4 Sheets—Sheet 1.

O. GASSETT.

Electric Railway-Signal Apparatus.

No. 228,187. **Patented June 1, 1880.**

Fig: 1.

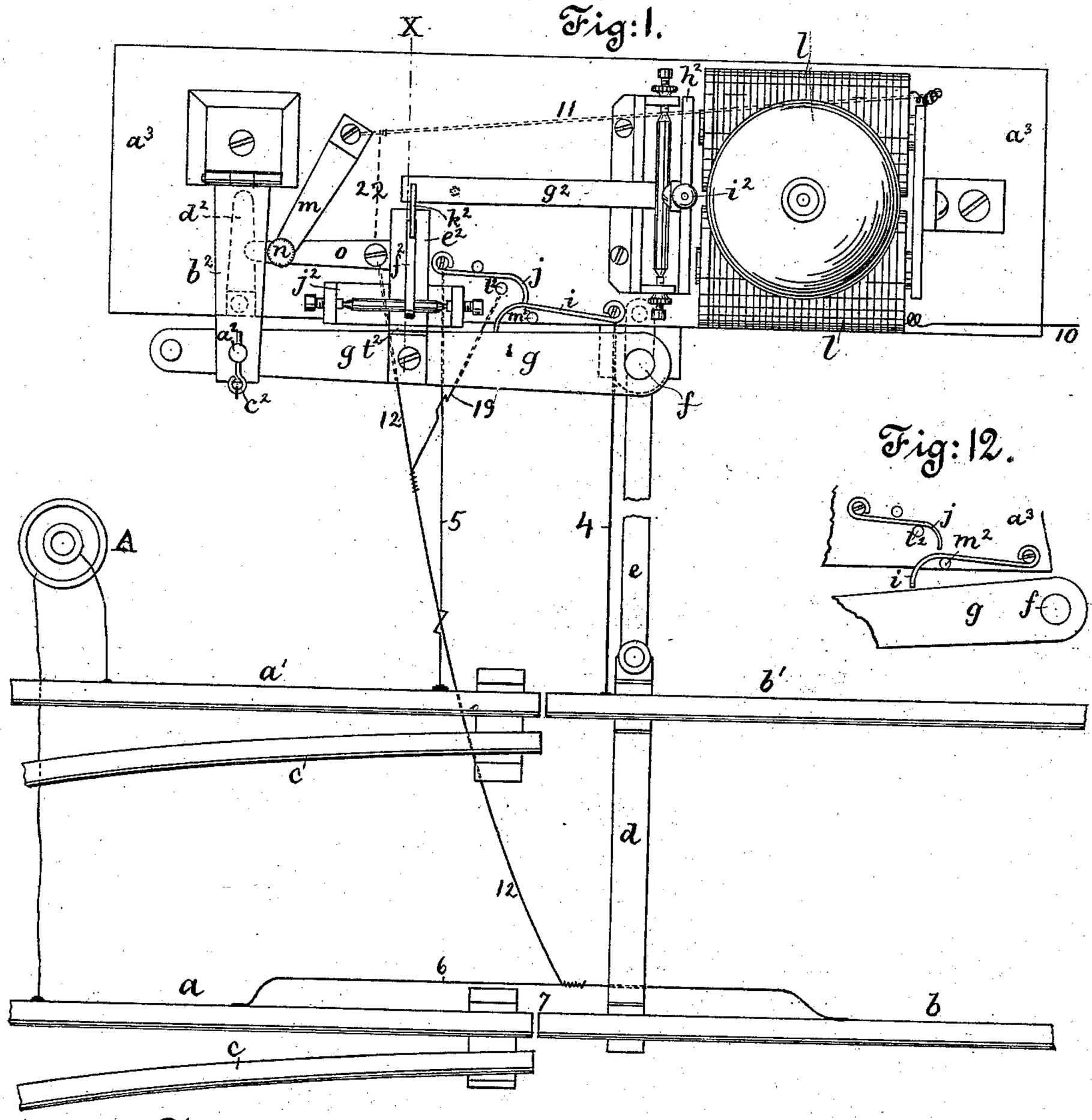


Fig: 12.

Fig: 2.

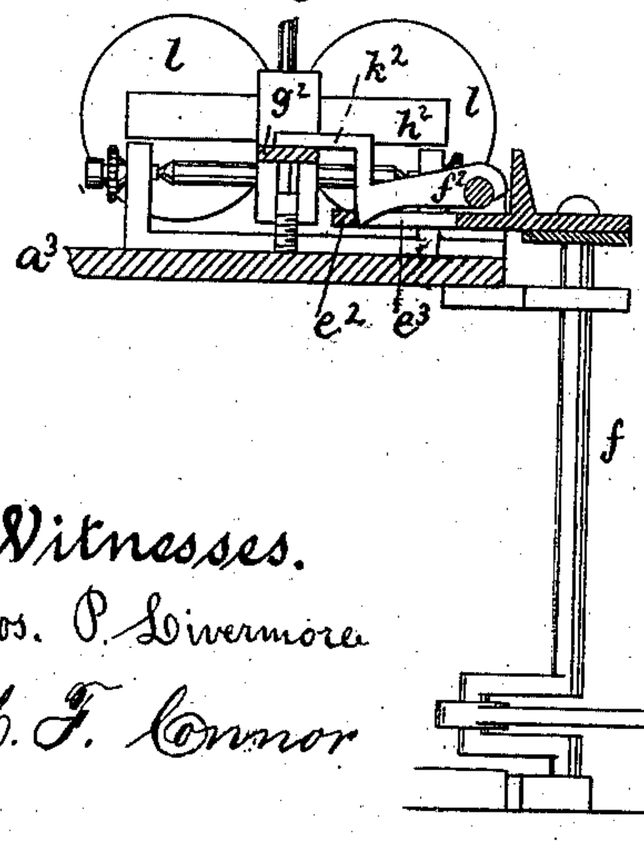
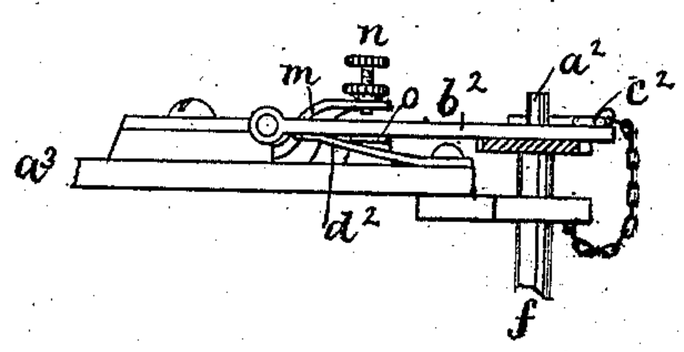


Fig: 3.



Witnesses.
Jos. P. Livermore
L. F. Connor

Inventor.
Oscar Gassett
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O. GASSETT.

4 Sheets—Sheet 2.

Electric Railway-Signal Apparatus.

No. 228,187. Patented June 1, 1880.

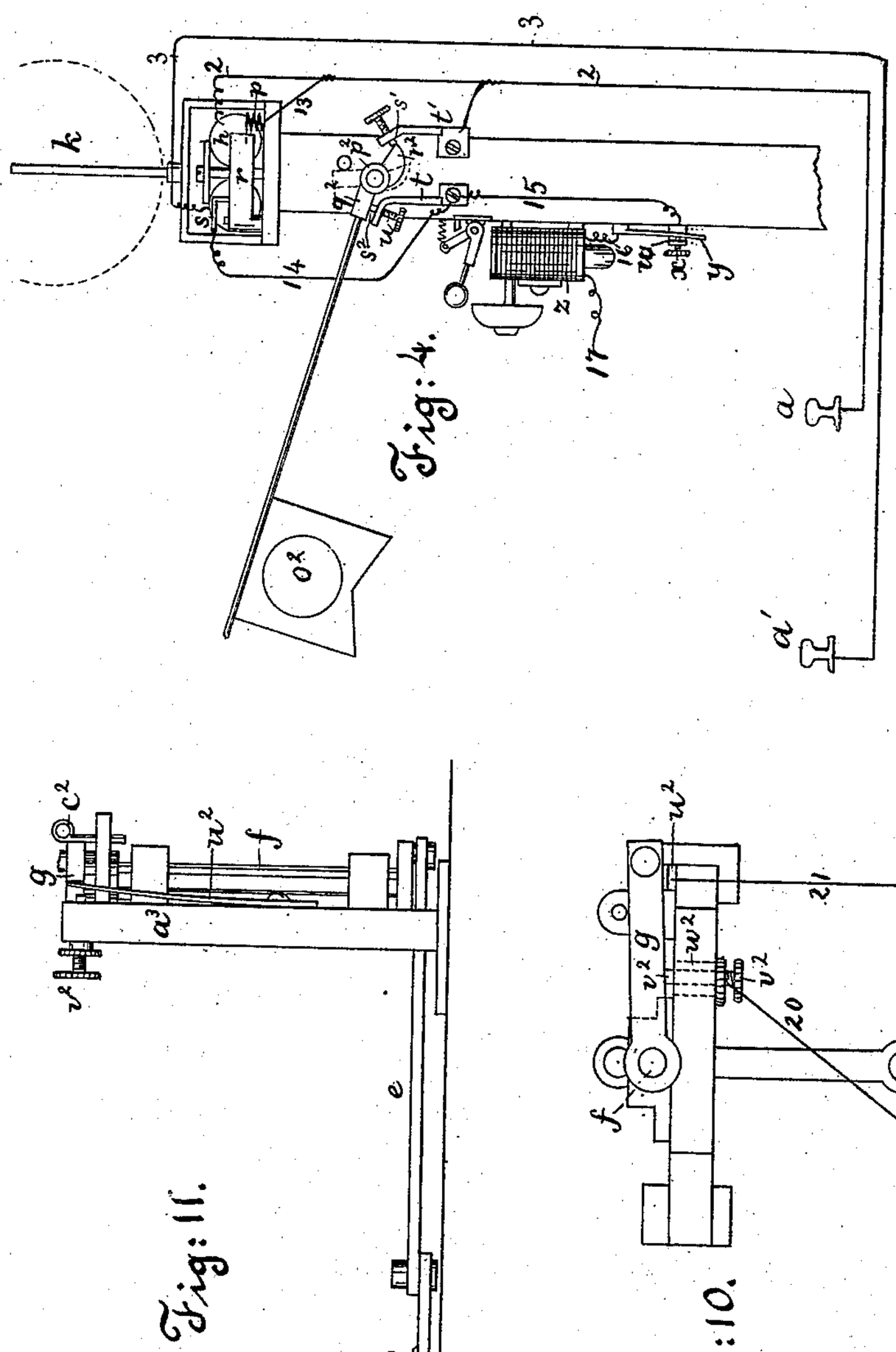

Fig: 4.

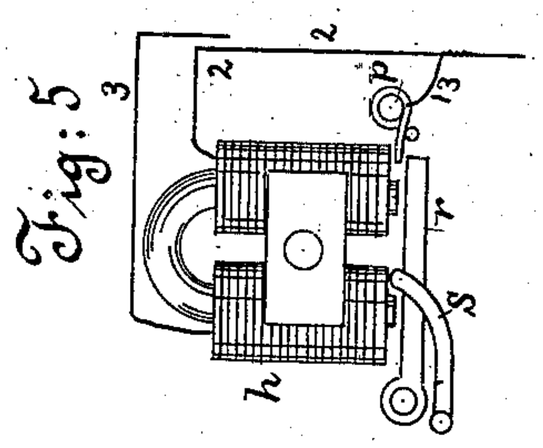

Fig: 5

Fig: 11.

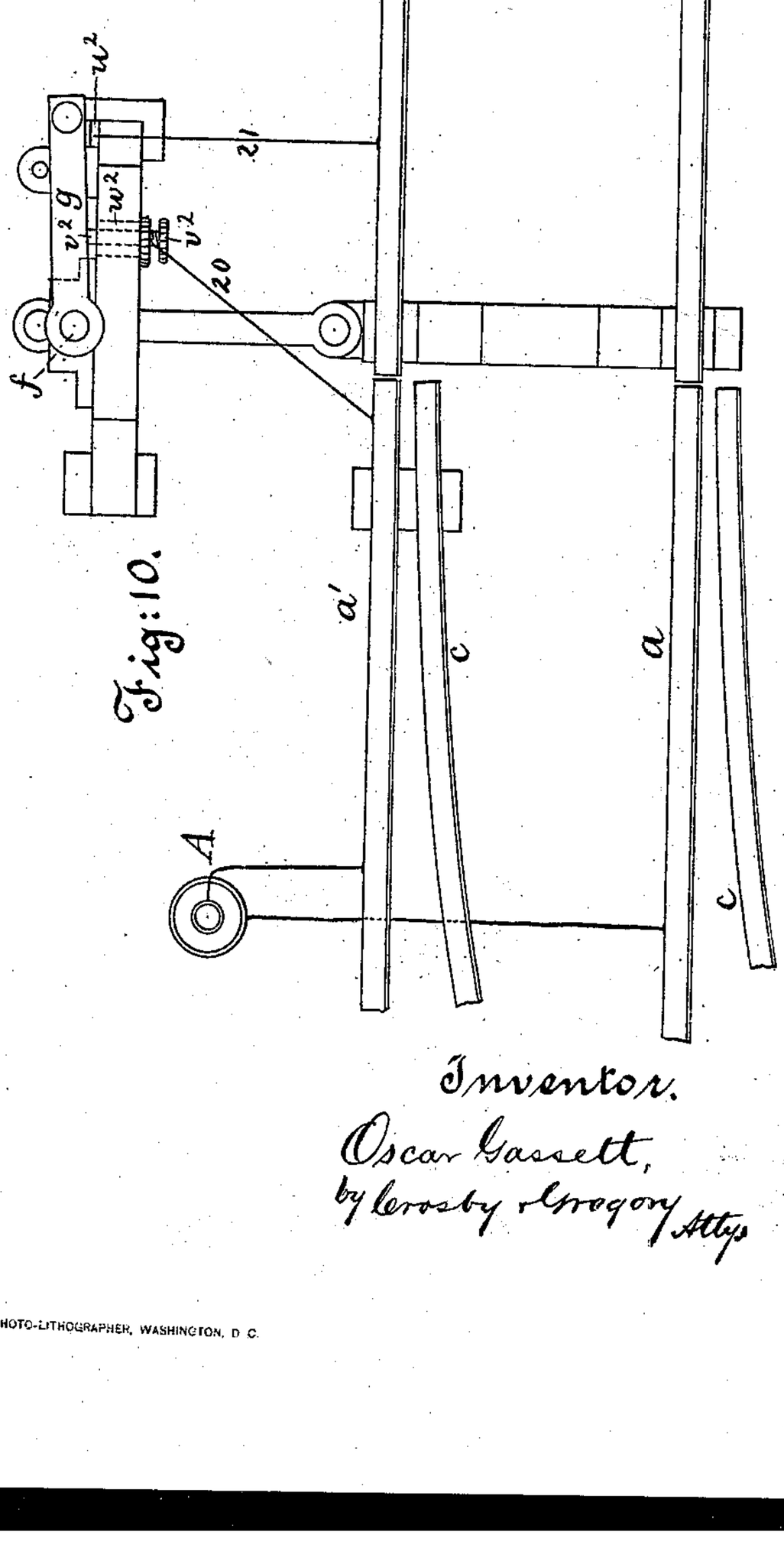

Fig: 10.

Witnesses

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4 Sheets—Sheet 3.

O. GASSETT.

Electric Railway-Signal Apparatus.

No. 228,187. Patented June 1, 1880.

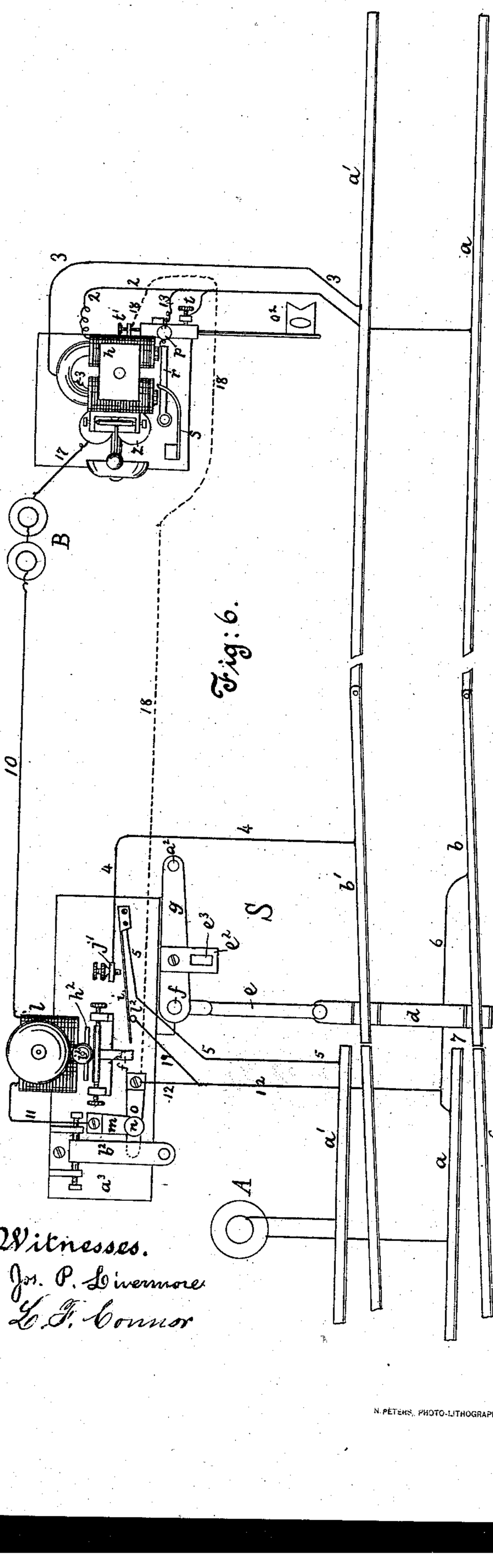

Fig: 6.

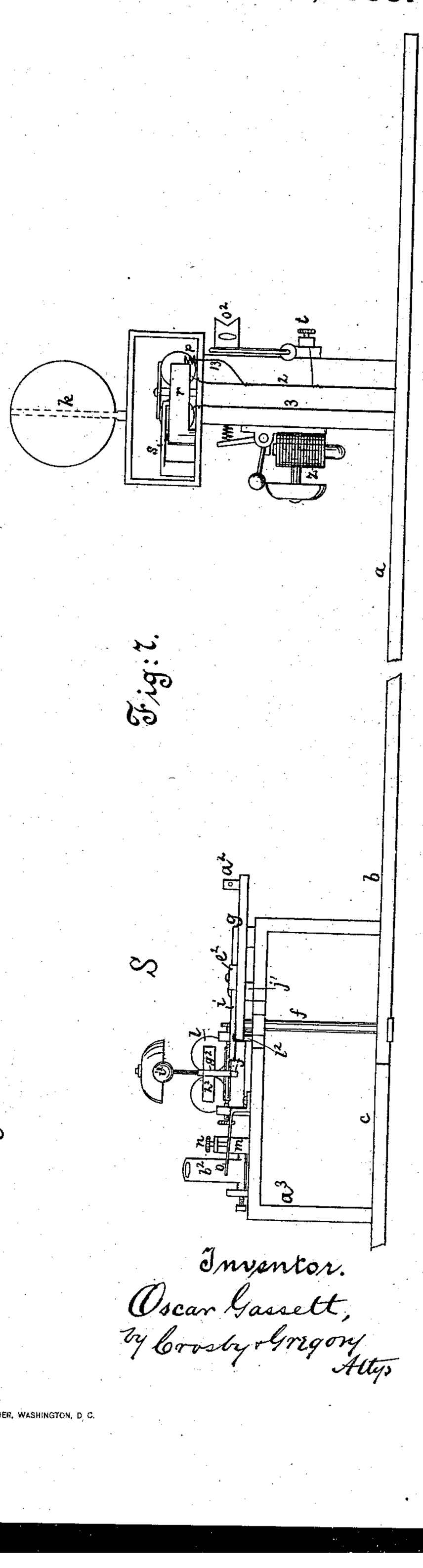

Fig: 7.

Witnesses.

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4 Sheets—Sheet 4.

Electric Railway-Signal Apparatus.

No. 228,187. Patented June 1, 1880.

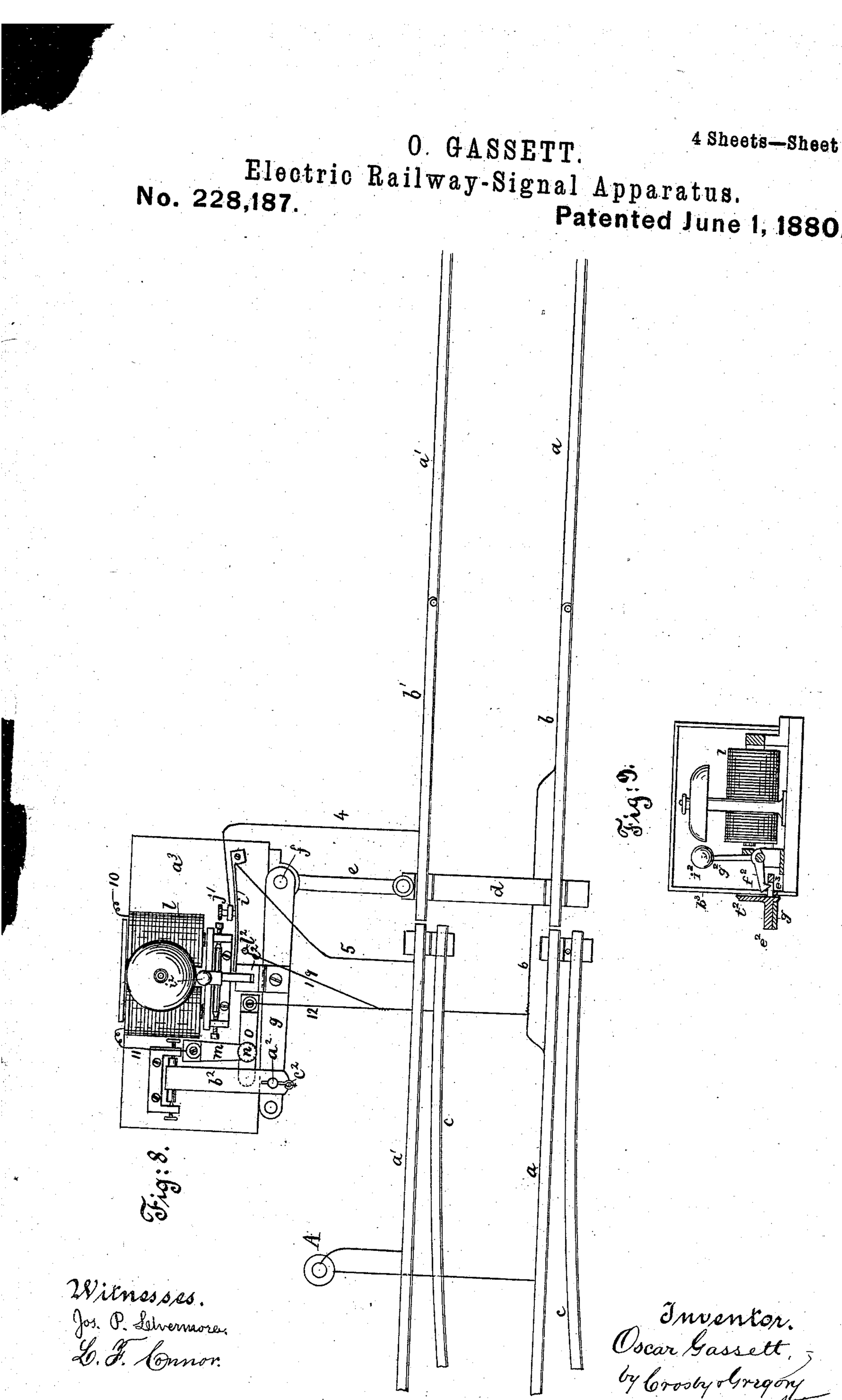

Fig: 8.

Fig: 9.

Witnesses.
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UNITED STATES PATENT OFFICE.

OSCAR GASSETT, OF BOSTON, MASSACHUSETTS.

ELECTRIC RAILWAY-SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 228,187, dated June 1, 1880.

Application filed December 22, 1879.

To all whom it may concern:

Be it known that I, OSCAR GASSETT, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Electric Railway-Signal Apparatus, of which the following description, in connection with the accompanying drawings, is a specification.

This invention relates to electric-signal apparatus for railroads, and is herein shown as used in connection with that class of apparatus operating with a closed circuit, as described in reissued United States Patent No. 5,958, to which reference may be had.

In some of the systems of electric railroad-signals now in use, when a train enters upon a section of the track it operates a so-called block-signal, which remains in a certain position as long as the train is on that section, thereby giving warning to succeeding trains that the said section is occupied. Devices have also been employed whereby the opening of a switch in the section operates a signal at the end of said section, thereby announcing to approaching trains the fact that the section is unsafe.

It is obvious that a signal so controlled by the switch affords no protection if the switch be operated or opened after the train has already passed the signal, but before it reaches the switch.

My present invention consists in the employment, with such a signal operated by the opening of the switch or by the presence of a train on the said signal-section, of a locking device for said switch to automatically lock the switch arm or lever while the switch is closed and the signal at "danger," the said locking device being controlled by the signal at the end of the section in such manner that while said signal indicates "danger," as after a train has entered the section, the switch is locked and cannot be unlocked to be moved by the operator at the switch alone.

The locking device is operated to unlock the switch by an electro-magnet and battery in a local circuit between the switch and signal, and, as herein shown, the switch is unlocked when the local circuit is closed; but the said local circuit passes through certain points in the signal mechanism in such manner that said circuit is open while the signal indicates danger, and consequently the switch cannot be moved until the circuit is closed, and in practice the circuit-closer for doing this is placed at a distance from the switch, herein shown as at the signal; but it may be anywhere so that the switch cannot be moved by the man at the switch alone.

As herein shown, the local circuit is also open at points in the switch-moving mechanism, the said points being closed by releasing the usual hand-operated switch-holding mechanism.

It will thus be seen that the block-signal is so connected in a circuit controlled by the train and the switch mechanism so connected in a circuit with the said signal that the switch cannot be changed while a car is upon the section of track controlled by that signal, except by first closing the local circuit by hand at or so as to cut out the point opened by the signal mechanism, and preferably thereafter completing the local circuit by a disengagement of the switch arm or lever preparatory to moving it by hand.

In connection with the usual signal it is preferred to employ a separate and especial hand-operated signal to indicate that the cars on the section are being switched, this switching signal being shown as adapted to actuate the circuit-closer to close the local circuit over the point opened by the signal, as just described.

The switch arm or lever is so connected in the main signal-circuit that should it be unlocked and the switch-rails be moved at all out of the line of the main track, the signal will show "danger."

In order to make it the more certain that the engineer shall see that the section is in working order as he enters upon it, and that the rearward approach to his train is properly guarded by the signal, the latter is herein shown as located at a short distance within the section from its end, so that the train occupied by the engineer which controls the signal of the section upon which he is just entering will operate the said signal just before he passes it.

Figure 1 is an enlarged plan view of the switch and its operative mechanism and devices to lock it in place, the switch being locked on the main track, the cover or guard for the switch-locking device and its operat-

ing electro-magnet and bell being omitted. Fig. 2 is a section of Fig. 1 on the dotted line *x x*, and Fig. 3 is a partial end view of Fig. 1. Fig. 4 is a side view of the signal-post with the main signal at "danger," and with the switch-signal applied as it will be only when a train on that section of the track is to be switched off on a side track. Fig. 5 is a detail of the signal electro-magnet and its connections for operating the signal to "safety." Fig. 6 represents a plan view of a section of a railway, supposed to be one mile (more or less) long, with the signal-station at one end and the switch and its operating mechanism at the other end, the switch being set for the branch track, the signal being omitted to avoid confusion. The switch-locking mechanism therein shown is somewhat different from that shown in Fig. 1. Fig. 7 is a side elevation thereof, but showing the signal set for "danger." Fig. 8 is an enlarged plan of the switch and its operating mechanism of Fig. 6 and devices to lock it in place automatically, the switch being locked on the main track, the cover or protecting-box or guard for the switch-locking device and its electro-magnet being omitted. Fig. 9 is a sectional detail of the said protecting cover or guard. Figs. 10 and 11 are respectively a plan and end view of a modified form of parts, whereby the switch arm or lever is unlocked, the local or switch circuit is broken, and the signal is turned to "danger;" and Fig. 12 is a detail of some of the devices shown in Fig. 1 in a different position.

a and *a'* represent the rails of a main line of track, *b b'* the usual switch-rails, and *c* the rails of the side track.

The switch-rails are held in a shoe, *d*, connected by link *e* with the cranked or other usual shaft *f* of the switch, the said shaft having an attached arm or lever, *g*.

The main signal-circuit is as follows, viz: The rail *a* (see Fig. 4) is connected by wire 2 with (see Figs. 4 and 5) one electrode of the electro-magnet *h* of the signal, the opposite electrode being connected by wire 3 with the rail *a'*.

One of the switch-rails *b'* is connected by wire 4 (see Fig. 1) with the circuit-closing spring *i*, having a co-operating contact-point, *j*, which, in turn, is joined by wire 5 with the track *a'* beyond the switch-rail. The rail *a'* is in circuit with one pole of the battery A, while the rail *a* is in circuit with its other pole, and the wire 6, which bridges the switch at 7, connects the said rail *a* with the switch-rail *b*, thereby completing the main circuit.

The signal *k* is located near one end of a section of the track in which the switch-stations S (one or more in number) are situated, the said signal *k* indicating for that section either that it is safe, or that, for some reason, it is unsafe—as, for instance, being occupied by a train or containing an open switch or broken rail.

A switch-station is shown separately on a larger scale in Figs. 1 and 8.

The local circuit between the signal and switch stations, which controls the automatic switch-locking device, starts from battery B and connects by wire 10 with one electrode of the electro-magnet *l*, which controls the locking device for the switch, and the opposite electrode of the said electro-magnet is joined by wire 11 with the metallic stand *m*, having a contact-point, *n*, which at suitable times, as hereinafter described, may touch the circuit-closing spring *o*, connected by wire 12 with wire 6 and rails at *b*, and the rail *a* beyond the switch-rail *b* at the signal (see Fig. 4) is joined by the wire 2 with wire 13, attached to a circuit-closing spring, *p*, (herein shown as located between the armature *r* and magnet *h* of the signal,) as in Figs. 4 and 5, and the said armature *r*, having contact at its inner side with the spring *s*, is joined by wire 14 with wire 15, connected with the metallic stand *t*, provided with the contact-screw *u*. Wire 15 is joined with a metal stand, *w*, having a contact-point, *x*, which connects with the circuit-closing spring or transmitting-key *y*, attached by wire 16 with one electrode of the electro-magnet *z*, the opposite electrode of which is joined by wire 17 with the other pole of the battery B.

It is obvious that this local circuit may be completed through an independent wire, 18, (shown in dotted lines, Fig. 6,) which will join spring *o* with stand *t'*; but in such modification the wire 2 would not be employed to form part of the local circuit for the interlocking switch, and the rail would not be used in the said local circuit, the said rail being used only as a ground.

The signal *k* herein employed operates substantially as described in my application for Letters Patent of the United States, filed August 14, 1879, to which reference may be had. In that application it is described that the signal is electrically held to "safety" by the operation of a closed circuit, and is set to "danger" by the action of the train on that section of the road protected by the signal, the said train through its wheels and axles on the rails short-circuiting the current and demagnetizing the signal electro-magnet.

The switch-stations (one or more) are joined in the same local circuit with the signal.

The switch arm or lever *g* has at one end of it a perforated stud, a^2, with which engages the perforated end of the hinged switch-holding arm b^2 when the switch is in place, as in Figs. 1 and 8, the locking-pin c^2 being at that time inserted in the hole in stud a^2, so as to keep arm b^2 down, in which position the spring d^2, the tendency and purpose of which are to lift the arm b^2 when the pin c^2 is absent, is depressed. This arm b^2 is always engaged with and disengaged from the switch arm or lever *g* by hand, and the arm and spring are mounted upon a suitable plate, a^3, or framework, which also has connected with it the electro-magnet *l* and other parts in electric connection therewith, as shown in Fig. 1; but it will be understood that all the said parts,

with the exception of the switch-holding device b^2, spring d^2, and arm g, will, in practice, be covered by a strong box or cage, so as not to be accessible to a person at the switch. This protecting-box is shown at b^3 in Fig. 9.

Projecting laterally from the switch arm or lever g is an arm, e^2, suitably shaped to be engaged by the switch-locking device f^2, which, as herein shown, is a hooked pivoted catch, operated by a lever, g^2, having connected with it an armature, h^2, which at the proper times, or when the locking device is to be lifted and the switch is to be changed, is attracted by the electro-magnet l, made operative from the signal-station. When the armature is attracted the tap i^2 sounds the gong and lifts the catch from the notch e^3 in the arm e^2, leaving the latter free to be drawn laterally out from the box.

The under front face of the catch is beveled, so that the catch, when the armature h^2 is unattracted, is free to act by gravity and engage arm e^2 and lock the switch-lever g automatically whenever the switch is brought to position; and it is obvious that the said switch-arm will be firmly held locked until released electrically, as will be hereinafter described.

By means of the tap-bell and transmission-key y at the signal-station and lever b^2 at the switch the train-hands may communicate in the usual manner.

In Fig. 1 the locking device f^2 has its axis in bearings of a stand, j^2, and the free end of the locking device has a finger, k^2, which extends over the lever g^2, which carries the armature h^2, so that as the said armature is attracted the locking device is lifted from engagement with arm e^2.

In Figs. 6, 7, 8, and 9 the armature-lever g^2 has the locking device f^2 connected with its axis of motion, the two forms being, in operation, equivalents.

Upon the frame-work a^3 is a metal stand, m, provided with a contact-point, n, and connected with wire 11; and when the switch-holding lever b^2 is fastened, as in Figs. 1 and 8, the said contact-point rests just above, (see Fig. 3,) but so as not to touch, the circuit-closing spring o, connected with wire 12, the said circuit-closing spring being depressed below its normal position by the lever b^2, thereby breaking or leaving open at that place the local circuit. This spring o, operating with point n, constitutes the secondary circuit-closer to complete the circuit previously connected at the signal-station, as hereinafter described.

The shunting-wire 19 in all the figures extends from wire 12 to a metal stud, l^2, and a metal spring, i, in connection with wire 4 in Fig. 1, and with wire 5 in Figs. 6 and 8, is held by the switch lever or arm g, as in Fig. 1, or by its projecting arm e^2, as in Fig. 8, out of contact with the said metal stud; but if the switch arm or lever is at all moved out of true place from any cause, the spring i, Fig. 1, permits the point or spring j to meet the metal stud l^2 and close the circuit at that point, or, as in Fig. 8, the spring i will itself meet the stud l^2, which will shunt the circuit, and thereby demagnetize the signal electro-magnet and set the signal to "danger."

In Fig. 1, m^2 is a stop-pin, to limit the outward movement of the spring i.

At all times, when the switch is locked and the section in order, the spring i, (which is a circuit-closing spring,) pushed back through the instrumentality of the switch arm or lever g, will be held against its complementary contact-point j, or, as shown in Figs. 6 and 8, against the screw j', carried by a metal arm in connection with wire 4.

In Fig. 6 the switch is unlocked and the switch-rails are set for the side track, the signal is turned to "danger," and the switching-signal o^2, (see Fig. 4,) to be hereinafter described, is also down. As soon as the switch is closed and in position to be locked by the lever b^2 the person at the switch depresses the said lever b^2 a few times, using it in the manner of a transmitting-key to break and make the local circuit and sound the bell at the signal to notify the flagman, so that he may remove the especial switching-signal and return to the train; or the said lever b^2 may be so used as to communicate any other message between the switch and signal. The operator at the signal will use the lever y as his transmitting-key.

The arm b^2 being locked and the circuit being normally held open at $n\,o$, the automatic locking device will engage and hold the switch-arm.

The circuit governing the switch is closed at the signal by the armature r of the signal electro-magnet h when the said electro-magnet is excited by a current from the battery A at the opposite end of the section, there being no metallic connection across the rails, as by the wheels and axles of the car, or interruption of the circuit from any cause, as by a break in the rails, or wires, or battery, or switch.

When the armature r is attracted by the signal electro-magnet h it is brought into contact with spring p, thereby closing the local circuit through wires 13, 2, and rail a, also keeping the signal at "safety." When the parts are in this position the switch may be operated as follows: Raising the holding-arm b^2 closes the local circuit at $m\,n$, thereby raising the locking device and allowing the circuit-closing spring i to throw the lever g out, at the same time breaking the main signal-circuit at $i\,j$, and afterward shunting it over wire 19, thereby demagnetizing the signal-magnet and setting the signal to "danger."

It will be observed that the signal is not set to "danger" by the circuit-closer i until after the switch-arm g is beyond the reach of the locking device f^2, so that when the signal is dependent on the switch alone for its action the locking arrangement is practically inoperative, the switch and signal working as if there were no locking device, and it is only

when the signal is set to "danger" before the opening of the switch—that is, when it acts as a block-signal set by a passing train or otherwise—that it affects the locking device to automatically lock the switch.

When it is desired to use the section for switching a train is usually on the section, and the signal consequently at "danger." When this is the case the local locking-circuit is open at p r and the switch locked, so that raising the arm b^2 and closing the points m n does not close said circuit, which must be done before the switch can be moved.

The local circuit is closed to release the locking device by the primary-circuit closer p^2, shown in Fig. 4 as pivoted, provided with a metal holding-arm, q^2, and a metal counterbalance, r^2, the normal condition of the said circuit-closer being as in dotted lines, so as to break the circuit between the contact-points s' s^2. This primary-circuit closer p^2 is turned into the full-line position, Fig. 4, in any proper way, to thereby partially make or connect at that point the local circuit between s' s^2.

As herein shown, this circuit-closer is arranged to be turned by the weight of the especial switching-flag o^2 inserted in the socket q^2. The local circuit being thus partially completed, the switchman may disengage the holding-arm b^2 from the switch arm or lever g, which arm b^2, when partially raised by the spring d^2, but not fully removed from stud a^2, permits the spring o of the secondary-circuit closer to touch the contact-point n, and thus complete the local circuit, when the armature h^2 is at once attracted by its electro-magnet l, and the switch-locking device f^2 is raised to release the switch arm or lever g, when it may be turned to do switching. During all this time the signal stands to "danger," and it must so stand until the switch is again closed and held in place.

As soon as the switch-arm is automatically locked by the locking device the circuit is again closed through spring i and its contact-point, as hereinbefore described, and the electric circuit, no longer being shunted, is closed through the electro-magnet of the signal, setting the signal to "safety," provided the train has left the said section.

When a train is on the section, or a rail or wire is broken, or a switch open, the armature of the electro-magnet h, being no longer attracted, is thrown away from the said magnet by a spring, s, the end of which bears against the inner face of the armature t, opening the circuit, as in Fig. 5.

The protecting box or cover b^3 has at its side an opening just large enough to receive the arm e^2; and to prevent the automatic locking device from being lifted by the insertion of something at this opening, I have added a guard, t^2, which projects above and below the said arm e^2 and completely conceals and protects the opening in the box which receives the end of the said arm.

In switches connected with the electric signal, and being without the automatic locking device, the method of demagnetizing the signal-magnet so as to turn the signal to "danger" by unlocking the switch may be modified, as shown in Figs. 10, 11, wherein the arm g is adapted to be locked by the pin c^2, a spring, u^2, being employed to move the arm g when unlocked, so as to break the main circuit.

The switch-stand a^3 has a connecting-screw, v^2, which is insulated by a rubber bush, w^2, from the stand, and connects with the arm g when locked.

The battery A is connected with the rails of the main track, as shown in said Fig. 10.

The screw v^2 is connected with the rail a' by a wire, 20, and the spring u^2 through wire 21 with the switch-rail b', the rail-circuit and its connections at the signal-station being as before described, thus making a closed circuit and holding the signal to "safety;" but as soon as the pin c^2 is withdrawn the arm g is thrown out of connection by the spring u^2, and the circuit is thereby broken, demagnetizing the signal-magnet and setting the signal to "danger."

By the method of shunting, herein described, through the wire 19 and stud l^2, when the arm g is opened the circuit of the signal-section is first broken and then shortened, which thereby deprives the signal-magnet of residual magnetism through any ground-circuit, and consequently the signal-magnet is thoroughly demagnetized.

If desired, I wish it to be understood that the spring o and point n of the metal stand m, hereinbefore denominated the "secondary-circuit closer," may be entirely dispensed with, the wire 11 in such event being united with wire 12, as indicated by the heavy single dotted line 22 at the right of stand m, Fig. 1. In such plan the switch-locking device would be electrically disengaged from the switch arm or lever as soon as the primary-circuit closer p^2 was operated.

It will be noticed in this modification so long as the switch-arm is engaged by the switch-holder, and the electric apparatus in order, and no train upon the section of track, that the signal for that section of track will always stand to "safety," and at the same time the switch-locking device will, by means of its controlling-armature and electro-magnet, be held disengaged from the switch-arm, for the train being absent from the section permits the electro-magnet l to be excited by the closed circuit at the signal electro-magnet; but as soon as a train arrives upon the section the electric current, being shunted through the wheels and axles, demagnetizes the signal electro-magnet and permits the switch-locking device to automatically fall, lock, and hold the switch-arm in position so long as the train is upon the section, unless the steps hereinbefore described for switching have been taken.

I wish it to be understood that the signal electro-magnet, when demagnetized by the shunting of the circuit by the presence of the

train on the track, will positively insure the locking of the automatic switch-locking device.

In this specification I have in Figs. 6 and 8 shown and described how a circuit-closer on the main line may be operated to close the main-line circuit, the device or arm e^2, which actuates the said circuit-closer, being attached to the switch arm or lever; but I expressly desire to state that I do not herein especially claim the said projection to operate the said circuit-closer, or the guard t^2 thereon, or the arrangement of the circuits, as the same is to be made the subject of another application for United States patent.

I have herein stated that the signals will be operated as in my application hereinbefore referred to as already filed, and it will therefore be understood that the shaft carrying the signal will be operated mechanically at proper times to change the position of the signal, and that the signal electro-magnet will at the proper time operate an armature-lever, which will release a detent, all substantially as described in the said application.

I have described the interlocking switch as used in connection with a block-signal operated by a closed rail-circuit; but it is obvious that it may be used with any block-signal, either operated mechanically or electrically, it being only necessary to have a circuit-closer in the circuit which actuates the locking device controlled by the said signal, itself under control of the passing trains, so that the circuit is in condition to lock the switch while the signal indicates "danger," and to retain it unlocked while the signal indicates "safety."

It is obvious, also, that an independent signal in the circuit controlled by the circuit-closer *i* may be used to be set by the opening of the switch; but such signal should be placed between the block-signal and the switch, and its operation would be entirely independent of the locking device.

I am aware that a switch-locking device controlled by an electro-magnet has been used to retain the switch-arm locked until after the signal for open switch has been set, such a device being merely a check upon the proper action of the switch-signal, and performing no important function while the parts are in proper working order.

The essential feature of my invention is that the switch cannot be accidentally or maliciously changed after a train has passed the last block-signal before arriving at the switch, as might be done in other systems of signaling, and the locking may be used independently of any visual signal, as it is evident that the signal-magnet merely acts as a relay in closing the secondary or locking circuit.

When used in connection with the closed rail-circuit, as herein shown, the electro-magnet *l* might be placed in what has been herein called the "primary circuit," in which case it and the locking device would be operated directly by the train. In such an arrangement an independent circuit controlled by hand from a point not in reach of the man at the switch would be necessary for unlocking the switch.

I am aware that a secondary signal has been used located a short distance within a section and dependent on a primary signal for its movement; but I am not aware of any signal apparatus arranged, as herein described, so that the main signal turns to "danger" just as the engineer is passing it.

I claim—

1. In an electric railway-signal apparatus, a switch and switch-locking device, to automatically engage and lock the switch-rails or their moving mechanism when the switch is closed, and an armature and electro-magnet to operate the locking device, and a circuit therefor under control of a passing train, substantially as described.

2. In an electric railway-signal apparatus, a block-signal to be operated by a passing train, and a circuit-closer operated by said signal to control an electric circuit, and a switch-operating arm or lever, a switch-locking device, and an armature and electro-magnet to operate it, the said electro-magnet being connected in the circuit controlled by the block-signal, substantially as described, whereby the switch-locking device is caused to automatically lock the switch arm or lever so long as the signal indicates "danger," as while a train is on the said section of track in which the said switch is located, substantially as set forth.

3. In an electric railway-signal apparatus, a switch-operating arm or lever, a guarded switch-locking device, and an armature and electro-magnet to operate it, the said armature and magnet being connected in circuit, substantially as described, combined with a circuit-closer to partially complete the circuit in which the switch-locking device is located, a secondary-circuit closer, and a switch-holder, whereby, when the switch-holder is disengaged from the switch arm or lever, the secondary-circuit closer is made to complete the said circuit and operate the armature of the switch-locking device and disengage it from the switch arm or lever, to permit the switch to be moved or changed when the train is upon that section of track, substantially as described.

4. The combination, with the switch arm or lever, its automatic locking device, and an armature and electro-magnet to operate said locking device, of a circuit-closer in the circuit of said electro-magnet, and a hand-operated switching-signal to control said circuit-closer, substantially as and for the purpose set forth.

5. In an electric railway-signal apparatus, a switch-arm and locking device therefor, combined with a block-signal mechanism electrically connected with the said locking device and controlled by the train, whereby the train is enabled to control the signal, causing the

latter to lock the switch, substantially as described.

6. In an electric railway-signal apparatus, a switch-arm, a switch-holder, and an automatic switch-locking device, and an armature and electro-magnet to disengage the switch-locking device at the proper time, the said electro-magnet being located in an electric circuit provided with a circuit-closer operated by the switch-holder, and another circuit-closer operated by hand at a distance from the switch, substantially as described.

7. In an electric railway-signal apparatus, a switch-arm, a switch-holder, switch-locking device, and electro-magnet and armature to at the proper time disengage it from the switch-arm, combined with a signal controlled by the train on the section, with which signal the said parts are in electric circuit, substantially as described.

8. In an electric railway-signal apparatus, a signal electro-magnet normally in closed circuit when the train is absent from the section of track and switch-arm fastened, combined with a second electro-magnet to disengage the switch-locking device, the circuit of the latter magnet being held closed by the closing of the circuit of the signal electro-magnet, substantially as and for the purpose described.

9. The signal electro-magnet, placed in closed circuit with the rails of the track, to be demagnetized by the presence of the train on that section of track, combined with an electro-magnet to release and permit the switch-locking device to engage and hold the switch locked while the train is on that section of track or the electrical apparatus is out of order.

10. In an electric railway-signal apparatus, a circuit-closer in a local circuit controlling a switch, as described, provided with a socket to receive a visual switching-signal to operate the said circuit-closer, substantially as described.

11. The switch-arm, combined with a circuit-closer in circuit with the signal electro-magnet, and a shunt-circuit, arranged as described, whereby, when the switch-arm is in position to close the switch on the main track, the circuit with the signal electro-magnet is closed, but the moment it is released to move the rails the said circuit is first broken and then shunted, substantially as described.

12. The switch-arm, combined with a circuit-closing spring to move it when unlocked, the said spring at that time breaking the circuit on the signal electro-magnet, substantially as described.

13. In a railway-signal apparatus, a switch and switch-locking device and a visual signal operated by an electric circuit having a circuit-closer operated by the movement of the switch mechanism, and a secondary circuit which controls the switch-locking device and has a circuit-closer operated by the signal, when arranged, substantially as described, to cause the secondary circuit to be operated by the signal after the switch mechanism has moved from a position to be controlled by the locking device, substantially as described.

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

OSCAR GASSETT.

Witnesses:
G. W. GREGORY,
A. J. DUNN.