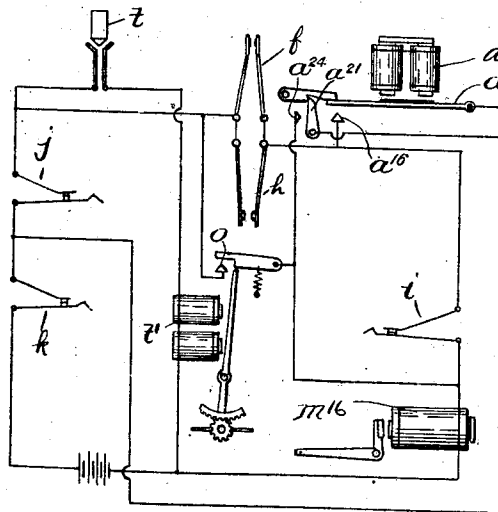
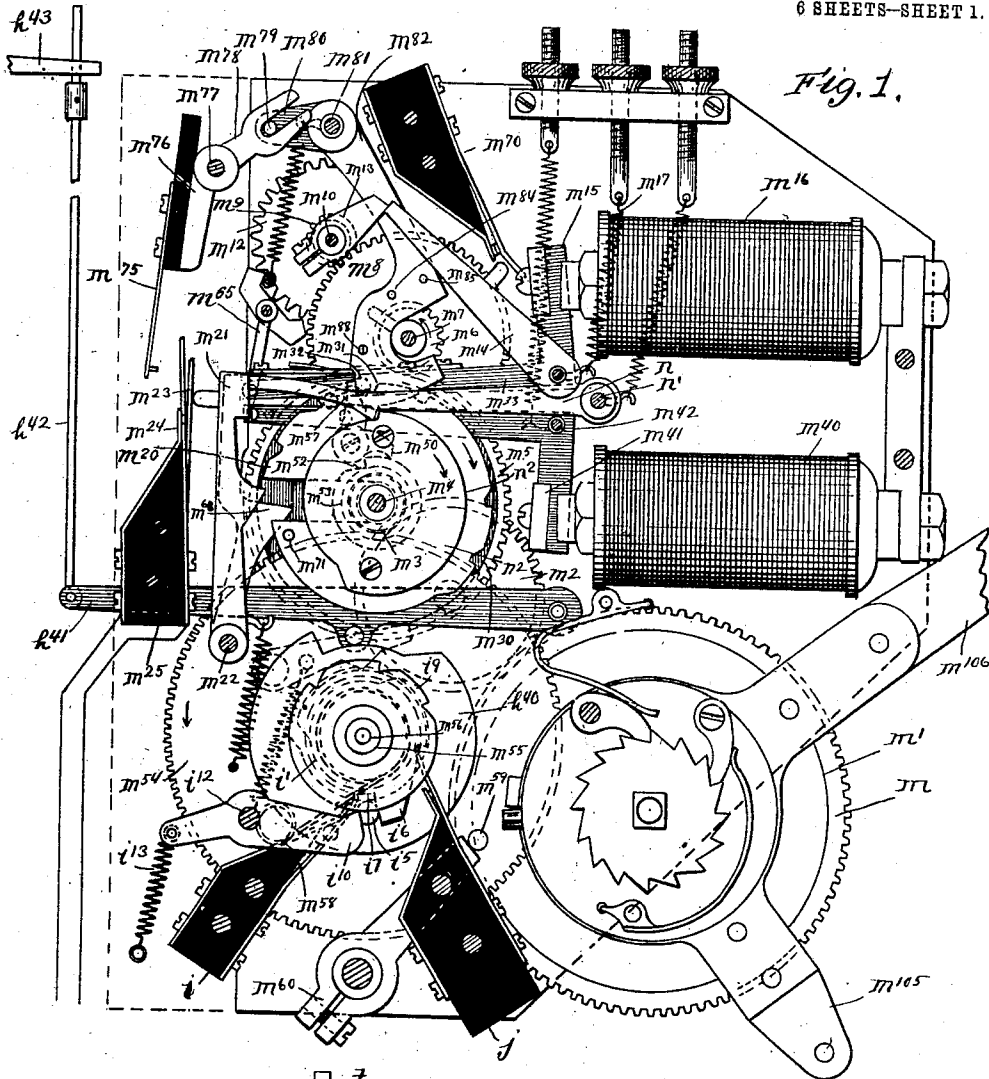


F. W. COLE.
ELECTRIC SIGNAL TRANSMITTING APPARATUS.
APPLICATION FILED APR. 15, 1910.

1,058,728.

Patented Apr. 15, 1913.

6 SHEETS—SHEET 1.



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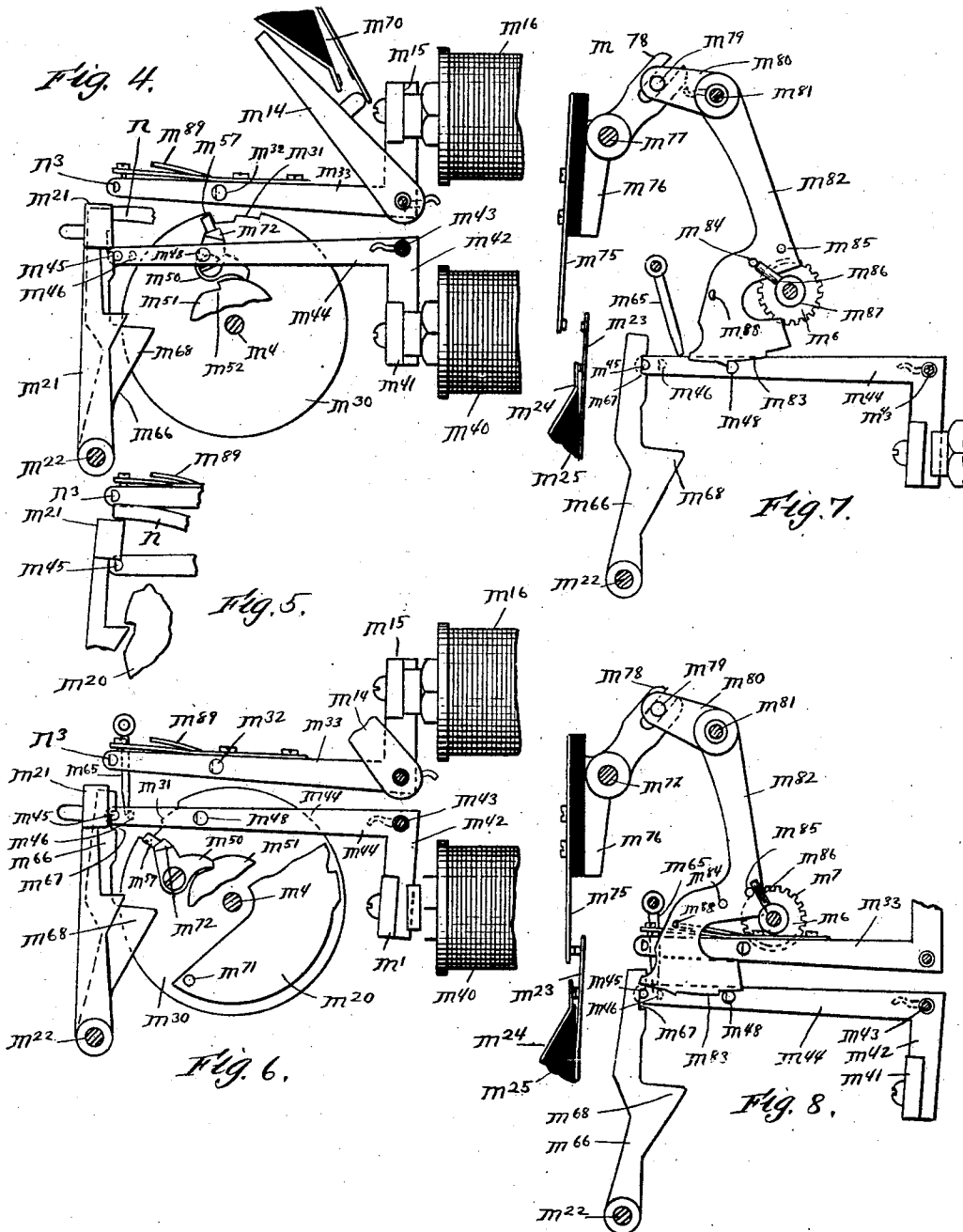
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6 SHEETS—SHEET 3.

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6 SHEETS—SHEET 4.

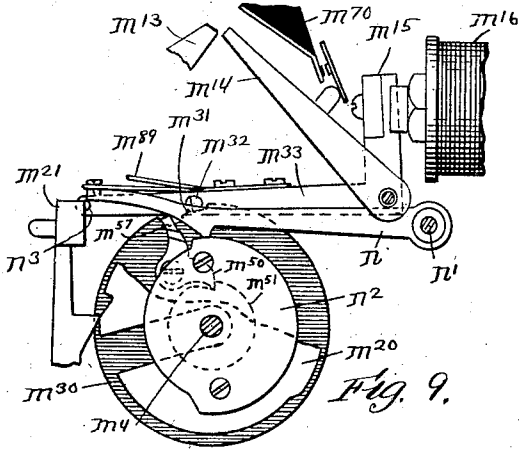


Fig. 9.

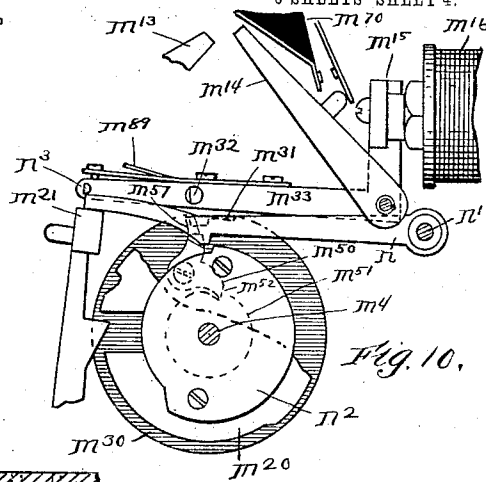


Fig. 10.

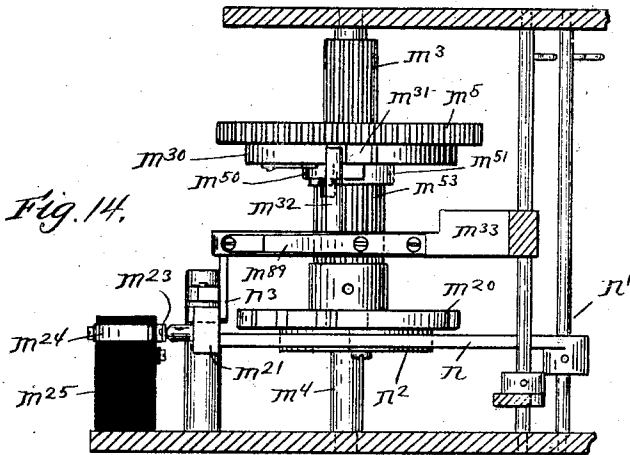


Fig. 14.

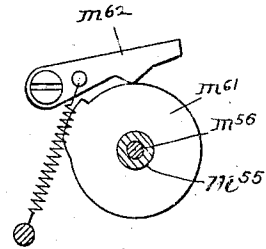


Fig. 11.

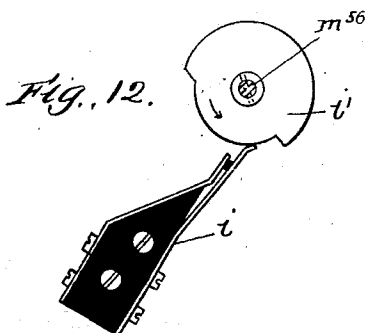


Fig. 12.

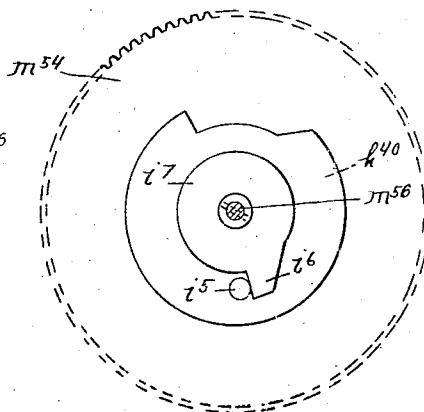


Fig. 13.

Witnesses:
H. B. Davis.
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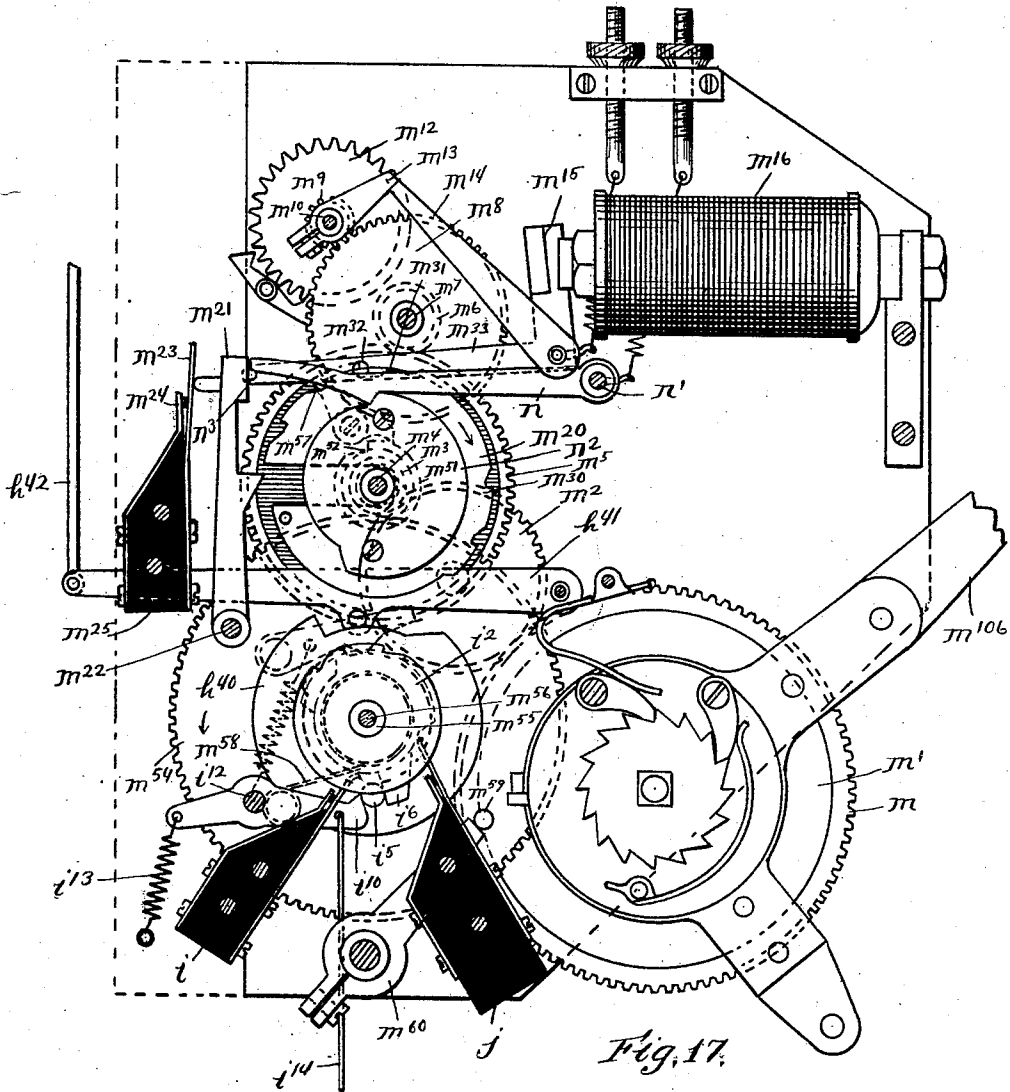
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ELECTRIC SIGNAL TRANSMITTING APPARATUS.
APPLICATION FILED APR. 15, 1910.

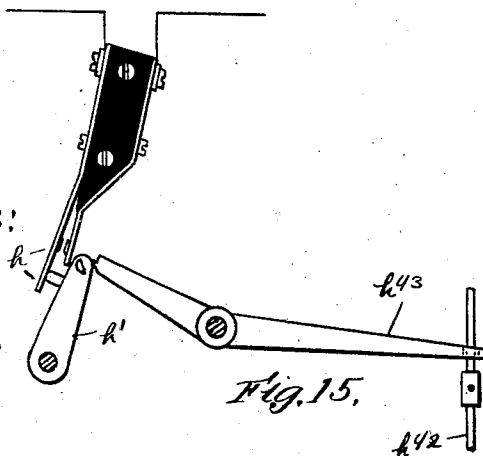
1,058,728.

Patented Apr. 15, 1913.

6 SHEETS—SHEET 5.



Witnesses:
H. B. Davis.
H. K. Boyle.



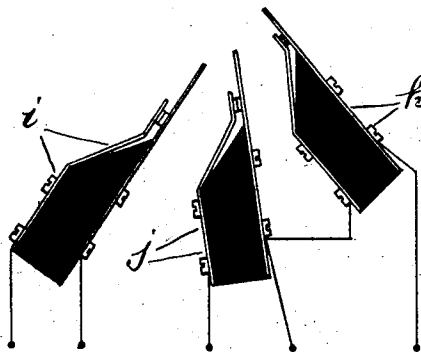
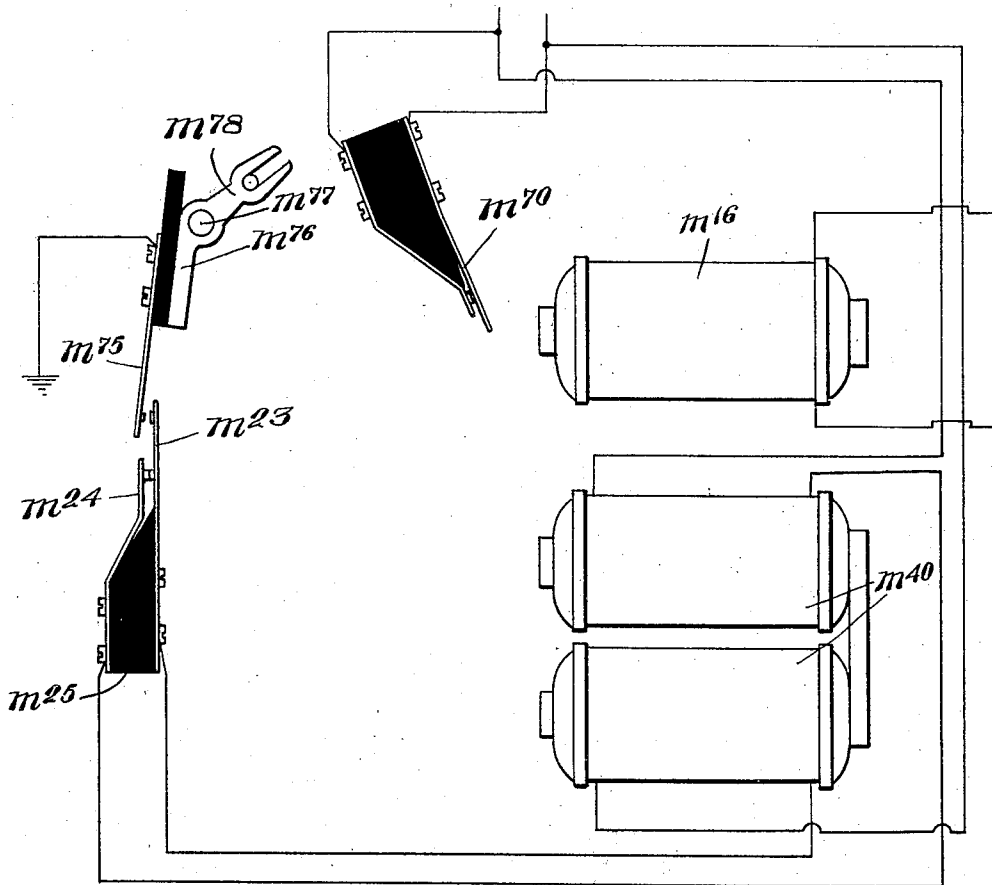
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ELECTRIC SIGNAL TRANSMITTING APPARATUS.
APPLICATION FILED APR. 15, 1910.

1,058,728.

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6 SHEETS—SHEET 6.



Witnesses:
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Fig. 18.

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UNITED STATES PATENT OFFICE.

FREDERICK W. COLE, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO THE GAMEWELL FIRE ALARM TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRIC SIGNAL-TRANSMITTING APPARATUS.

1,058,728.

Specification of Letters Patent.

Patented Apr. 15, 1913.

Application filed April 15, 1910. Serial No. 555,605.

To all whom it may concern:

Be it known that I, FREDERICK W. COLE, of Newton, in the county of Middlesex and State of Massachusetts, have invented an
5 Improvement in Electric Signal-Transmitting Apparatus, of which the following is a specification.

This invention relates to electric signal-transmitting devices, and has for its object
10 the construction of an improved form of multiple signal-transmitting device adapted to send a number of different signals, preferably with a differentiating signal-impulse in connection with some of the signals, whereby the signals may be received
15 upon an electric signal-recorder of any usual or suitable construction, and those signals having a differentiating signal-impulse may cause the operation of an audible alarm.

This signal-transmitting device is especially adapted to be used in connection with supervisory signal-systems, such as represented in my applications for Letters Patents, Serial Numbers 555,601, 555,602,
25 555,603 and 555,604.

My invention is embodied in an apparatus adapted to send a code-signal which preferably represents a number to identify its location. The identification number once
30 sent may be termed a round. The different signals are represented by the number of times this identification number is repeated; as, for instance, the identification number once sent, or one round, will constitute a
35 certain signal; twice sent, or two rounds, another signal; and so on. Each round may be composed of a series of signal-impulses of short duration, and between all, or at least some of the rounds, a prolonged signal-impulse may be employed as the differentiating signal-impulse. In such case the
40 signals on the tape of a recorder will be represented by dots, and the differentiating signal-impulses by dashes.

The signal transmitting-apparatus embodying my invention comprehends the employment of a starting-magnet by which it is released or caused to operate, and said magnet is connected in an electric circuit
50 which has several branches, each having one or more circuit-closers, for operating the starting-magnet according to the different signals to be sent; yet the apparatus may be otherwise operated. As the different signals
55 are represented by a different number of

rounds, the operation of the transmitter, when released to send any of them, will be governed according to the number of rounds to be transmitted by it, and, for this purpose, signal-determining devices are employed, adapted to be operated by the transmitting mechanism in conjunction or cooperation with the means operated to release it, to determine the number of rounds which shall be transmitted in response to the particular releasing-means operated.

For simplicity of construction the starting-magnet may be employed to serve also as the controlling-magnet for the transmitting mechanism, and, in such case, the
70 circuit-closers for operating the starting-magnet, or the branch-circuits for said circuit-closers will be respectively controlled by the signal-determining devices; as, for instance, the circuit-closer in one branch of
75 the circuit of the starting-magnet may be operated momentarily and be self-restoring, and, in such case, the starting-magnet will be momentarily operated, and therefore will merely release or otherwise operate the
80 transmitter to send a signal of one round; the circuit-closer of another branch may be operated permanently and a signal-determining device provided for opening it or restoring it to normal when a signal of two
85 rounds has been sent by said transmitter; the circuit-closers of other branches of the circuit may be operated permanently and signal-determining devices employed for opening these branches of the circuit when
90 the transmitter has sent a signal of three or four or five rounds.

Both forms of signal-determining devices for thus mechanically and also electrically controlling the operation or the effect of the
95 operation of the circuit-closers are herein adopted, and they may and preferably will be operated by the transmitting mechanism.

In the circuit of the transmitter over which the code-signals are sent, and which may be
100 called a supervisory-circuit, a non-interference magnet is provided for governing the operation of suitable non-interfering devices connected with the signal-transmitting mechanism, whereby the signal-transmitting
105 mechanism is both non-interfering and successive, and the correct positive transmission of any signal selected is absolutely insured.

The signal-transmitting mechanism also has connected with it automatic means for
110

connecting a ground-circuit thereto, under certain conditions, or after a predetermined period of time, so that the signal may be transmitted over a ground-circuit in case the metallic circuit is out of order. The ground circuit will be connected to the transmitter-circuit between the coils of the non-interference magnet, so that a coil of said magnet will be in circuit in either direction from said ground circuit, and said ground circuit will be opened and closed simultaneously with the opening and closing of the signaling-contacts which will be connected in circuit between said coils, and a signal sent over the ground-circuit in either direction will therefore be non-interfering and successive, the same as though the ground-circuit was not used.

Means are provided for temporarily stopping the transmitting-mechanism to prevent it from running unnecessarily while attempting to send a signal over a disabled circuit.

Figure 1 is a front elevation of a multiple signal-transmitting apparatus embodying this invention, the front plate being removed. Fig. 2 is a right-hand side elevation of the apparatus shown in Fig. 1. Fig. 3 is an under side view. Figs. 4 to 15, inclusive, are details to be referred to. Fig. 16 is a diagram of the circuit and devices of a part of an electric signal-system, involving the employment of the signal-transmitting device. Fig. 17 is a front elevation of a modified form of signal-transmitting apparatus, the non-interfering devices being omitted. Fig. 18 is a diagram of the circuit-connections of the transmitter.

In the embodiment of my invention, as here shown, for purposes of illustration, m represents a spur-gear connected with a barrel m' containing a main-spring. Said gear engages a spur-gear m^2 , which engages a pinion m^3 , secured to a shaft m^4 , bearing a spur-gear m^5 , which engages a pinion m^6 , secured to a shaft m^7 , bearing a spur-gear m^8 , which engages a pinion m^9 , secured to a shaft m^{10} , bearing an escape-wheel m^{12} , with which coöperates a suitable pallet. A detent m^{13} is secured to said shaft m^{10} , which is normally engaged by an arm m^{14} of a locking-lever, which is secured to the pivot-shaft of the armature-bearing lever m^{15} of the starting-magnet m^{16} . Said magnet is normally de-magnetized and its armature is held in its retracted position by a suitable retractile-spring m^{17} , and the locking-lever m^{14} is thereby normally held in engagement with the detent to hold the train at rest.

A signal-wheel m^{20} is secured to the shaft m^4 , to be revolved thereby, and at the edge of said wheel a signal-key m^{21} is arranged, which is mounted loosely on a pivot-stud m^{22} . Said key has an insulating pin projecting from it, which engages one member of a pair of contact-pens m^{23} , m^{24} , arranged on

an insulating-block m^{25} , and normally holds said members in engagement with each other. As here shown, said signal-wheel has arranged on it a code-signal identification number and a blank space, and on each complete revolution it is designed to transmit said number; but it may be otherwise constructed. When the signal-key is permitted to co-act with the signal-wheel, it engages the signal-wheel and its movements are controlled thereby, being moved in one direction by the spring-acting contact-pen m^{23} , to permit separation of the contact-pens, when entering one of the notches of said wheel, and being moved in the opposite direction to close the contact-pens when the unnotched portion of the wheel passes by it. The electric signaling-circuit including said contact-pens is thus operated to send a signal.

To the signal-wheel shaft m^4 , a disk m^{30} is secured see particularly Figs. 9 and 10 which coöperates with an arm, m^{31} , of the locking-lever. It has a two-stepped notch m^{31} , at a single point in its periphery, which is made quite long and adapted to receive a pin m^{32} , extended laterally from said arm m^{31} , to allow the locking-lever to move into locking position and engage the detent m^{13} . The locking-lever, when moved by the starting-magnet to disengage the detent m^{13} , is not permitted to return and reengage said detent and stop the train by reason of the unnotched portion of the disk moving beneath the pin m^{32} until said disk has made a complete revolution. If the starting-magnet is operated only momentarily, as by a momentary closure of its circuit, as, for instance, by the operation of a circuit-closer f , the train will be released and the locking-lever will be held in abnormal position by the disk until the notch m^{31} arrives in position beneath the pin m^{32} , when said pin will enter said notch and the locking-lever will resume its normal position and engage the detent m^{13} and thereby stop the train, and a signal of one round of the identification number only will be transmitted. The circuit-closer f is the one which is momentarily closed to cause an "on-duty" signal, as for instance, a signal of one-round to be sent, as shown in my application #555,603.

On one side of the disk m^{30} a pawl m^{50} is pivotally mounted see Figs. 4 and 6, the engaging end of which rests on the periphery of another disk m^{51} , see dotted lines Fig. 1, mounted loosely on the shaft m^4 , and said disk m^{51} has a single notch m^{52} , the radial side of which is arranged to be engaged by the pawl at or just before the end of the first round of the number transmitted, see Fig. 9, so that in case the disk m^{30} is caused or permitted to turn more than one revolution, as will be described, said pawl will operate to turn the disk m^{51} .

The pawl m^{50} has an extension m^{57} which extends to the edge of the disk m^{30} , or thereabout, and when said pawl enters the notch m^{52} in the disk m^{51} , its extension moves over the side of the long notch in the disk m^{30} on which it is mounted, see Fig. 6, so that it may be engaged and held from movement by the pin m^{32} on the locking-lever, if said lever is allowed to drop into the notch to thus cause the pawl to be turned on its pivot as it is thereafter carried forward until it has moved far enough to disengage the disk m^{51} which is being carried forward by it. The signal-wheel continues to turn a short distance after the pin m^{32} has entered the notch m^{31} before its movement is checked, and it is during this time that the extension on the pawl is engaged and held by the pin long enough to disengage the pawl from the notch of disk m^{51} . The pawl m^{50} and toothed-disk m^{51} constitute a clutch, and, in lieu thereof, a clutch of other suitable form may be employed. It will be noted that the operation of the clutch is controlled by the starting-magnet. Said clutch is employed for the purpose of connecting the signal-determining devices with the transmitting-mechanism. The disk m^{51} , as here shown, is fastened to a pinion m^{53} , mounted loosely on the shaft m^4 , which engages a spur-gear m^{54} secured to a sleeve m^{55} mounted loosely on shaft m^{56} .

As soon as the pawl disengages the disk, said disk and parts connected therewith and operated by it, are immediately restored or returned to normal position by a spring m^{58} connected at its outer end to the frame and at its inner end with the sleeve m^{55} . The stop for limiting the return movement of said parts is here shown as a pin m^{59} projecting from the side of the spur-gear m^{54} , which engages a stop-arm m^{60} , fastened to the frame. In order to insure disengagement of the clutch after the transmitter has operated long enough to send any possible signal, an emergency disengaging device is provided, see Fig. 11, consisting of a lever m^{62} pivoted to the frame, having a projection which engages the periphery of a disk m^{61} , secured to the spur-gear m^{54} , and said disk has a raised portion which will lift the lever m^{62} after the transmitter has transmitted five rounds of its code-signal number. The end of this lever m^{62} , when thus raised, will lie in the path of the extension m^{57} of the pawl m^{50} , thereby causing said pawl to disengage the disk m^{51} , allowing it to be restored in case for any reason it had not been previously disengaged at the end of five rounds of the signal-wheel.

Fastened to and mounted on the face of the spur-gear m^{54} is a cam-disk h^{40} , on which rests a pivoted lever h^{41} , which is connected by a rod h^{42} with a restoring-lever h^{43} , adapted to engage and move a lever h' , to

open a circuit-closer h , see Figs. 1, 15, and 17. This circuit-closer h is one which is automatically closed to cause an "off-duty" signal when a signal from some watch substation has not been received within a certain reasonable lapse of time. The cam-disk h^{40} is so proportioned, and its movement so-controlled, that it will operate to raise the lever h^{41} and thereby open the circuit-closer h at or just before two rounds of the identification number have been transmitted. If the circuit of the starting-magnet is operated, as a result of the action of the circuit-closer h , its armature will therefore remain in attracted position until said circuit-closer is thus opened mechanically by a rising movement of the lever h^{41} , and, upon the circuit being thus opened, said armature is thereafter free to retract when the pin m^{32} of the locking-lever is next opposite the notch in the disk m^{30} , and the code-signal sent will have included two rounds of the identification number. The cam-disk h^{40} and means operated by it thus serve as and constitute one of the signal-determining devices, although its construction may be modified in many ways.

The circuit-closers for operating the branch or other circuits connected with the starting-magnet, which are employed for the purpose of operating the signal-transmitter to send other signals, as three rounds, four rounds, and five rounds, are all designed, when closed, to remain closed permanently until manually or otherwise restored, and hence the armature of the starting-magnet will remain in attracted position until said circuits are opened. As here shown such additional circuit-closers are represented at a^{14} , a^{16} , controlled by a relay a^{13} ; and at o , controlled by a slow-responding electromagnet t' in a circuit controlled by a circuit-closer t ; and at a^{24} , a^{21} , also controlled by said relay a^{13} , see Fig. 16, and switches, as i , j , and k , are employed for opening the circuits, each comprising a pair of normally closed contact-pens adapted to be separated to open the circuits by the operation of the supervisory signal-transmitter. The circuit-closer a^{14} , a^{16} comprises, as here shown, a back contact and the armature of a relay a^{13} , reference being had to my application #555,601, and the armature of said relay normally occupies a semi-attracted position, and when the circuit of said relay is broken or other trouble occurs whereby the armature of said relay is caused to fully retract, a circuit of the starting-magnet m^{16} , including the switch i will be closed, and a trouble-signal transmitted which is here represented as a three-round signal. Said circuit will remain closed until opened by the switch i . The circuit-closer t is designed to be operated automatically in the usual manner by a thermostat or sprinkler

of ordinary construction, reference being had to my application #555,602, and when operated to close the circuit of the electro-magnet t' , and said electro-magnet t' has a slow-responding armature which controls the operation of the circuit-closer o , of a circuit of the starting magnet m^{16} , including a switch j , so that said magnet m^{16} responds to a prolonged closure of the circuit-closer t , and its armature will remain in its attracted position until the circuit of the electro-magnet t' is opened by the switch j . An automatic fire-signal is thus sent, being a signal of four-rounds. The relay a^{13} is also adapted to respond to an auxiliary fire-signal, reference being had to my applications #555,601 and #555,602, and its armature being normally in a semi-attracted position is adapted to be moved into attracted position upon the operation of an auxiliary fire-signal device, and when so moved will trip the circuit-closer a^{24} , a^{21} of a circuit of the starting-magnet m^{16} , including a switch k , and when closed will cause said magnet to respond, and the armature of said magnet will remain attracted until the circuit including said circuit-closer a^{24} , a^{21} is opened by the switch k . These switches i , j and k are arranged about the shaft m^{56} , and to said shaft three cam-disks i' , j' , k' , of insulating material are secured, adapted to respectively engage said switches i , j and k , and open them *seriatim* as the shaft m^{56} is revolved.

The cam-disks i' , j' , and k' , serve as switch-opening devices and in connection with means operated in conjunction with them serve as and constitute signal-determining devices by which the signal to be transmitted may be determined, yet my invention includes other forms of signal-determining devices arranged to be operated by the transmitting-mechanism by which substantially the same results may be accomplished.

The cam-carrying shaft m^{56} is turned for the purpose of moving the several cams to engage and open the several switches, through the medium of a pin i^5 , see Fig. 13, which projects laterally from the cam-disk h^{40} , and engages a projection i^6 on the edge of a disk i^7 , which is secured to said shaft m^{56} . The movement imparted to this cam-shaft may be more or less, according to the number of rounds, of the signal to be transmitted, and the cam-disks i' , j' , and k' are arranged to engage their respective switches at different times, as, for instance, when the cam-disk h^{40} is moved in response to a signal of more than two rounds, as it will be if the armature of the starting-magnet remains in its attracted position, the pin i^5 will turn the cam-carrying shaft to first bring the cam-disk i' into engagement with the switch i , to open it, next the cam-disk j' into en-

gagement with the switch j , to open it, and, finally, the cam-disk k' into engagement with the switch k and open it. As a result, the several switches will be successively operated and the circuits including them opened, one after the other, and, when the branch-circuit which is closed by a circuit-closer that was operated to start the transmitter is opened, then the armature of the starting-magnet is free to be retracted and the transmitter stopped at the end of the round during or at the end of which the switch was opened.

When the pawl m^{50} , already described, disengages the disk m^{51} , said disk and pinion on which it is mounted, and the spur-gear-wheel m^{54} meshing with it, together with the cam-disk h^{40} mounted on said gear-wheel, will be returned to normal position by the restoring-spring m^{58} , before-described, and the parts will be stopped by the said stop-pin m^{59} on the spur-gear engaging the stop-arm m^{60} .

When a signal has been sent, as a result of the operation of a circuit-closer which remains permanently closed until manually restored, it is obvious that the starting-magnet should not be placed again under the control of such circuit-closer until the latter has been properly restored. It is desirable, therefore, when such signals are sent, that the return movement of the cam-shaft m^{56} shall be manually controlled, so that the switches which are opened by the cams shall not be closed again until after or simultaneously with the restoration of said circuit-closers. To accomplish this result, a disk i^9 is secured to the front end of the cam-shaft m^{56} , having, as here shown, three notches or teeth, corresponding to the switch-operating projections of the switch-cams. A catch-lever i^{10} is provided for engaging said notches to hold the switch-cams against backward rotation until said catch-lever is manually moved to disengage it, and a restoring-spring i^8 is provided, see Fig. 2 which is fastened to the cam-shaft, to return it to normal position when manually released.

The catch-lever is pivoted at i^{12} , and is held in engagement with the notched-disk by a spring i^{13} , and a cord i^{14} , or other means see Fig. 17, is connected to said catch-lever for the purpose of moving it to disengage the notched-disk. Thus, whenever any one of the three switches is operated to control the transmission of a three or four or five-round signal, as the case may be, said switch, in particular, will be held open until it is permitted to return by a movement of the catch-lever.

In order that a differentiating signal-impulse may be transmitted with all the signals, except the one-round signal, a long notch is formed on the signal-wheel m^{20} , 130

but the signal-key is prevented from falling into said notch when only one round is sent and in the following manner: A lever n , pivoted at n' , has a projection at one side which is held pressed into engagement with a cam-disk n^2 , secured to the side of the signal-wheel m^{20} , or otherwise arranged to move with the signal-wheel. This cam-disk n^2 has a long notch which corresponds to the long notch between rounds on the signal-wheel, and it passes beneath the projection on lever n slightly retarded or out of step with the movement of the long notch on the signal wheel beneath the engaging portion of the signal-key; but normally both long notches are arranged beneath the engaging-projections of their cooperating levers. The end of lever n normally lies in the path of movement of the signal-key, at which time said key is in raised position, with its circuit-contacts closed, see Figs. 1 and 17, said lever being held in such position independently of the signal-wheel by a pin n^3 on the locking lever-arm m^{33} which pin also engages the signal-key when both the lever bearing it and key are in their normal positions.

When the locking-lever is moved to disengage the stop-wheel, see Fig. 4, its pin is raised so as to disengage the signal-key, but the lever n will remain beneath said signal-key while the cam-disk n^2 revolves with the signal-wheel until the raised portion of the cam-disk arrives in position to lift said lever, see Fig. 9, and this occurs just after the end of the long notch on the signal-wheel. The signal-key is thus held mechanically from co-acting with the signal-wheel or opening its circuit-contacts until after the long notch on the signal-wheel has passed by the engaging-portion of the signal-key, and on the first round of the signal-wheel the long notch is not utilized to transmit the differentiating signal-impulse.

At the end of the first round of the signal, if the starting-magnet is deenergized, its armature will retract when the first step of the two-stepped notch in the stop-wheel arrives beneath the pin m^{32} on the locking-lever, and while the signal-key is raised on the last tooth of the signal-wheel. Such movement of the locking-lever is sufficient to cause the pin n^3 to pass beneath the end of the signal key and lock it from dropping into the deep notch, but not sufficient for the locking-lever m^{14} to be engaged by the detent m^{13} . When, however, the pin m^{32} falls on to the second step of the notch in the stop-wheel, then the lever m^{14} is moved far enough to be engaged by the detent to stop the mechanism. The parts are so arranged that the cam-disk n^2 arrives in position to permit the lever n to fall and resume its normal position, only after the last

tooth of the signal-wheel has passed beneath its key. If, however, the armature of the starting-magnet should remain in its attracted position at the end of the first round, the mechanism will not then be stopped, nor will the signal-key be engaged or supported by the locking-lever, hence as the long notch of the signal-wheel passes beneath the signal-key said key will move into said long notch and open its circuit-contacts, so that, during the first part of the second revolution of the signal-wheel, the circuit-contacts will be opened to cause a long or differentiating impulse between the first and second rounds of the transmitter number. The cam-disk n^2 would have permitted the lever n to resume its normal position during this time, but said lever, when falling, engages the end of the signal-key, see Fig. 10, and is thereby held, and when the signal-key is again moved by the signal-wheel to release said lever, the signal-wheel will have been moved to the end of the long notch, and the cam-disk n^2 correspondingly moved, so that said lever will be engaged by the high part of said cam-disk while the signal-key rests on the top of the first tooth of the signal-wheel and before the first break of the circuit has occurred. A differentiating signal-impulse is thus transmitted at or previous to the beginning of the second round, and also, it will be understood, a like differentiating signal-impulse will be transmitted at the beginning of each succeeding round, or, in other words, between all rounds when the signal consists of more than one round or repetition of the location or identification number of the transmitter, and the differentiating impulse, as well as the selection of the signal to be transmitted, is controlled by the operation of the starting-magnet of the said transmitter.

The multiple transmitter embodying this invention is also here shown as provided with means whereby it is absolutely non-interfering and successive for all its signals, so that, regardless of how many of such transmitters are operated simultaneously, or one after another, on a circuit, no confusion will arise at the central-station and no signal will be lost.

m^{40} represents the non-interference magnet which is included in series with others in the circuit over which the signals are transmitted, and m^{41} is its armature, which is attached to a lever m^{42} pivoted at m^{43} and bearing the non-interference lever m^{44} .

Several pins or projections extend laterally from said lever m^{44} , one of which, as m^{45} , is adapted to cooperate with the signal-key and also with a latch-lever m^{46} , which, for convenience, is pivotally supported on the pivot-shaft m^{22} see Figs. 1 and 4 to 8; another projection, as m^{48} , is adapted to cooperate with an arm m^{49} on the pallet of

the train; another, as m^{47} , see Fig. 2 is adapted to cooperate with the clutch-member m^{50} , and another, as m^{48} , is adapted to cooperate with the member controlling the application and removal of a ground-circuit connection. Said pins m^{47} and m^{48} are arranged opposite each other on the lever m^{44} .

The pivoted latch-lever m^{60} is arranged in upright position at the side of the signal-key, and the pin m^{45} is made long enough to extend over both said lever and key. This latch-lever has a notch m^{67} in its edge, and also a tooth m^{68} . The signal-key has a notch in its edge, near its extremity, and the notched portions of said key and lever are arranged so that the lower end of the notch in the lever extends a short distance below the upper end of the notch in the key.

When the transmitter is at rest the armature of the non-interference magnet is retracted, see Fig. 1, as its magnet is shunted from the circuit of the shunt contacts m^{70} , and said pin m^{45} lies in the path of the signal-key above the notch therein and extends across the notch in the latch-lever, but at such time said latch-lever is held clear of the pin m^{45} by the pin n^3 on the locking-lever, which is made long enough to extend over both said lever and the signal-key.

When the locking-lever is moved to release the train the shunt m^{70} is first opened by it so that the armature of the non-interference magnet is immediately attracted, but the pin m^{45} will be caught by the shoulder on the latch-lever and held until said lever is raised by pin m^{71} on the signal-wheel a moment after, whereupon the armature will be further attracted until the pin m^{45} is moved down to a position below the notch in said latch lever, see Fig. 4. When the train is released the pin n^3 on the locking-lever is moved up above both the lever m^{60} and the signal-key, and said key is then held by the pivoted-lever n , until said lever n is raised to disengage the signal-key after the long notch in the signal-wheel has passed. When the first tooth of the signal-wheel has also passed beneath the signal-key, then said key is free to move toward the signal-wheel, see Fig. 5, and the upper end of the notched portion thereof will move over the pin m^{45} , to thereby lock the non-interference lever m^{44} with the armature of the non-interference-magnet in its attracted position and hold it while the circuit is opened by the key.

Should the circuit be in use, as by the sending of a signal from another transmitter at the time this transmitter is started, or should the signaling-circuit be opened during the long interval of time preceding the sending of the first signal-impulse of the round, then the armature of the non-interference magnet will be or will remain retracted and the lever m^{44} controlled by it

raised, so that the pin m^{45} will be opposite to or enter the notch in the latch lever m^{60} , and said pin m^{45} will also overlie the signal-key at a point above the notch in said key, to thereby hold the signal-key from cooperating with the signal-wheel. If the armature is in this retracted position, after the pin m^{71} has passed its cooperating projection m^{68} on the latch-lever m^{60} , then the notch in said latch lever will lock the lever m^{44} from moving into its most attracted position to allow the signal-key to thereafter effectively cooperate with the signal-wheel until said latch-lever is again raised by the pin m^{71} upon another revolution of the signal-wheel, and no signal will be sent meanwhile by reason of the signal-key being positively and mechanically held from opening the circuit during such revolution. In order, therefore, to prevent a possibility of interference if the transmitter is started while another signal is being sent, its non-interference devices are placed under the control of the circuit before the transmitter opens the circuit and for a time longer than any closures during signals. To accomplish this result the pin m^{71} passes its engaging projection on latch-lever m^{60} to unlock the non-interference lever m^{44} at such a time before the signal-key could first open the circuit that the intervening time would be longer than the length of any closure of the circuit during a signal and if the armature drops away during this time, then the latch-lever will prevent it returning until said latch-lever is again moved by pin m^{71} just before the beginning of another round of the signal wheel, when the non-interference lever is again placed under the control of the non-interference magnet, as at the beginning of the operation. As the latch-lever is free to act at all times, except while being lifted by pin m^{71} , it can lock out the armature of the non-interference magnet at any time said armature is retracted during signaling, and, as said armature is unlocked and put under control of its signaling-circuit on every closure of its signal-key, it will immediately cut out its signaling-device at any time that the signal is not being properly sent, as from any accidental or other break, and will therefore prevent interference even though two or more transmitters had started simultaneously, or had sent more or less impulses in unison, as one of the transmitters will be cut out the moment the other opens the circuit out of unison therewith, leaving the full control of the circuit to one alone.

The clutch-pawl m^{50} has arranged on it a forward extension m^{72} , and the pin m^{47} on the non-interference lever m^{44} is adapted to be moved by said lever, when said lever is retracted under the conditions above-named, or equivalent conditions, into position to be engaged by said extension m^{72} , so that its

pawl m^{50} will be moved by such engagement to unclutch the disk m^{52} and permit the return of the signal-determining devices which are brought into action when the members of the clutch are in engagement.

When the transmission of the signal is not interfered with, the non-interference lever remains attracted and said extension m^{72} passes over and free from engagement with the pin m^{47} . By providing this pin m^{47} and arranging it to engage the clutch-member and disengage the clutch in this way provision is made for restoring parts of the transmitter to normal at the end of any signal, and for the re-setting of parts in case the signal is interfered with when but partially transmitted, as, for instance, when two rounds of a three, four, or five-round signal have been transmitted, and, when the parts are re-set, the operation will be repeated until the complete signal is sent for which the transmitter was started. It will thus be observed that the clutch is controlled not only by the non-interference magnet for the purpose of disengaging it when the signal is not properly sent, but also by the starting-magnet to disengage it when the proper number of rounds have been correctly sent.

For the purpose of applying a ground connection when the transmitter is operated upon a continuously broken circuit, so that the signal may be sent over a ground circuit, a circuit-controlling device is provided at the transmitter, so that, whenever the circuit breaks and stays broken longer than any break which would be caused by a signal, the circuit-controlling-device will be operated and a ground connection established over which the signal will be sent.

Referring to Figs. 1, 7 and 8 m^{75} represents a contact-pen which is connected with a ground branch circuit. It is attached to a lever m^{76} , pivoted at m^{77} , said lever having a bifurcated extension m^{78} , which is engaged by a pin m^{79} on an arm m^{80} , pivoted at m^{81} , and to said pivot-shaft a plate m^{82} is fixed, having its end formed with a series of steps m^{83} , and having on its side two pins m^{84} , m^{85} , arranged a short distance apart, to be successively engaged by a pin m^{86} on a hub m^{87} of the pinion m^8 . Said plate m^{82} also has a pin m^{88} adapted to be moved into position to engage the end of a spring-catch m^{50} attached to the locking-lever arm m^{33} . As the pinion m^8 revolves, the pin borne by it first engages the pin m^{84} and acts to move the plate a short distance, but far enough for the first step thereon to engage the pin m^{85} on the non-interference lever m^{44} , and such engagement will be effected if said non-interference lever is in its elevated position, caused by the retraction of the armature of the non-interference magnet, but not otherwise. In case said lever is not in its ele-

vated position, the plate, when thus moved, will be returned to its normal position by a spring attached to it as soon as the pin m^{86} passes by the pin m^{84} and releases it. In the normal operation of the transmitter, the plate will thus be moved repeatedly a short distance and returned to normal during each revolution of the pinion.

If the non-interference lever is in elevated position when the plate is moved, as it will be in case the circuit is continuously broken during or prior to the first revolution of the pinion, the first step of the plate will engage the pin m^{85} , and, during the next revolution, the pin m^{86} will engage pin m^{85} to further move the plate m^{82} , and the second step of the plate will engage said pin m^{86} , and, at the same time, the pin m^{88} will pass over the end of the spring-catch m^{50} on the locking-lever, so that the plate will then become locked in its abnormal position, and by this last movement the contact-pen m^{75} will also be moved into engagement with the signaling contact-pen m^{23} to close the ground connection. The steps of the plate are arranged at different distances from its pivot, so that the lever m^{44} is permitted to rise farther when the pin thereon passes on to this second step, and such additional upward movement of the lever will cause the pin m^{86} to engage the arm m^{65} on the pallet and stop the train while in such most upward position. As soon as the ground connection is thus established, if a circuit is closed thereby over either side of the line to the battery and free from interference, the armature of the non-interference magnet will be immediately attracted and the lever m^{44} moved downward far enough to disengage the arm on the pallet, permitting the train to continue its operation, but the ground plate will still remain locked in abnormal position by the spring-arm on the locking-lever, keeping its ground in operative connection with the signaling-contacts and will be opened and closed by them simultaneously with their operation one with relation with the other; in other words, when the line contacts are closed with each other, they will also close connection with the ground, and, when they open or separate from each other, they will also open or separate their connection with the ground, so that a signal may be transmitted if either side of the line remains intact to the battery. These signals sent through the ground in either direction will also be non-interfering, as the signaling-contacts are connected in circuit between the coils of the non-interference magnet, and therefore one or the other coil will be in either ground-circuit that may be made by the operation of the transmitter.

At the completion of the signal the locking-lever is permitted to resume its normal

position by the retraction of the armature of the starting-magnet, and the ground plate thereby released and permitted to resume its normal position, disconnecting the ground.

5 In case the transmitter is started while another signal is being transmitted, and the circuit intermittently opened and closed, then the ground will not be put on for the reason that the non-interference magnet, which may hold the plate m^{82} at its first step, will be attracted at a closure of the circuit made by the signal being transmitted, which will be made before the plate
10 can be caused to make its second step, as the parts will be so related and arranged that the time elapsing between two possible successive steps will be much longer than the longest break in the signaling-circuit caused by any signal.

20 m^{105} and m^{106} represent radial arms on the winding-device of the main spring of the transmitter to which handles or levers may be connected, either of which may be operated to wind said spring.

I claim:

1. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit several different signals, and a plurality of signal-determining devices operated successively by the transmitting-mechanism and adapted to control its operation to determine the signals which shall be transmitted, substantially as described.

35 2. A signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, and a plurality of signal-determining devices operated by the transmitting-mechanism and adapted to control its operation to determine the number of times said number shall be transmitted, substantially as described.

45 3. A signal-transmitter having a signal-wheel adapted for transmitting signal-impulses representing a code-identification signal, and signal-impulses in addition thereto representing other signals, means for operating it to transmit the different signals, and a plurality of signal-determining devices operated successively by the transmitting-mechanism and adapted to control its operation to determine the signal which shall be transmitted, substantially as described.

55 4. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for the transmitting-mechanism, and a plurality of signal-determining devices operated successively by the transmitting-mechanism, adapted to control the operation of the starting-magnet to determine the signal which shall be transmitted, substantially as described.

5. A signal-transmitter having means for sending different signals, a starting-magnet for the signal-sending mechanism connected with two signaling-circuits, each circuit having a circuit-closing device to operate the starting-magnet, and means operated by the signal-sending mechanism to open one of said circuits, substantially as described.

6. A signal-transmitter having a signal-wheel, and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism connected with several circuits, each having a circuit operating device, and means operated by the transmitting-mechanism for opening said circuits, substantially as described.

7. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism connected with several circuits and adapted to be operated by a circuit-operating device in each circuit, and means operated by the transmitting-mechanism for opening said circuits at different periods of time during the operation thereof, substantially as described.

8. A signal-transmitter having a signal-wheel, and mechanism for operating it, a starting-magnet for said transmitting-mechanism, connected with a circuit having a circuit operating device, and means operated by the transmitting-mechanism for operating the circuit-operating device of the circuit of said starting-magnet to open the circuit, substantially as described.

9. A signal-transmitter having means for sending different signals, a starting-magnet for the signal-sending mechanism connected with a signaling-circuit having two circuit-operating devices, one to close and the other to open said circuit, and means operated by the signal-sending mechanism for operating one of said circuit-operating devices to open the circuit of the starting-magnet, substantially as described.

10. A signal-transmitter having means for sending different signals, a starting-magnet for the signal-sending mechanism connected with two signaling-circuits, each having a circuit-closing device, and means operated by the signal-sending mechanism for operating one of said circuit-closing devices to open the circuit of said starting-magnet, substantially as described.

11. A signal-transmitter having means for sending different signals, a starting-magnet for the signal-sending mechanism connected with several signaling-circuits, each having a circuit-operating device, and means operated by the signal-sending mechanism for opening one of the circuits of the starting-magnet, and means operated by the signal-sending mechanism for operating one of the circuit-operating devices to open another

circuit of the starting-magnet, substantially as described.

12. A signal-transmitter having a signal-wheel and mechanism for operating it, a starting-magnet for said transmitting-mechanism, connected with a circuit having a circuit operating device, a cam-disk operated by the transmitting-mechanism, and means operated by said cam-disk for operating the circuit-operating device, of the circuit of said starting-magnet to open the said circuit, substantially as described.

13. A signal-transmitter having a signal-wheel, and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism, connected with several circuits, all having circuit-operating devices, and some having switches, and means operated by the transmitting-mechanism for operating the switches at different periods of time to open the circuits and thereby control the operation of the transmitting-mechanism and the signal transmitted by it, substantially as described.

14. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism, connected with several circuits, all having circuit-operating devices and some having switches, and means operated by the transmitting-mechanism at different periods of time for operating the circuit-operating devices and for operating said switches, to open the circuits, to thereby control the signal transmitted, substantially as described.

15. A signal-transmitter having means for sending different signals, a starting-magnet for said signal-sending mechanism, a signal-determining device operated by the signal-sending mechanism to control the operation of the starting-magnet to determine the signal which shall be sent, and means operated by the starting-magnet to disconnect said signal-determining device from the signal-sending mechanism at the completion of a signal, permitting it to be restored, substantially as described.

16. A signal-transmitter having means for sending different signals, a starting-magnet for said signal-sending mechanism, a circuit operating device for the circuit of said starting-magnet, a signal-determining device operated by the signal-sending mechanism and adapted to operate said circuit-operating device to open the circuit of the starting-magnet, and means operated by the starting-magnet to disconnect said signal-determining device from the signal-sending mechanism at the completion of a signal, permitting it to be restored, substantially as described.

17. A signal-transmitter having means for sending different signals, a starting-magnet for said signal-sending mechanism con-

nected with several signaling-circuits, each having a circuit-operating device and a switch, a plurality of signal-determining devices operated by the signal-sending mechanism to open said switches and thereby control the operation of the starting-magnet, and means operated by the starting-magnet to disconnect said signal-determining devices from the signal-sending mechanism at the completion of a signal permitting them to be restored, substantially as described.

18. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a signal-determining device operated by the transmitting-mechanism and adapted to control its operation to determine the signal which shall be transmitted, and means for restoring said signal-determining device at the completion of a signal, substantially as described.

19. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a signal-determining device operated by the transmitting-mechanism and adapted to control its operation to determine the signal which shall be transmitted, and means for restoring said signal-determining device independently of the transmitting-mechanism at the completion of a signal, substantially as described.

20. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a plurality of signal-determining devices operated successively by the transmitting-mechanism and adapted to control its operation to determine the signal which shall be transmitted and restoring means for said signal-determining devices, substantially as described.

21. A signal-transmitter having a signal-wheel, and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism, a signal-determining device operated by the transmitting-mechanism, adapted to control the operation of the starting-magnet to determine the signal which shall be transmitted, and means for restoring said signal-determining device at the completion of a signal, substantially as described.

22. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism connected with several circuits, each having a circuit-operating device, a plurality of signal-determining devices operated by the transmitting-mechanism which control the operation of said starting-magnet, and means to restore all of said signal-determining devices, substantially as described.

23. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism, a signal-

determining device for operating the circuit-operating device of a circuit for said starting-magnet to open the circuit, and restoring means for said signal-determining device, substantially as described.

24. A signal-transmitter having means for sending different signals, a starting-magnet for said signal-sending mechanism, a circuit-operating device for the circuit of said magnet, a signal-determining device operated by the signal-sending mechanism and adapted to operate said circuit-operating device to open the circuit of the starting-magnet, and restoring-means for said signal-determining device, substantially as described.

25. A signal-transmitter having means for sending different signals, a starting-magnet for said signal-sending mechanism connected with several circuits, each having a circuit-operating device and a switch, several signal-determining devices operated by the signal-sending mechanism to respectively open said switches and thereby control the operation of the starting-magnet, and restoring-means for said signal-determining devices, substantially as described.

26. A signal-transmitter having means for sending different signals, a starting-magnet for said signal-sending mechanism connected with several circuits, each having a circuit-operating device and a switch, several signal-determining devices operated by the signal-sending mechanism to respectively open said switches and thereby control the operation of the starting-magnet, and manually operated restoring-means for said signal-determining devices, substantially as described.

27. A signal-transmitter having a signal-wheel and mechanism for revolving it to transmit different signals, a signal-determining device adapted to be operated by the transmitting-mechanism to control its operation and determine the signal which shall be transmitted, and a clutch for connecting said signal-determining device with said transmitting-mechanism, substantially as described.

28. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a plurality of signal-determining devices adapted to be successively operated by the transmitting-mechanism to control its operation and determine the signal which shall be transmitted, and a clutch for connecting said signal-determining device with said transmitting-mechanism, substantially as described.

29. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for the transmitting-mechanism and a signal-determining device adapted to be operated by the transmitting-mechanism to control the operation of the starting-magnet

to determine the signal which shall be transmitted, and a clutch for connecting said signal-determining device with the transmitting-mechanism, the operation of which is controlled by said starting-magnet, substantially as described.

30. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit signal-impulses representing a code identification-signal and other signal-impulses in addition thereto representing other signals, a starting-magnet for the transmitting-mechanism and a signal-determining device adapted to be operated by the transmitting-mechanism to control the operation of the starting-magnet to determine the signal which shall be transmitted, a clutch for connecting said signal-determining device with the transmitting-mechanism when the identification signal has been sent, and means controlled by the starting-magnet for disengaging the clutch when the signal-impulses of another signal have been sent, substantially as described.

31. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for the transmitting-mechanism and a signal-determining device adapted to be operated by the transmitting-mechanism to determine the signal which shall be transmitted, and a clutch for connecting said signal-determining device with the transmitting-mechanism, the operation of which is controlled by said starting-magnet, and means for restoring said signal-determining device when the clutch is operated to disconnect it from the transmitting-mechanism, substantially as described.

32. A signal-transmitter having a signal-wheel and mechanism for revolving it to transmit signal-impulses representing a code identification number and additional signal-impulses representing other signals, a starting-magnet for the transmitting-mechanism, a signal-determining-device adapted to be operated by the transmitting-mechanism to open the circuit of the starting-magnet, to thereby determine the signal which shall be transmitted, a clutch for connecting said signal-determining-device with the transmitting-mechanism and means operated by the starting-magnet for operating the clutch to disconnect the signal-determining-device from the transmitting-mechanism at the end of each group of signal-impulses, and restoring means for said signal-determining-device, substantially as described.

33. A signal-transmitter having a signal-wheel and mechanism for revolving it to transmit different signals, a starting-magnet for the transmitting-mechanism connected with several circuits, each having a circuit-operating-device, and a plurality of sig-

nal-determining-devices adapted to be operated by the transmitting-mechanism to open the several circuits of the starting-magnet at different periods of time, to thereby determine the signal which shall be transmitted, a clutch for connecting said signal-determining-devices with the transmitting-mechanism, means operated by the starting-magnet for controlling the operation of said clutch and means for restoring the signal-determining-devices when the clutch is operated to disconnect them from the transmitting-mechanism, substantially as described.

34. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet for said transmitting-mechanism which is connected with a circuit having a circuit-operating-device, a switch for opening the circuit of said magnet, a cam for operating said switch at the end of a signal, a clutch for connecting the cam-shaft bearing said cam with the transmitting-mechanism, the operation of which is controlled by the starting-magnet, substantially as described.

35. A signal-transmitter having a signal-wheel and mechanism for revolving it to transmit different signals, a starting-magnet for said transmitting-mechanism connected with a circuit having a circuit-operating-device and also a switch for opening said circuit, a cam for operating said switch at the end of a signal, a clutch for connecting the cam-shaft bearing said cam with the transmitting-mechanism, means operated by the starting-magnet for operating said clutch to disconnect the cam-shaft from the transmitting-mechanism, and means for restoring said cam-shaft, substantially as described.

36. A signal-transmitter having a signal-wheel and mechanism for revolving it to transmit different signals, a starting-magnet for said transmitting-mechanism connected with several circuits having circuit-operating-devices and normally closed switches, a plurality of cams, one for each switch, arranged to open said switches successively at the ends of the different signals, a cam-shaft bearing said cams, a clutch for connecting the cam-shaft with the transmitting-mechanism, the operation of which is controlled by the starting-magnet, and means for restoring said cam-shaft when the clutch is operated to disconnect it from the transmitting-mechanism, substantially as described.

37. A signal-transmitter having a signal-wheel with a long notch and mechanism for operating it to transmit different signals, a signal-key, means for holding the signal-key from coacting with the signal-wheel while the long notch of the signal-wheel passes beneath it on the first round of the

signal-wheel and thereafter releasing said key, permitting it to engage the signal-wheel during the remainder of the round and on succeeding rounds, whereby a differentiating signal-impulse may be transmitted on the second and subsequent rounds only, substantially as described.

38. A signal-transmitter having a signal-wheel with a long notch and mechanism for operating it to transmit different signals, a signal-key, a cam-disk movable with the signal-wheel, a lever engaging said disk for holding the signal-key from coacting with the signal-wheel while the long notch thereof passes beneath it on the first round of the signal-wheel only, a stop-wheel, a locking-lever engaging it adapted to engage said signal-key and hold it in normal position with the circuit-contacts closed, said stop-wheel being arranged to permit the locking-lever to fall and engage the signal-key before the cam-disk permits its lever to fall and engage the signal-key, substantially as described.

39. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a signal-determining-device operated by the transmitting-mechanism and adapted to control its operation, to determine the signal which shall be transmitted, a clutch for connecting said signal-determining-device with the transmitting-mechanism, a locking-device for locking the signal-determining device in its abnormal position and means for restoring said signal-determining-device when released, substantially as described.

40. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet connected with several circuits having circuit-operating-devices and normally closed switches, means operated by the transmitting-mechanism for successively opening said switches at the ends of the different signals, a clutch for connecting said switch-opening means with the transmitting-mechanism controlled by the starting-magnet, whereby said switch-opening means is disconnected from the transmitting-mechanism at the completion of the signal, and a locking-device for said switch-opening means for holding it in its abnormal position, and a restoring-device for said switch-opening means, substantially as described.

41. A signal-transmitter having a signal-wheel and mechanism for operating it to transmit different signals, a starting-magnet connected with several circuits having circuit-operating-devices, and normally closed switches, cams for operating said switches to open the circuits, a cam-shaft bearing them, a clutch for connecting said cam-shaft with the transmitting-mechanism controlled by the starting-magnet, a locking-device for

locking said cam-shaft in different positions and means for restoring said cam-shaft when released, substantially as described.

42. A non-interference signal-transmitter having means for sending several different signals and having selecting means to operate it to send the different signals, and a non-interference device controlled by the signal-sending mechanism and the transmitting circuit over which the signal is sent, to control the operation of the signal-sending mechanism, substantially as described.

43. A non-interference signal-transmitter having means for sending several different signals and having selecting means to operate it to send the different signals, and a non-interference device controlled by the signal-sending mechanism and the transmitting circuit over which the signal is sent, to control the operation of the signal-sending mechanism, and also to keep the signal-sending mechanism set when once operated until the signal has been correctly sent, substantially as described.

44. A non-interference signal-transmitter having signal-sending mechanism responsive to the operation of the signaling-circuit, a signal-determining device operated by the signal-sending mechanism to open said signaling-circuit when the signal has been sent, a non-interference device controlled by the signal-sending mechanism and by the circuit over which the signal is sent to control the operation of the signal-sending mechanism and the signal-determining device operated thereby, substantially as described.

45. A non-interference signal-transmitter having signal-sending mechanism responsive to the operation of the signaling-circuit, a signal-determining device operated by the signal-sending mechanism to open said signaling-circuit when the signal has been sent, a non-interference device controlled by the signal-sending mechanism and by the circuit over which the signal is sent to control the operation of the signal-sending mechanism and the signal-determining device operated thereby, and to keep the signal-sending mechanism set when once operated until the signal has been correctly sent, substantially as described.

46. In a non-interference signal-transmitter having means for sending several different signals, a signal-determining device and means to operate it to determine the signal which shall be transmitted in response to the particular means employed to operate the signal-sending mechanism, and means controlled by the signal-sending mechanism and the circuit over which the signal is sent to insure the correct transmission of the signal, substantially as described.

47. A non-interference signal-transmitter having means for sending several different

signals, a plurality of signal-determining devices operated successively by the signal-sending mechanism and adapted to control its operation to determine the signals which shall be sent, and a non-interference device controlled by the signal-sending mechanism and by the circuit over which the signal is sent, to control the operation of the signal-sending mechanism and signal-determining device operated thereby, substantially as described.

48. A non-interference signal-transmitter having a signal-wheel for sending an identification number, and mechanism for operating it to send said number one or more times for different signals, a signal-determining device operated by the signal-sending mechanism and adapted to control its operation to determine the number of times said number shall be sent, a non-interference device controlled by the signal-sending mechanism and by the circuit over which the signal is sent, to control the operation of the signal-sending mechanism and signal-determining device operated thereby, substantially as described.

49. A non-interference signal-transmitter having a signal-wheel for sending an identification number, and mechanism for operating it to send said number one or more times for different signals, a plurality of signal-determining devices operated by the signal-sending mechanism and adapted to control its operation to determine the number of times said number shall be sent, a non-interference device controlled by the signal-sending mechanism and circuit over which the signal is sent, to control the operation of the signal-sending mechanism and signal-determining devices operated thereby, substantially as described.

50. A non-interference signal-transmitter, comprising signal-sending mechanism, a starting-magnet therefor, responsive to the operation of a signaling-circuit, a non-interference device including a magnet, which is controlled by the signal-sending mechanism and the transmitting-circuit over which the signal is sent to control the operation of the signal-sending mechanism and also the signaling-circuit, substantially as described.

51. A non-interference signal-transmitter, comprising signal-sending mechanism adapted to send several different signals, a starting-magnet therefor, responsive to the operation of several signaling-circuits, a non-interference device including a magnet, which is controlled by the signal-sending mechanism, and the transmitting-circuit over which the signal is sent to control the operation of the signal-sending mechanism and also the signaling-circuits, substantially as described.

52. A non-interference signal-transmitter comprising signal-sending mechanism adapted

ed to send several different signals, a starting-magnet therefor, responsive to the operation of several signaling-circuits, a signal-determining device operated by the signal-sending mechanism and adapted to control the operation of the starting-magnet to determine the signal which shall be sent, a non-interference device including a magnet, which is controlled by the signal-sending mechanism and transmitting-circuit over which the signal is sent to control the operation of the signal-sending mechanism and also the signal-determining device, substantially as described.

53. A non-interference signal-transmitter comprising signal-sending mechanism adapted to send several different signals, a starting-magnet therefor, responsive to the operation of several signaling circuits, a plurality of signal-determining devices operated by the signal-sending mechanism adapted to control the operation of the starting-magnet to determine the signal which shall be transmitted, a non-interference device including a magnet, which is controlled by the signal-sending mechanism and transmitting-circuit over which the signal is sent, to control the operation of the signal-sending mechanism and also the signal-determining devices, substantially as described.

54. A signal-transmitter comprising signal-sending mechanism adapted to send over a transmitting-circuit several different signals, a starting-magnet for said signal-sending mechanism connected with several signaling-circuits, each having a circuit-operating device, means operated by the signal-sending mechanism for opening said signaling-circuits, a magnet, responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said means, substantially as described.

55. A signal-transmitter comprising signal-sending mechanism adapted to send over a transmitting-circuit several different signals, a starting-magnet for said signal-sending mechanism connected with several signaling-circuits, each having a circuit-operating device, means, operated by the signal-sending mechanism for opening said signaling-circuits at different periods of time to control the operation thereof, a magnet, responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said means, substantially as described.

56. A signal-transmitter comprising signal-sending mechanism adapted to send a signal over a transmitting-circuit, a starting-magnet for said signal-sending mechanism connected with a signal-circuit having a circuit-operating device, means operated by the signal-sending mechanism for operating said circuit-operating device to open the circuit,

a magnet, responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said means, substantially as described.

57. A signal-transmitter comprising signal-sending mechanism adapted to send a signal over a transmitting-circuit, a starting-magnet for said signal-sending mechanism connected with a signaling-circuit having a circuit-operating device, a cam-disk operated by the signal-sending mechanism, means operated by said cam-disk for operating said circuit-operating device to open the signaling-circuit, a magnet, responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said cam-disk, substantially as described.

58. A signal-transmitter comprising signal-sending mechanism adapted to send different signals over a transmitting-circuit, a starting-magnet for said signal-sending mechanism connected with several signaling-circuits, all having circuit-operating devices and some having switches, means operated by the signal-sending mechanism for operating the switches at different periods of time to open the signaling-circuits and thereby control the operation of the signal-sending mechanism and the signal sent by it, a magnet responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said switch-operating means, substantially as described.

59. A signal-transmitter comprising signal-sending mechanism adapted to send several different signals over a transmitting-circuit, a starting-magnet for said signal-sending mechanism connected with several signaling-circuits, all having circuit-operating devices and some having switches, means operated by the signal-sending mechanism at different periods of time for operating the circuit-operating devices and for operating said switches to open the signaling-circuits and thereby control the signal which is transmitted, a magnet, responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said means, substantially as described.

60. A signal-transmitter comprising signal-sending mechanism adapted to send several different signals over a transmitting-circuit, a signal-determining device operated by the signal-sending mechanism and adapted to control its operation to determine the signal which shall be sent, a magnet, responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said signal-determining device, and restoring-means for said signal-determining device, substantially as described.

61. A signal-transmitter comprising signal-sending mechanism adapted to send several different signals over a transmitting-circuit, a plurality of signal-determining devices operated successively by the signal-sending mechanism and adapted to control its operation to determine the signals which shall be sent, a magnet responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said signal-determining device, and restoring-means for said signal-determining device, substantially as described.

62. A signal-transmitter comprising signal-sending mechanism adapted to send several different signals over a transmitting-circuit, a starting-magnet for said signal-sending mechanism, a circuit-operating device for the circuit of said starting-magnet, a signal-determining device operated by the signal-sending mechanism and adapted to operate said circuit-operating device to open the circuit of the starting-magnet, a magnet responsive to the operation of the transmitting-circuit, and means controlled by said magnet to control the operation of said signal-determining device, and restoring-means for said signal-determining device, substantially as described.

63. A signal-transmitter comprising signal-sending mechanism adapted to send several different signals over a transmitting-circuit, a starting-magnet for said signal-sending mechanism connected with several signaling-circuits, each having a circuit-operating device and a switch, a plurality of signal-determining devices operated by the signal-sending mechanism to open said switches and thereby control the operation of the starting-magnet, a magnet responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said signal-determining devices, and restoring-means for said signal-determining devices, substantially as described.

64. A signal-transmitter comprising signal-sending mechanism adapted to send several different signals over a transmitting-circuit, a starting-magnet for said signal-sending mechanism connected with several signaling-circuits, each having a circuit-operating device and a switch, a plurality of signal-determining devices operated by the signal-sending mechanism to open said switches and thereby control the operation of the starting-magnet, a magnet responsive to the operation of the transmitting-circuit, and means controlled by said magnet for controlling the operation of said signal-determining devices, and manually operated restoring-means for said signal-determining devices, substantially as described.

65. A non-interference signal-transmitter

having a signal-wheel, and mechanism for operating it to transmit different signals, a signal-determining-device adapted to be operated by the transmitting-mechanism to determine the signal which shall be transmitted, a clutch for connecting said signal-determining-device with the transmitting-mechanism at the beginning of a signal, a non-interference magnet and means controlled by said magnet for operating said clutch to disconnect said signal determining-device from the transmitting-mechanism, substantially as described.

66. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for revolving it to transmit said number one or more times for different signals, a signal-determining-device adapted to be operated by the transmitting-mechanism to determine the number of times said identification number shall be transmitted, a clutch for connecting said signal-determining-device with the transmitting-mechanism at the beginning of an identification number, a non-interference magnet and means controlled by said magnet for operating said clutch to disconnect said signal-determining-device from the transmitting-mechanism, and restoring means for said signal-determining-device, whereby it may be restored preparatory to being again engaged at the beginning of a subsequent identification number, substantially as described.

67. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a plurality of signal-determining-devices adapted to be operated by the transmitting-mechanism to determine the number of times said identification number shall be transmitted, a clutch for connecting said signal-determining-devices with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet and means controlled by it for operating said clutch to disconnect said signal-determining-devices from the transmitting-mechanism, restoring means for all said signal-determining-devices adapted to restore them preparatory to being again engaged at the beginning of a subsequent identification number, substantially as described.

68. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a starting-magnet connected with a circuit having a circuit-operating-device, a signal-determining-device adapted to be operated by the transmitting-mechanism to determine the number of times said identification number

shall be transmitted, a clutch for connecting said signal-determining-device with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet, means operated by it for operating said clutch to disconnect said signal-determining-device from the transmitting-mechanism, permitting it to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for operating said clutch to disconnect said signal-determining-device from the transmitting-mechanism at the completion of an identification number, substantially as described.

69. A non-interference signal-transmitter having a signal wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, and a starting-magnet connected with several circuits, each having a circuit-operating-device, a plurality of signal-determining-devices adapted to be operated by the transmitting-mechanism to determine the number of times each identification number shall be transmitted, a clutch for connecting said signal-determining-devices with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet, means operated by it for operating said clutch to disconnect the signal-determining-device from the transmitting-mechanism permitting it to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for disconnecting said switch-opening-device from the transmitting-mechanism at the completion of the signal, substantially as described.

70. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a starting-magnet connected with a circuit having a circuit-operating-device, a signal-determining-device adapted to be operated by the transmitting-mechanism to determine the number of times said identification number shall be transmitted, a clutch for connecting said signal-determining-device with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet and means operated by it for operating said clutch to disconnect said switch-opening-devices from the transmitting-mechanism, permitting them to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for disconnecting said switch-opening-devices from the transmitting-mechanism at the completion of the signal, substantially as described.

71. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a starting-magnet connected with a circuit having a circuit-operating-device, a signal-determining-device adapted to be operated by the transmitting-mechanism to determine the number of times the identification number shall be transmitted, a clutch for connecting said switch-opening-devices with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet and means operated by it for operating said clutch to disconnect said switch-opening-devices from the transmitting-mechanism, permitting them to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for disconnecting said switch-opening-devices from the transmitting-mechanism at the completion of the signal, substantially as described.

and restoring means for said signal-determining-device operating when said signal-determining-device is disconnected from the transmitting-mechanism, substantially as described.

72. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a starting-magnet connected with a circuit having a circuit-operating device, a normally closed switch for said circuit, a switch-opening-device adapted to be operated by the transmitting mechanism to determine the number of times the identification number shall be transmitted, a clutch for connecting said switch-opening-device with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet, and means operated by it for operating said clutch to disconnect said switch-opening-device from the transmitting-mechanism, permitting it to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for disconnecting said switch-opening-device from the transmitting-mechanism at the completion of the signal, substantially as described.

73. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a starting-magnet connected with several circuits each having a circuit-operating-device, and a normally closed switch, a plurality of switch-opening-devices adapted to be operated by the transmitting-mechanism to determine the number of times the identification number shall be transmitted, a clutch for connecting said switch-opening-devices with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet and means operated by it for operating said clutch to disconnect said switch-opening-devices from the transmitting-mechanism, permitting them to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for disconnecting said switch-opening-devices from the transmitting-mechanism at the completion of the signal, substantially as described.

74. A non-interference signal-transmitter having a signal-wheel for transmitting an identification number, and mechanism for operating it to transmit said number one or more times for different signals, a starting-magnet connected with a circuit having a circuit-operating-device, and a normally closed switch, a switch-opening-device adapted to be operated by the transmitting-

mechanism to determine the number of times said identification number shall be transmitted, a clutch for connecting said switch-opening device with the transmitting-mechanism at the beginning of an identification number, a non-interference-magnet, and means operated by it for operating said clutch to disconnect said switch-opening device from the transmitting-mechanism, permitting it to be again engaged at the beginning of a subsequent identification number, and means operated by the starting-magnet for disconnecting said switch-opening device from the transmitting-mechanism at the completion of the signal, and restoring-means for said switch-opening device, substantially as described.

74. A non-interference signal-transmitter having a non-interference-device controlled by a non-interference-magnet, a ground circuit contact-pen, means operated by the transmitting-mechanism for moving it to close a ground circuit connection, and means, operated by the non-interference-device, for controlling its operation, substantially as described.

75. A non-interference signal-transmitter having a non-interference-device controlled by a non-interference-magnet, a ground circuit contact-pen, means operated by the transmitting-mechanism for moving it to close a ground circuit connection, means operated by the non-interference-device for controlling its operation, and means for locking said ground circuit contact-pen in closed position, substantially as described.

76. A non-interference signal-transmitter having a non-interference-device controlled by a non-interference-magnet, a ground circuit contact-pen, means operated by the transmitting-mechanism for moving it to close a ground circuit connection, means operated by the non-interference device for controlling its operation, and means controlled by the starting-magnet for locking

said ground circuit contact-pen in closed position, substantially as described.

77. A non-interference signal-transmitter having a non-interference-device controlled by a non-interference-magnet, a ground circuit contact-pen, means operated by the transmitting-mechanism for moving it to close a ground circuit connection, means operated by the non-interference-device for controlling its operation and for also temporarily stopping the transmitting-mechanism, substantially as described.

78. A non-interference signal-transmitter having a non-interference-device controlled by a non-interference-magnet, a ground circuit contact-pen, means operated by the transmitting-mechanism for moving it to close a ground circuit connection, means operated by the non-interference-device for controlling its operation and for also temporarily stopping the transmitting-mechanism, means for locking the ground circuit contact-pen in closed position, and means controlled by the non-interference magnet for subsequently releasing the transmitting-mechanism without releasing said ground circuit contact-pen, substantially as described.

79. A non-interference signal-transmitter having a non-interference-device controlled by a non-interference-magnet, a ground circuit contact-pen, a step-by-step-device operated intermittently by the transmitting-mechanism and controlled by the non-interference-device to close the ground circuit connection, and means for restoring said step-by-step-device at the completion of the signal, substantially as described.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FREDERICK W. COLE.

Witnesses:

B. J. NOYES,

H. B. DAVIS.