N. H. SUREN.

REPEATING TRANSMITTER FOR FIRE ALARM TELEGRAPH SYSTEMS.

APPLICATION FILED JULY 22, 1910.

1,065,478.

Patented June 24, 1913.

3 SHEETS—SHEET 1.

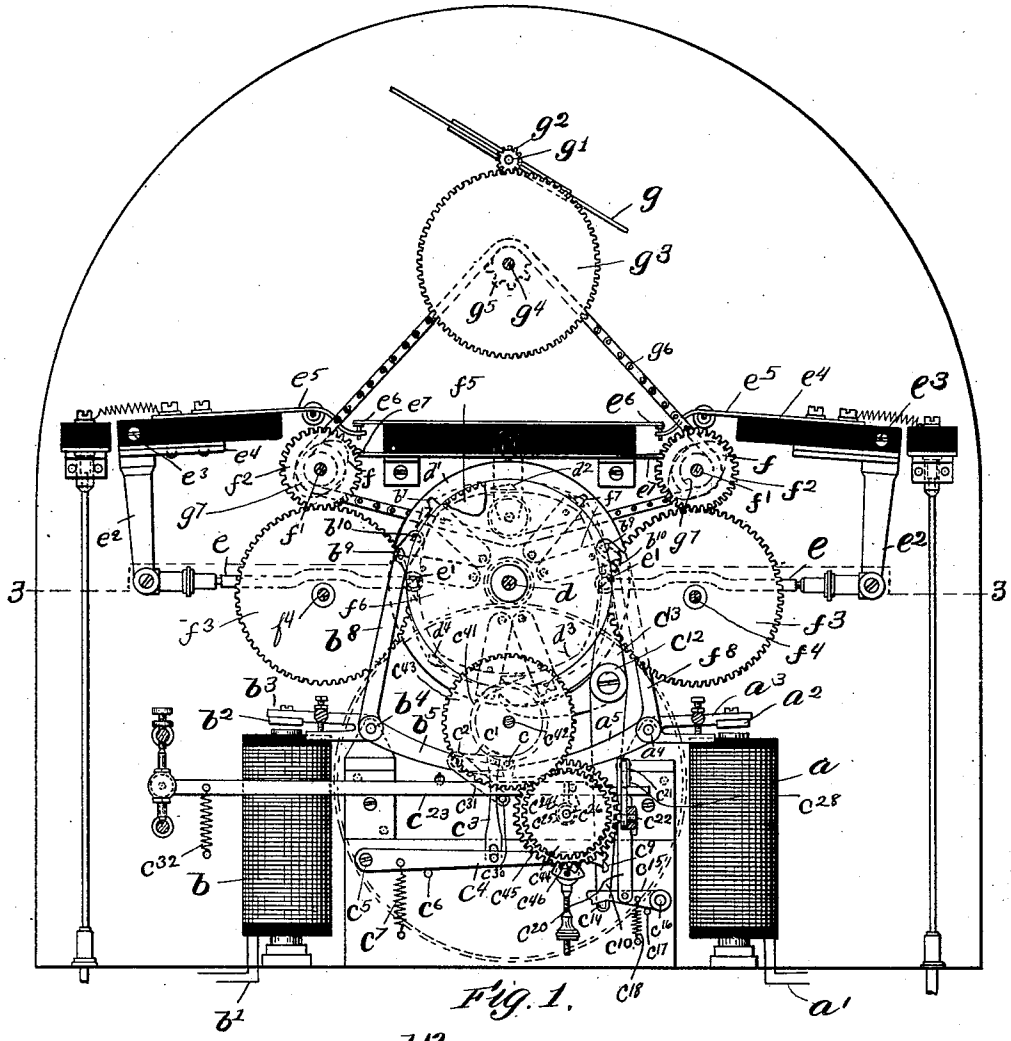

Fig. 1.

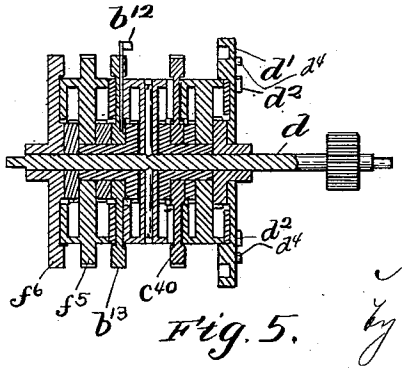

Fig. 5.

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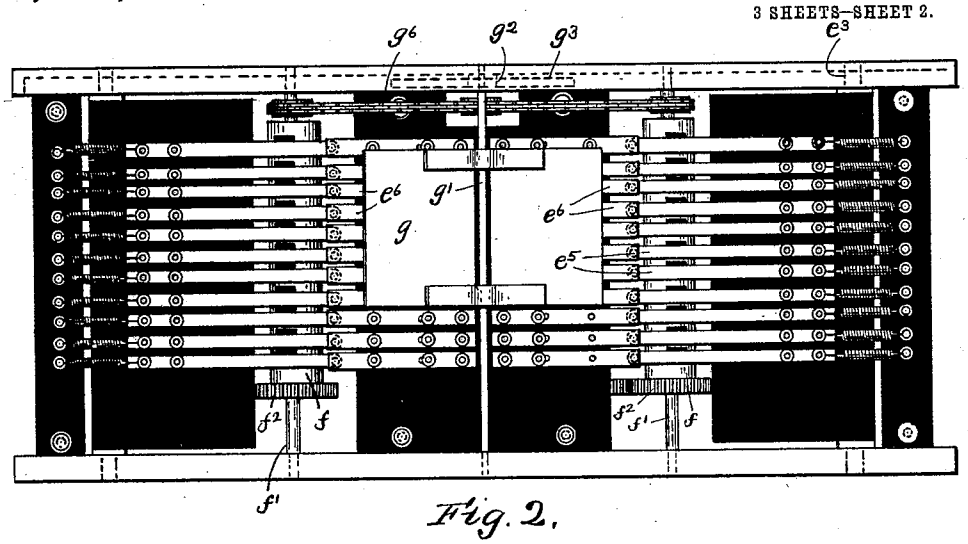

Fig. 2.

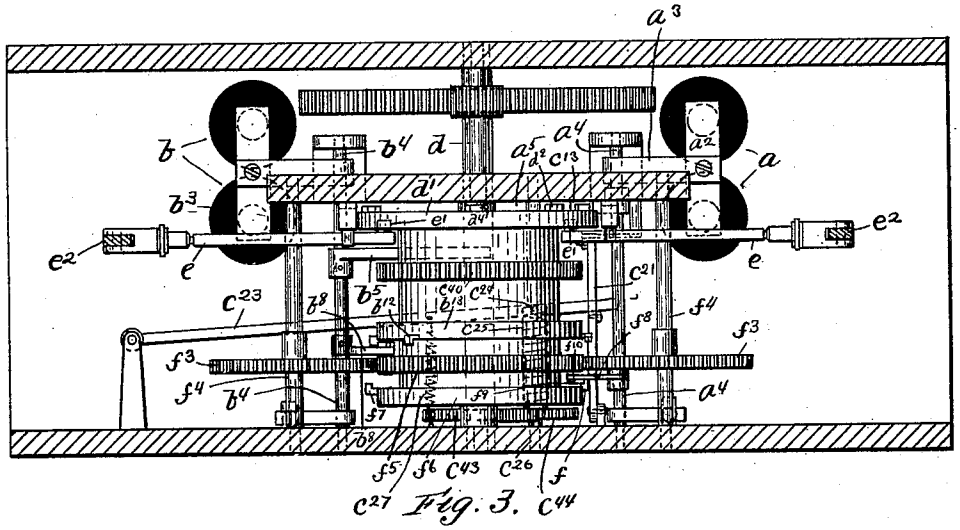

Fig. 3.

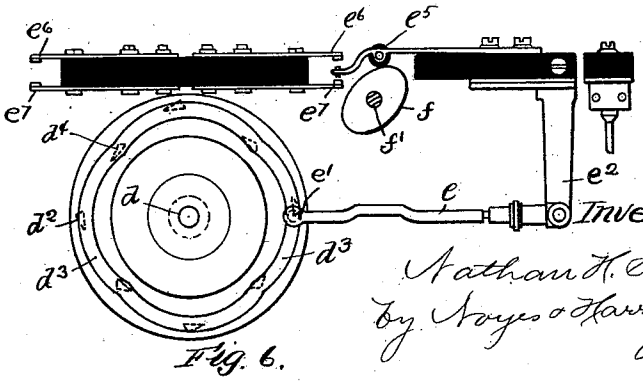

Fig. 6.

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APPLICATION FILED JULY 22, 1910.

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3 SHEETS—SHEET 3.

Fig. 4.

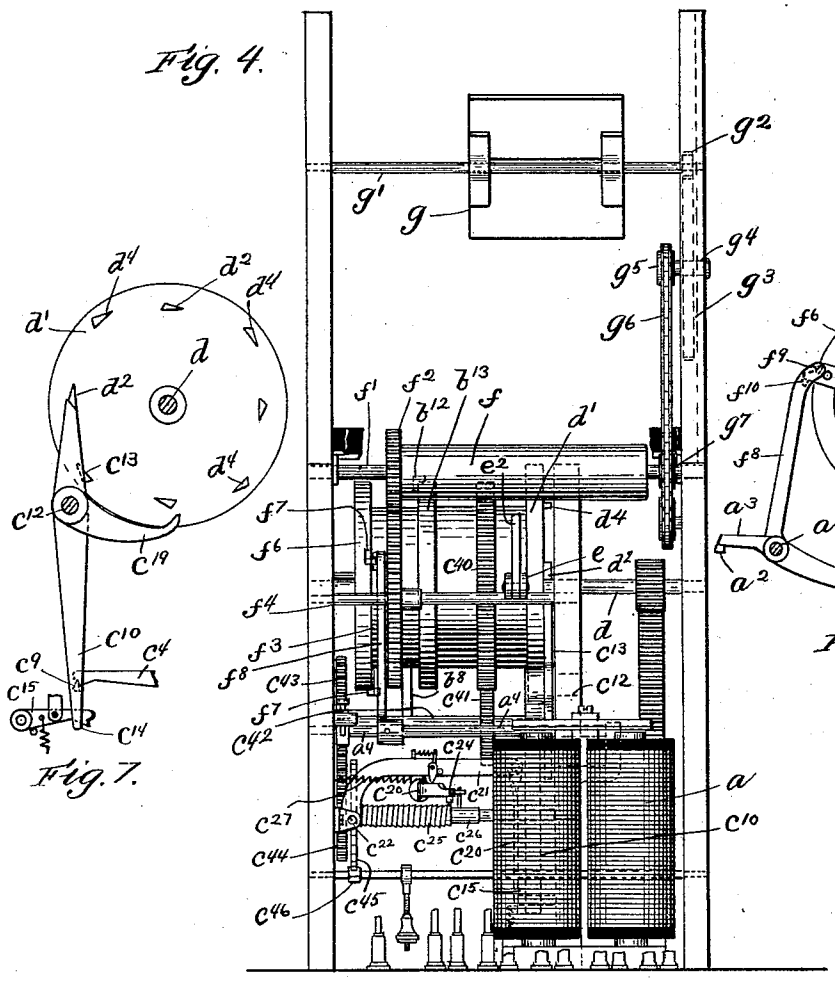

Fig. 7.

Fig. 8.

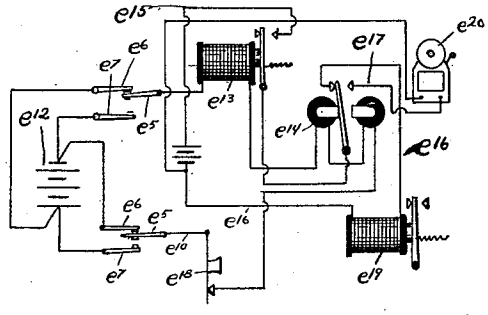

Fig. 9.

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UNITED STATES PATENT OFFICE.

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REPEATING-TRANSMITTER FOR FIRE-ALARM TELEGRAPH SYSTEMS.

1,065,478. Specification of Letters Patent. Patented June 24, 1913.

Application filed July 22, 1910. Serial No. 573,289.

To all whom it may concern:

Be it known that I, NATHAN H. SUREN, of Needham, county of Norfolk, State of Massachusetts, have invented an Improvement in Repeating-Transmitters for Fire-Alarm Telegraph Systems, of which the following is a specification.

This invention relates to repeating-transmitters for fire-alarm telegraph systems. In such systems a repeating-transmitter is employed to repeat the signals received at the central-station from all the signal-circuits to the engine-houses and elsewhere, and is operated by the repeating-mechanism at said central-station. In case it becomes necessary to disconnect the repeating-mechanism, as for instance for purposes of repair, the signals are manually transmitted to the engine-houses, which involves liability of errors, and one of the objects of this invention is to provide a repeating-transmitter adapted to be operated by the repeating-mechanism and also by the signal-circuits, so that either operating means may be employed, and the signals automatically repeated.

Another object of the invention is to provide for operating the repeating-transmitter by manually operated means located at the central-station, in case of emergency. Ordinarily the operating-magnet of the repeating-transmitter is included in an open circuit which is operated by the repeating-mechanism, and the signal-transmitters of the boxes are included in closed circuits, and another object of this invention is to arrange for operating the repeating-transmitter by means controlled by both open and closed circuits. Heretofore repeating-transmitters, in addition to operating the engine-house circuits, have included means for changing the polarity of the battery of said circuits, so that when the transmitter is not in use said circuits may be employed for telegraphic purposes or other forms of signaling, but immediately the transmitter starts the polarity of the battery is changed, thereby placing said circuits exclusively under the control of the transmitter, and another object of this invention is to provide the transmitter with improved means for accomplishing this result; and, also improved means for operating the engine-house circuits.

Another object of the invention is to provide two independent operating-devices for the actuating-means for the circuit-operating device for the engine-house circuit, whereby said means may be operated by either operating-device.

Another object of the invention is to provide the circuit-operating-device for the engine-house circuit with a setting-device, by which the polarity of the battery of the engine-house circuit may be reversed, and to so construct and arrange said setting-device that it may be operated by either one of two independent operating-devices, and when operated will hold the circuit-operating-device in position to be operated to in turn operate the engine-house circuit.

Figure 1 is a front elevation of a repeating transmitter embodying this invention. Fig. 2 is a plan view of the repeating-transmitter shown in Fig. 1. Fig. 3 is a horizontal section of the repeating-transmitter shown in Fig. 1, taken on the dotted line 3—3. Fig. 4 is a right hand side elevation of the repeating-transmitter shown in Fig. 1. Fig. 5 is a longitudinal section of the power-driven shaft and actuating-disks thereon. Fig. 6 is a detail showing one of the circuit-operating devices and setting-device therefor. Fig. 7 is a detail showing the releasing-device for the operating-member of the setting-device. Fig. 8 is a detail showing the releasing-device for the actuating-means of the circuit-operating-device. Fig. 9 is a diagram to be referred to.

a represents an operating-magnet for the repeating-transmitter, which is included in or adapted to be operated by an electric-circuit *a'* which is operated or controlled by the automatic repeating-mechanism, or by a manually operated signal-transmitter, not shown; and *b* represents another operating-magnet for the repeating-transmitter, which is adapted to be included in or operated by an electric-circuit *b'*, which is operated or controlled directly by the signal-transmitters of the fire-alarm boxes. The armature a^2 of the magnet *a* is borne by a lever a^3, secured to a pivot-shaft a^4, and is normally held retracted. An arm a^5 is secured to said pivot-shaft a^4, which is employed to control the operation of a setting-device for the contact-pens, by which said pens are moved into abnormal position, whereby the polarity of the engine-house cir-

cuits may be changed and said circuits also operated. Said arm a^5 is designed to operate releasing-mechanism for the operating-member of said setting-device, and, as here shown, it extends beneath a pin c, projecting laterally from a short arm c', pivoted at c^2, which is connected by a link c^3, with an arm c^4, pivoted at c^5, and held against a stop pin c^6 by a spring c^7. The arm c^4 has at its extremity a projection c^8, which engages a detent c^9, projecting laterally from a lever c^{10}, pivoted at c^{12}. A releasing-arm c^{13}, connected with said lever c^{10}, is adapted to engage one or another detent on the operating-member of the setting-device and hold it at rest, and when moved to release said member, permitting it to operate. In lieu of the specific form of releasing-mechanism here shown, for the operating-member of the setting-device, it is obvious that other forms of releasing-mechanism may be employed.

As here shown the operating-member consists of a revoluble disk d', see Figs. 5 and 7, connected with a power-driven shaft d, and having several detents d^2, arranged on one side of it, any one of which is adapted to engage the releasing-arm c^{13}. Said disk d', as here shown, has four detents d^2, arranged equal distances apart, adapted to engage said releasing-arm, but any other number may be employed. Said detents have beveled faces which engage the beveled end of the releasing-arm, and when the releasing-arm is permitted to operate, by an upward movement of the arm c^4, disengaging the detent c^9, the power-driven disk d' advances, and pushes the detent which at such time engages the releasing-arm, past said releasing-arm, thereby moving said releasing-arm on its pivot and moving the lever c^{10} toward the left a short distance. Said lever c^{10} has at its extremity a detent c^{14}, normally lying beneath the end portion of a locking-lever c^{15}, pivoted at c^{16}, and held down against a stop c^{17}, by a spring c^{18}, and when said lever c^{10} is moved toward the left, as aforesaid, its detent c^{14} passes from beneath the end-portion of the locking lever, to a position just beyond the end of said locking-lever, lifting the locking-lever during such movement, and as said locking-lever immediately resumes its normal position it falls back of said detent c^{14} and acts to prevent the return of said lever c^{10}. The disk d', having thus been released, moves but a short distance, when its movement is checked, but during such movement it operates the setting-device to set the contact pens, and therefore serves as an operating-member for said setting-device.

For the purpose of checking forward movement of the disk d', other detents d^4 are arranged on one side of it, which are made like the detents d^2, and said detents d^4 are arranged respectively between the several detents d^2, alternating therewith, but are more remotely disposed relative to the axis of the disk, and an arm c^{19} is connected with the pivot-shaft c^{12}, of the lever c^{10}, which, when the disk d' is released as aforesaid, and said lever moved into abnormal position, is moved into the path of movement of said detents d^4, so as to engage any one of said detents and thereby check movement of said disk, and said arm c^{19} is held in its engaging-position by the lever c^{10}, which is at such time locked. Said arm c^{19} acts, by engaging one of said detents d^4, to hold the disk d' at rest, with the setting-device in position to hold the contact-pens "set", while the signal is being repeated, and subsequently when said lever c^{10} is permitted to resume its normal position, said disk d' again operates and pushes the detent d^4, which is in engagement with said arm c^{19}, past said arm, and thereby moves said arm and lever c^{10} connected therewith and the releasing-arm c^{13} back to their normal positions, said releasing-arm returning into the path of movement of the detents d^2, in order that it may subsequently be engaged by one of said detents d^2 and movement of the disk thereby again checked. Hence the arm c^{19} acts not only as a means for holding the disk d' at rest while the signal is being repeated, but also as a restoring-arm, being operated by any one of the detents d^4 on the disk d', to restore the releasing-arm.

The operating-member of the setting-device is, therefore, herein designed to not only operate the setting-device, but also to operate the releasing-arm which is employed to release it, but I do not limit my invention to the employment of an operating-member having the capability of performing both of these functions, or to the particular construction of operating-member herein shown.

To control the return movement of the lever c^{10} in such manner that it will not be returned until the complete signal has been repeated a timed controlling-device is provided which is designed to lift the locking-lever c^{15} only after the circuit of the operating-magnet has remained normal for a predetermined period of time, and thereby disengage said lever c^{10}, permitting it to resume its normal position. As here shown said locking-lever c^{15} is connected by a link c^{20}, with the extremity of an arm c^{21}, pivoted at c^{22}, beneath which travels an arm c^{23}, universally connected at one end to a suitable support whereby it may be moved back and forth in a horizontal plane, and also moved up and down. Said arm c^{23} bears a finger c^{24}, adapted to engage a worm c^{25} on a shaft c^{26}, so that it may be moved in one direction, in a horizontal plane, by said

worm, and when lifted free from said worm may be moved in the opposite direction by a spring c^{27} attached to it. Movement of said arm is limited in opposite directions by stop-pins. The pivoted-arm c^{21} bears a pivoted spring-pressed pawl c^{28}, which enters the path of movement of the arm c^{23}, so as to be engaged by said arm for the purpose of lifting the arm c^{21} and in turn lifting the locking-lever c^{15}. Up and down movement of the arm c^{23} is controlled by the operating-magnet, and, as here shown, a pin c^{30} extends beneath said arm c^{23}, which projects laterally from an arm c^{31}, secured to the pivot-shaft c^2, and as said shaft is rocked by the arm c' connected therewith and the arm a^5 connected with the armature-lever of the operating-magnet, said arm c^{23} will be correspondingly moved, it being positively lifted by said pin c^{30} and returned by a spring c^{32} attached to it. When the armature of the operating-magnet is attracted the arm c^{23} is lifted, disengaging the worm, and is immediately moved in a horizontal plane by the spring c^{27}, and when said armature is retracted said arm is permitted to fall and engage the worm and is moved in a homeward direction by said worm, and such movements of the arm c^{23} are repeated as the armature of the operating-magnet vibrates, until such time as it is permitted to remain in engagement with the worm long enough to return home, when it passes beneath the pawl on the pivoted-arm c^{21}, and during such passage lifts said arm and thereby lifts the locking-lever c^{15}, permitting the lever c^{10} to be restored to its normal position by the action of the disk d', as previously described. Hence the setting-device will be held until such time as the circuit of the operating-magnet has remained normal for a predetermined period of time. The worm-shaft c^{25} is driven by a train of gearing connected with the power-driven shaft d, and as here shown a toothed gear c^{40} is connected with said shaft d, which engages a pinion c^{41} secured to a shaft c^{42} bearing a toothed-gear c^{43}, which engages a pinion c^{44}, secured to the worm-shaft, and an escape-wheel c^{45} is also secured to said worm-shaft with which coöperates a suitable pallet c^{46}.

Other means may be employed for controlling the movement of the lever c^{10}, in lieu of that here shown, which comes within the scope of my invention.

The setting-device, as here shown, consists of a horizontally arranged bar e, having a laterally extended pin e' at one end, with or without a roll thereon, which engages a cam-groove d^3 formed in one side of the disk d', and its opposite end is loosely or pivotally connected to an arm e^2 of an elbow-lever pivoted at e^3, the other arm e^4 of said lever bearing the contact-pens e^5, adapted to normally engage contact-pens e^6, and to be moved out of engagement therewith and into engagement with contact-pens e^7. The cam-groove d^3 is so shaped with respect to the detents on said disk d' as to operate to move the bar longitudinally and thereby set the setting-device when said disk is first released, and before or by the time its movement is checked and subsequently to return said bar to its normal position and thereby positively restore the setting-device when said disk is a second time released and operates to restore the releasing-arm, the setting-device being thereby held with the contact-pens "set", during the time the disk d' remains disengaged by the releasing-arm and is held checked by the restoring-arm. In lieu of the setting-device herein shown any other form may be employed. The contact-pens e^5, e^6 and e^7 are arranged in pairs, that is to say, the arm e^4 bears a pair of contact-pens e^5 for each engine-house circuit e^{10}, and said contact-pens normally engage a pair of contact-pens e^6 connected with a battery e^{12}, and are movable out of engagement with said contact-pens e^6 and into engagement with a pair of contact-pens e^7, which are also connected with the battery, but said contact-pens e^6 and e^7 are reversely connected with the battery, so that as the contact-pens e^5 are moved out of engagement with one pair and into engagement with the other pair the polarity of the battery e^{12} is reversed.

The engine-house circuits e^{10}, one only of which is here shown in diagram, see Fig. 9, are normally closed, and, as here shown, the circuit includes a neutral-relay e^{13} and a polarized-relay e^{14}, and the armature of the neutral-relay is adapted to operate a local-circuit e^{15}, and the armature of the polarized-relay is adapted to connect one or the other branch wire e^{16}, e^{17}, in said local circuit, according as it is moved to one or the other side of the relay. When the armature of the polarized-relay is in the position shown in Fig. 9 and the engine-house circuit e^{10} operated by a key e^{18}, or other means, the armature of the neutral-relay e^{13} will operate a circuit including the branch-wire e^{16} and sounder e^{19}, but when the contact-pens e^5 are operated by the repeating-transmitter the armature of the polarized-relay will be moved to the other side and the local branch-wire e^{17} connected in circuit, and the gong e^{20}, included in said branch circuit-wire will be operated, the sounder being disconnected.

The setting-device moves the contact-pens e^5 into coöperative engagement with a controller by which they are subsequently repeatedly operated, to operate the engine-house circuit. The controller, as here shown, consists of an elliptical or other shaped roll f, secured to a shaft f', and arranged be-

neath the contact-pens e^5, and so disposed relative thereto that when the contact-pens are set they will engage it. As here shown said contact-pens each bear a small roll adapted to engage the roll f to reduce the friction at the point of engagement. When the contact-pens e^5 are in engagement with that part of the roll f, of shortest diameter, they will engage the contact-pens e^7, and, as the roll f is turned, they will be lifted out of engagement with said contact-pens e^7, but not far enough to engage the contact-pens e^6. Hence the engine-house circuit is operated by the contact-pens e^5 repeatedly engaging and disengaging the contact-pens e^7. The shaft f' is turned a half revolution for each signal-impulse, to thereby correspondingly turn the roll f. Normally the roll f is arranged in a middle position, so that when the contact-pens are set by the setting-device they will engage said roll, but will occupy a middle position between the contact-pens e^6 and e^7, and as the roll is turned they will engage and then disengage said contact-pens e^7. For the purpose of intermittingly revolving the roll f a pinion f^2 is secured to the shaft f', which is engaged by an intermediate toothed-gear f^3, secured to a shaft f^4, which engages a toothed-gear f^5 arranged on the power-driven shaft d, and said toothed-gear is connected by gearing with a disk f^6, also arranged on said shaft d, which is provided with several detents f^7, three being here shown, arranged at equal distances apart, and projecting outwardly from the periphery of said disk, any one of which is adapted to engage a double-locking-arm f^8, secured to the pivot-shaft a^4 of the armature-lever of the operating-magnet, whereby said disk f^6 is intermittently released by movements of the armature of said magnet.

The locking-arm f^8 has two pins f^9, f^{10}, projecting laterally from it, one above the other, and any one of the detents f^7 normally engages one of said pins, as f^{10}, and when the armature is attracted and the arm f^8 moved in one direction, said pin f^{10} is moved from beneath the detent f^7 and the disk permitted to revolve until the next detent f^7 engages the other pin f^9, when its movement is checked; and then when the armature is retracted said arm f^8 is moved in the opposite direction and the pin f^9 moves from beneath said detent f^7, to again release the disk and permit it to revolve until its movement is again checked by said detent engaging the other pin f^{10}. The movement of the disk f^6 is sufficient to operate the gearing and turn the roll f one-half revolution and thereby permit the contact-pens e^5 to engage the contact-pens e^7 and then disengage them, thereby closing and again opening the engine-house circuit.

For the purpose of regulating the movement of the roll f a suitable regulating-device is provided, which, as here shown, consists of a revolving-fan g, secured to a shaft g', bearing a pinion g^2, which engages a toothed-gear g^3, secured to a shaft g^4, bearing a sprocket-wheel g^5, over which passes a sprocket-chain g^6, which passes around a sprocket-wheel g^7, secured to the shaft f'.

The invention is not limited to the employment of the particular form of controller for the contact-pens e^5 here shown, or to the particular means here shown for operating it.

As many engine-house circuits e^{10} will be connected with the repeating-transmitter as desired, and for simplicity of construction and compactness of parts two setting-devices may be employed, arranged at opposite sides of a single operating-member, so that both may be operated by said member, and each setting-device will bear as many pairs of contact-pens e^5 as may be required, there being one pair for each engine-house circuit. As here shown, two shafts f' are provided, bearing rolls f, for operating the contact-pens e^5.

The operating-magnet b is designed to be included directly in the main signal-circuit or to be operated directly thereby, in case the automatic repeating-mechanism should be disconnected, and as said signal-circuit is normally closed the operating-magnet b is designed to be operated as a closed circuit-magnet. Normally, however, it is disconnected from the circuit, hence its armature is retracted, but when connected in circuit its armature is attracted, and is ready to respond. Its armature b^2 is connected to an armature-lever b^3, secured to a pivot-shaft b^4, and to said pivot-shaft b^4 an arm b^5 is attached, which extends beneath the pin c on the arm c', so that when the armature is attracted said arm c' will be lifted just the same as it is lifted by the arm a^5, and the operating-member of the setting-device or devices will be released. A double-locking arm b^8 is also connected to said pivot-shaft b^4, having at its upper end two pins b^9, b^{10}, arranged one above the other and adapted to engage one or another detent b^{12}, on a disk b^{13}, connected with the power-driven shaft d. Said disk b^{13} is constructed substantially the same as the disk f^6, and is intermittently released by a movement of the armature b^2. Normally one of the detents b^{12} on the disk b^{13} engages the lowermost pin b^9, and when the arm b^8 is moved, incident to the armature attracting, said detent disengages said pin b^9, and as the disk revolves, it immediately engages the detent d^{10}, although such short movement of the disk is not sufficient to accomplish any effective results, but when the armature is retracted the arm b^8 is moved in the opposite direction and the disk b^{13} thereby re-

leased and permitted to revolve until the next detent b^{12} engages the pin b^9, and during such movement of the disk the toothed-gear f^5 is operated to revolve the shafts f', and thereby operate the contact-pens e^5. Thus it will be seen that either operating-magnet may be employed to effect the operation of the engine-house circuits. In case it becomes necessary to operate the repeating-transmitter manually the operating-magnet a will preferably be selected as said magnet is designed to be operated as an open-circuit-magnet, and the circuit which is operated by the manual transmitter will, ordinarily, be an open-circuit.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A repeating-transmitter having one or more circuit-operating devices, actuating-means therefor, and two separate operating-magnets for said actuating-means, one operating by a movement of its armature toward its poles and the other by a movement of its armature away from its poles, substantially as described.

2. A repeating-transmitter having one or more circuit-operating-devices, actuating-means therefor, two independent operating-devices for said actuating-means, and two electro-magnets for releasing said operating-devices, respectively, one operating by a movement of its armature toward its poles and the other by a movement of its armature away from its poles, substantially as described.

3. A repeating-transmitter having one or more circuit-operating-devices, power-driven actuating-means therefor having two detent-carrying disks connected therewith, a releasing-lever for each disk having two locking-pins adapted to be successively engaged by the detents thereon and two electro-magnets for operating said releasing-levers, respectively, substantially as described.

4. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, motor-mechanism to operate said setting-device at the beginning of a signal and to restore same at the end of a signal, actuating-means for said circuit-operating-device operated by said motor-mechanism, and two separate magnets to release said motor-mechanism and to control the operation of said actuating-means, one adapted to be operated by repeating-mechanism connected with the signal-circuits and the other by the signal-circuits, substantially as described.

5. A repeating-transmitter having a circuit-operating device, a setting-device for said circuit-operating-device, a motor-driven operating-member therefor, motor-driven actuating-means for said circuit-operating-device, and two separate magnets for releasing said operating-member at the beginning of a signal and for releasing said actuating-means on each signal-impulse, one of said magnets adapted to be operated by repeating-mechanism connected with the signal-circuits and the other by the signal-circuits, substantially as described.

6. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, an operating-member therefor, releasing-mechanism for said operating-member, actuating-means for said circuit-operating-device, and two independent operating-magnets for said releasing-mechanism and actuating-means, substantially as described.

7. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, an operating-member therefor, releasing-mechanism for said operating-member, timed-controlled restoring-mechanism for said releasing-mechanism, actuating-means for said circuit-operating-device, and two independent operating-magnets for said releasing-mechanism and actuating-means, which also control the operation of said restoring-mechanism, substantially as described.

8. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, timed-controlled restoring-mechanism for said setting-device, actuating-means for said circuit-operating-device, and two independent operating-magnets for said setting-device and actuating-means, which also control the operation of said restoring-mechanism, substantially as described.

9. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, motor-mechanism to operate said setting-device at the beginning of a signal and to restore same at the end of a signal, actuating-means for said circuit-operating-device operated by said motor-mechanism, and a magnet to release said motor-mechanism and to control the operation of said actuating-mechanism, substantially as described.

10. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, a motor-driven operating-member therefor, motor-driven actuating-means for said circuit-operating-device, and a magnet for releasing said operating-member at the beginning of a signal and for releasing said actuating-means on each signal-impulse, substantially as described.

11. A repeating-transmitter having a circuit-operating device, a setting-device for said circuit-operating-device, a motor-driven operating-member therefor, releasing-means and locking-means for said operating-member, motor-driven actuating-means for said

circuit-operating-device, and a magnet for operating said releasing-means at the beginning of a signal and for releasing said actuating-means on each signal-impulse, substantially as described.

12. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, an operating-member therefor, releasing-mechanism for said operating-member, timed-controlled restoring-mechanism for said releasing-mechanism, actuating-means for said circuit-operating-device, and an operating-magnet for said releasing-mechanism and actuating-means, which also controls the operation of said restoring-mechanism, substantially as described.

13. A repeating-transmitter having a circuit-operating-device, a setting-device for said circuit-operating-device, timed-controlled restoring-mechanism for said setting-device, actuating-means for said circuit-operating-device, and operating-mechanism for said setting-device and actuating-means, which also controls the operation of said restoring-mechanism, substantially as described.

14. A repeating transmitter adapted to operate a circuit and to reverse the polarity of the current in said circuit, having a pole-changing circuit-operating-device, a setting-device for said circuit-operating-device, motor-mechanism to operate said setting-device at the beginning of a signal and to restore same at the end of the signal, actuating means for said circuit-operating-device operated by said motor-mechanism and a magnet to release said motor-mechanism and to control the operation of said actuating-means, substantially as described.

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

NATHAN H. SUREN.

Witnesses:
H. B. DAVIS,
B. J. NOYES.