylinder, an impulse arm for each set of teeth adapted to be reciprocated thereby when said cylinder is rotated, means for longitudinally adjusting each arm with relation to its corresponding set of teeth whereby an arm is reciprocated by a number of its corresponding teeth whereby an arm is reciprocated by a number of its corresponding teeth depending upon its relative longitudinal adjustment, said sets of teeth being so disposed upon said cylinder with relation to their corresponding arms, that no two of said arms are reciprocated at the same time during rotation of the cylinder.
14. A calling device comprising impulse mechanism, a manually operated setting member for adjusting said mechanism for transmitting different numbers of impulses, a spring motor device adapted for operating said mechanism, means for normally locking said mechanism, a second independently manually operated member for winding said motor device, and means actuated upon final winding movement of said winding member to unlock said mechanism for operation by said motor device.
15. A calling device comprising a plurality of independently operable setting members, impulse mechanism adjustable by said members, motor mechanism for operating said impulse mechanism, and means for preventing any effective actuation of said setting members during the operation of the impulse mechanism when transmitting impulses.
16. A calling device comprising relatively stationary sets of impulse teeth, an impulse arm and associated adjusting means for each set of teeth, impulse contacts adapted to be operated by said arms, and means for moving said teeth to operate said arms and impulse contacts.
17. A calling device comprising cylindrically disposed relatively stationary sets of impulse teeth, an impulse arm and associated adjusting means for each set of teeth, impulse contacts adapted to be operated by said arms, and means for rotating said teeth to operate said arms and impulse contacts according to the adjustment of said arms.
18. A calling device comprising cylindrically disposed relatively stationary sets of impulse teeth, an impulse arm and associated adjusting member for each set of teeth, a common set of impulse contacts adapted to be operated by said arms, a spring motor adapted to rotate said teeth to operate said arms and impulse contacts according to the adjustment thereof, and manually operated winding means for said motor.
19. A calling device comprising cylindrically disposed relatively stationary sets of impulse teeth, an impulse arm and associated

adjusting member for each set of teeth, impulse contacts adapted to be operated by said arms, a spring motor adapted to rotate said teeth to operate said arms and impulse
5 contacts according to the adjustment thereof, manually operated winding means for said motor, and means to cause an operation of said impulse teeth by said motor rendered effective by the winding operation thereof.
10 20. A calling device comprising cylindrically disposed relatively stationary sets of impulse teeth, an impulse arm for each set of teeth, means for adjusting said arm for

various degrees of operation by their associated impulse teeth, impulse contacts adapted to be operated by said arms, and means
15 for driving said impulse teeth to operate said arms and contacts according to the adjustment thereof.

Signed by me at Chicago, county of Cook
20 and State of Illinois, in the presence of two witnesses.

WILLIAM KAISLING.

Witnesses:

GEORGE E. MUELLER,
M. R. ROCHFORD.