W. F. HOFFMANN.

IMPULSE TRANSMITTER.

APPLICATION FILED MAY 26, 1911.

1,124,021. Patented Jan. 5, 1915.

3 SHEETS—SHEET 1.

Fig. 1.

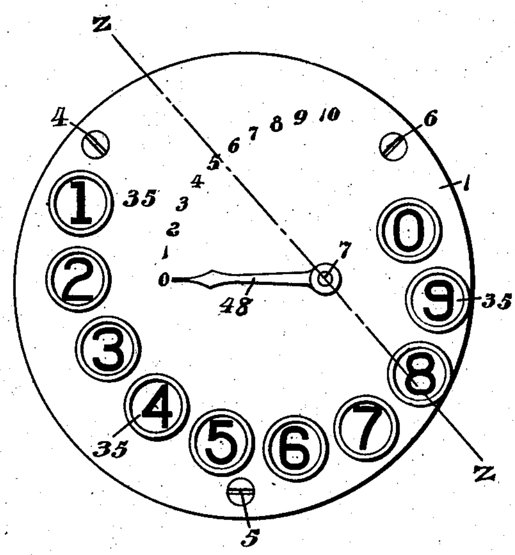
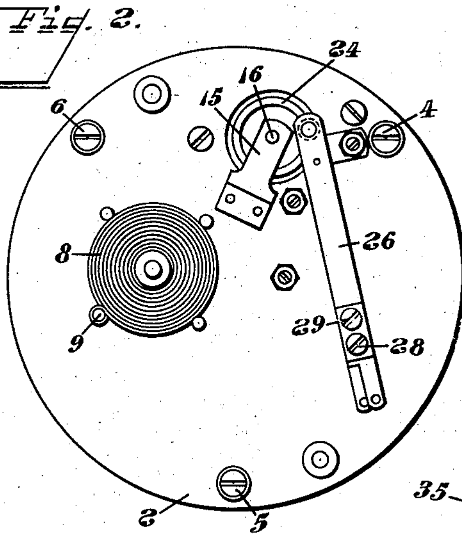


Fig. 2.



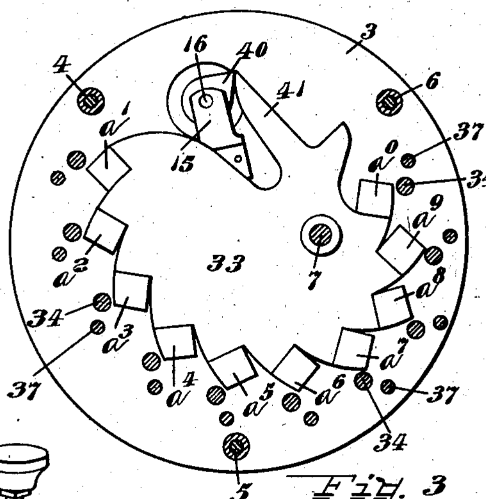
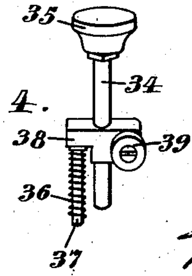


Fig. 3

Fig. 4.



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3 SHEETS—SHEET 2.

Fig. 5.

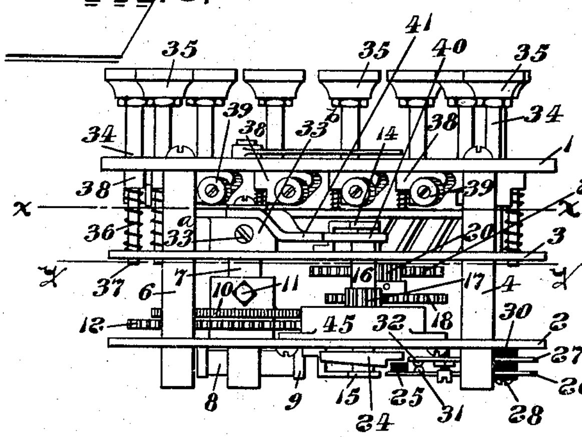
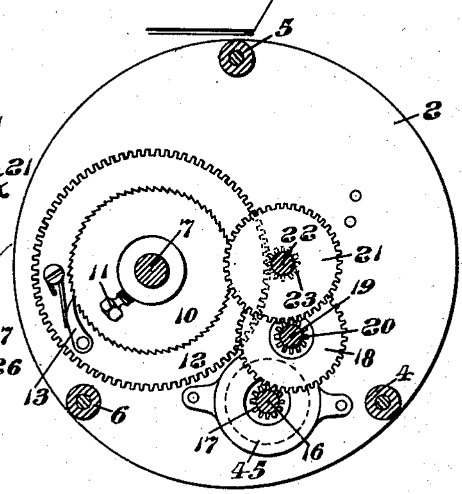


Fig. 6.



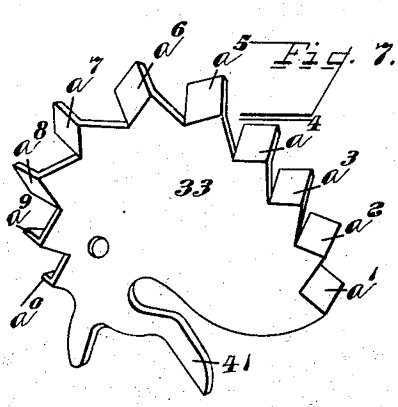
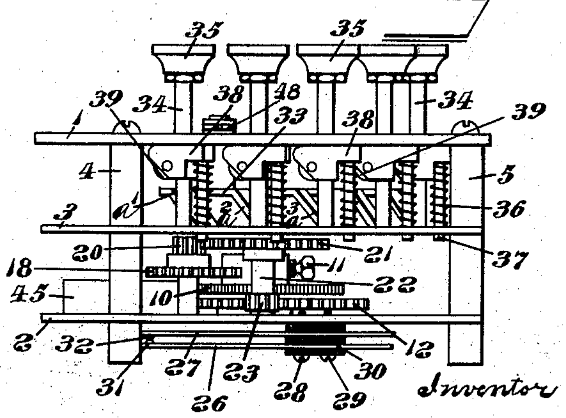


Fig. 8.



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3 SHEETS—SHEET 3.

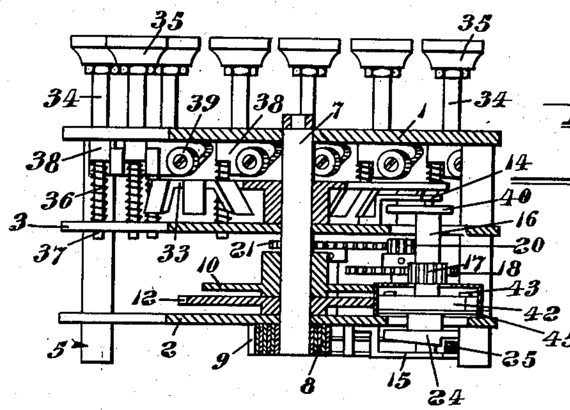


Fig. 9.

Fig. 11.

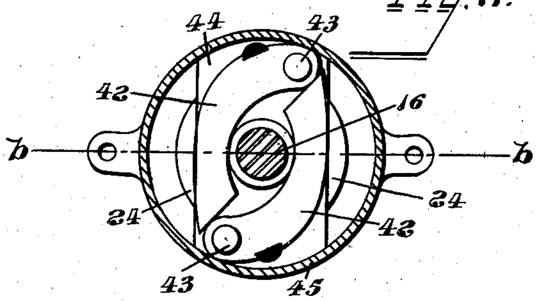


Fig. 10.

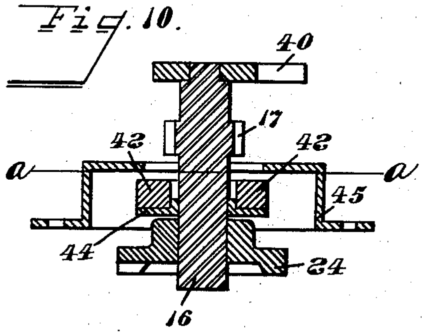
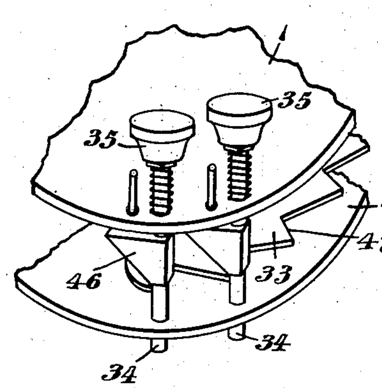


Fig. 12.



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UNITED STATES PATENT OFFICE.

WILLIAM F. HOFFMANN, OF SPRINGFIELD, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTERN ELECTRIC COMPANY, OF NEW YORK, N. Y., A CORPORATION OF ILLINOIS.

IMPULSE-TRANSMITTER.

1,124,021. Specification of Letters Patent. Patented Jan. 5, 1915.

Application filed May 26, 1911. Serial No. 629,581.

To all whom it may concern:

Be it known that I, WILLIAM F. HOFFMANN, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Impulse-Transmitters, of which the following is a specification.

This invention relates to impulse transmitters for electric circuits, and it particularly relates to improvements in calling devices used in connection with automatic telephone systems, although the constructions are likewise applicable to other electrical systems such as fire alarms, telegraph and the like.

The object of the invention is to simplify the construction and make more effective the operation of devices of this character.

The invention consists in the constructions and combinations of parts hereinafter described and set forth in the claims.

In the accompanying drawings: Figure 1 is a top plan view of a device embodying the invention. Fig. 2 is a bottom plan view of the same. Fig. 3 is a section on the line *x*—*x* of Fig. 5. Fig. 4 is a detail view of one of the keys. Fig. 5 is a rear elevation of the device. Fig. 6 is a section on the line *y*—*y* of Fig. 5. Fig. 7 is a detail view in perspective of the graduated operating lever. Fig. 8 is a side elevation of the device looking from the front. Fig. 9 is a vertical section on the line *z*—*z* of Fig. 1. Fig 10 is a vertical section in detail of the governor, the section being on the line *b*—*b* of Fig. 11. Fig. 11 is a transverse section of the governor on the line *a*—*a* of Fig. 10. Fig. 12 is a perspective view of a portion of the mechanism of the manner of transmitting the motion from the operating keys.

Like parts are represented by similar characters of reference in the several views.

In the embodiment of the invention as shown in the drawings, a frame work is provided consisting of an upper and bottom plate 1 and 2 and a central plate 3, circular in form and spaced apart and connected together by posts 4, 5 and 6. Journaled in the frame parts 1, 2 and 3 is a main driving shaft 7, having connected therewith just beneath the bottom plate 2 one end of a coil spring 8, the other end of said spring being fastened to a downwardly projecting pin 9 on said plate 2. Secured to said shaft 7 by a set screw 11 between the plates 2 and 3 is a ratchet wheel 10. Journaled loosely on the shaft 7 is a gear 12, carrying a spring-pressed pawl 13, (Fig. 6) adapted to engage with the teeth of the ratchet wheel 10 so as to cause the gear 12 to revolve in one direction therewith but permit said ratchet wheel to move freely in the opposite direction.

Journaled looselv in bearings 14 and 15 secured respectivelv to the upper side of the frame plate 3 and the lower side of the frame plate 2, is an arbor 16, geared to the main gear 12 through the medium of a pinion 17 on said arbor; gear 18 on a shaft 19 journaled loosely in said frame plates 2 and 3; pinion 20 on said shaft 19; gear 21 on a second shaft 22 also journaled in said frame plates, and a pinion 23 on said shaft 22 meshing with said gear 12; the proportion of the gearing being preferably such that a movement the distance of one notch of said ratchet wheel 10 will impart one complete revolution to the arbor 16.

Secured to the lower end of the arbor 16 just beneath the frame plate 2 is a cam disk 24, the high part of which, upon each revolution of the arbor, is adapted to strike the block 25, of insulating material, on a spring strip 26 which forms one member of the circuit breaker, the other member being stationary and represented by reference character 27. The respective members 26 and 27 of the circuit breaker are secured to the underside of the frame plate 2 by screws 28 and 29, and are spaced apart and from the plate 2 by blocks 30 of insulating material, and are provided at their outer ends with contact points 31 and 32. In the present instance the construction is such that the contacts are normally closed.

Secured to the upper end of the main driving shaft 7, is a main operating arm 33; this arm being fastened to the shaft by the set-screw 33^a which passes through the hub 33^b thereof.

Slidably mounted in the frame parts 1 and 3 are the stems 34 of a series of keys 35, ten in number, each of said keys being held in its normal inoperative position by a spring 36 on a pin 37, projecting from a block 38 on the key-stem 34; said blocks 38 also serving as stops for the keys by contacting the lower side of the top plate 1 so

as to limit the upward movement of said keys. Means are provided for causing the respective keys, when depressed, to impart varying movements to the operating arm 33 and hence to the operating mechanism. The preferred form for accomplishing this is shown in Figs. 3 to 9 inclusive. Located upon the outer edge of the operating arm 33 is a series of ten inclined surfaces or projections a^1, a^2, a^3, a^4, a^5, a^6, a^7, a^8, a^9, and a^0, arranged at varying distances from the center of rotation of said arm, one projection being adapted to coöperate with each key. Journaled on each of the blocks 38 is a friction roller 39 which normally stands just above the inclined projection on the arm 33 corresponding thereto. The inclinations of the respective surfaces are such, having due regard to their distances from the shaft 7, that the depression of the keys will impart varying movements to the arm 33, this movement gradually increasing from the key marked 1 to the key marked 0. The surfaces on the arm are arranged at different inclinations or angles. This has been done for the purpose of incorporating the mechanism into small compass; it being obvious that if the projections were at uniform progressive distances from the center of rotation, the inclinations or angles might all be the same.

In Fig. 12 there is shown a modification of the manner of transmitting the movement of the keys to the operating arm 33. In this modified construction, instead of having graduated projections on the arm 33, the key stems are provided with blocks 46 having inclined surfaces adapted to contact the serrated edge 47 of the arm 33, the inclination of the inclined surfaces of the blocks being suitably graduated so as to cause the depression of the keys to impart varying movements to the operating mechanism in the manner heretofore described in connection with the preferred form of construction.

The mechanism is held in check against the tension of the spring 8 by a detent in the nature of a projection 40 upon the upper end of the arbor 16, which is normally in contact with a stop 41 on the main operating lever 33.

In order to prevent too rapid rotation of the cam there is provided a governing mechanism. This governing mechanism consists of a pair of arms 42 pivoted at 43 to the plate 44 secured to the arbor 16. When the revolution of the arbor exceeds a certain speed these arms will by centrifugal force be thrown into contact with the inner wall of a casing 45 so as to act as a friction brake and thus maintain a uniform speed.

In the operation of the device, the calling subscriber depresses the keys corresponding to the number of the telephone with which he desires to connect. If, for instance, the key 3 is depressed, upon the depression of said key the contact of the friction roller with the projection a^3 will rotate the lever 33, and hence the main driving shaft, a distance corresponding in the present case to the movement of three notches in the ratchet wheel 10. This movement of the operating lever also causes the stop 41 to release the detent 40 so that when the operator releases the depressed key 3 and it returns to its normal position by its spring, the main spring 8 will cause the shaft 7 to rotate back to its normal position. This return movement of the main shaft causes the arbor 16 which carries the cam 24, to be given three complete revolutions through the medium of the train of gearing described, so that said cam will cause the circuit breaker to open and close the circuit three successive times and thus send three successive impulses over the circuit. The stop 41 and detent 40 are so disposed with respect to each other that the revolution of the parts will be checked at the end of the third revolution of the arbor. In like manner now, if the 6 key is next depressed, the inclination and disposition of its projection a^6 is such that the parts will be rotated a distance corresponding to six notches of the ratchet wheel, and cause the cam on the arbor to be given six complete revolutions upon the return movement of the parts, thus sending six impulses over the circuit. After one of the keys 35 has been depressed it will of course be necessary that such key be permitted to return to its normal position before another key is depressed. To insure this, there is provided an index hand 48 (Fig. 1) connected to the upper end of the shaft 7. This index hand normally stands at a zero indication, and as said shaft revolves it will be moved from its normal zero position a distance to correspond to the key depressed and will be returned to the zero indication when the parts are returned to their normal position. It will be seen that the operator by observing this index hand may tell when the parts have been fully returned to their normal position and be in proper condition for the operation of the next key.

Having thus described my invention, I claim:

1. In an impulse transmitter, circuit terminals, operating mechanism therefor comprising a movable member, a series of contact surfaces on said member, and a series of actuating devices each having means cooperating with one only of the surfaces of said movable member whereby said actuating devices will impart varying degrees of movement to said movable member.

2. In an impulse transmitter, circuit terminals, an operating mechanism therefor comprising a movable arm having a series

of projections, and a series of actuating devices each having means coöperating with one only of said projections whereby said actuating devices will impart varying degrees of movement to said movable member.

3. In an impulse transmitter, circuit terminals, operating mechanism therefor comprising a movable member, a series of projections on said member, and a series of actuating devices each having surfaces cooperating with one only of the projections of said movable member whereby said actuating devices will impart varying degrees of movement to said movable member to cause said circuit terminals to be closed a number of times corresponding to the actuating device operated.

4. In an impulse transmitter, the combination with the circuit terminals, of a spring operated shaft, an operating arm connected with said shaft, a series of inclined surfaces associated therewith, a cam operatively connected with said shaft and coöperating with said terminals, and a series of actuating devices each having means to coöperate with one only of said surfaces whereby said cam is given a varying movement determined by the actuating device operated.

5. In an impulse transmitter, the combination, with the circuit terminals, of a spring actuated shaft, an operating arm connected to said shaft, a rotatable cam geared to said shaft and coöperating with said circuit terminals, the proportion of the gearing being such that a partial rotation of said shaft imparts one or more complete revolutions to said cam; and a series of actuating devices coöperating with said arm for imparting varying rotary movements to said shaft whereby said cam is given a varying number of complete revolutions determined by the actuating device operated.

6. In an impulse transmitter, the combination, with the circuit terminals, of a rotatable shaft, a rotatable cam geared to said shaft so as to rotate therewith in one direction only and coöperating with said circuit terminals, the proportion of the gearing being such that partial rotation of said shaft will impart one or more complete revolutions to said cam, an arm connected with said shaft, a series of actuating devices cooperating with said arm to impart varying rotary movements to said shaft, and a spring for returning said shaft to normal position, substantially as specified.

7. In an impulse transmitter, a rotatable shaft, a rotatable spindle geared to said shaft so as to rotate therewith in one direction only, the proportion of the gearing being such that a partial movement of said shaft will impart one or more complete revolutions to said spindle, circuit terminals, a cam on said spindle coöperating with said terminals, an arm on said shaft, a series of actuating devices coöperating with said arm to impart varying partial movements to said shaft, a spring for returning said shaft to normal position, and projections on said arm and spindle coöperating with each other to arrest the movements of said parts, substantially as specified.

8. In an impulse transmitter, the combination, with the circuit terminals, of operating mechanism coöperating with said terminals, said operating mechanism comprising a movable arm having a series of contact surfaces, and a series of actuating devices also having a series of contact surfaces each coöperating with one only of the contact surfaces of said arm, so arranged as to cause said actuating devices to impart varying movements to said arm whereby said terminals are opened and closed a varying number of times determined by the actuating device operated.

9. In an impulse transmitter, the combination, with the circuit terminals, of an operating mechanism coöperating with said terminals, said operating mechanism comprising a movable arm having a series of contact surfaces, a series of actuating devices also having a series of contact surfaces each coöperating with one only of the contact surfaces of said arm, one series of contact surfaces being graduated so as to cause said actuating devices to impart varying movements to said arm whereby said circuit terminals will be opened and closed a varying number of times determined by the actuating device operated.

10. In an impulse transmitter, the combination, with the circuit terminals, of an operating mechanism coöperating with said terminals, said operating mechanism comprising a movable arm having a series of contact surfaces, a series of actuating devices arranged at right-angles to said arm also having a series of contact surfaces coöperating with the contact surfaces of said arm and arranged to impart varying movements to said arm, and means for returning said arm to normal position.

11. In an impulse transmitter, the combination, with the circuit terminals, of an operating mechanism coöperating with said terminals, said operating mechanism comprising a rotatable arm having a series of inclined projections arranged at varying distances from the center of rotation of said arm, and a series of actuating devices having contact surfaces coöperating with said inclined projections, substantially as specified.

12. In an impulse transmitter, the combination, with the circuit terminals, of an operating mechanism coöperating with said terminals, said operating mechanism com-

prising a rotatable arm having a series of contact surfaces arranged at varying distances from the center of rotation of said arm, a series of spring-pressed keys arranged at right-angles to said arm, one key for each contact surface, and a contact surface on each of said keys coöperating with its corresponding contact surface on said arm whereby upon the depression of any key said arm will be moved a distance corresponding to the key operated, and means for returning said arm to normal position.

13. In an impulse transmitter, the combination with the circuit terminals, of an operating mechanism coöperating with said terminals, said operating mechanism comprising a rotatable arm having a series of contact surfaces, arranged at varying distances from the center of rotation of said arm, a series of spring-pressed keys arranged at right-angles to said arm, one key for each contact surface, each of said keys having a friction roller adapted to coöperate with its corresponding contact surface when said key is depressed so as to move said arm a distance determined by the position of said contact surface, and means for returning said arm to normal position.

14. In an impulse transmitter, the combination, with the circuit terminals, of an operating mechanism coöperating with said terminals to open and close the same, a series of actuating devices coöperating with said operating mechanism to cause the same to be moved varying distances to open and close said terminals a varying number of times determined by the operated actuating device, means for returning said operating mechanism to normal position, and an indicator for indicating the position of said mechanism, substantially as specified.

15. In an impulse transmitter, a supporting plate, circuit terminals, operating mechanism therefor comprising a movable plate substantially parallel to said supporting plate, a series of push buttons having shanks passing through said supporting plate, and operable connections between said buttons and said movable plate whereby the depression of said buttons will impart varying degrees of movement to said movable plate according to the button depressed.

16. In an impulse transmitter, a pair of supporting plates, circuit terminals, operating mechanism therefor comprising a movable plate substantially parallel to said supporting plates, a series of push buttons having shanks passing through said supporting plates, and operable connections between said buttons and said movable plate whereby the depression of said buttons will impart varying degrees of movement to said movable plate according to the button depressed.

17. In an impulse transmitter, a supporting disk, circuit terminals, operating mechanism therefor comprising a movable plate substantially parallel to said supporting disk, a series of push buttons circularly arranged adjacent to the circumference of said supporting disk and having shanks passing therethrough, and operable connections between said buttons and said movable plate whereby the depression of said buttons will impart varying degrees of movement to said movable plate according to the button depressed.

18. In an impulse transmitter, a supporting plate, circuit terminals, operating mechanism therefor, a series of contact surfaces associated therewith, a series of push buttons having shanks passing through said plate, and connections between each of said buttons and one only of said contact surfaces whereby the depression of said buttons will variously actuate said mechanism to cause said circuit terminals to be closed a number of times corresponding to the button depressed.

19. In an impulse transmitter, a supporting disk, circuit terminals, operating mechanism therefor, a series of push buttons arranged adjacent to the circumference of said disk and having shanks passing therethrough, and connections between said buttons and said operating mechanism whereby the depression of said buttons will variously actuate said mechanism to cause said circuit terminals to be closed a number of times corresponding to the button depressed.

In testimony whereof, I have hereunto set my hand this 8th day of May 1911.

WILLIAM F. HOFFMANN.

Witnesses:
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ELSA K. SMITH.