

No. 772,604.

PATENTED OCT. 18, 1904.

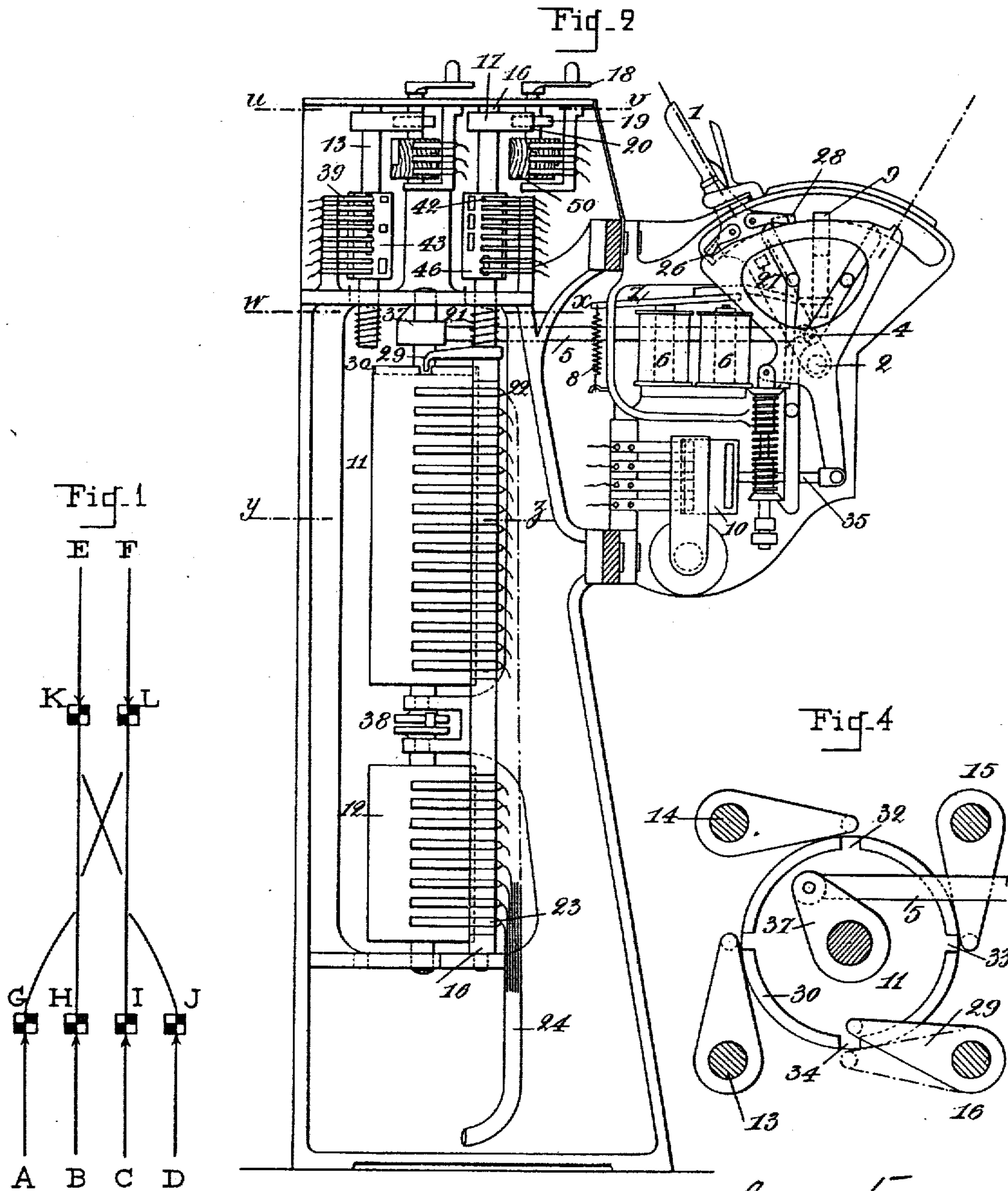
G. BLEYNIE & T. DUCOUSSO.

ELECTRIC INTERLOCKING SWITCH AND SIGNAL SYSTEM.

APPLICATION FILED APR. 20, 1904.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:
E. H. Bond
H. A. Spencer.

Inventors
Gustave Bleynie
& Thophile Ducouso.
Marion Marion
Attorneys

No. 772,604.

PATENTED OCT. 18, 1904.

G. BLEYNIE & T. DUCOUSSO.

ELECTRIC INTERLOCKING SWITCH AND SIGNAL SYSTEM.

APPLICATION FILED APR. 29, 1904.

NO MODEL.

2 SHEETS—SHEET 2.

Fig-3

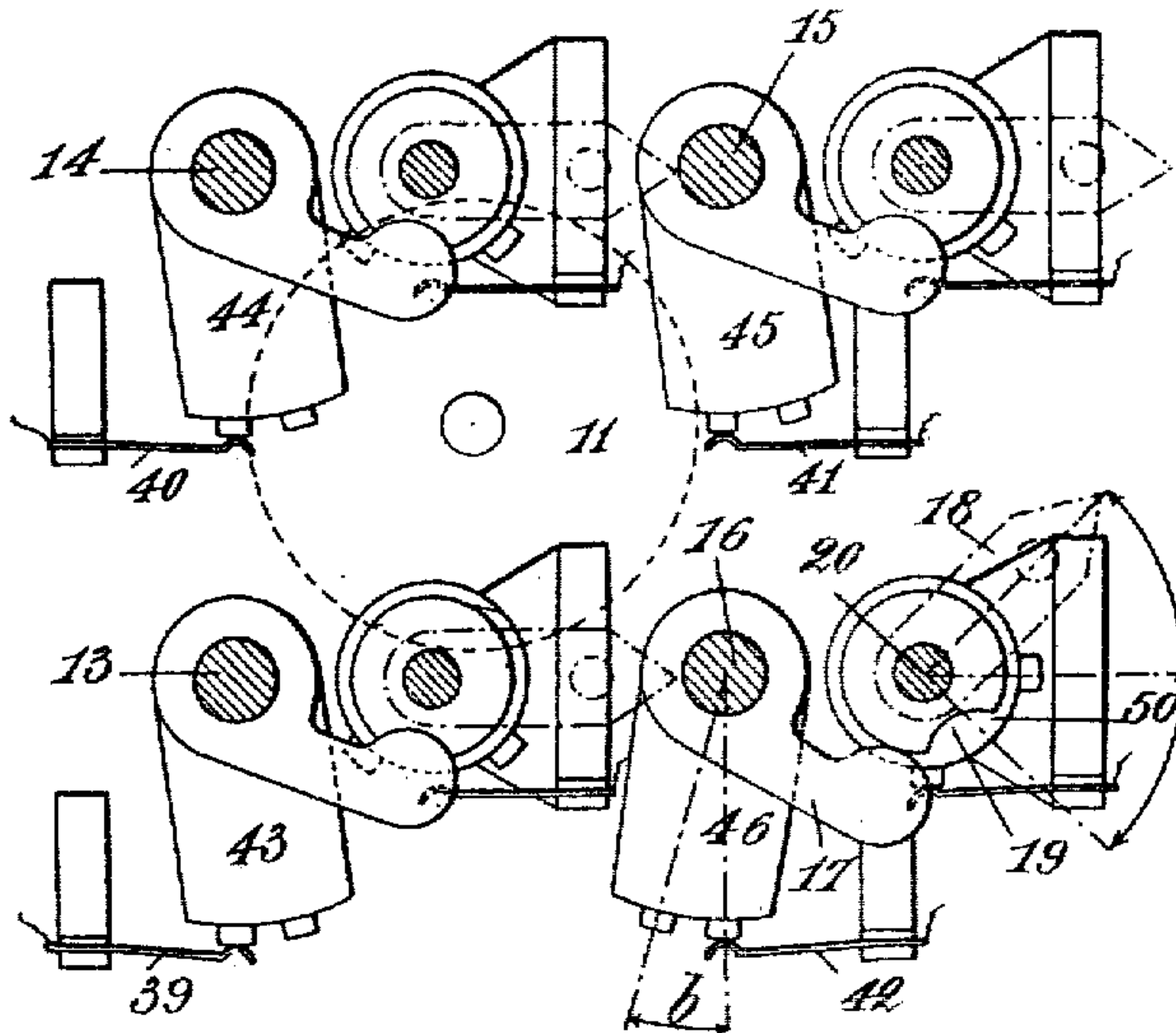
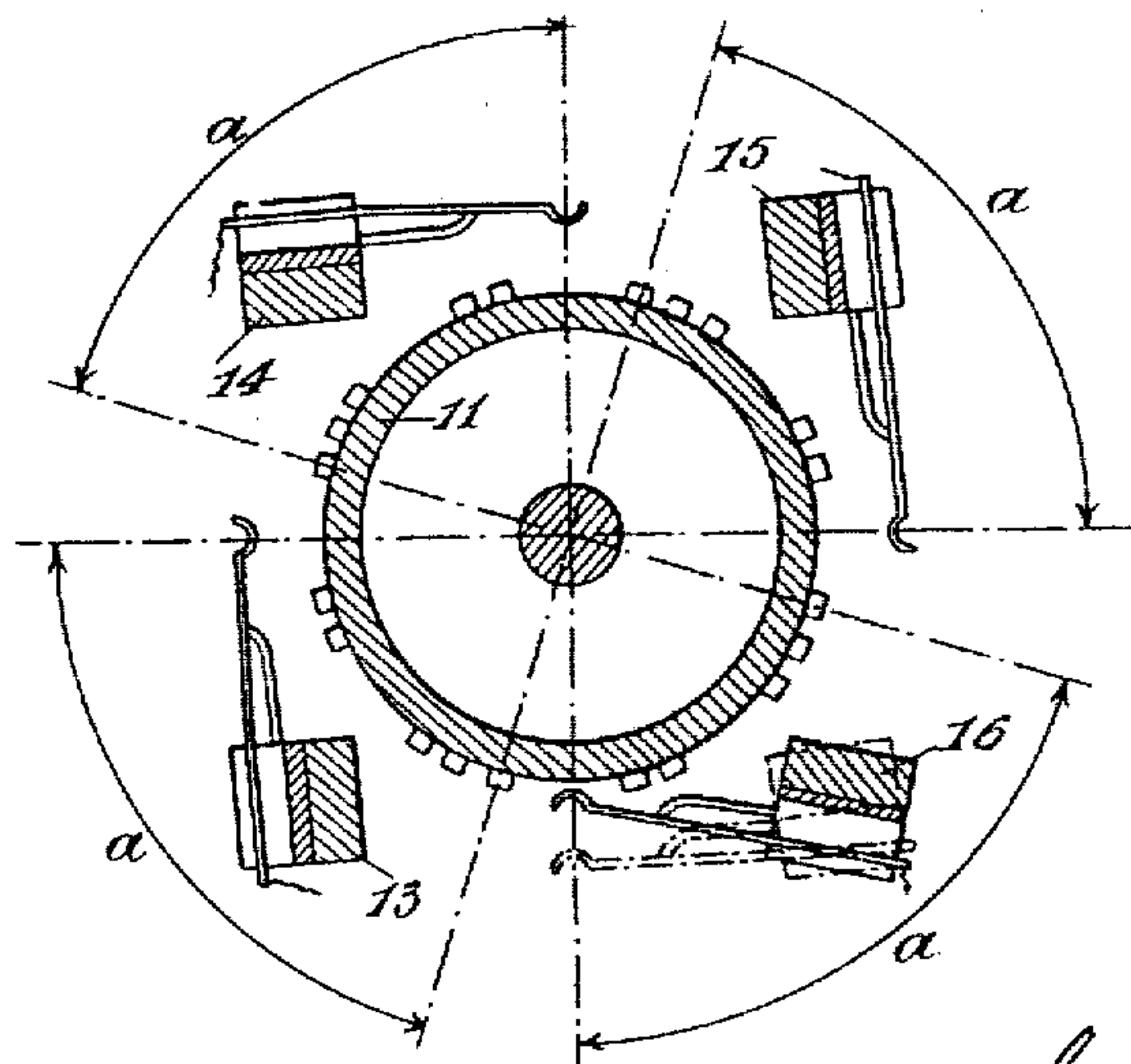


Fig. 5



inventors.

Gustave Bleyne
Theophile Ducouso.
67 Marion & Marion
Attorneys

Witnesses:-
E. A. Bond
H. A. Spencer.

UNITED STATES PATENT OFFICE.

GUSTAVE BLEYNIE AND THÉOPHILE DUCOUSSO, OF PARIS, FRANCE.

ELECTRIC INTERLOCKING SWITCH AND SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 772,604, dated October 18, 1904.

Application filed April 29, 1904. Serial No. 205,460. (No model.)

To all whom it may concern:

Be it known that we, GUSTAVE BLEYNIE and THÉOPHILE DUCOUSSO, citizens of the Republic of France, and residents of Paris, France, have invented certain new and useful Improvements in Electric Interlocking Switch and Signal Systems, (for which we have obtained in France a patent of addition, No. 1,765, bearing date May 1, 1903, to the Patent No. 315,724, bearing date November 8, 1901,) of which the following is a specification.

This invention has for its object an improved system for directly operating railway switches and signals by means of a single lever called an "itinerary-lever," said system comprising the same essential parts and working in an absolutely analogous manner to the system of itinerary-levers fully described and claimed in our American Patent No. 749,255—that is to say, enabling the whole of the apparatus of the track and the signals arranged for a given itinerary to be operated and interlocked and their position ascertained from a central station, such operation and control being effected by the manipulation of a single member (lever, fly-wheel, or the like) directly operated in the central station.

Conformably with our American Patent No. 749,255 our operating system always comprises, first, a series of itinerary-levers which are preferably arranged in a row like the levers now in use; secondly, a series of operating-motors for each of the switches or signals under control and proper means of transmission between these motors and the respective levers; thirdly, controlling devices operated by the respective itinerary-levers for working the proper motors in the proper direction at the proper time, and thereby causing the proper setting of the switches and signals; fourthly, a return transmission means between each of said switches and signals and the station; fifthly, a system of interlocking controllers operated by said return transmission means and so connected with each other of the said itinerary-levers that they cannot be moved to their final position to clear the signals over the itinerary or route until all of the switches have been actually set in their

proper positions, and, conversely, cannot move the switches from these positions until after the signals have been raised to block the itinerary.

The improvements which form the object of the present invention are adapted to enable a single itinerary-lever to be used for controlling several itineraries which cannot be traveled over simultaneously without danger. For this purpose the mode of action has been extended and the use of the auxiliary handle referred to by the numeral 18 in the specification and drawings of our patent hereinbefore named generalized, which handle already reduced by one-half the number of itinerary-levers required in a central station, allowing a single lever to be utilized for two opposite itineraries.

The improved arrangement which forms the object of the present invention is also characterized by the combination, with a single lever, (the combining member of which contains all the conditions of the circuits interested in all the itineraries which it is desired to operate by this single lever,) of as many auxiliary handles as there are itineraries capable of being operated by the single lever in question, each of said handles corresponding to a selected one of the itineraries and no longer acting merely on the signals of this itinerary, as in our patent hereinbefore named, but also on a selecting mechanism enabling only the circuits of the said given itinerary to be brought under the action of the single lever.

In order to facilitate the comprehension of the specification, reference will now be made to the accompanying drawings, in which—

Figure 1 is a diagram of the whole of four tracks converging toward two principal tracks; Fig. 2, a lateral elevation of the whole arrangement of the improved itinerary-lever provided with auxiliary commutators, selectors, and a combinator; Fig. 3, a sectional plan view of the same arrangement made on the line *uv* of Fig. 2; Fig. 4, a sectional plan view of the same arrangement on the line *w* of Fig. 2; Fig. 5, a sectional plan view of the same arrangement made on the line *yz* of Fig. 2. These three sections are drawn to a scale double that of Fig. 2.

The same reference characters indicate the same parts in the various figures, and we have designated by the numerals already employed in the description and drawings of our patent
5 hereinbefore named the parts of the itinerary-lever which are reproduced in the improved arrangement forming the object of the present invention.

The example selected in Fig. 1 comprises four
10 tracks A B C D, converging toward two tracks E F, which gives eight different simple itineraries, or sixteen itineraries if each of the foregoing may be traversed in both directions. With the arrangement described in our patent
15 hereinbefore named eight itinerary-levers must be arranged at the central station on a switch-table, while with our improved arrangement only a single itinerary-lever may, for instance, be employed for controlling the four itineraries connecting the tracks A B C D with the track E and another single itinerary-lever controlling the four itineraries connecting the tracks A B C D with the track F. Auxiliary commutators working as in our patent
25 hereinbefore named and equal in number to the number of itineraries will respectively act on the signals clearing each itinerary. Thus for one of the itinerary-levers the first commutator will act on the signals G and K, the second on the signals H and K, the third on the signals I and K, the fourth on the signals J and K. Similarly, for the other itinerary-lever the first auxiliary commutator will act on the signals G and L, the second on H and L, the third on I and L, and the fourth on J and L. Under these conditions of arrangement it is evident that in order to open an itinerary it suffices to manipulate at the central station a single itinerary-lever and an
40 auxiliary commutator. The manipulation of the central station is therefore no longer complicated, as in the case of our patent hereinbefore named, the sole difference being that with the present arrangement the operation of the auxiliary commutator must necessarily precede that of the lever. The operating-lever proper is arranged, as in our patent hereinbefore named, with its handle 1, its shaft 2, its electric pawl 9, attached to the armature 7 of an electromagnet 6 and held up by a spring 8, its dogs 26, 27, and 28, and its rod 5, pivoted at 4 for operating the cylinder 11, connected with the cylinder 12 by a coupling 38, having a predetermined play, this
55 operating member also comprising a reversing mechanism 10, actuated by the rod 35 of the reversing-lever 31, arranged in the same manner and functioning in the same way as the arrangement described in our American Patent No. 749,255 under the action of pawls or a spiral spring 36. In the improved arrangement in question the two cylinders 11 and 12 have a diameter proportionate to the number of incompatible itineraries grouped
65 under the control of a single lever, such as 1,

and they are divided into as many equal parts as there are itineraries controlled by the single lever on which they are dependent--say 4 in the present case taken as an example. Each of these parts has on suitably-spaced
70 generating-lines and each corresponding to a given position of the lever 1 all the contact-keys necessary for a given itinerary. As in the patent hereinbefore named, these generating-lines number six. The first, corresponding to the normal position of the lever, is generally not provided with keys, and the others effect, by means of their keys, the same contact combinations as those described in our patent hereinbefore named. These six
80 generating-lines are comprised in the angle α , Fig. 5, which is precisely equal to that to which the cylinder 11 is displaced when the lever 1 passes from the normal position to the reversed position, or vice versa. For
85 this object the rod 5 is connected with a crank 37, Fig. 4, attached to the cylinder 11 and arranged in such a way as to communicate to this cylinder a rotary movement of given amplitude. Parallel to the cylinders 11 and
90 12 there are arranged selecting-shafts 13 14 15 16, all of which are arranged in the same way and the number of which is equal to that of the incompatible itineraries grouped under the control of a single lever operating the combining-cylinders 11 and 12. It will consequently suffice to describe one of them—for instance, the shaft 16, Fig. 3. This shaft may turn
95 freely in the framework of the apparatus and carries an arm 17, mounted on the shaft, and the end of which penetrates into the recess or hollow part of a cam 19, keyed on the shaft 20 of a corresponding auxiliary commutator 50 when the handle 18 of this auxiliary commutator is in a normal position. When, on
105 the contrary, this handle 18 is displaced to the right or left of its normal position, the full part of the cam 19 removes the arm 17, thus imparting to the shaft 16 an angular movement b , Fig. 3, of a given amplitude. The
110 shaft 16 also carries an opposing spring 21, Fig. 2, which tends to produce a movement in the reverse direction to the foregoing, and consequently to return the arm 17 into the hollow part of the cam 19 when the latter is returned to its normal position. This shaft 16 is flattened along the whole length 22 23, Fig. 2, and carries in this part all the sets of contact-springs necessary for the circuits of an itinerary, each connected directly with the
120 end of a flexible cable 24 and arranged in such a way as to be able to coact with corresponding contacts arranged on the generating-lines of the combining-cylinders 11 and 12 in order to produce a series of successive effects identical with the series described in our American Patent No. 749,255. These springs, which vary in number according to the itineraries, are seen in profile in the plan view shown in Fig. 5, in which they are all in a normal po-
130

sition except those of the selecting-shaft 16, which is shown in a reversed position, the dotted lines corresponding to the normal position of said shaft. The angular displacement b , 5 Fig. 3, between these two positions is that which arises from the rotation of the shaft 16 under the action of the handle 18, already described. When an auxiliary handle, such as 18, is in a normal position, the corresponding 10 selecting-shaft, such as 16, is arranged so that the springs carried by the part 22 23 of said shaft are removed from the cylinders 11 and 12 while these same springs are in engagement with these cylinders, and consequently in a con- 15 dition to operate in combination with the keys carried by these latter when the auxiliary handle is reversed to one side or the other of its normal position. Finally, each of the selecting-shafts 13 14 15 16 also carries a lever-arm, such 20 as 29, Fig. 4, terminated by a bent catch or finger. The upper part of the cylinder 11 has a flange 30, having as many apertures 31 32 33 34 as there are itineraries controlled by the lever of this cylinder. When the cylinder 11 25 and consequently the lever 1 are in a normal position, these apertures stand opposite the corresponding fingers, so that it is only when the lever 1 is in a normal position that it is possible to cause the selecting-shafts 13 14 15 30 16 to turn, and consequently to bring the contact-springs into engagement with the cylinders or even to displace from its normal position any one of the handles, such as 18. Further, when a handle is reversed, as the 35 figures show for the handle 18, the finger of the corresponding lever 29 has passed to the interior of the flange 30 through the aperture 34, Fig. 4, so that if the lever 1 be operated, which involves the rotation of the cylinder 40 11, the aperture 34 is no longer opposite the finger, which therefore remains locked by the flange 30. The result of this is that the springs from 22 to 23 remain necessarily in engagement with the cylinders after the handle 18 45 has been placed in a normal position until, the lever 1 having been itself returned to a normal position, the aperture 34 again stands opposite the finger of the lever 29, which allows the selecting-shaft 16 to resume its nor- 50 mal position under the action of the spring 21.

The whole operating-lever shown in Fig. 2 is described in our patent hereinbefore named, as well as the electric connections of its different parts, more particularly the electro- 55 magnet 6 of the pawl 9 and the pole-changer 10, with the contact-springs of the combinator. In the arrangement which forms the object of the present invention these connections are made with each of the series of springs carried 60 by the various selecting-shafts 13 14 15 16 in the part 22 23 of these shafts according to the same method as the one which was explained in our patent hereinbefore named. These different series of springs each correspond, 65 as has been hereinbefore stated, to a given

itinerary, and a single one of them may when the handle of the corresponding auxiliary commutator is turned enter into combina- 70 tion with the cylinders 11 and 12, the other series of springs being held away from these cylinders. As was explained in our patent hereinbefore named, the cylinder 11 groups in series with the electromagnet 6 and the 75 source of electricity, all the control-circuits of the apparatus interested in the itinerary, and also by its combination with the auxiliary commutator 10, corresponding to this itinerary, the circuit of transmission of the 80 signal or signals opening this same itinerary. The cylinder 12 groups in parallel the circuits of transmission operating the dis- 85 tributers of energy to the motor apparatus of the switches and other apparatus of the track to be actuated in order to constitute the itinerary in question. The result is that the 85 working of the improved arrangement is absolutely the same for a given itinerary among those which it is adapted to control as in the case of our patent hereinbefore named. It 90 remains now to indicate in what manner this arrangement prevents two incompatible itineraries from being given simultaneously—that is to say, how the interlocking is realized, which interlocking may be for that mat- 95 ter obtained by mechanical or electric means. In the latter case we employ a means already described in our patent hereinbefore named for producing the interlocking at a distance, which means consist in preventing the lever 1 continuing its movement if certain mem- 100 bers dependent on other levers do not actually occupy the indispensable position to allow of the itinerary which it is desired to employ being traveled over. For this purpose the 105 catch 28 on the lever 1, Fig. 2, is cut normally and encounters in its course the pawl 9, so that the lever 1, starting from its normal position, cannot proceed farther unless the electromagnet 6 is excited by a circuit 110 passing in series into an interrupter fitted on each of the members, which must occupy a given and indispensable position in order to authorize the movement. This grouping in series with the electromagnet 6 and the source 115 of electricity is effected by the play of the keys of the cylinder 11 and contact-springs of that one of the selector-shafts 13 14 15 16 which corresponds to the itinerary consid- 120 ered, as well as by the play of contacts of normal position and of reversed position adapted to said shafts 13 14 15 16, (as well as to other like shafts, if necessary, operated by other levers in the same station,) which con- 125 tact mechanisms are represented by springs 39 40 41 42, Fig. 3, rubbing against two series of appropriate keys mounted on insulated blocks 43 44 45 46, keyed, respectively, on the shafts 13 14 15 16. The arrangement of the circuits is for that matter already 130 known, and the foregoing sufficiently explains

their adaptation in combination with the pawl of the itinerary-lever. Under these conditions of arrangement this improved apparatus works in the following manner: Supposing that it is desired to open the itinerary corresponding to the selecting-shaft 16, for this purpose the handle 18 of the auxiliary commutator 50 belonging to this itinerary is first reversed, which, in addition to the effect described in our patent hereinbefore named, produces a selection among the various combinations governed by the single lever 1. This itinerary-lever is therefore reversed, the result of which is to produce only on the combination utilized—that is to say, on the apparatus of the only itinerary determined on and in prospect—all the effects described in our patent hereinbefore named, including the clearing of the signal, as soon as the lever 1 is entirely reversed. As soon as the lever has quitted the normal position and until its return there-to it remains connected with the itinerary first chosen and determined by the selection operated by the movement transmitted to the selecting-shaft 16, the flange 30 and the catch of the lever 29 forming an obstacle to any change. This is why the improved apparatus forming the object of the present invention no longer requires to include the locking arrangement specified in our American Patent No. 749,255, the object of which was to prevent the simultaneous operation of levers corresponding with the incompatible itineraries. Immediately it is desired to do so the signal which cleared the itinerary is closed by returning, by means of the handle 18, the auxiliary commutator 50 into a normal position. This movement, for that matter, does not prevent the corresponding selecting-shaft 16 from remaining with its springs in engagement with the cylinders 11 and 12, said shaft being maintained in position by the catch of the lever 29 encountering the interior flange 30 of the cylinder 11. Finally, in order to block the itinerary the lever 1 is returned to its normal position, which produces all the effects described in our patent hereinbefore named, but only on the combination or itinerary in question, and, further, at the end of its course the selecting-shaft 16 is automatically returned to its normal position by the spring 21, which causes the catch of the lever 29 to pass through the aperture 34 of the flange 30, which aperture has again come opposite this catch at the end of the return movement of the lever 1. The lever 29 may, in fact, actually effect the movement corresponding to the passage of its finger through the aperture 34, seeing that the head of the lever 17, governing the rotation of the shaft 16, on which is keyed the lever 29, may lodge in the notch of the cam 19, the handle 18 having been returned to its normal position.

It will be seen that to a lever governing n itineraries there are annexed n auxiliary com-

mutators acting on the signals, as in our patent hereinbefore named, each of these commutators also operating the selection of the predetermined itinerary to which it corresponds.

It must of course be understood that the mode of selection which has been more fully hereinbefore set forth, and shown in the accompanying drawings, is not an exclusive one and that we reserve the right of varying its arrangement while remaining within the limit of its essential character, which is to bring into engagement with corresponding springs a series of contacts arranged on these generating-lines of the combining-cylinders, so as thus to effect, by the operation of the itinerary-lever actuating these cylinders in any suitable manner, the series of successive effects completely set forth in our American Patent No. 749,255. We may, for instance, arrange for n itineraries, n combination-cylinders, with their contact-springs always in engagement, as in our Patent No. 749,255, and utilize the action of the auxiliary handle for connecting with the sole operating-lever the combinator corresponding to the itinerary which it is desired to open. A single cylinder may also be divided into n sectors for n itineraries by employing a single series of contact-springs which represent the circuits of all the itineraries, each cylinder-sector then carrying the necessary keys for producing between these circuits the combination and effects desired for a given itinerary and the said cylinder being adapted to be keyed on its shaft in n different positions, which keying positions are each produced mechanically by the action of the corresponding auxiliary handle. Finally, it may also be pointed out that the method in which the movement of each auxiliary handle is transmitted to the corresponding selector is not essentially mechanical, as in the example selected, for facilitating the comprehension of this specification. The right is reserved of varying this method of transmission while preserving its essential character, which is to produce the displacement of the selecting member when the auxiliary handle is displaced in one direction or the other from its normal position. Thus we might employ any other means of transmission, preferably of the same nature as that which actuates postal apparatus—that is to say, electricity—in the case taken as an example for the detailed description of our Patent No. 749,255 and of this invention. In this case the mechanism controlling the angular movement would no longer comprise the cam 19; but the lever 17 would be connected with the armature of an electromagnet capable of imparting to it the same movement as the cam 19, and the exciting-circuit of the said electromagnet would be closed by the auxiliary commutator in a reversed position and opened by the same in a normal position.

We declare that what we claim is—

1. An improved system for operating railway switches and signals, comprising; the combinator actuated by a single member directly operated from a central station and effecting during the operation of the said member the necessary connections for bringing into the desired position all the track apparatus and signals relating to a given itinerary and simultaneously controlling the position and the interlocking of said apparatus; means enabling the transmission and control circuits of several incompatible itineraries to be grouped under the control of a single operating member, and of effecting particularly in each of these itineraries an auxiliary commutator, the movement of which has for effect to specialize at will the said operating member for operating and controlling the switches and signals corresponding to said commutator, the operation of the single member directly actuated in the central station only then acting on the transmission and control circuits of the itinerary to which it becomes momentarily particularly attached; substantially as set forth.

2. In a system for operating railway switches and signals by means of a single member directly actuated from a central station, a combinator divided into as many sectors as it is desired to group itineraries under the command of the said single member; contacts arranged on the generating-lines of each of these sectors to coact with corresponding springs and effect the necessary connections for simultaneously grouping on the source of energy, the transmission-circuits controlling the distribution of energy to the motor apparatus of the switches and signals which it is a question of operating, and for grouping in series with the motor of a control-pawl the circuits for controlling the position of these apparatus; a suitable means for transmitting the movement between the combinator and the single operating member, enabling the latter to transmit to the combinator a rotation of an amplitude equal to the arc of each of the sectors of said member auxiliary commutators equal in number to the number of said sectors and acting, when they are brought into a reversed position, so as to bring into engagement with the corresponding contacts of the combinator, the springs with which the transmission and control circuits of the track apparatus and signals interested in the itinerary corresponding with the commutator actuated, are connected; substantially as set forth.

3. In a system for the operation of railway switches and signals by means of a single member directly operated from a central station; a combinator provided with contacts corresponding to all the itineraries grouped under the control of said operating member; auxiliary commutators of equal number to that of said itineraries each of said commutators acting, when it is in a reversed position, to bring

into engagement with the corresponding contacts of the combinator, the springs with which the operating and controlling circuits of the track apparatus and the signals interested in the itinerary corresponding to the said commutator, end, and according to the direction of the reversal of this latter, for enabling by the maneuver of the single member directly actuated in the central station, the clearing of one or other of the two signals situated respectively at the two ends of the itinerary in question, to be effected; an interlocking arrangement adapted to prevent the displacement of any one of the auxiliary commutators so long as the operating member is not in a normal position; a recoil-spring for maintaining the springs of the said commutators constantly away from the combinator so long as these commutators are in a normal position; and an arrangement of lever with a catch for maintaining in contact with the combinator, the springs of a commutator, brought into a reversed position during the whole of the movement of the operating member substantially as set forth.

4. In a system for operating railway switches and signals by means of a single member directly operated from a central station; a combinator divided into as many sectors as there are groups of itineraries under the control of the said single member; contacts arranged on the generating-lines of each of these sectors to coact with corresponding springs and effect the necessary connections for simultaneously grouping on the source of energy all the transmission-circuits controlling the distribution of energy to the commutators of the apparatus to be actuated and for grouping in series with the motor, a control-pawl, circuits for controlling the position and interlocking of these apparatus; auxiliary commutators of equal number to that of these itineraries, each of said commutators acting when in a reversed position for bringing into engagement with corresponding contacts of the combinator, the springs which form the ends of the operating and controlling circuits of the apparatus interested in the itinerary corresponding to the said commutator, and, according to the direction in which the latter is reversed, for allowing one or other of the two signals respectively situated at the two ends of the itinerary in question to be cleared by the manipulation of the single member directly actuated in the central station; and suitably adapted to transmit the movement between the combinator and the auxiliary commutators, so that when the reversal of one of these latter has brought the desired contacts of the commutator into engagement, the said combinator shall share in the movement of the sole operating member directly actuated in the central station; substantially as described.

5. In a system adapted to operate railway

switches and signals by means of a single member directly actuated in a central station; a combining mechanism comprising as many individual combinators as there are itineraries
5 grouped under the control of said single member; contacts arranged on the generating-lines of each of these cylinders to coact with corresponding springs and effect the necessary connections for simultaneously grouping on
10 the source of energy all the circuits controlling the distribution of energy to the motors of the apparatus to be actuated, and for grouping in series with the motor of the controlling-pawl, the circuits controlling the position and interlocking of these apparatus; a
15 suitable means of transmission between the said individual combinators and the sole operating member directly actuated in the central station; auxiliary commutators equal in

number to that of the itineraries grouped under the control of the said sole member, each
20 of these commutators acting when in a reversed position to connect the individual combinator to which it corresponds, with the single
operating member directly actuated in the central station, enabling one or other of the two
25 signals respectively placed at the two ends of the itinerary corresponding to the commutator which has been reversed to be cleared, according to the direction of its reversal, substantially as described. 30

In witness whereof we have hereunto set our hands in the presence of two witnesses.

GUSTAVE BLEYNIE.

THÉOPHILE DUCOUSSO.

Witnesses:

HANSON C. COXE,

JULES FAYOLLET.