

(No Model.)

2 Sheets—Sheet 1.

F. B. HERZOG & S. S. WHEELER.

ELECTRIC SIGNALING APPARATUS.

No. 573,591.

Patented Dec. 22, 1896.

Fig. 1,

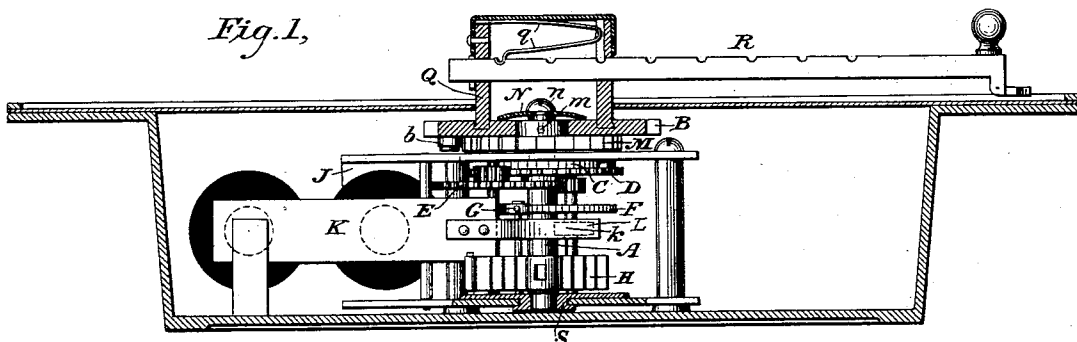
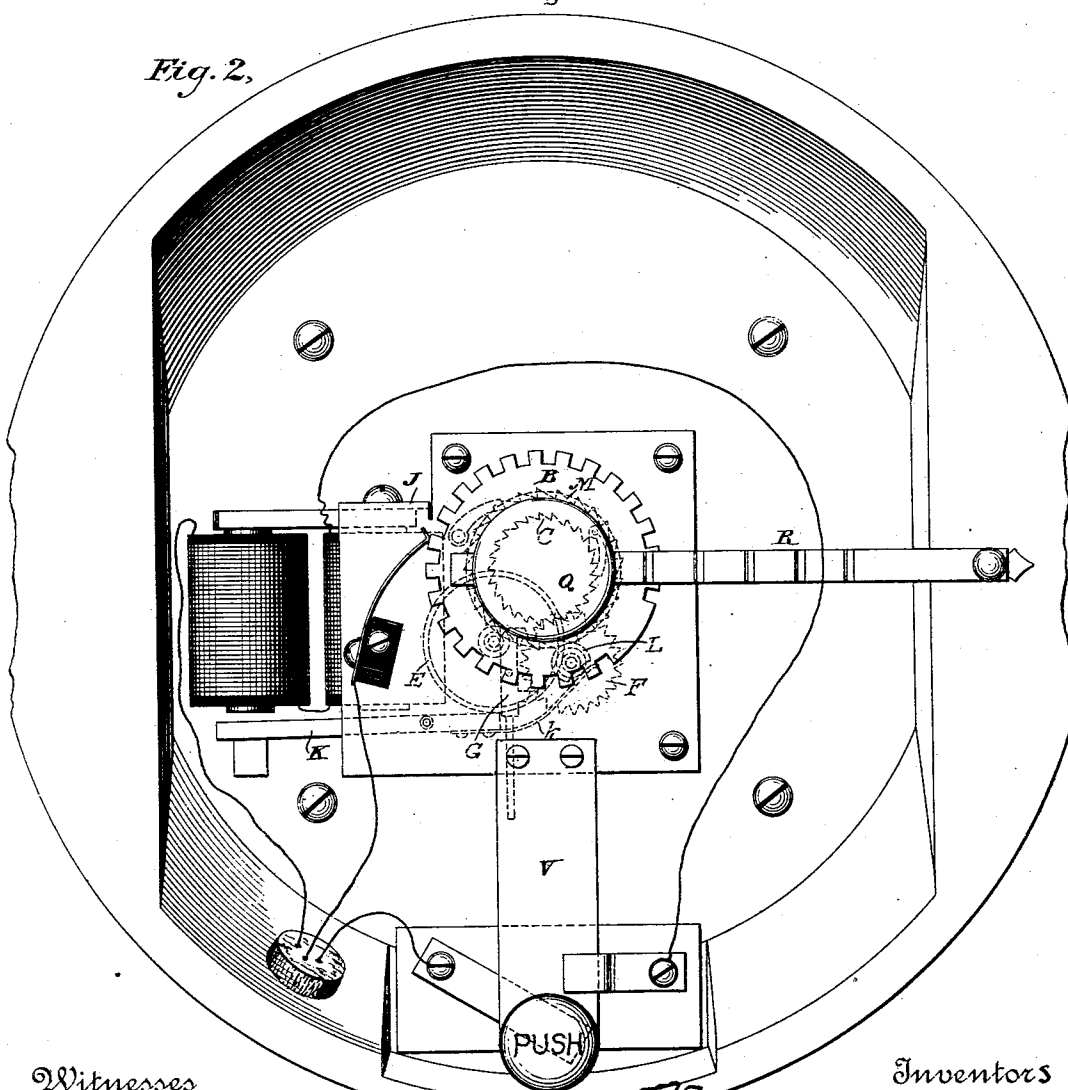


Fig. 2,



Witnesses
William D. Dugan
Frank J. Demarist

Inventors
F. Benedict Herzog & S. S. Wheeler
By their Attorneys
Curtis & Crocker

UNITED STATES PATENT OFFICE.

FELIX BENEDICT HERZOG AND SCHUYLER S. WHEELER, OF NEW YORK,
N. Y., ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE HERZOG ELECTRIC
APPLIANCE COMPANY, OF NEW YORK.

ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 573,591, dated December 22, 1896.

Application filed March 12, 1885. Serial No. 158,530. (No model.)

To all whom it may concern:

Be it known that we, FELIX BENEDICT HERZOG and SCHUYLER S. WHEELER, citizens of the United States, residing in the city of New York, State of New York, have invented new and useful Improvements in Electric Signaling Apparatus, Circuits, and Methods, of which the following is a specification.

Letters Patent No. 289,834, issued to said Herzog December 11, 1883, describe an automatic signaling apparatus applicable to many different uses, such as telephone-exchange systems, district-telegraph and private circuits, hotel service, &c., the principal feature of which is that the instrument may be properly set by a person desiring to signal to a distant point, and is so constructed that the desired signal is not sent at the moment of setting the instrument, (as is the case in instruments of the kind known as "transmitters,") but the apparatus retains the signal as set until it is released or caused to operate, directly or indirectly, by the person who is to receive the signal, at a time when he is ready to receive it, whereupon the signal is automatically transmitted to such receiver without further action on the part of the sender. These instruments, being capable of being set so as to transmit different signals or combinations of signals, enable the sender to convey any desired information, within certain limits, to the receiver, the time of receiving such signal, however, being entirely under the control of the receiver after the signal has been properly set by the sender. In this and other pending and future applications such instruments are called "latent-signal transmitters," for the reason that when set to signal they remain inoperative and hold the signal until they are caused to operate from the receiving-station. Letters Patent No. 292,115, dated January 15, 1885, issued to said Herzog, show another type of the latent-signal transmitter. This differs from the first in that the signal is caused to operate positively by an electromagnetic motor instead of negatively by the release of a spring-actuated train, as described in the first-mentioned patent. There is also described and claimed in the patent of December 11, 1883,

a form of transmitting instrument which is constructed to transmit successively two signals or groups of impulses, each of which is separately variable, with a dividing-signal between the two, and this instrument is provided with two hands or setting devices, one of which can be set to determine the first signal transmitted and the other of which can be separately set to determine the second signal transmitted, the information or call being thus transmitted by different combinations of these two signals, to each of which may be attached a certain conventional meaning.

A pending application filed by F. Benedict Herzog November 20, 1884, and divided and the division filed again on March 7, 1885, describes and claims a signaling apparatus provided with a dial bearing several different sets or groups of indications arranged in substantially radial and concentric lines cooperating with an indicator, which indicates an entire row or group instead of a single indication, as is customary in signal-transmitters. Additional means are provided whereby the receiving operator is made aware of the particular indication desired.

Our present invention relates partly to improvements on the above-mentioned apparatus; and it consists, first, in combining with a compound or double-signal transmitter such as described in Herzog's patent, No. 289,834, of December 11, 1883, (whether of the spring-actuated latent-signal-transmitter type therein described, or whether of the magnetic motor-actuated form shown by him in Patent No. 292,115 of January 15, 1884, or of the ordinary spring-actuated-transmitter type,) a new form of multiple dial or designator resembling the one referred to above, which is provided with several rows or sets of indications or calls and a common pointer so arranged that one of the signals or part of the compound signal automatically transmitted indicates which row is being employed and the other signal or part transmitted indicates the particular indication of the row selected, thus greatly increasing the transmitting capacity of the instrument without lengthening the signals transmitted and at the same time greatly facilitating the operation; sec-

only, in a new form of setting device for instruments transmitting more than one separately-variable signal at each transmission, whereby the act of setting a single movable pointer at the proper want or division determines the different signals transmitted, thereby dispensing with the necessity for setting a second pointer; thirdly, in providing a latent-signal transmitter with means whereby when the pointer has been moved too far in one direction it can be moved back by simply reversing its motion without the necessity of pushing a distinct button or releasing device, as was the case with the forms described in my before-mentioned patent; fourthly, in certain details of construction, organization, and methods hereinafter described.

In the drawings, Figure 1 is a view looking upward of the instrument, of which Fig. 2 is a front view showing its face or dial removed. Fig. 3 is a view of the dial. Fig. 4 is a front view of a detail of the train of gearing as in Fig. 2, with the front frame-plate removed. Fig. 5 is a modified form of the setting arm or pointer.

The transmitter is fixed in the center of a box or case, which we prefer to have shaped as shown, and may conveniently be made of cast-iron. The transmitter-train is of the usual construction, consisting of a main arbor A, carrying the break-wheel B and ratchet-disk C, rigidly attached to it, and a loose gear-wheel D, carrying a pawl which engages the ratchet. The arbor A is driven by the coiled spring H. (Shown in section.) The gear-wheel D gears with the pinion and gear E, which drives the escapement-wheel F, controlled by the anchor G.

In order to control the transmitter by an electro magnet, as described in the previous patent referred to, we fix within the case an electro magnet. The armature K is pivoted on an arbor turning in the train-frame, and is placed so that its other end blocks the escapement-anchor G when the armature is back, as indicated in the drawings. The armature drops and stays back by its own weight, but when drawn up by the electro magnet its other end is depressed sufficiently to clear the anchor and allow it to vibrate.

The armature K carries a finger or projection *k*, which bears upon a drum or disk L on the arbor of the escapement-wheel, and a segment of this drum is cut away on one side to allow the finger to move nearer the arbor and the armature thus to drop back, in which case it occupies the position shown. The break-wheel B is provided with twenty-three teeth and the train of gearing is so arranged by proportioning the teeth that the drum L makes one turn every time the break-wheel advances one tooth and occupies the position shown, so as to present its recess and not to support the armature when each tooth of the break-wheel is in electrical contact with the spring. Consequently the drum L acts to support the armature mechanically during the

breaks in the circuit while the notches are passing under the spring, at which time the armature would otherwise drop; but it allows the armature to drop back and thus lock the escapement whenever one of the notches is in contact with the spring. During the signal, therefore, the armature remains up unless the circuit is broken by some other means than the break-wheel.

The break-wheel B is not rigidly attached to the arbor A, but it is fitted to turn freely upon it, and carries a pawl *b*, which engages with a ratchet M, attached to the spindle by a pin *m* passing through its hub. The break-wheel B is held in place against the ratchet M by a spring-washer N, held in place by a screw *n* in the end of the arbor. A circular head or tube Q is fixed to the break-wheel, as shown, and is provided with a cap and is slotted on both sides to receive an arm R, which slides radially through this head and tends to spring into or remain in a series of positions by means of the notches in the arm and the spring *q*, fixed in the head.

The teeth of the ratchet M are inclined and shaped so that when the arm carrying with it the head is turned backward the pawl *b* trips over its teeth and does not carry with it the arbor A, so that this construction permits the arm, and with it the break-wheel, to be set back at any time by simply turning the arm, in case it has been set at a wrong signal or it is desired to unset the instrument, so as not to have it transmit any signal at all. When, however, the arm is set forward, the pawl *b* carries with it the ratchet M, turning the spindle and winding up the spring H to that extent. It is to be observed that when the operator sets back the arm it does not unwind the spring, but when he turns it forward again in setting the instrument it winds the spring still farther, so that ultimately, if he continues to set back the hand, the spring H will become entirely wound up. When this has occurred, and to prevent this fact from interfering with the setting of the instrument, we attach the fixed end of the spring H to the disk or flat sleeve S, which fits tightly in the rear plate, but is nevertheless made loose enough to be carried around by the spring when it is completely wound up in setting the hand. Unless the instrument is frequently set back this sleeve S will slip but very little, and consequently it will not wear loose, because every time the instrument sends its signal after being set the spring unwinds to the same extent that it was wound up in the act of setting.

Screwed to the front of the box is a dial, (represented in Fig. 3,) over which sweeps the setting-arm R. Upon this dial are formed in concentric and radial rows the indications or wants for persons using the instrument, and each concentric circle of wants corresponds to one of the notches in the arm R, so that when the pointer carried by this arm stands at one of the wants the arm is set so

that the spring *q* has fallen into one of its notches, as represented. The circular frame T, which holds the dial in place, we prefer to have formed in the form shown, with a series of steps or obstructions *t t t*, lying directly in the path of the arm R and placed in such positions that they arrest the arm R at successive divisions of the signal.

The operation of our instrument will now be understood. Suppose it is desired to call for "cough-cure," for example. The arm R is turned and at the same time moved lengthwise radially by the knob till the pointer stands at "cough-cure," as shown. This sets the break-wheel in the position shown, the break-wheel being so adjusted on the arbor that one of its teeth is directly under the break-spring whenever the pointer is set in any of the radial lines of signals, and the number of teeth of the break-wheel of course agreeing with the number of radial groups of signals. The instrument being thus set, when it is released from another point by the electromagnet at the will of the receiving-operator there it unwinds and as the arm sweeps over the signals on the dial transmits a succession of impulses corresponding to the radial division at which the arm was set. This signal is then followed by an interval produced by the blank in the break-wheel shown, and as the instrument continues unwinding the break-wheel transmits a second series of impulses until the arm R fetches up against one of the stopping-points *t t*, which stops the instrument, and in this particular case the second signal would consist of a single impulse, thus denoting that the pointer had been set at one of the outer circles of indications or wants. By this construction the instrument first transmits a signal corresponding to the whole group of the wants, at one of which it has been set, and then a signal corresponding to some particular one of that group, thus denoting and informing the receiver by the combination of the two signals the particular indication or want intended by the person calling. We have shown our instrument with its dial constructed to transmit thirteen radial sets of calls or wants, each composed of eight separate calls, but it may evidently be made to transmit any desired number, either more or less, by continuing the two signals or parts of the signal in the same general way, and the dial may of course be marked or divided and arranged in many different ways for this purpose.

Of course the instrument may be used for other purposes. We have described the above invention as a typical embodiment, but we wish it distinctly understood that almost all of the elements described can be materially changed without departing from the spirit of the invention.

In order to make our claims more clear, we wish to explain the meaning of some of the terms used therein. "Signal-changer" is the element which changes the character of the

signal to be transmitted, whether the signal is to be transmitted immediately after operation or requires some other coöperation from a station other than the sending-station. "Signal-designator" is a device whereby the sending-operator perceives what the signal is which he is sending. In the present apparatus the sliding arm is an important factor in both of the heretofore-described elements, but other forms of apparatus have been invented by us as well as by Herzog alone, in which there is not this direct connection between the material elements which perform or coöperate in the performance of these functions. The "signal-divider" acts to divide the total number of impulses into two series, and in the embodiment shown does this by lengthening the closure of the circuit at a fixed stage in the revolution of the wheel, which, in the present embodiment, is the main feature of the "signal-transmitting mechanism." Each of the above elements, as well as the circuits external to the box and those within the box and the other adjunctive elements, may be widely varied without departing from our invention.

We claim—

1. The combination, in signaling apparatus, of a transmitter; a signal-changer; together with a signal-designator, consisting of an indicating surface or "field," bearing indications grouped in two substantially intersecting directions, coöperating with an indicator, one of these movable with respect to the other in such manner as to designate any desired indication; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

2. The combination, in signaling apparatus, of a transmitter; a signal-changer; together with a signal-designator, consisting of a fixed dial bearing indications arranged in groups or series of two directions, one radial and the other at an angle, to the first, and an indicator radially and concentrically movable, in such manner as to designate any indication; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

3. The combination, in signaling instrument, of a transmitter; a signal-changer; together with a signal-designator, consisting of a dial bearing groups or series of indications arranged in two directions, the one radial and the other circumferential, and an indicator movable in such manner as to designate any indication; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

4. The combination, in signaling instrument, of a transmitter; a signal-changer; together with a signal-designator, consisting of a dial bearing groups or series of indications arranged in parallel rows, and an indicator movable in such manner as to designate any

indication; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

5 5. The combination, in signaling apparatus, of a transmitter; a signal-changer; together with a signal-designator, consisting of a dial bearing coordinately arranged groups of indications arranged in radial and circumferential directions, and an indicator radially and concentrically movable in such manner as to designate an indication corresponding to the signal to be transmitted; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

6. The combination, in signaling apparatus, of a transmitter; a signal-changer, consisting of a traveler and controlling the transmitter; a stopping device comprising fixed stopping-points in the path of travel, and means whereby the traveler is engaged by one of these at a predetermined one of several stages of its movement, thereby controlling the signal, substantially as described.

7. The combination, in signaling apparatus, of a transmitter; a signal-changer, consisting of a traveler actuated by a motor, and controlling the transmitter, a stopping device comprising a series of fixed stopping-points in the path of travel, together with regulating devices whereby said traveler can be set so as to be stopped at any one of the stops, thereby controlling the signal, substantially as described.

8. The combination, in signaling apparatus, of a transmitter; and a signal-changer, consisting of a traveler actuated by a motor and controlling the transmitter, a stopping device comprising a series of fixed stopping-points in the path of travel and at different radial distances from a common center, and regulating devices whereby said traveler can be set so as to be stopped by any desired one of the stopping-points, thereby controlling the signal, substantially as described.

9. The combination, in signaling apparatus, of a transmitter and a signal-changer, consisting of a traveler actuated by and adjustable with reference to a central spindle and controlling the transmitter; a stopping device comprising a series of fixed stopping-points in the path of travel, and in different radii of a circle drawn around the central spindle, substantially as described.

10. The combination, in signaling apparatus, of a transmitter and a signal-changer, consisting of a traveler actuated by a motor and controlling the transmitter, and a stopping device comprising a series of fixed stopping-points in the path of travel and at different radial distances from a common center, and also in different radii of a circle drawn around said center; together with regulating devices whereby said traveler can be set so as to be

stopped at any one of the stops, thereby controlling the signal substantially as described.

11. The combination, in signaling apparatus, of a transmitter and a signal-changer, consisting of a rotating and radially-movable traveler actuated by a motor and controlling the transmitter; a stopping device comprising a series of fixed stopping-points in the path of travel, and means whereby the said traveler can be adjusted so as to be stopped at any one of these, and thereby limit its circular motion, substantially as described.

12. The combination, in signaling apparatus, of a transmitter, comprising a circuit-controlling wheel constructed to advance a certain number of steps before it reaches a signal-dividing point and another set thereafter; and a signal-changer, comprising an arm moving with respect to the wheel and controlling it, and adjustable to different radial positions which determine a first signal transmitted; and two or more fixed stops arranged at different points in the path of the arm as it revolves; together with a projection on said arm which engages with any desired one of the points and limits the revolution of the circuit-wheel and determines the second signal, substantially as described.

13. The combination, in signaling apparatus, of a transmitter, comprising a circuit-wheel carried by a spindle; and a signal-changer, comprising a crank for turning said spindle and wheel to different positions; an arrester for limiting the revolution of the crank and spindle, and a projection on the crank radially movable with respect to the spindle and adapted to engage with the arrester at different points, thereby limiting the movement of the spindle and wheel, substantially as described.

14. The combination, in signaling apparatus, of a transmitter; a revolving spindle; an arm controlling its revolution and also moving with respect to it; and two or more fixed stopping-points constructed to severally engage said arm during its revolution, and means for determining the engaging-point by the position of the arm, substantially as described.

15. The combination, in signaling apparatus, of a transmitter, comprising a revolving spindle carrying a circuit-wheel; and a signal-changing mechanism, comprising an arm moving with respect to the head of the spindle and provided with position-holding devices, together with two or more fixed stops, respectively engaging said arm according to its position, substantially as described.

16. The combination, in signaling apparatus, of a transmitter; a signal-divider; a signal-changer controlling the signal according to the position of one movable part thereof; and a signal-designator controlled by the signal-changer, comprising a field bearing indications and an index, one of these movable

with respect to the other, and indicating by its position how the transmitter is set; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

17. The combination, in signaling apparatus, of a transmitter; a signal-divider (for separating a signal transmitted into two separately-variable portions); a signal-changer controlling both portions of the signal according to the position of one movable part thereof; together with a signal-designator, comprising a multiple dial, coöperating with an indicator, the indicator forming a part of the signal-changer; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

18. The combination, in signaling apparatus, of a transmitter; a signal-divider (for separating a signal transmitted into two separately-variable signals); a signal-designator, comprising a multiple dial bearing indications arranged in radial groups, and an indicator movable with respect to any desired indication on the dial and controlling the first signal transmitted; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

19. The combination, in signaling apparatus, of a transmitter; a signal-divider; a signal-designator, consisting of a multiple dial bearing two or more sets of indications arranged in substantially radial or concentric groups or series, and an indicator movable with respect to any indication on the dial, and by that act controlling the signal to be transmitted according to the indication; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

20. The combination, in signaling apparatus, of a transmitter; a signal-divider; a signal-designator, comprising a multiple dial bearing groups of indications radially arranged with respect to a common center; an indicator-arm movable with respect to any desired indication, and turning around said center; and two or more fixed stops located at different radial distances so arranged in the path of travel with relation to a projecting part of the arm as severally to engage with it at points corresponding, in their distance from the common center, to the indications at which the arm can be set, substantially as described.

21. The combination, in signaling apparatus, of a transmitter; a signal-designator, comprising a dial provided with rows of indications radially arranged with respect to a common center; and an indicator-arm moving radially with respect to this common center, and provided with position-holding devices retaining it in position to point at any desired indication of a radial row; together with two or more fixed stops in the path of

said arm arranged to limit its revolution at different points according to the position in which it is held; together with means whereby the signal transmitted is varied to correspond with the indication, substantially as described.

22. The combination, in a spring-actuated automatic variable latent-signal transmitter, of a motor; a winder therefor; an electromagnetic retaining and releasing device; and an unsetting device whereby the instrument may be unset mechanically before it is released electrically, said device being controlled by reversing mechanism so organized that the actuation of the winder in one direction sets the instrument, while its actuation in a reverse direction unsets it, substantially as described.

23. The combination, in a spring-actuated automatic variable latent-signal transmitter, of a motor; a winder therefor; an electromagnetic retaining and releasing device; and an unsetting device whereby the instrument may be unset mechanically before it is released electrically, said device being controlled by a signal-changer; and reversing mechanism so organized that the actuation of the winder in one direction prepares the instrument to transmit a certain number of impulses, and after it has been set, its actuation in another direction lessens this number, substantially as described.

24. The combination, in signaling apparatus, of a transmitter; signal-setting mechanism; a signal-divider (to separate the signal to be transmitted at one transmission into two separately-variable portions); and a signal-changer, comprising the movable arm R co-operating with circuit-controllers, and the position of which determines both signals transmitted, and coöperates with unsetting reversing mechanism, and is so connected and organized that the reversal of its movement after the instrument has been set changes the number of impulses of which one of the signals is to be composed, substantially as described.

25. The combination, in signaling apparatus, of a transmitter; signal-setting mechanism; a signal-divider (to separate the signals transmitted into two separately-variable portions); and a signal-changer, comprising the arm R, movable in two senses, the position of which, with reference to coöperating circuit-controllers determines both signals; and co-operating unsetting mechanism, so organized and connected that the reversal of the movement of the arm in both of these senses changes the number of impulses in both signals, substantially as described.

26. The combination, in a signal-transmitter, of the indicator-carrying hub Q, carrying a circuit-wheel B, and pawl b, and turning on the motor-spindle, with a ratchet-disk M, rigidly attached to the spindle, its teeth being shaped so that the break-wheel is carried along when the hub is moved forward, but it

is not so carried when it is moved backward, substantially as described.

27. The combination, in a spring-actuated latent-signal transmitter, of the armature 5 which, when unattracted by the magnet operates to lock the train; the cam L, mounted upon an arbor of the train other than the main; and the lock K, whereby the transmitter-wheel can be locked in one of several 10 stages of its revolution, the said lock bearing upon said cam so as to support said armature close to the magnet mechanically, at times when it would otherwise drop back on account of a break in the circuit produced by the signal transmission, and thereby preventing 15 the locking of the train, substantially as described.

28. The combination, in a spring-actuated latent-signal transmitter, of the motor-actuated train, including an arbor carrying a break-wheel; a locking device; another arbor 20 so geared in the train as to make at most one revolution for every advance of the break-wheel one tooth; and a locking-cam carried by said arbor, controlling the lock and operating mechanically to hold the train unlocked 25 during each break in the circuit, substantially as described.

29. The combination, in a spring-actuated

latent-signal transmitter, of the motor-actuated train, including an arbor carrying a break-wheel; a locking device; another arbor 30 so geared in the train as to make one revolution for every advance of the break-wheel one tooth; and a cam L, carried by said arbor, 35 controlling the lock, and operating mechanically to hold the train unlocked during each break in the wheel, substantially as described.

30. The combination, with a latent-signal transmitter, of a motor-actuated train; a locking device; and an arbor bearing both the locking-cam L and the escape-wheel of the train, 40 substantially as described.

31. In a latent-signal transmitter, a motor-actuated gear-train; a revolving break-wheel; 45 a contact-brush; the cam L; a lock K, so placed with relation to each other that the contact-brush always closes the circuit on the break-wheel whenever the lock K, is opposite the hollow on the cam L, substantially as de- 50 scribed.

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F. BENEDICT IERZOG.
SCHUYLER S. WHEELER.

Witnesses:

CHARLES G. CURTIS,
FRANCIS B. CROCKER.