No. 848,293. PATENTED MAR. 26, 1907.

A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 1.

FIG. 1.

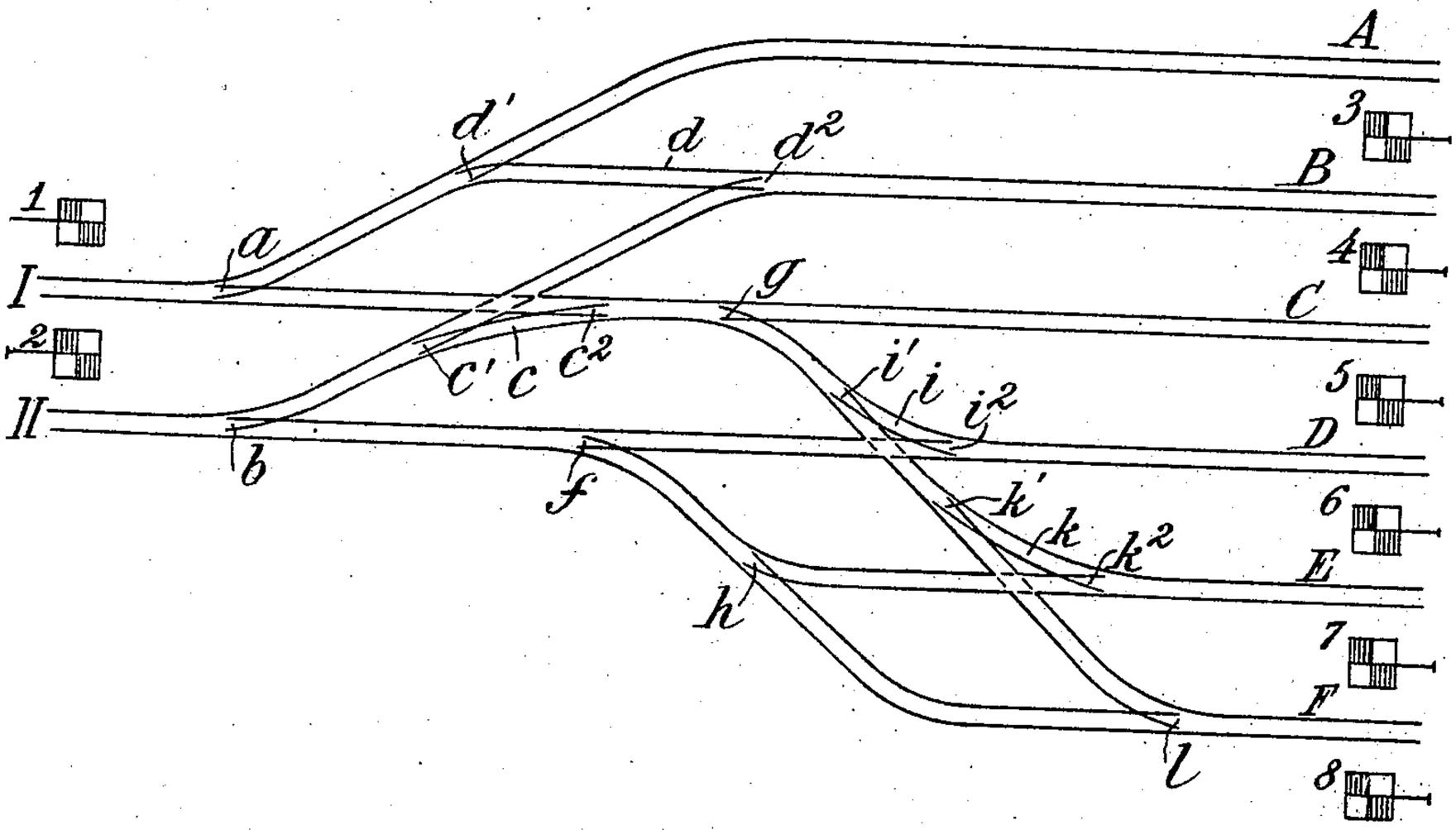
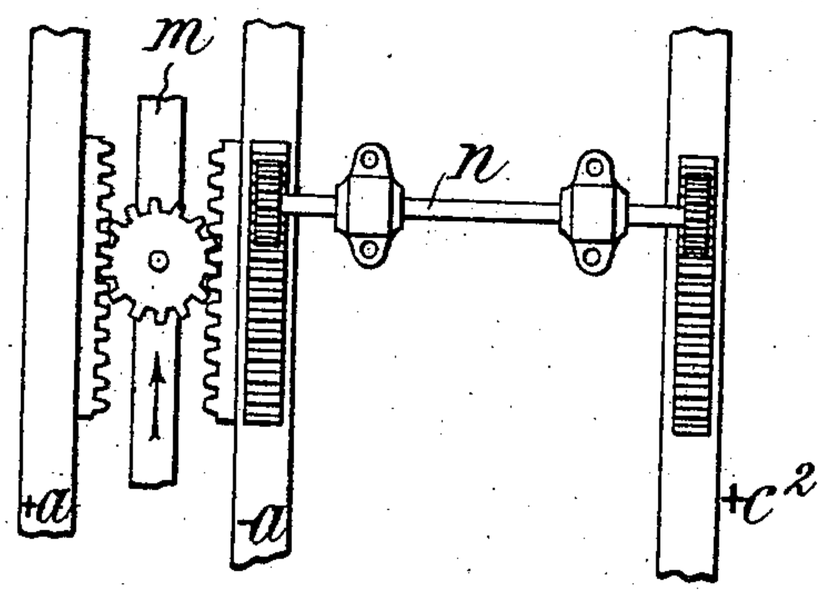


FIG. 3.



WITNESSES:
Fred White
Arthur Peterson

INVENTOR:
Albert Descubes,
By Attorneys,
Arthur C. Fraser & Co

No. 848,293. PATENTED MAR. 26, 1907.

A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 2.

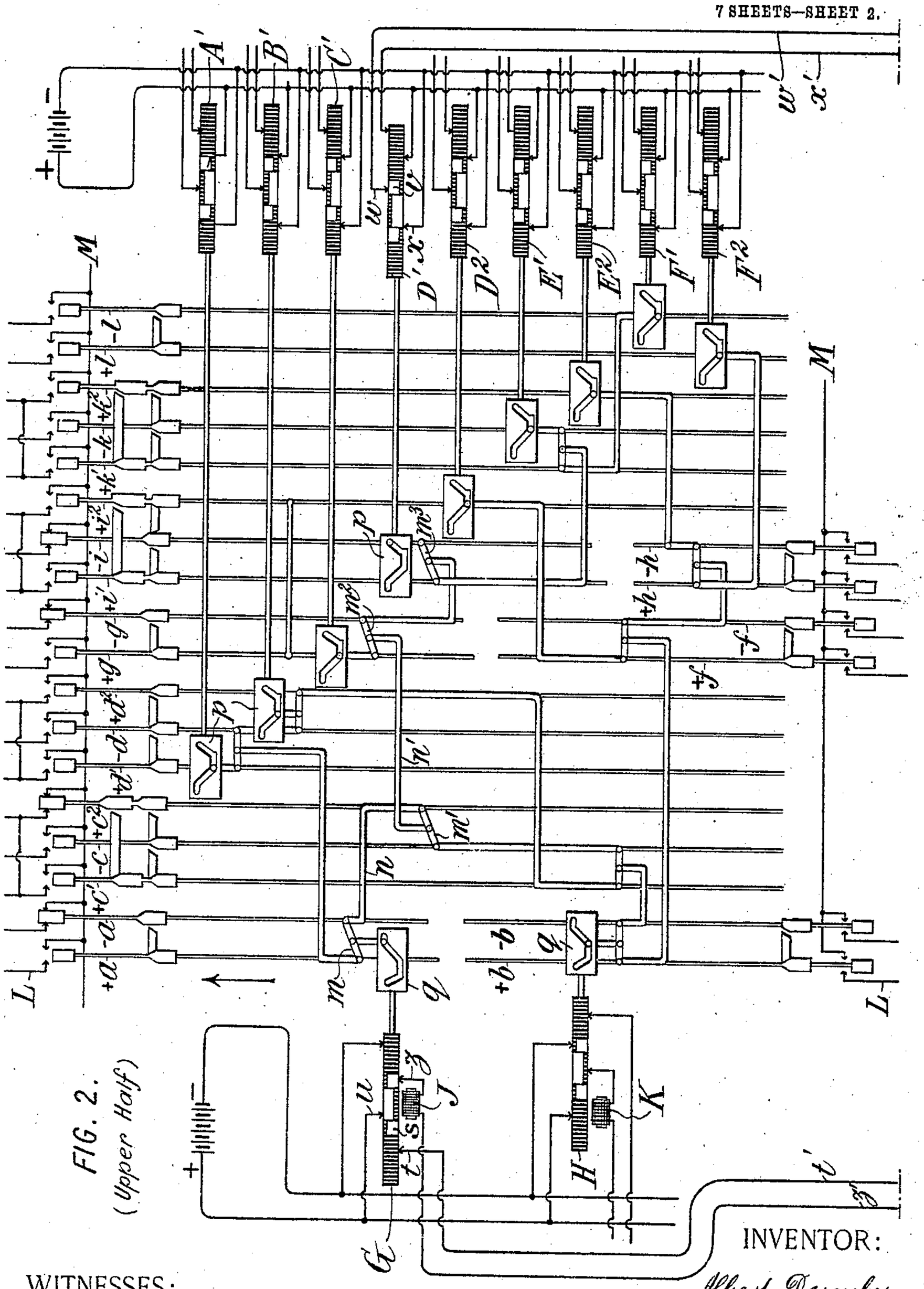


FIG. 2.
(Upper Half)

WITNESSES:
Fred White
Arthur Peterson

INVENTOR:
Albert Descubes,
By Attorneys,
Arthur G. Fraser & Co.

No. 848,293. PATENTED MAR. 26, 1907.

A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 3.

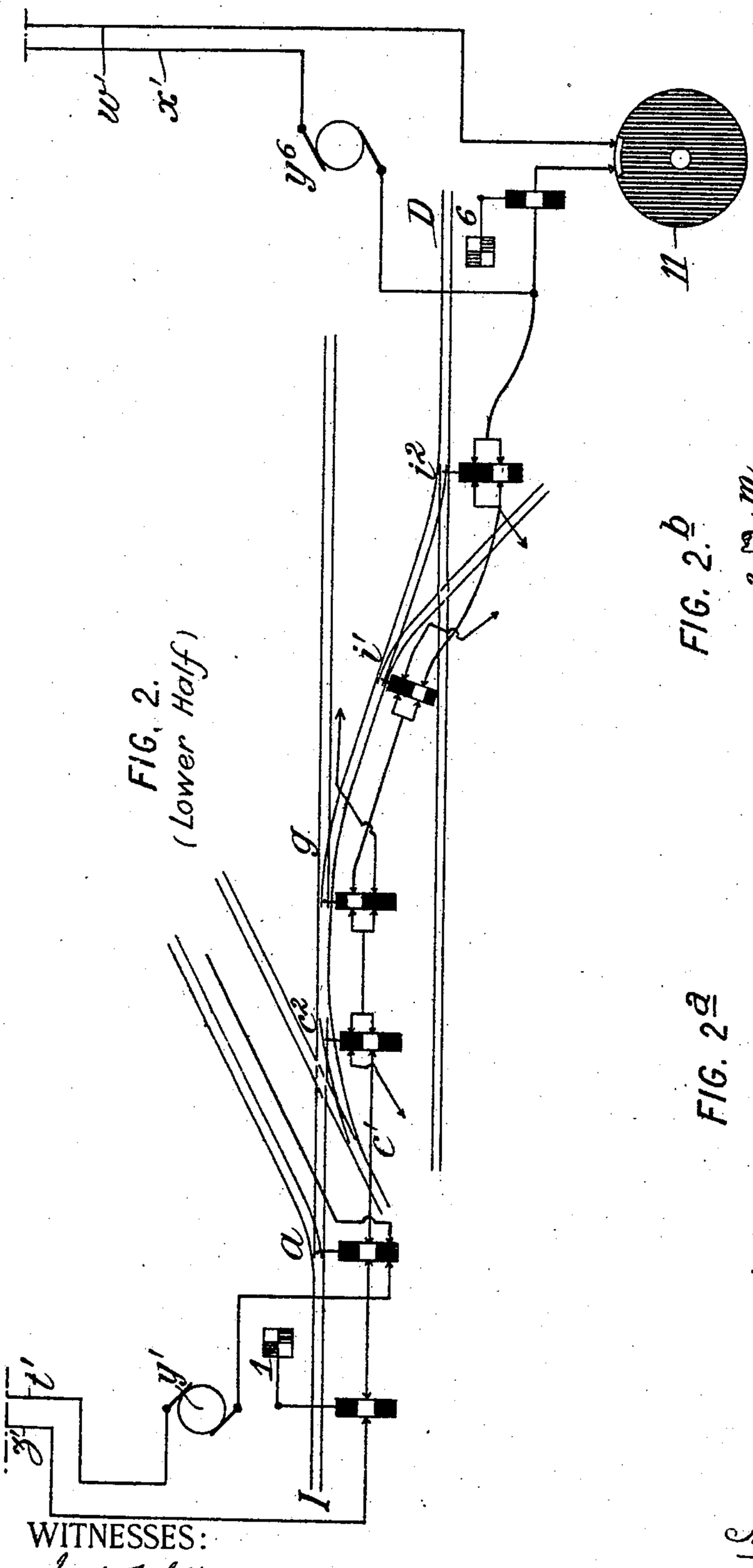


FIG. 2.
(Lower Half)

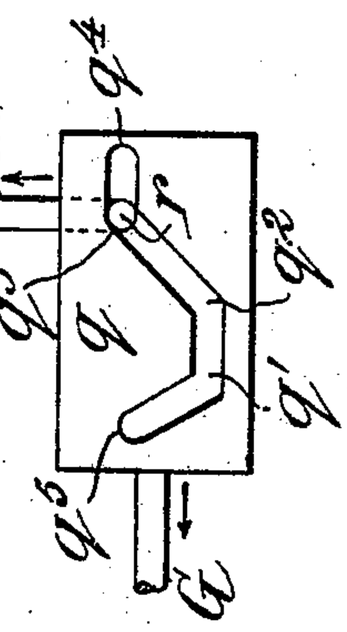


FIG. 2b

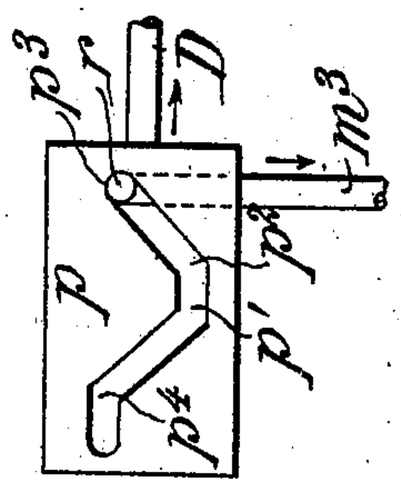


FIG. 2a

WITNESSES:
Fred White
Arthur C. Patton

INVENTOR:
Albert Descubes,
By Attorneys,
Arthur C. Fraser & Co.

No. 848,293. PATENTED MAR. 26, 1907.

A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 4.

FIG. 4.

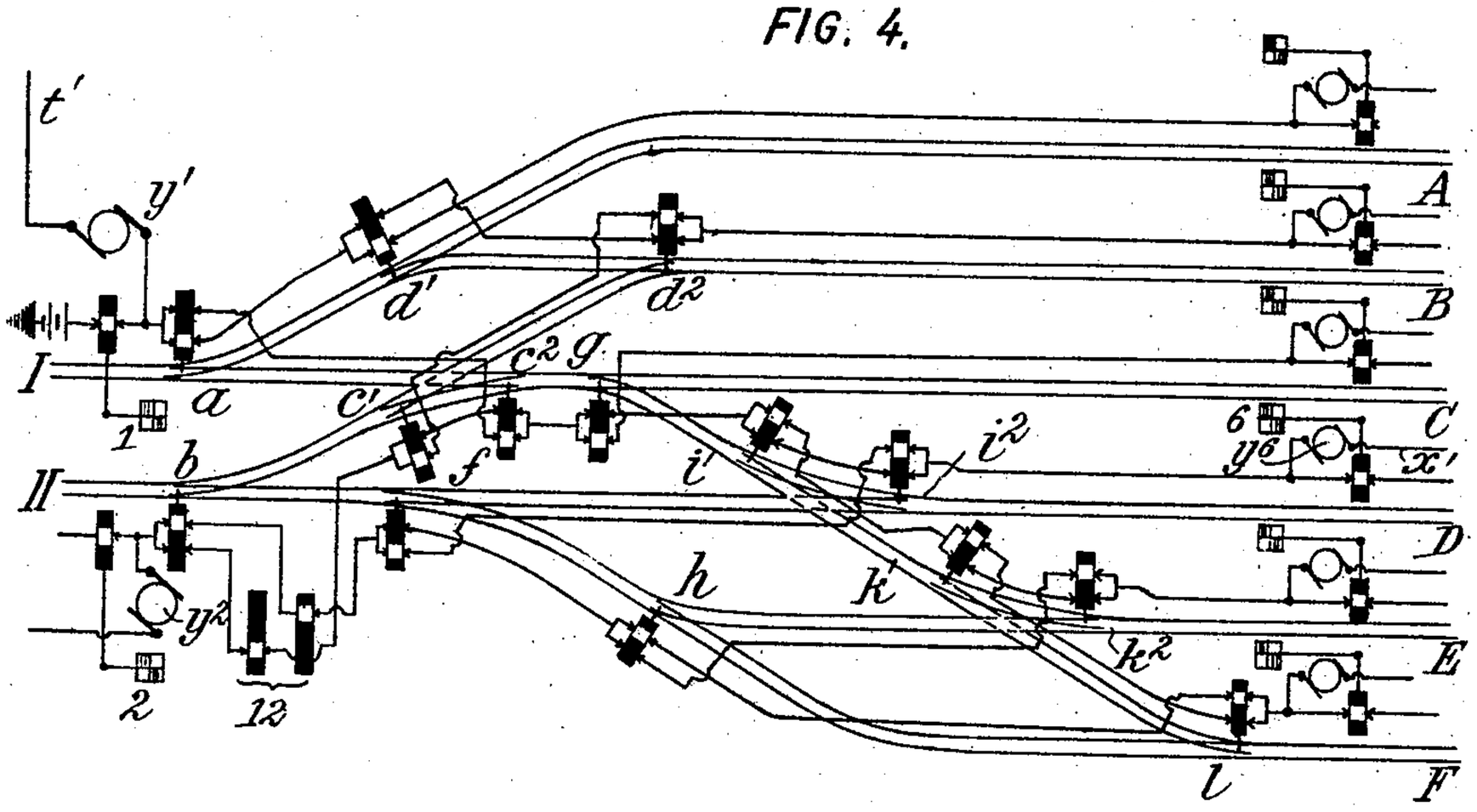
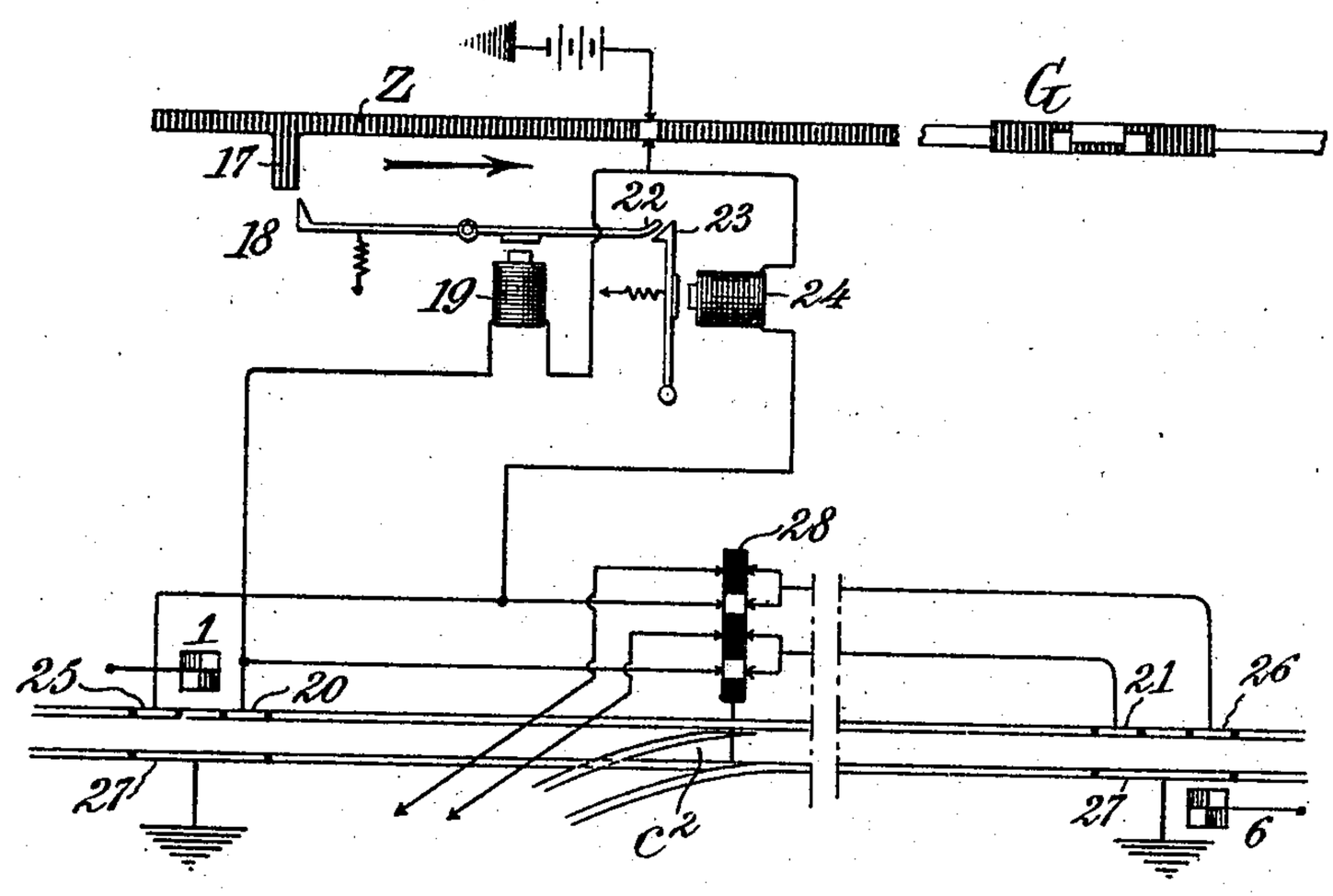


FIG. 6.



WITNESSES:

Fred White
Arthur C Paterson

INVENTOR:

Albert Descubes,

By Attorneys,

Arthur C. Fraser & Co

No. 848,293. PATENTED MAR. 26, 1907.

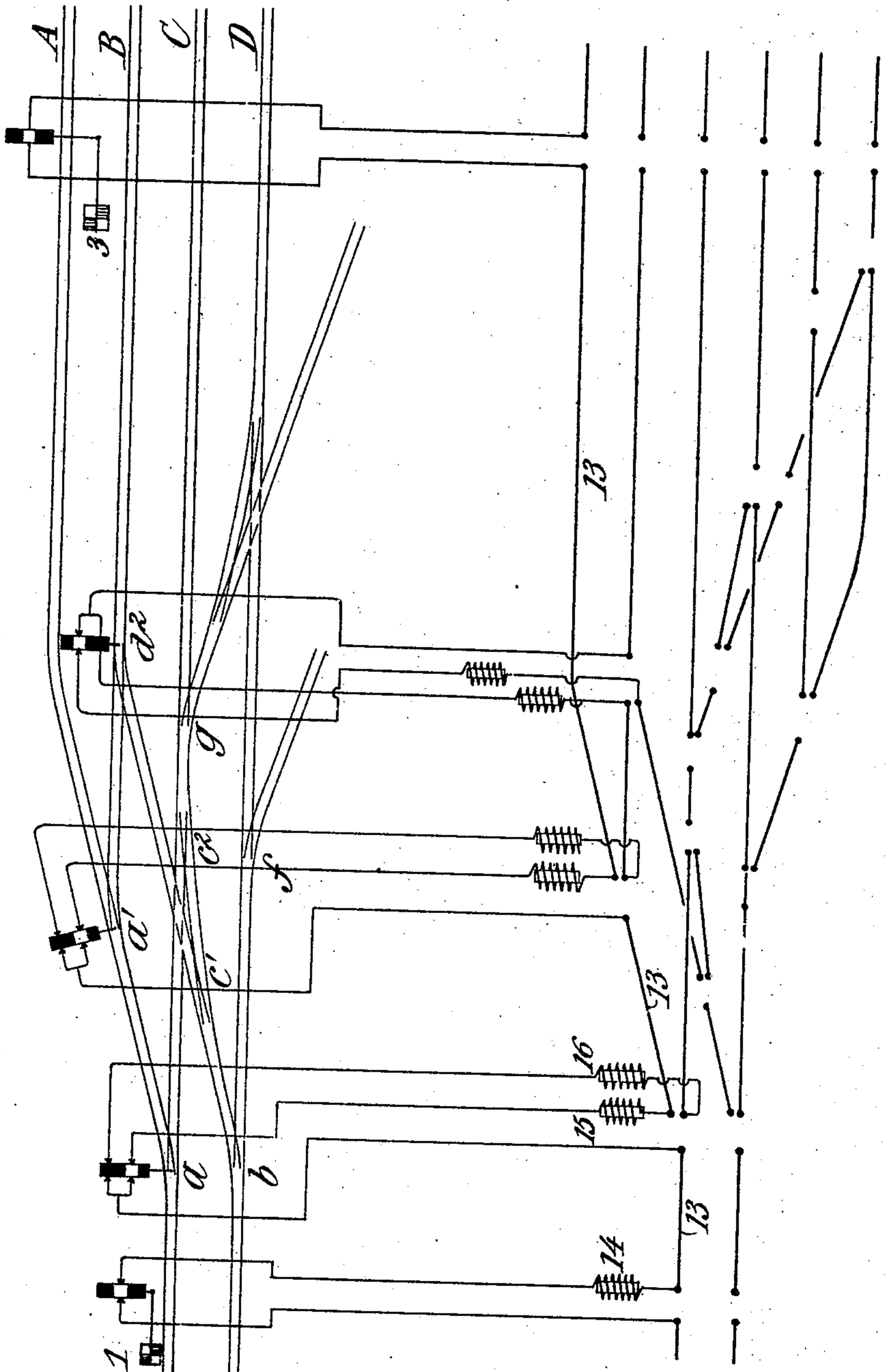
A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 5.

FIG. 5.



WITNESSES:

Fred White
Arthur Patton

INVENTOR:

Albert Descubes,

By Attorneys,

Arthur G. Fraser & Co

No. 848,293. PATENTED MAR. 26, 1907.

A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 6.

FIG. 7.

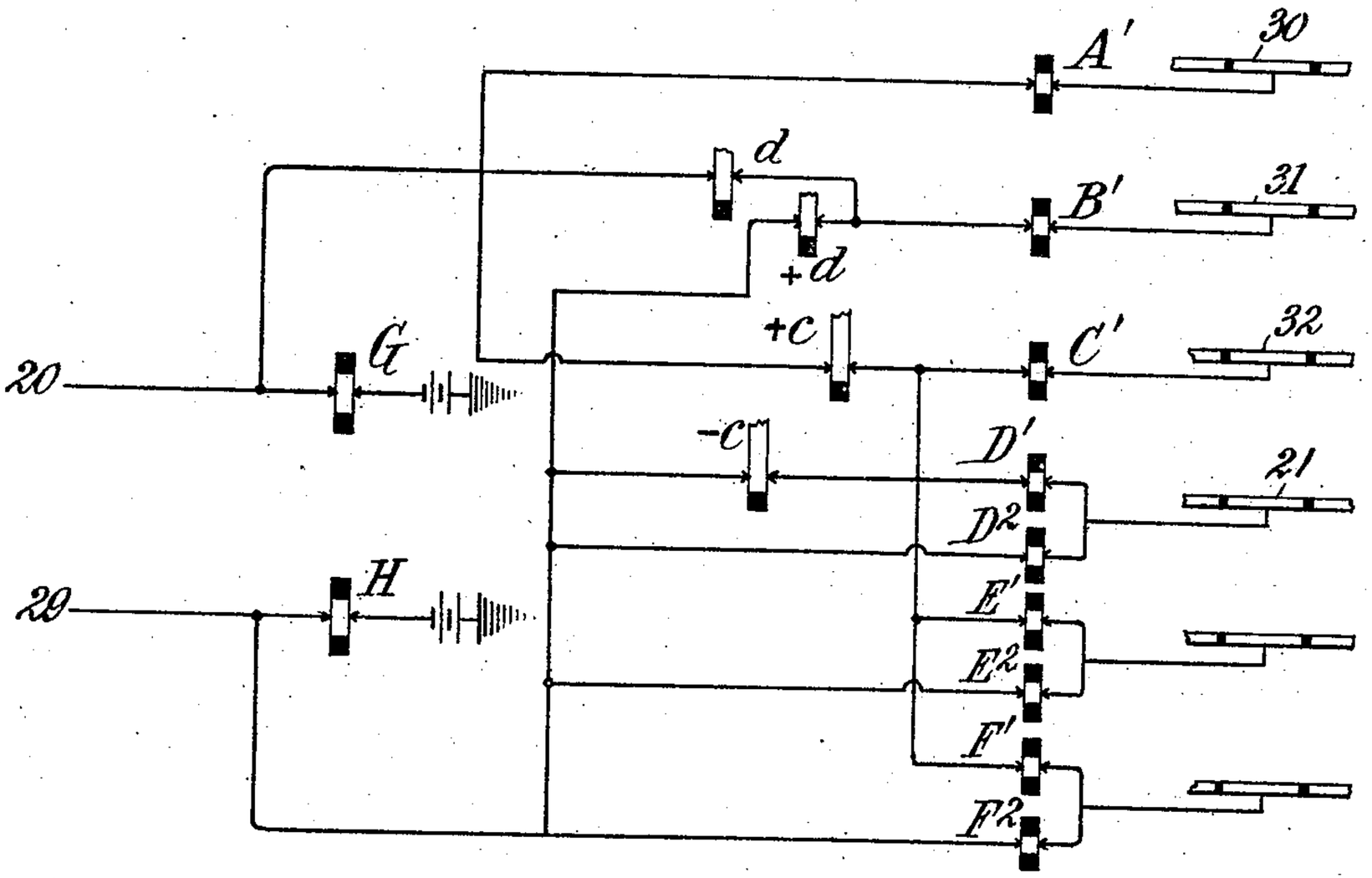
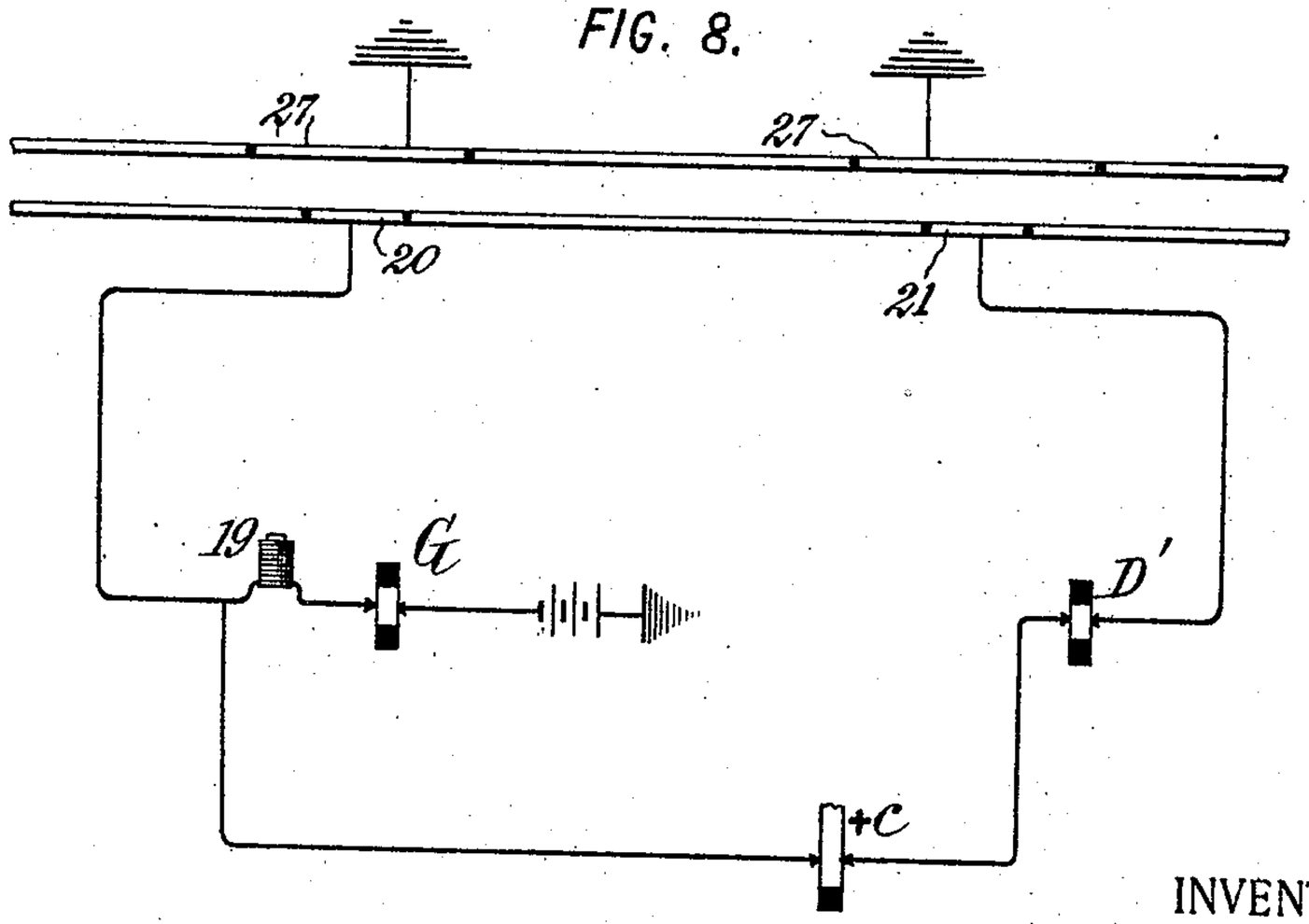


FIG. 8.



WITNESSES:
Fred White
Arthur C Patton

INVENTOR:
Albert Descubes,
By Attorneys,
Arthur O. Fraser & Co

No. 848,293. PATENTED MAR. 26, 1907.

A. DESCUBES.

SYSTEM FOR OPERATING SWITCH POINTS AND SIGNALS.

APPLICATION FILED AUG. 27, 1904.

7 SHEETS—SHEET 7.

FIG. 9.

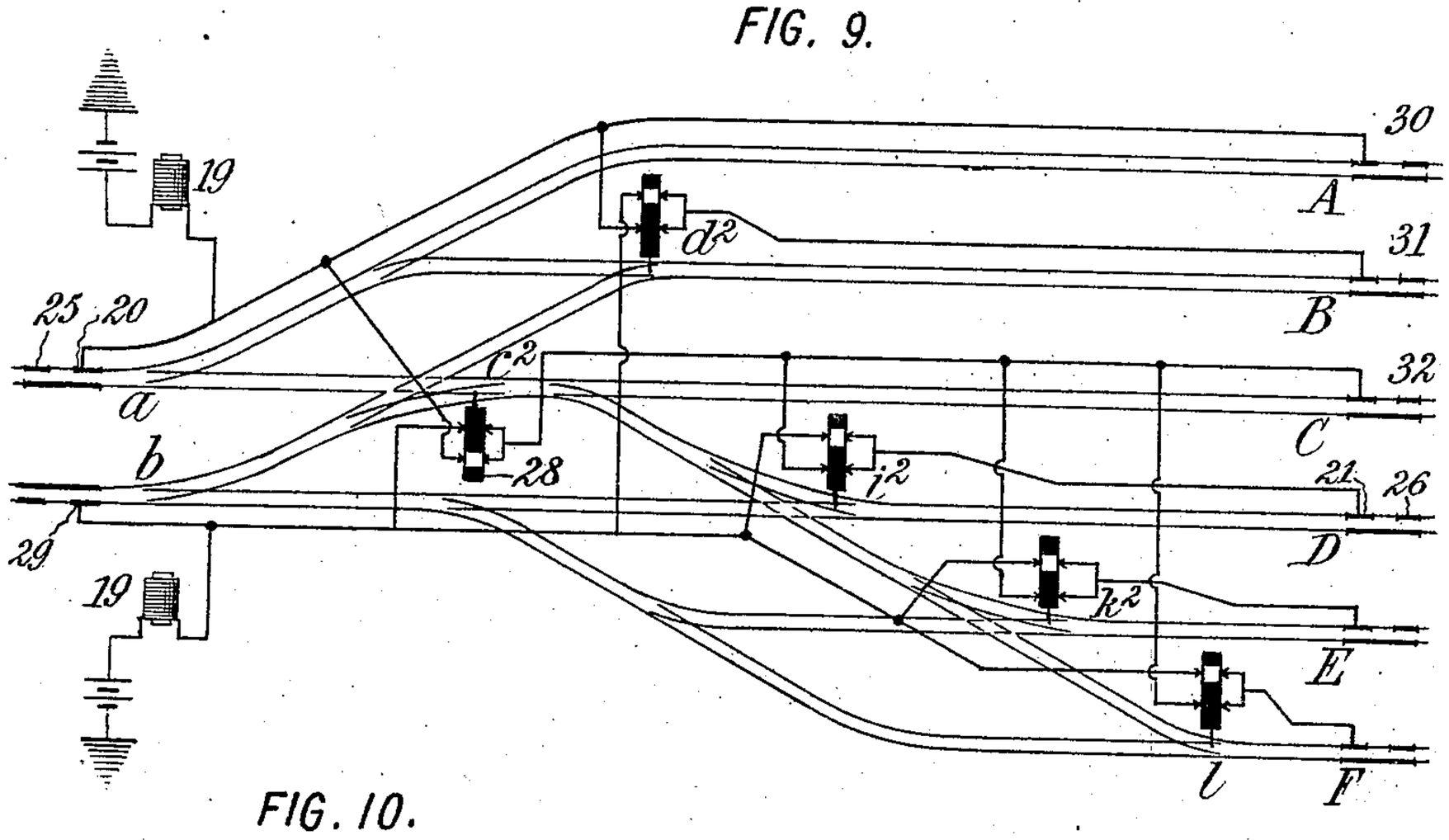


FIG. 10.

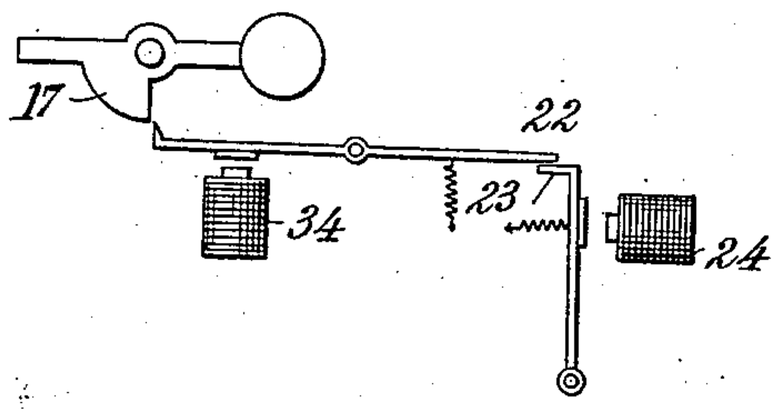


FIG. 11.

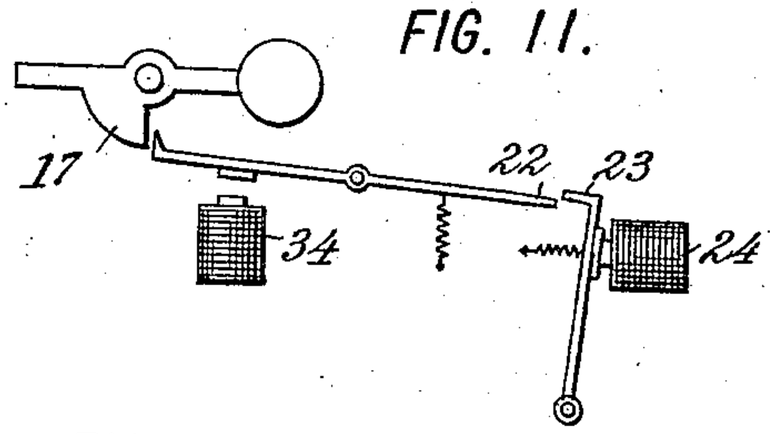
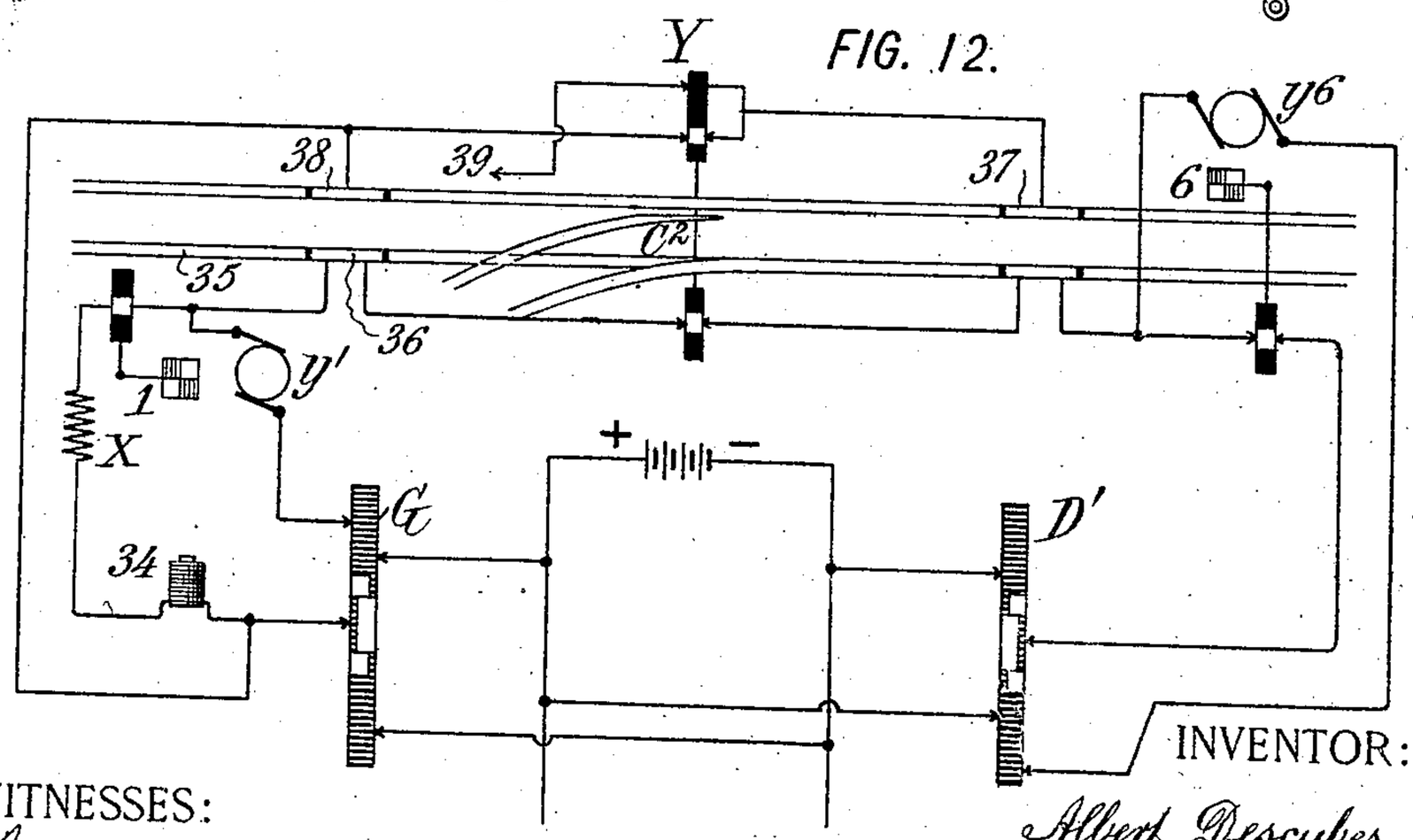


FIG. 12.



WITNESSES:

Fred White

Arthur C. Patton

INVENTOR:

Albert Descubes,

By Attorneys,

Arthur G. Fraser & Co

UNITED STATES PATENT OFFICE.

ALBERT DESCUBES, OF PARIS, FRANCE.

SYSTEM FOR OPERATING SWITCH-POINTS AND SIGNALS.

No. 848,293. Specification of Letters Patent. Patented March 26, 1907.

Application filed August 27, 1904. Serial No. 222,451.

To all whom it may concern:

Be it known that I, ALBERT DESCUBES, a citizen of the Republic of France, residing in Paris, France, have invented a certain new and useful System and Apparatus for Operating Switch-Points and Signals, of which the following is a specification.

This invention relates to a new system and apparatus for working railway-switches and signals, and has for its principal object to provide an apparatus for working such switches and signals by means of two levers, each of which corresponds to one of the ends by which a train can enter or leave a protected zone or route.

Other features are referred to in detail hereinafter.

The accompanying drawings illustrate the principles of the invention and certain means by which it can be realized.

Figure 1 shows a plan of a number of tracks in a yard. Fig. 2 illustrates diagrammatically an interlocking table and operating mechanism and the application of the apparatus to one of the routes indicated in Fig. 1. Figs. 2^a and 2^b are enlarged portions of Fig. 2. Fig. 3 illustrates mechanically a part of the mechanism indicated diagrammatically in Fig. 2. Fig. 4 is a diagram of the indication or control-circuits. Fig. 5 is a diagram illustrating a method by which the indication or control circuit is realized in the operating-cabin, repeating at the same time the position of each switch. Fig. 6 is a diagram of a new track-circuit operating in conjunction with the interlocking table. Fig. 7 shows the general arrangement of the track-circuits in the operating-cabin. Fig. 8 shows the connections of the same circuits with the clearance-bars or insulated rails or other contact devices at each end of the protected zone. Fig. 9 shows the general arrangements of the track-circuits, obtained by means of circuit-controllers in direct relation with the railway-switches. Figs. 10 and 11 illustrate modifications of the apparatus of Fig. 6. Fig. 12 illustrates the arrangement of the track-circuit of the apparatus shown in Figs. 10 and 11.

Suppose a yard in which the points are arranged as shown in Fig. 1. The main tracks are indicated at I and II, and the tracks in the yard at A, B, C, D, E, and F. The several switches are shown at $a, b, c', c^2, d', d^2, f, g, i', i^2, k', k^2$, and l, those having similar reference-letters, as c' and c^2, being at opposite ends of short crossovers c, d, i, and k. The route-signals for the several switches are shown at 1, 2, 3, 4, 5, 6, 7, and 8, corresponding to the tracks I II A B, &c. If it is wished to establish a route for passing from road I to road D, it is only necessary to first use the lever corresponding with road D and then that belonging to road I in order to set all the points in the proper positions—that is to say, the switch-point a reversed, (that is, in position to switch a train onto the straight-line track,) which will be represented by the symbol $-a$, this being the symbol which is applied to the control-bar for reversing the switch a; the switch-point c^2 in its normal position, (leaving the straight line clear,) which will be represented by $+c^2$, the symbol applied to the corresponding control-bar; the switch-point g reversed, which will be represented by $-g$, and the switch-points i' and i^2 reversed, which will be represented by $-i$. The interlocking mechanism is so arranged that as soon as the points have been set in the desired positions, the route or covering-signal 1 can be lowered to allow of the protected zone being entered from the road I. The signal can then be placed at "danger" again, and as soon as the indicator has shown that the signal is at "danger" (but no sooner) the levers can be brought back to their normal positions. Finally, insulated rail-sections or any equivalent contact devices can be arranged in the road so as to prevent the levers controlling the switches of any particular route being moved as long as a train in the protected route has not left it at one end or the other. The signalman may also be prevented from lowering any particular signal by a simple circuit-changer or by means of a slide-valve worked from another cabin.

I will now describe in detail the apparatus, and in order to facilitate the description it is supposed that electricity is used both for control and indication purposes.

1. *Interlocking frame.*—The interlocking frame is shown diagrammatically by Fig. 2. G and H are slides controlled in the usual or any suitable way by the principal levers corresponding to the roads I and II, which can be locked by means of the indication-magnets J and K and which operate cam-plates q for moving the control-bars hereinafter described. A′ B′ C′ D′ D^2 E′ E^2 F′ F^2 are slides controlled by secondary levers corresponding to the roads shown in Fig. 1 and

having corresponding letters and operating cam-plates p for moving the control-bars. The levers corresponding to roads D E F have been duplicated, as it is possible to use two different routes to get to the same point from these roads. For instance, the passage from II to D can be effected by $+b$, $+f$, and $+i^2$ or by $-b-c-g-i$. The letters D′ E′ F′ refer to routes passing over the switch g in its reversed or minus position and ending on the roads I and II, the letters D^2 E^2 F^2 to the routes passing over switch b in its normal or plus position and which therefore end only in road II. Each of the secondary levers A′ B′, &c., locks the others during its stroke. The principal levers G and H are also interlocked during their stroke. These lockings are effected by the usual or any suitable means. $+a-a+c'$, &c., are the control-bars for the points a c', &c. Thus when the bar $+c'$ or $+c^2$ is worked the two points belonging to the crossover c are placed in their normal position. If, on the other hand, the bar $-c$ is worked, the two switches c' and c^2 are reversed by their motors. But one reversing-bar is used for the two switches of each of the crossovers c d, &c. The control-bars, which can only be moved in the direction of the arrow or the reverse direction, but not laterally, are interlocked, as indicated diagrammatically, so that one cannot move $+a$ at the same time as $-a$, or $-d$ at the same time as $+d'$ or $+d^2$, &c. In the same way the bars $+c'$ and $+c^2$, $+i'$ and $+i^2$, $+k'$ and $+k^2$ are respectively interlocked in order to prevent the two routes, which cut each other, being set at the same time, such as I–C and II–B, the first of which includes $+c^2$ and the second $+c'$.

Having set forth the above conditions, the principle of the arrangement is the following: When it is wished to set a route coming from road I, the points a will have to be normal or reversed. The slide G will therefore act on a device m, connecting the bar $+a$ and the bar $-a$, which device is represented as a lever connecting $+a$ and $-a$ in the diagram. On the other hand, a route passing by the point a reversed ought to find c^2 normal, and g may be either normal or reversed. The bars $-a$ and $+c^2$ will therefore be connected, so as to move simultaneously in opposite directions, by means of a lever m' and connecting member n, and the latter will be connected through lever m' and connecting member n' to a lever m^2, connecting the bars $+g$ and $-g$, &c. Suppose now that it is wished to set the route I–D. The slide D′ would first be moved in order to push the corresponding cam-plate p from right to left until the point p^2, Fig. 2^a, comes into contact with the pin r, which is connected to the lever m^3 of the switch i. The bar $-i$, which was locked by horizontal slot p' p^2 of the slide p, is thus unlocked. This done, the cam-plate q of the slide G is then pushed from right to left. The inclined slot q^2 q^3 pushes the pin r and the connecting-lever m in the direction of the arrow. Now the bar $+a$, which is coupled to the lever connecting $+d'$ and $-d$ in such a way that the latter moves with it, cannot be moved, because the bars $+d'$ and $-d$ are locked by means of the cam-plate p, corresponding with A′ and B′. The bar $-a$ is therefore obliged to move, carrying with it the bar c^2 by means of the rigid connection n. The bar c^2 acts on connecting-lever m', and therefore also on m^2, with which it moves. The bar $+g$ being locked by the slide p of lever C′, the bar $-g$ is obliged to move and finally the bar $-i$. The inclined slot q^2 q^3 therefore acts on the control-bars $-a$ $+c^2$ $-g$ $-i$, and thus on the corresponding points in the route to be formed. The last bar acts in its turn on the inclined slot p^2 p^3 of the cam-plate p of the slide D′, and thus completes the stroke of slide D′ and unlocks the slides A′ B′, &c. If the stroke of slide G is then completed, the slide is moved to the left of the position indicated in Fig. 2, so that the pin connected with the connecting-lever m which was at the point q^3 will be at point q^4 of the slot. The lever m does not move during the operation and is locked in position. In this new position the part s of the contact of slide G will be brought opposite the contact t, and thus connected with the positive pole of the battery through contact u. At the same time the contact v of slide D′ has connected up contacts w and x, the latter being connected to the negative pole of the battery, so that the current can pass through wire t' to the motor y' of the signal 1 only if all the corresponding points are in their correct positions, and if the signal 6 is at "danger," the current passing from the positive pole of the generator, through u, t, t', motor y', the circuit-controllers of the several switches and signals, thence through w', w, and x, to the negative pole of the generator. The signal 1 can then be lowered. The + and − wires at the opposite sides of the upper half of Fig. 2 are connected to the same source of current. The train having passed, the cam-plate q can be moved back from point q^4 to point q^3; but as long as the signal 1 remains lowered this plate cannot be moved any farther, as the signal-circuit is broken by the circuit-controller at the signal and the slide G is locked by the indication-magnet J. As soon as the signal 1 is returned to "danger" the indication-current can pass through contacts u and z, wire z', the circuit-breaker at the signal 1, those at the switch-points, the circuit-breaker at signal 6, the circuit-breaker 11, hereinafter referred to, and the contacts w and x. The current can thus pass by the magnet J and unlock the slide G by attracting the armature of the electromagnet. Fig. 2 shows the position of the slides correspond-

ing to this part of the operation. As soon as the lever is unlocked the slide can be moved farther toward the right, the inclined plane $q^3\,q^2$ acts on the connecting-lever m in the opposite direction to the arrow, the bars $-a$, $+c^2$, $-g$, and $-i$ are thus placed in their normal positions by a movement opposite to that described above, and the slide D′ is moved from left to right until the point p^2 comes into contact with the pin r, connected with the connecting-lever. During the stroke of slide D′ the slides A′ B′ are locked by any usual or suitable interlocking mechanism. The lever D′ is pushed farther to the right until the point p' of the slide has taken the place of point p^2. It is only at this moment that the levers A′ B′ are unlocked. In order to set the same route, but in going from D toward I, it is only necessary to carry out the same operations in the reverse order—that is to say, from left to right—beginning by the slide G. The different parts of the operation will be the same as in the previous case. As long as the indication-circuit is not closed the slide G is locked by the magnet J in its end position—that is to say, when the point q^5 is in contact with the pin r, connected with lever m. It is therefore impossible to move the cam-plate p from point p^4 to point p', the two plates being at the time connected together through the various connecting-levers.

In order to render the diagram more easy to understand, the slides have been shown as moving at right angles to the control-bars. This arrangement is not, however, absolutely necessary. The levers can be placed so as to move parallel with the control-bars and connecting-levers. They can be moved as described, or a rotary movement can be used. The slide can be placed on the frame or on a sector of the lever.

The electric lock will be of a form to suit the kind of lever adopted. The lock will generally only act in one direction—that is to say, it will allow a movement from q^2 to q^3 and from q' to q^5; but the opposite movement from q^3 to q^2 or q^5 to q' will not be possible unless current is flowing through the indication-magnet.

It has also been supposed in the diagram that the control-bars—such as $+a$ $-a$ $+c^2$, &c.—were connected by rigid connections and connecting-levers; but any other means can be employed, such as cams, rotating shafts, &c. Fig. 3 shows one of the simple arrangements which may be adopted. The connecting-levers are replaced by pinions, each one gearing into two racks. They can be placed in any position in the frame or arranged in groups. In the same way the bars connecting up two bars controlling the switch-points are formed of rotating shafts carrying two pinions of suitable diameters to suit the strokes. For instance, the control-bars might have double the stroke of the connecting-levers. The bars controlling the switch-points carry circuit-breakers which make and break the switch-point motor-circuits L M. If pneumatic, hydraulic, &c., motors are used, the bars can act on slide-valves connecting with pipes leading to the motors. It will be seen that the signals are worked by the same levers which work the points; but they can be worked by means of special levers interlocked with the levers described previously, the construction of which would thus be simplified.

2. *Indication-circuit and signal-operating circuit.*—The principle on which the switch-control mechanism has been based depends upon the relations existing between neighboring pairs of switch-points, and the same principle can be applied to the indication-circuit, so that the current can only pass through the circuit-controllers of the switch-points of a given route. Fig. 4 shows the way in which the circuit has been made up. A glance at the figure will show that if the wire t', leading from the slide G, is connected up to the positive pole of the battery and that, x', leading from slide D′ to the negative pole, as shown in Fig. 2, the current can only pass if the route I–D is really set.

There can be confusion in connection with only the routes II–D, II–E, II–F, it being possible to get from one point to the other in two ways, one by b normal and the other by $b\ c\ g$ reversed. In order to get over this, it is only necessary to lead the wires coming from the circuit-controller of the point b, for instance, to a special indication-circuit controller 12, situated in the operating-cabin and on the control-bars of the switch-point b. The current can then pass only if the points are really in the position corresponding to the position of the control-bar. The same arrangement can be adopted for any points which one wishes to be indicated in the interlocking table itself.

The indication-circuit is used for lowering the signals at the extremities of the route given. As shown in Fig. 2, the signal-motors only need to be coupled up to the circuit-controllers on the slides when they are at the end of their strokes. With this arrangement the circuit is broken, and the signal goes to "danger" as soon as any of the points on the route are moved.

3. *Indication of all the points in the operating-cabin.*—Fig. 5 shows an arrangement allowing the indication-circuit to be completed in the operating-cabin. The same figure indicates to the operator in the cabin the position of all the points in any particular route. The upper part of this figure shows the indication-circuits connected up to the switch-circuit controllers. Only part of the roads have been shown for simplicity. The lower part of the figure shows the arrangement which has to be carried out in the

operating-cabin and the connections which have to be made between the various terminals of the indication-circuits. Three wires are connected up to a commutator at each switch—one coming from the toe direction of the points and two from the direction of the heel of the points. The terminals are connectedup by connectors 13, disposed in the cabin and arranged to form a miniature plan of the tracks and switches outside. In order to have a visible indication of the position of the points, electromagnets 14 15 16, &c., (corresponding, respectively, to signal 1, switch-bars $+a$ $-a$, &c.,) are introduced into the circuits leading to the heel of the switch-points. These magnets move suitable switch-points on a miniature track to show in the cabin the exact position of the points on the road.

4. *Arrangement to hinder a train being sent onto a road.*—In order to allow another cabin to hinder a train being sent on to any particular road—the road D, for instance—the slides D′ and D² can be interlocked by means of an electric lock or the indication-circuit be made to pass through the other cabin, a circuit-breaker 11 being fixed on the frame to allow the circuit to be broken. (See Fig. 2.) If the current is broken at 11, it is impossible to lower the signal 1 or the signal 2 after having set the route ending in road D. On the other hand, it is still possible to lower the signal 6 in order to send a train from the road D toward I or II, since the circuit of motor y^6 passes around 11.

5. *Clearance-bars.*—I use double clearance-bars of the kind described in a previous French patent concerning converging routes and which are intended to hinder a route which has been set from being changed as long as a train is in the protected route. Fig. 6 is a diagram of the arrangement. The bar Z is part of the mechanism connected with slide G and is shown in the position it would occupy when the cam-plate q of the slide G is placed so that the pin r of the connecting-lever m is at point q^3, Fig. 2ᵇ. The bar moves in the direction of the arrow when the slide acts on the pin from q^3 to q^2. The bar Z has a projection 17, which can be stopped by a catch 18 on the armature of a magnet 19, the latter being connected up directly to an insulated rail 20, which forms a clearance-bar. It is also connected indirectly by one of the means hereinafter described to an insulated rail 21 near the signal 6. The armature ends in a curved part 22, which can engage with the catch 23 of a second electromagnet 24, connected up directly to an insulated rail 25 and indirectly to other insulated rails, such as 26, situated near the signals. The rails 27 opposite the insulated rails are connected to earth.

The following results are obtained with the arrangement shown in Fig. 6:

First. Whenever the current passing through the magnet 24 is cut out and a current still passes through the magnet 19, the end 22 of the armature of 19 will be held down by the catch 23 of 24. Consequently the projection 17 will be stopped by the catch 18. The bar Z cannot, therefore, be moved in the direction of the arrow, and the slide G will be locked.

Second. Whenever the current continues to pass through magnet 24, the armature of 19 is free to go back to its normal position as soon as the current is cut off from 19. Therefore if a train is going from signal 1 to signal 6 the slide G will be locked as soon as the first axle has touched the clearance-bar 20 and will remain locked even after all the axles have passed over the clearance-bar. The lever will only be freed when the last axle has left the clearance-bar 21. If the train is shunted back after having passed the clearance-bars 25 and 20, the slide G will only be freed when the last axle has left the bar 20. In other words, the slide G will be locked as long as there is an axle between the clearance-bars 20 and 21.

In order to connect up the two bars 20 and 21, for instance, which are at the two extremities of the route I D, it is necessary to consider the following principle: The slide D′ sets the route to road I if c^2 is normal and to the road II if c^2 is reversed. It is therefore only necessary to interpose the slide D′ in an electrical connection from the bar 21 to a circuit-controller 28, which is moved by the control-bar belonging to the point c^2 and to do the same for the bar 20. Thus the reversal of c^2 reverses the effect of a movement of the slide D′.

Fig. 7 shows the arrangement in the locking-frame, and Fig. 8 the connections with the clearance-bars. Clearance-bars 30 31 32 33, &c., correspond with the ends of the several roads A B C D, &c. If the route I D is set, the bar 21 is connected up to the bar 20. If, on the contrary, the route II D is set, it will be connected up to the bar 29, Fig. 9. A similar arrangement will be adopted for the outer clearance-bars, such as 25 and 26. In certain cases it will be more economical to fix the current-controllers on the points themselves and to connect up the circuits to the electromagnets in the frame. It is not necessary to place current-controllers on all the points, but only on the facing-points, when coming from A B, &c. Fig. 9 shows this arrangement.

6. *Clearance-bars without the electromagnets 19.*—In the arrangement just described the current only passes through the magnets 19 when an axle is on the insulated rail. The arrangement shown by Figs. 10 and 11 can be adopted for the magnets 19 and 24 and the circuits arranged as described, but so that the current only passes through the mag-

net 19 when there is no axle on the insulated rail. The magnet 24, on the other hand, will only be energized when there is an axle on one of the insulated rails connected up to it.

The arrangement shown in Figs. 10 and 11 allows an indication-magnet 34 to be used instead of the magnet 19. The arrangement of the circuits to obtain this result is shown diagrammatically in Fig. 12. It is only necessary to pass the indication-circuit through the insulated rails and to place a resistance X between the magnet 19 and the current-controller of the signal 1, also to insulate the rail 35 from the right-hand end of the rail 36 and to connect up the latter to the battery in such a way that the current will not pass through the magnet as long as there is an axle on the rails. The rail 37 will be connected to the circuits of the rails 38 and 39 by means of a current-controller Y of the point *c*, so as to connect up this rail to the circuit of the rail 38 if c^2 is normal and to the circuit of the rail 39 if c^2 is reversed.

The arrangements described above can be applied to any system of working points and signals, such as electric, electropneumatic, pneumatic, hydraulic, and liquid air.

The terms "normal" and "reversed" are not used in any absolute sense. Any one of the two positions of a switch may be assumed to be its normal position.

What I claim is—

1. An apparatus for working the switch-points and signals of a route having switches at and intermediate of its ends, including in combination two levers corresponding respectively to the opposite ends of said route, and means controlled by said two levers for operating all the switches of said route.

2. An apparatus for working the switch-points and signals of a route having switches at and intermediate of its ends, including in combination two levers corresponding respectively to the opposite ends of said route, bars each of which corresponds to one of the switches of said route, and a circuit-controller carried by each of said bars for controlling the position of its switch, all said bars being controlled by said two levers.

3. An apparatus for working the switch-points and signals of a plurality of routes having the same ends, including in combination a lever at one end and a plurality of levers at the opposite end, one corresponding to each of said routes, and means controlled by the single lever at one end or by the corresponding one of the plurality of levers at the opposite end for operating all the switches of each of said routes.

4. In an apparatus for working switch-points and signals, an indication-circuit arranged so as to allow only the extremities of the routes and the points which lead to duplicate routes, to be indicated in the cabin.

5. An apparatus for working switch-points and signals, including in combination an indication-circuit connecting in succession circuit-controllers corresponding to all the switches of a route, so that the current cannot pass through the control-motors except when all the switches of said route are in their desired positions.

6. An apparatus for working switch-points and signals, including mechanism for operating a signal at each end of a route, and a circuit controlling said mechanisms and connecting in succession circuit-controllers corresponding to all the switches of said route so that the current cannot pass except when all the switches of said route are in their desired positions.

7. In an apparatus for working switch-points and signals in combination, an indication-circuit, and devices in the cabin controlled by said circuit and showing the positions of all the points of any route set.

8. In an apparatus for working switch-points and signals in combination, an indicator-circuit connecting in succession circuit-controllers corresponding to all the points of a route and passing by means of fixed connections through the cabin, and devices in the cabin controlled by said circuit for indicating the actual positions of all the points of said route.

9. In an apparatus for working switch-points and signals, in combination an indication-circuit, means controlled thereby for indicating the positions of the points, and means controlled by said circuit to hinder the sending of a train into any particular route.

10. An apparatus for working switch-points and signals, including mechanism for operating a signal at each end of a route, and a circuit controlling said mechanisms and connecting in succession circuit-controllers corresponding to all the switches of said route so that the current cannot pass except when all the switches of said route are in their desired positions, and a supplementary interrupter in said circuit for preventing the setting of a signal to send a train onto a determined track.

11. In an apparatus for working switch-points and signals, double clearance-bars operatively connected onto a special circuit or onto the indication-circuit.

In witness whereof I have hereunto signed my name, this 10th day of August, 1904, in the presence of two subscribing witnesses.

ALBERT DESCUBES.

Witnesses:

RICHARD JONES,

HARVEY BAVERSTOCK.