(No Model.) 2 Sheets—Sheet 1.

F. A. SKELTON.

FIRE ALARM TELEGRAPH REPEATER.

No. 415,578. Patented Nov. 19, 1889.

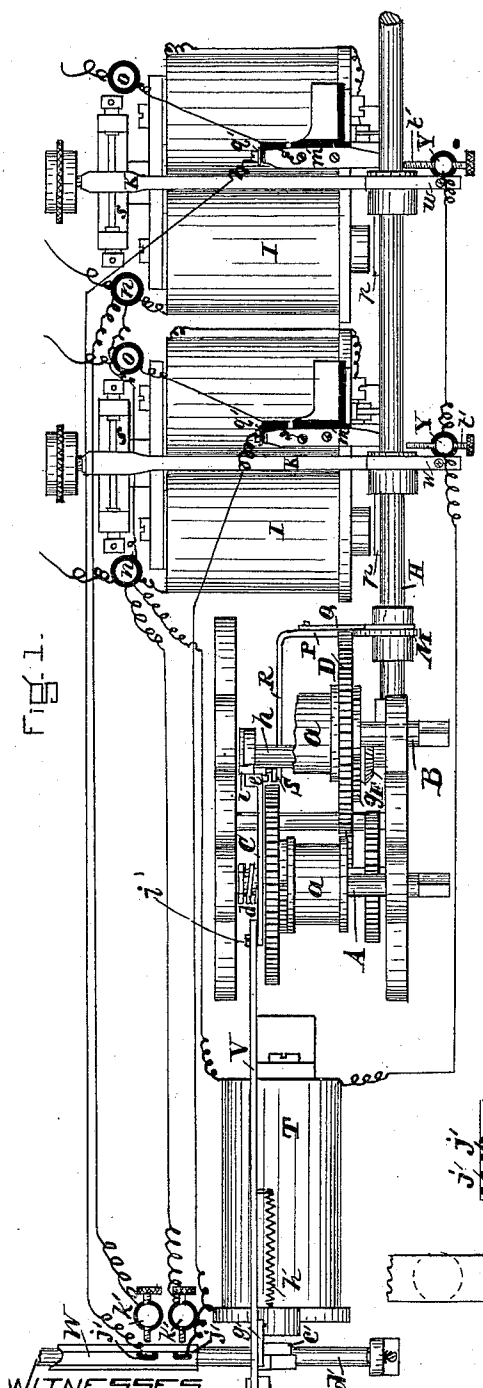

Fig. 1.

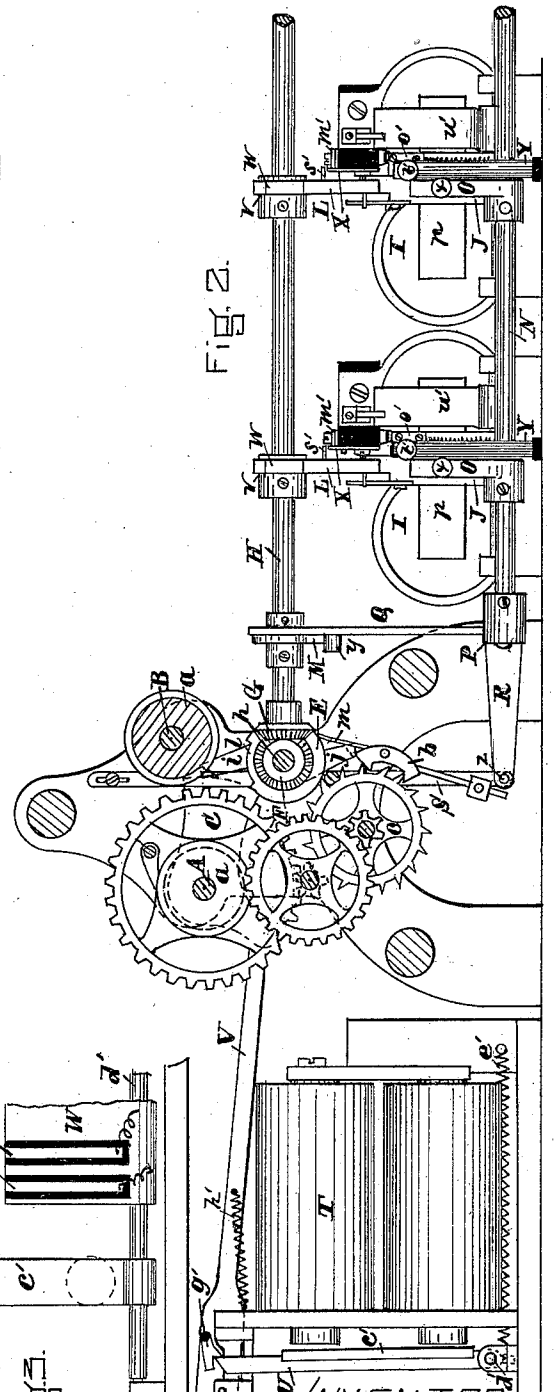

Fig. 2.

Fig. 3.

WITNESSES.
Charles H. Fogg,
Louis E. Hawes.

INVENTOR.
Francis A. Skelton,
per Edw. Sumner, Atty.

(No Model.) 2 Sheets—Sheet 2.

F. A. SKELTON.

FIRE ALARM TELEGRAPH REPEATER.

No. 415,578. Patented Nov. 19, 1889.

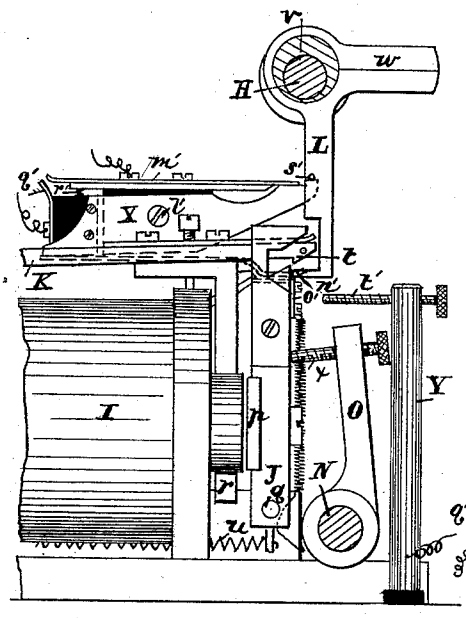

Fig. 4.

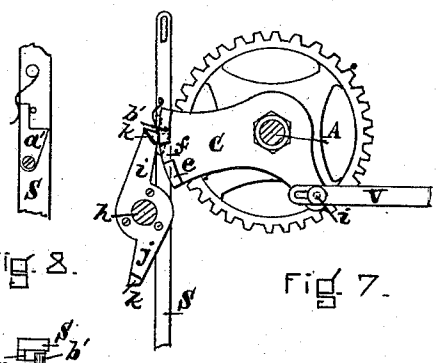

Fig. 7.

Fig. 8.

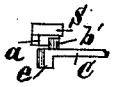

Fig. 12.

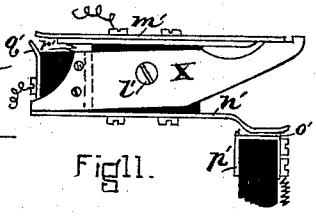

Fig. 11.

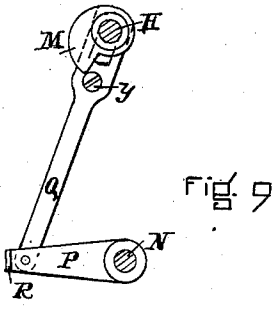

Fig. 9.

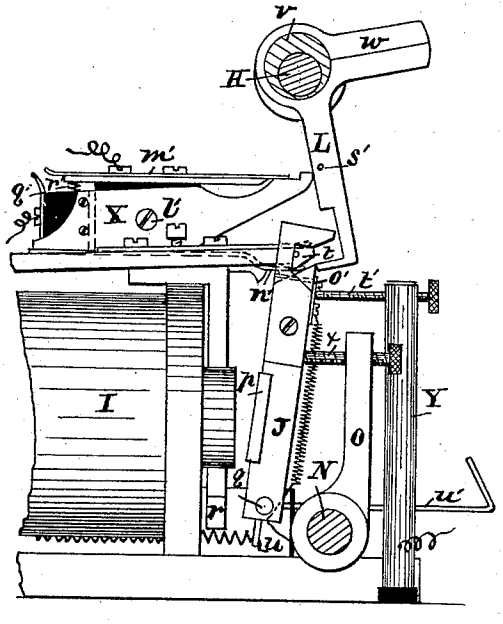

Fig. 5.

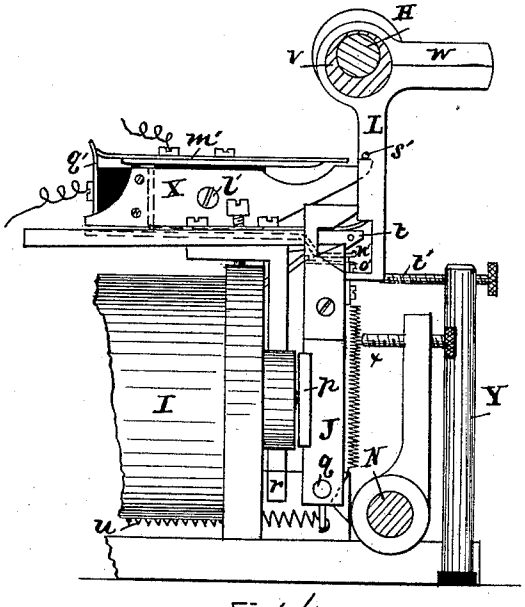

Fig. 6.

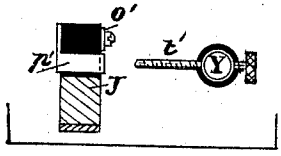

Fig. 10.

WITNESSES.

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UNITED STATES PATENT OFFICE.

FRANCIS A. SKELTON, OF NEWTON, MASSACHUSETTS.

FIRE-ALARM-TELEGRAPH REPEATER.

SPECIFICATION forming part of Letters Patent No. 415,578, dated November 19, 1889.

Application filed May 27, 1889. Serial No. 312,334. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS A. SKELTON, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Fire-Alarm-Telegraph Repeaters, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to that class of apparatus especially adapted for employment in fire-alarm telegraphs and known as an "automatic non-interfering repeater," whereby a signal transmitted over one of several independent circuits is automatically repeated on each of the other of said circuits, and also whereby, while a signal is thus being transmitted on one circuit and repeated on the other circuits, such signal cannot be interfered with by an attempt to transmit another signal on either of said circuits.

The object of my invention is a non-interfering repeater more rapid in operation, more certain in action, and simpler in construction than those known heretofore, these advantages being gained mainly through the employment of an electro-magnet in a shunt-circuit in combination with a mechanical time-motor and locking-out train, whereby it is possible to dispense with a large part of the mechanism heretofore used, as hereinafter set forth, and specifically pointed out in the claims.

In the drawings, (two sheets,) Figure 1 is a plan view of so much of an apparatus embodying my invention as is sufficient for illustration of the same. Fig. 2 is a side view of certain parts, one side plate of the frame supporting the motor and parts of the gearing being omitted. Fig. 3 is a rear view of the armature c', the pivoting-shaft d', bearing the arm w, and contact-pieces j'. Figs. 4, 5, and 6 are views of a portion of a circuit-magnet and adjacent devices in different working positions. Fig. 7 shows the other side of the gear on shaft A and adjacent devices from that shown in Fig. 2. Figs. 8 and 12 are enlarged views (side and plan) of the rod S and catch a'. Figs. 9 and 11 are front views, and Fig. 10 a plan view, of details.

Supported in bearings in the side plates are two shafts—one A of the time-motor, and the other B of the locking-out train. These shafts are caused to rotate independently of each other, which may be done by means of cords and weights suspended from the drums a, in the usual manner. The rotation of the shaft A is regulated by means of the pallet b, the escapement-wheel c, and the intermediate gearing shown. On the shaft A is a plate C, which has a frictional connection with the shaft or the gear thereon, as by means of a spring d. This plate C has a flange e along part of its periphery, which flange has an opening f therethrough.

On the shaft B is a gear D, which engages with a pinion g on a shaft h, having bearings in the side plates. Fastened on this shaft h are two arms i and j, the one i being longer than the one j. Each of these arms has a side projection k, which may bear against the flange e, and thus prevent rotation of the shaft h, or pass through the opening f, and thus permit rotation of the shaft h. On the shaft h is also fastened a plate E and a bevel-gear F. The plate E has a part of its rim cut away at l. An arm m, fixed to the pallet b, is in position to bear against the unbroken portion of the rim of the plate E, and thus stop the vibration of the pallet, and hence rotation of the shaft A. When the opening l is opposite the arm m, this arm may vibrate and the shaft A rotate. With the bevel-gear F engages a bevel-gear G on a shaft H, extending through the distance occupied by the electro-magnets of the several circuits. The bearings for this shaft, as well as those of the shaft N, hereinafter described, are not shown in the drawings.

I have shown the devices at the main station connected with two independent circuits, this being sufficient to illustrate the invention. There may be as many of such circuits as are required. In each of these circuits is a magnet I, which may be termed the "circuit-magnet," from the binding-posts n and o of which extend the outgoing and incoming lines of the circuit, in the usual manner and as indicated. For each of these magnets is an armature p on a lever J, pivoted at g, and an auxiliary armature r on a lever K, pivoted

at *s*. This lever is formed at one end as a latch *t*, to engage with the upper end of the lever J and hold the latter in position to retain the armature *p* against the poles of the magnet. The lever K is balanced by means of the weight shown at the other end, in order that it may swing sluggishly. The armature *p* and the lever J will fall rapidly by means of a spring *u* away from the magnet, when the current is broken and the latch *t* raised. Opposite each circuit-magnet is an eccentric *v*, fastened on the shaft H. To move loosely on this eccentric is a piece having an arm L, the lower end of which bears against the lever J, a weight *w* being on this piece for that purpose. There is also a cam M fixed on the shaft H. A shaft N extends along through the distance occupied by the circuit-magnets. For each of the latter there is an arm O fixed on this shaft, the upper end of which bears by means of the adjusting-screw *x* against the lever J. Fastened on the shaft N is an arm P, to which is pivoted the lower end of a rod Q. The upper end of this rod has a slot to receive the shaft H and to allow the rod to move endwise. There is a pin bearing a roller *y*, fixed to the rod Q, against which the cam M acts. Fixed to the arm P is an extension R, in position to be pivoted at *z* to a rod S. This rod is retained in position to slide vertically, as shown. On this rod is pivoted a catch *a'*, which on the upward motion of the rod will engage with a pin *b'* on the plate C to swing this plate a certain distance and then pass the pin. On the downward motion of the rod the catch will be swung so as to pass the pin and not move the plate. I employ another electro-magnet T, which is in a shunt-circuit. I prefer to locate the poles and armature *c'* as shown, the armature-lever U being fixed on a pivotal shaft *d'*. Quick removal of the armature from the magnet is insured by a spring *e'*. In a slot *f'* in a fixed support is the pivot of a rod V. To this rod is pivoted a latch *g'*, with such relation to the lever U that the movement of the latter toward the magnet will slide the rod, but a reverse movement of the lever will not cause movement of the rod, the rod being slid backward by a spring *h'*. This latch also slips over the lever, owing to the fixed inclined plane shown, when the lever has completed its forward movement. The other end of the rod V has a slot, in which is a pin *i'* on the plate C. Fastened to the shaft *d'* is an arm W, bearing several contact-pieces *j'*, each of which may come in contact with a post *k'*, or adjusting-screw therein, to form a circuit-breaker for each main circuit.

At each circuit-magnet is pivoted at *l'* to a fixed support an insulated metallic piece X, which may be termed a "locking-out device." Fastened to this fixed support are two insulated metallic pieces *m'* and *n'*. Fastened on the upper end of the armature-lever J are two metallic pieces *o'* and *p'*, which are insulated from the lever and from each other. Fastened to the piece X is an insulated piece *q'*. A spring *r'* presses the inner end of the piece X downward in such a manner as to bring this inner end in contact with the piece *n'* and the outer end in contact with the piece *m'*.

On the arm L is a pin *s'*, which on the downward motion of this arm, caused by the corresponding movement of the eccentric *v*, will carry the piece X out of contact with the pieces *m'* and *n'*. When the armature *p* is against its magnet, the piece *n'* will be in contact with the piece *o'*; but if the armature has been swung away the piece *n'* will be in contact with the piece *p'*. In the latter position of the armature the piece *p'* will be in contact with the insulated post Y or adjusting-screw *t'* therein, thus forming a switch to bring the shunt-circuit into a main circuit, as herein appears.

For each of the main circuits an electric connection extends from post *o* to piece *m'*, from piece *o'* to and through the coils of the magnet to post *n*, from post *n* to the appropriate post *k'*, and from the corresponding contact-piece *j'* to the piece *q'*. All of the posts Y are electrically connected together and with the magnet T, the other side of this magnet being connected with all of the posts *n*, which posts are thus connected together.

When no signal is being given, the mechanism of motor and locking-out train is at rest, the relative positions of the plate C, arms *i* and *j*, the plate E, arm *m*, cam M, eccentrics *v*, and arms L being substantially as illustrated in Figs. 1, 2, 4, and 9, the main and auxiliary armatures of each of the circuit-magnets being drawn to the poles—these circuits being closed—the current for each circuit passing from post *o* to piece *m'*, to piece X, to piece *n'*, to piece *o'*, through the magnet to post *n*. The armature of the magnet T, through which there is no current, is swung away from the magnet, and hence the contact-pieces *j'* from the posts *k'*. On a signal being given on any one of the circuits the action is as follows: The circuit on which an alarm is originally transmitted is first broken, and therefore the armatures of its magnet are released and swing away from the poles, the main armature *p* before the auxiliary armature *r*. Therefore this armature will fall away from its magnet and the shaft N will be rotated slightly by means of the armature-lever J and the arm O, so that the rod S will be slid upward by means of the arm P R, the catch *a'* engaging with the pin *b'*, and thus causing the plate C to rotate a sufficient distance to allow the projection *k* on the arm *i* to pass through the opening *f*; hence the shaft B will make a half-revolution, and only a half-revolution, since the projection on arm *j* will meet the flange of the plate C, so that the cut-away part *l* of the plate E will be brought down opposite the arm *m*, and the pallet may vibrate and the shaft A revolve. This shaft with its train will continue to revolve during the time the

signal is being given. The shaft H has also made a half-turn by means of the bevel-gears F and G, so that each eccentric *v* has been brought into position to carry the arms L downward. The arm L, opposite the magnet of the circuit on which the alarm is being given, having been swung out by the corresponding armature-lever J, as shown in Fig. 5, its pin *s'* will not meet the piece or locking-out device X; but each of the other pieces or locking-out devices X will be swung down, as shown in Fig. 6. Therefore all these other circuits will be broken immediately upon the breaking of the one circuit, as stated above, since the contact of each piece *m'* with piece X for these other circuits will be broken; but the armatures *p* and levers J for each of these other circuits will not fall away from their magnets, since the corresponding arms L have pressed downward each corresponding latch *t*. Furthermore, a contact will be made and maintained between the pieces *m'* and *q'*, and thus the magnets of these other circuits will be locked out. Since the lever J for the circuit on which the alarm is being transmitted has swung out, the piece *n'* has passed from piece *o'* to piece *p'*, and the latter has been brought in contact with the screw *t'*, and thus this circuit-magnet has also been cut out, and the magnet T has been brought into this circuit. This circuit now being closed after the first break, the magnet T will act, swinging toward itself its armature and the lever U, and hence swinging the contact-pieces *j* to the screws in the posts *k'*, so that each of the other circuits, as well as the one on which the signal is being originally transmitted, will be closed. There being friction between the plate C and its shaft or gear thereon, there is a tendency of rotation of said plate when said shaft is revolving; but the swing of the lever U will cause, by means of the rod V, a reverse movement of the plate C sufficient to prevent for a time the opening *f* from being brought opposite the projection *k* on arm *j*. The second break of the circuit on which the signal is being given will cause a break of each of the other circuits by the release of the armature *c'* and the removal of the contact-pieces *j'* for these other circuits from the screws or posts *k'*, and so in a similar manner the second closing of the former circuit will cause a closing of each of the other circuits by means of the pieces *j'* and posts *k'*. Thus the action will continue while the several impulses of the signal are being transmitted over one circuit, for the forward motions of the plate C, by means of a weight or spring, are suitably regulated by the pallet *b* and escapement-wheel *c*, there being substantially equal reverse motions of this plate by means of the magnet T, lever U, and rod V, and there being corresponding impulses on each of the other circuits by means of this magnet and swinging arm W having corresponding contact-pieces *j'*. When the signal has thus been fully transmitted on the one circuit and repeated on each of the other circuits, and a short space of time has thereafter elapsed, the plate C will be carried forward, there being now no backward movement thereof, to allow the projection *k* on arm *j* to pass through the opening *f*, so that the shaft B will make the other half of the revolution, and only a half-revolution, since the projection *k* on arm *i* will be brought against the flange *e*, and the arm *m* will be met by the rim of the plate E, and thus the shaft A and train connected therewith stopped. The shaft H making a corresponding half-revolution, the cam M will act on the pin or roller *y*, and by means of the rod Q rotate the shaft N in the reverse direction from its former movement, so as to swing the armature *p* of the circuit, on which the signal has been originally transmitted, to its magnet by means of the arm O and lever J. The eccentrics *v*, and hence the locking-out devices, will also pass to their former positions. Thus all the parts of the mechanism and the electric connections will be brought to their normal conditions, ready to act, as set forth, when a signal is to be transmitted and repeated. Since when a signal is being transmitted on one circuit the circuit-magnet of each of the other circuits is locked out, there can be no action through these magnets, and hence no interference with said signal through any attempt to transmit a signal on any one of the other circuits. For each circuit there may be a drop *u'* for visual indication, as is common. It will be seen that the auxiliary armature *r* and latch *t* for each circuit will insure against the falling away of the appropriate main armatures from the poles of their magnets.

I claim as my invention—

1. The combination of several main electric circuits, a circuit-breaker in each main circuit, a shunt-circuit, an electro-magnet in each of said circuits and an armature therefor, a switch connected with the armature of each of the magnets in the main circuits by which this magnet may be cut out and the shunt-circuit brought into the corresponding main circuit, and several circuit-breakers—one for each of the main circuits—connected with the armature of the magnet in the shunt-circuit, substantially as set forth.

2. The combination of several main electric circuits, a circuit-breaker in each main circuit, a shunt-circuit, an electro-magnet in each of said circuits, and an armature therefor, a switch connected with the armature of each of the magnets in the main circuits by which this magnet may be cut out and the shunt-circuit brought into the corresponding main circuit, several circuit-breakers—one for each of the main circuits—connected with the armature of the magnet in the shunt-circuit, and an independent locking-out train for locking out the magnets of the main circuits, released by the connection with the ar-

matures of the main-circuit magnets, and controlled by the armature of the magnet in the shunt-circuit, substantially as set forth.

3. The combination of several main electric circuits, a circuit-breaker in each main circuit, a shunt-circuit, an electro-magnet in each of said circuits and an armature therefor, a switch connected with the armature of each of the magnets in the main circuits by which this magnet may be cut out and the shunt-circuit brought into the corresponding main circuit, several circuit-breakers connected with the armature of the magnet in the shunt-circuit, and an automatic time-motor and locking-out train for locking out the magnets in the main circuits, released by the connection with the armatures of the main-circuit magnets, and controlled by the armature of the magnet in the shunt-circuit, substantially as set forth.

FRANCIS A. SKELTON.

Witnesses:
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EDW. DUMMER.