No. 885,915. PATENTED APR. 28, 1908.

C. J. ERICKSON.

BUSY SIGNAL APPARATUS.

APPLICATION FILED NOV. 12, 1906.

2 SHEETS—SHEET 1.

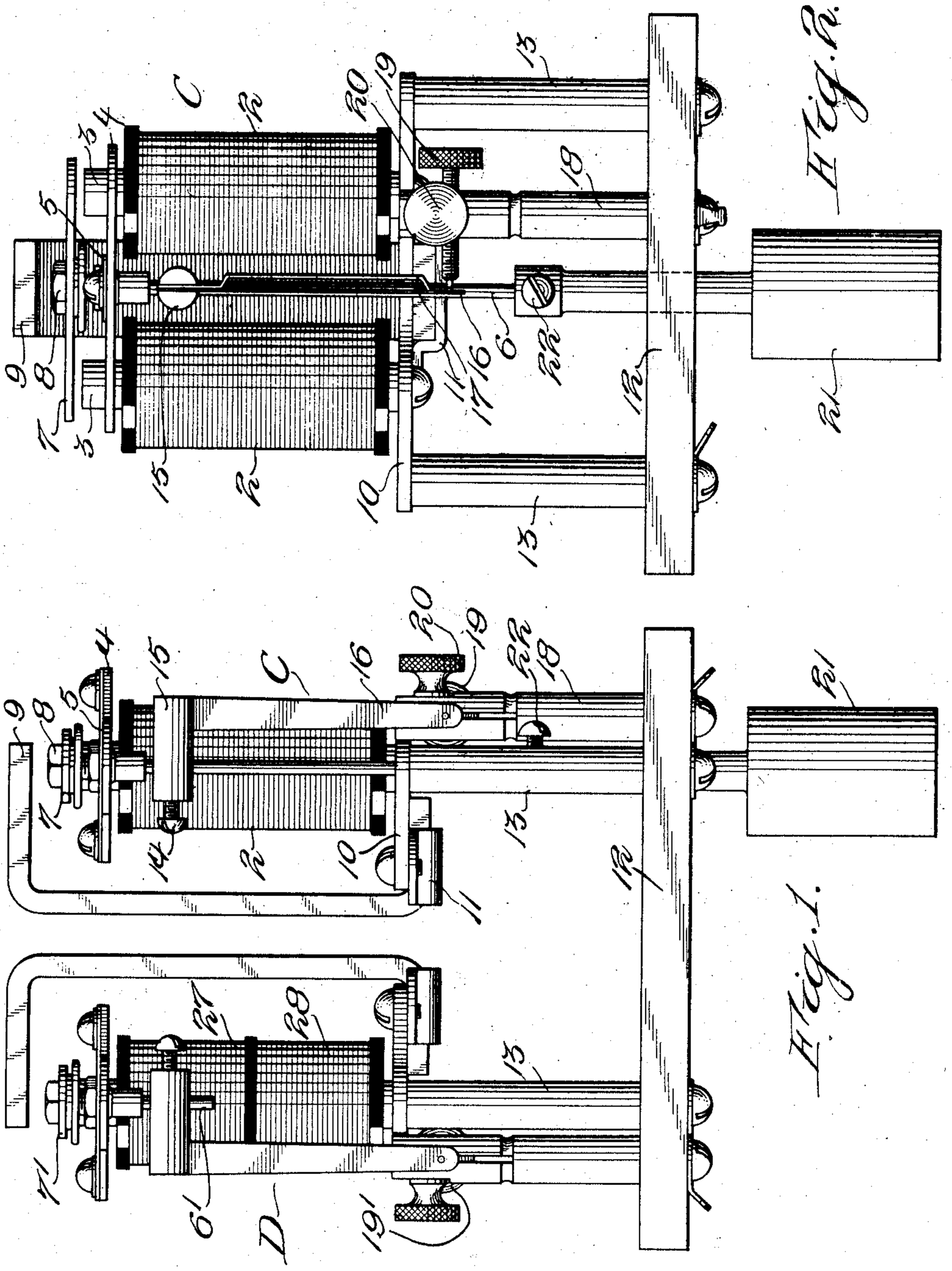

Fig. 1.

Witnesses.
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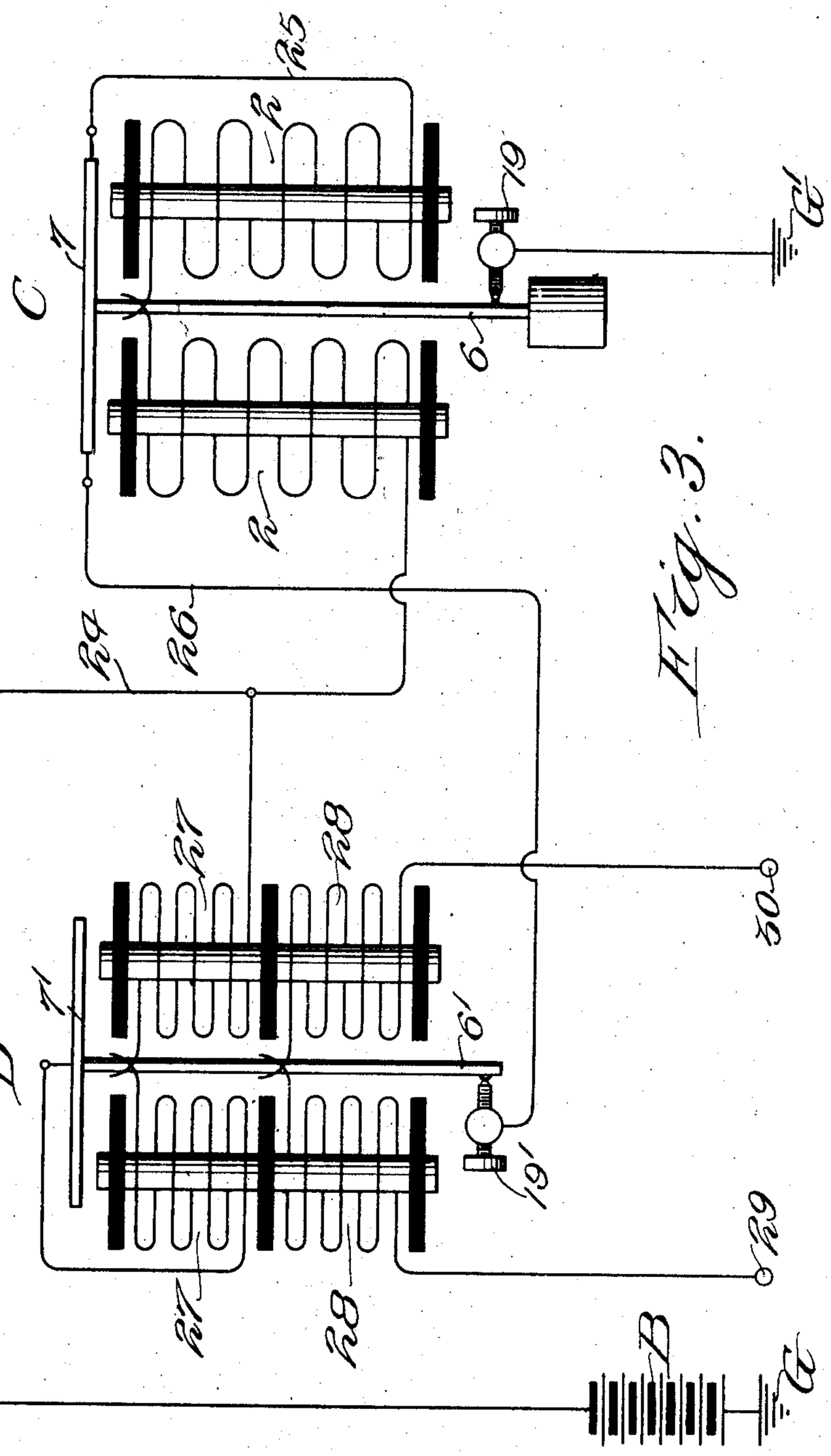

Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES J. ERICKSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

BUSY-SIGNAL APPARATUS.

No. 885,915. Specification of Letters Patent. Patented April 28, 1908.

Application filed November 12, 1906. Serial No. 343,029.

To all whom it may concern:

Be it known that I, CHARLES J. ERICKSON, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Busy-Signal Apparatus, of which the following is a specification.

My invention contemplates the combination of a plurality of current-interrupters of different rates or periods of vibration, for producing an interrupted high frequency alternating current suitable for use in giving signals, such as the busy signals in a telephone exchange system, or for any other purpose.

In the accompanying drawings, my improved busy signaling device, as shown in Figure 1, comprises two polarized magnets C and D, such as are used for harmonic ringers. In this view one coil of each magnet is removed to more clearly show the different parts. In Fig. 2 is shown a front elevation of the magnet C. Fig. 3 shows diagrammatically the magnet coils and circuit connections of my busy signaling apparatus.

The magnets may be of any suitable type. For instance, the magnet C shown in Fig. 2 comprises the coils 2 having the cores 3 supporting the yoke 4. Upon the yoke 4 is secured the spring 5 to which the pendulum rod 6 is fastened. Upon the end of the said pendulum rod is secured the armature 7, by means of the nut 8. The permanent magnet 9, as well as the coils 2, are secured to the frame 10, the former by means of the yoke 11. The frame 10 is mounted upon the base 12 by means of the posts 13. In addition the magnet C has secured to the pendulum 6, by means of the screw 14, a bracket or arm 15, which latter clamps the springs 16 and 17. The spring 17 is provided for stiffening or reinforcing the spring 16. The post 18 is provided for supporting the contact screw 19, which latter may be locked or clamped by the screw 20. The post 18 with the screw 19 and the springs 16 and 17 are so relatively adjusted that when the pendulum swings to the left (Fig. 2) the spring 17 bears against the spring 16 and carries the latter out of engagement with the post 19. When the pendulum swings to the right the spring 16 engages the screw 19, while the reinforcing spring 17 is carried out of engagement with the spring 16. Furthermore, the pendulum rod 6 is provided with the weight 21, which may be adjusted by means of the screw 22 up or down the pendulum rod 6, whereby the period of vibration of the said pendulum may be varied. The magnet D is like the magnet C, except that the pendulum rod 6′ of the former is shorter and is not provided with a weight. The pendulum of the magnet C may be so adjusted that its period of vibration is two strokes per second, and the pendulum of the magnet D being very light its period of vibration is very high, like that of the armature of a buzzer.

The operation of the busy signaling apparatus may be more clearly understood by referring to Fig. 3 where the different coils are shown with their proper connections. When the switch 23 is closed the battery B is connected to the battery lead 24, thereby closing an energizing circuit through the magnet D and also through the magnet C. This energizing circuit for the magnet C extends from ground G′, contact screw 19 to the pendulum rod 6, armature 7 to the conductor 25, through the coils 2 in series to the battery lead 24, switch 23, thence through battery B and to ground G. The energizing circuit through the magnet D extends from ground G′, contact screw 19, pendulum rod 6, armature 7, conductor 26, contact screw 19′ of the magnet D, pendulum 6′, armature 7′, through the windings 27 to the battery lead 24, switch 23, through the battery B and to ground G. The magnet C upon energization operates its polarized armature 7 in such a manner that the pendulum rod 6 is carried out of engagement with the contact screw 19, thereby breaking the energizing circuit through the magnets C and D. The pendulum rod then swings back to its normal position in engagement with the contact screw 19, and again the energizing circuit is established with the same result.

On referring to Fig. 2 it will be seen that when the pendulum swings to the left, and the stiffening spring 17 carries the spring 16 out of engagement with the contact screw 19, the energizing circuit of the said magnet C is broken. Now when the pendulum on its return stroke reaches the position it occupies when at rest, the spring 16 again engages the contact screw 19, but the pendulum, due to its momentum, swings past its normal position to the right; therefore, while the pendulum passes through one complete vibration, the spring 16 is in contact

with the screw 19 for a considerable time—that is, while the pendulum passes from its normal position to the right and back again. The magnet D, of course, energizes when the pendulum 6 is in contact with the screw 19, whenever the switch 23 is closed. The armature 7′ is operated when the pendulum rod 6′ is carried out of engagement with the screw 19′, thus breaking the energizing circuit through the said magnet D—that is, through the windings 27. Again the pendulum rod 6′ returns to engagement with the contact screw 19, again establishing the energizing circuit, as previously explained. The pendulum rod 6′ is very light in weight, and accordingly the vibrations of the rod 6′ are very fast and quite similar to that of a buzzer. This buzzer action of the magnet D continues as long as the pendulum rod 6 is in contact with the screw 19, which completes the energizing circuit through the windings 27 of the magnet D, as explained. Obviously, then, from the foregoing, the energizing circuit of the windings 27 is intermittently opened by the magnet C. Hence the magnet D is caused to operate intermittently. Furthermore on the same cores with the windings 27 are the secondary windings 28. Therefore, while the magnet D is operating an alternating current is induced in the windings 28. From the terminals 29 and 30 of the secondary windings 28 the secondary current may be taken for any desired signaling purpose.

It is evident from the foregoing that the magnet C with its slow oscillating pendulum serves as a circuit-breaker for the magnet D which, when the circuit is closed by the magnet C, vibrates rapidly. The interruptions of the current in the windings 27 induces in the secondary windings 28 a current which is ordinarily known as a busy signaling current, as it is used in telephone systems for giving the busy signal to calling subscribers.

It will be evident that this signaling device may be used in connection with the connector disclosed in United States Patent No. 815,176, granted March 13, 1906, to Keith, Erickson & Erickson for supplying busy signaling current to signal the calling subscriber when a called line is busy.

The magnet coils may be wound to any suitable resistance, but with a central battery of fifty volts good results have been obtained when the windings 27 are wound to a resistance of three hundred and fifty ohms each; the windings 28 to a resistance of twenty-four ohms each; and the windings 2 of the magnet C to a resistance of twelve hundred ohms each.

From the foregoing it will be seen that I employ a plurality of current interrupters of different rates or periods of vibration for producing an interrupted high frequency alternating current suitable for giving signals. One buzzer or interrupter gives a rapid vibration to the current, and this current is then given a regular and moderate or relatively slow interruption by another buzzer or interrupter. The result, of course, is an interrupted high frequency current in the secondary 28 of the inductive connection or transformer. I find this arrangement exceedingly efficient and satisfactory in use.

What I claim as my invention is:—

1. An interrupter or buzzer for producing an interrupted current of a relative high rate of vibration, and a second interrupter or buzzer for interrupting the said current at a relatively low rate of vibration.

2. The combination of an interrupter or buzzer of a relatively high rate of vibration, another interrupter or buzzer of a relatively low rate of vibration, and means by which the two interrupters coöperate to produce an interrupted high frequency alternating current.

3. An interrupter or buzzer, a second interrupter or buzzer, circuits for said interrupters or buzzers, and means by which the second buzzer interrupts the current of both circuits.

4. A plurality of current interrupters or buzzers of different rates or periods of vibration, and means by which one buzzer interrupts the current of another.

5. In an apparatus of the character set forth, the combination of a primary winding, a secondary winding, means for producing a vibratory current in the primary, and means for interrupting the vibratory current of the primary, to produce a pulsating alternating current in the secondary.

6. In a device of the class disclosed, means for producing a vibratory current, and a buzzer provided with interrupter contacts included in the path of said current, said buzzer being timed for a rate of vibration different from that of said current.

7. In a device of the class disclosed, a buzzer provided with interrupter contacts included in a plurality of parallel circuits.

8. In a device of the class disclosed, a buzzer having a rate of vibration slower than that of the current which passes through its interrupter contacts, as set forth.

Signed by me at Chicago, Cook county, Illinois, this 7th day of November, 1906.

CHARLES J. ERICKSON.

Witnesses:

EDWARD D. FALES,
JOHN ERICKSON.