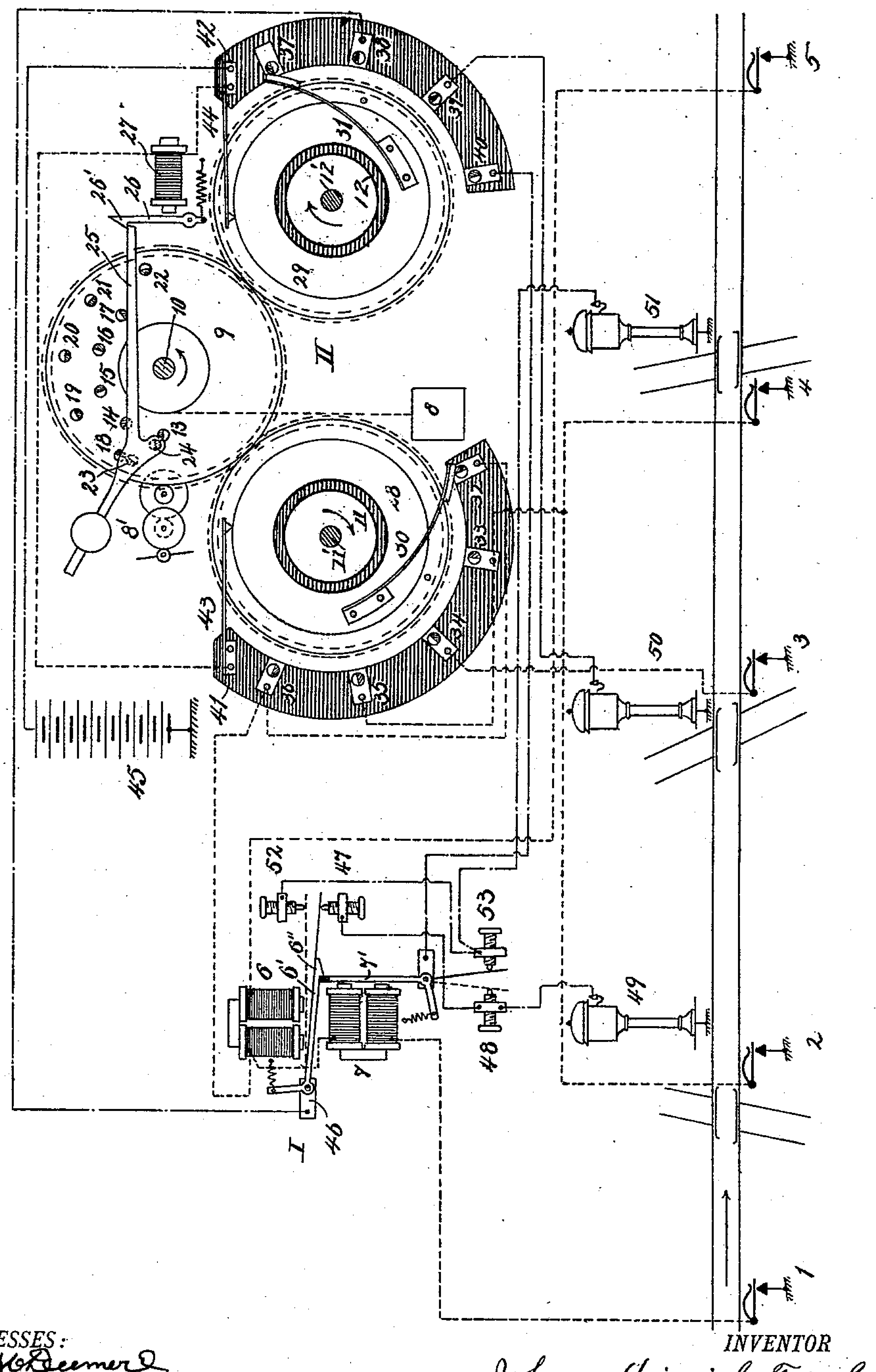
(No Model.)

J. H. FRISCHEN.

TRAIN OPERATED SIGNALING SYSTEM.

No. 529,165. Patented Nov. 13, 1894.



WITNESSES:

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TRAIN-OPERATED SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 529,165, dated November 13, 1894.

Application filed November 28, 1893. Serial No. 492,250. (No model.)

To all whom it may concern:

Be it known that I, JOHANN HEINRICH FRISCHEN, a subject of the King of Prussia, German Emperor, residing at the city of Berlin, Kingdom of Prussia, German Empire, have invented new and useful Improvements in Train-Operated Signaling Systems, of which the following is a specification.

This invention relates to train operated railway signals, and more especially to that class of apparatus in which signals for either direction are put into operation by the closing of a circuit through the same rail contact device. As it has been the practice in actuating railway signal devices to use track pedals operated by a wheel felly or flange upon the passage of a train, the danger of an accidental operation thereof has always been present, especially upon roads in which a good surveillance has been impossible, as for instance, in the case of branch tracks, which will be specially considered herein. It is therefore desirable to use a rail depression contact with mercury filling, which can only be operated by the passage of a heavy vehicle, the actuation however of which is independent of the direction of movement of the engine or train.

In carrying out my invention I employ, in connection with such a rail depression contact, a special device for making contact with the different signal devices along a line of railway. This apparatus is shown in the accompanying drawing, which is a side elevation and diagrammatic view of a signal system embodying my invention. The peculiarity of this device consists in the fact that the rail contacts are not in direct communication with the signal devices, but all the rail contacts are so connected with a switching apparatus that, when run over by an engine or train, the switch device is actuated for a brief space of time and comes to rest thereafter when the train has passed the rail depression contact. As before stated this contact will be made and the switch device correspondingly actuated independently of the direction and the movement of the passing train. This switching device is so constructed that the proper signal device at the track is switched into circuit upon the passing by the train of the depression contact through which the same is to be operated.

Referring to the drawing: 1, 2, 3, 4, 5, designate a number of rail contacts, the number of which is regulated by the number of signal devices along the line of track. Conductors corresponding to these contacts lead to a switching device, which may be located at a central station or at any other desired point.

The switching apparatus consists of two co-operating parts I and II.

6 and 7 represent two electro-magnets, the armatures 6′ and 7′ of which interlock so that when the one is attracted the other is drawn away from its magnet by a retractile spring. In the drawing it has been assumed that the electro-magnet 7 has attracted its armature 7′, in which position said armature will be held by a catch 6″ of armature 6′ after the breaking of the circuit. Should the current pass through the electro-magnet 6 and the armature thereof be attracted the two armatures would take the positions indicated in dotted lines.

The current passes through the electro-magnet 7 if the first contact 1 is run over, and through the other electro-magnet 6 if the last contact 5 is run over by a train. The switching devices shown at I then make a circuit in the proper direction to the signal device at the track, independently of the direction of movement of the train. This duplex switching device shown at I is, it will be understood, only necessary if two or more signal devices are connected to the switch device shown at II, and is omitted if only one signal is used.

The apparatus shown at II is actuated by a weight 8, provided with a suitable winding device, and is prevented from running down by a retarding device 8′, which may be of any well known construction. Other actuating mechanism may be used however.

9 is a gear wheel mounted upon a shaft 10, driven directly by the weight 8, and engages with and actuates two gear wheels 11, 12, mounted upon other shafts 11′, 12′. Upon the face of the gear wheel or disk 9 are two series of detent pins 13, 14, 15, 16, 17, and 18, 19, 20, 21, 22, the number of which corresponds

to the number of contacts along the line of railway. A lever 25, weighted as shown, is fulcrumed to the fixed portion of the apparatus, and is provided with two half pins 23, 24, adapted to co-operate with the two series of pins upon the face of the wheel 9, just described. The pin 23 forms the pivot or fulcrum of the lever 25. Said lever is balanced and weighted so that it tends to turn in a direction opposite to the direction of movement of the hands of a clock. At its front end the long arm of the lever is normally held by a pawl or catch 26', upon the end of the armature 26 of an electro-magnet 27. Said lever can turn only when this electro-magnet 27 is traversed by an electric current and attracts its armature, when the lever 25 will be released from engagement with the catch 26' of said armature 26, and will oscillate, thus freeing the wheel 9, which will in turn be actuated by the weight 8, owing to the release of the disk 9 from engagement with the lever 25, by the release of the pin 18 thereof from the pivot pin 23 of the lever. Upon the release of the wheel 9, it turns in the direction of the arrow until the pin 14 strikes the pin 24 of the lever 25, when said lever will be again pulled downward, in consequence of the continued rotation of the wheel, until the pawl 26' of armature lever 26 again engages it, when it will be stopped from further movement. The wheel will continue to turn, however, until the pin 19 strikes against the pin 23, when the said wheel 9 will stop and can only be moved again upon a second release of the lever 25. At every such movement of the wheel 9 the corresponding gear wheels 11, 12, are actuated also, for a space equal to or corresponding to the movement of said wheel 9. Upon these wheels 11—12 are mounted insulated metal fellies or hubs 28 and 29, upon whose faces are sliding contacts 30 and 31, adapted to make contact with series of pins 32, 33, 34, 35, 36, and 37, 38, 39, 40, which are arranged around the wheels at suitable intervals and insulated from one another. According to the positions of the respective wheels 9, 11 and 12, the terminals 41 and 42 make contact with one of each series of pins through contact springs 43 and 44, the fellies 28 and 29, and contact springs 30 and 31. These series of pins are located on terminals to which corresponding conducting wires are attached.

The pins 32, 33, 34, 35 and 36 are connected with the rail contacts in such a manner that the first and last rail contact devices are connected with the first and last pins 32 and 36, the second and second to the last rail contacts with the second and the second to the last pins 33 and 35, &c. In the drawing five contacts 1, 2, 3, 4, 5, have been shown as connected with five contacts 32, 33, 34, 32 and 36. Thus 1 and 5 are connected with 35 and 36, 2 and 4 with 33 and 35, and 3 with 34. This is necessary in order to have the conductors switched in properly for opposite directions of movement of a train upon the railway track adjacent to the signal devices.

Let it be supposed that a train is running over the section in the direction of the arrow. Contact is first made through the rail depression contact 1 and the circuit is closed therefrom to the electro-magnet 7, contact 36, contact 32, contact spring 30, felly 28, contact spring 43, binding post 41, electro-magnet 27, binding post 44, to battery 45, to the earth. By the passing of this current the electro-magnet 27 is energized and attracts its armature 26, whereupon the lever 25 is released and in turning releases the pin detent 18 from engagement with the pivotal detent 23 of the lever, when the disk or wheel 9 will rotate and turn until it again secures the lever by means of the pins 14 and 24, and will continue to turn until it is stopped by the striking of pin 19 against said pivotal pin 23. By this movement the gear wheels 11 and 12 have also been actuated in the directions of the arrows, and contact spring 30 released from engagement with contact 32 and brought into engagement with contact 33. If now the contact at 1 is again actuated it can produce no further effect, as the circuit can only be closed by the contact device at 2. If the train now runs over said contact 2, the lever arm will be released again and the wheels rotate as before, the switch 30 moving from contact 33 to 34. This operation will be repeated until the last track pedal or contact device 5 is run over, when the contact spring 30, after being released from 36, will again be placed upon the contact 32, owing to the continued movement of the three gear wheels. As the contact 32 is also connected with rail contact 5, it is evident that a second release of the mechanism would take place if said contact spring 30 reached the contact 32 before the train had left the track pedal 5. Hence, it is evident that the mechanism must remain in motion at least as long as the train is running over said pedal. Exactly the same results are accomplished by means of the circuits shown in the drawing (as will be evident), if the train were to pass over the section of railway in an opposite direction, that is, from contact 5 toward 1. In this case, however, the electro-magnet 6 will close the circuit instead of magnet 7.

The step by step movement of the gear wheels can only be used to switch the signal devices in or out. For this purpose the wheel 12 is also provided with a felly 29, contact spring 44 and a contact spring 31 similar to the corresponding mechanism of gear wheel 28. Contact pins 37, 38, 39 and 40 are also arranged to correspond to the pins for wheel 28.

In the drawing, it has been assumed that three warning or semaphore signals have been erected at crossings which are operated when the preceding rail depression contacts are run over, but which are released after the contact has been made and circuit completed.

When the apparatus is in the position of rest, contact spring 31 is upon contact pin 37, to which no wire conductor is fastened. After passing the track contact 1, this contact spring 31 moves to contact 38, and thereby closes a circuit through binding post 42, contact spring 44, felly 29, contact spring 31, contact 38, binding post 46, armature 6′, contact 47, contact 48, to the signal 49 (which is actuated by the passage of said current) to the earth and back to the battery. It is here that the object of using the duplex mechanism, shown at I, will be apparent; for, if the train had run in the opposite direction, that is, from rail contact 5, although contact would have been made with spring 31, through contact pin 38, yet a circuit would not have been closed to 49, but to signal 51, which would thus have been actuated instead of signal 49. This will be evident, as it will be seen that the current in such case would pass from contact 5 through electro-magnet 6,—whereupon the armature 6′ thereof would have been attracted,—and would then flow through said armature 6′, and through contact 52 instead of 47, to contact 53, and thence to the signal 51, which would be actuated thereby. If the track contact 2 is then passed, contact spring 31 will pass from contact piece 38 to contact piece 39, thus interrupting the current to signal 49, which signal is released. The current would then flow over said contact piece 39 to the signal device 50, which would then be actuated. When track contact 3 is passed, the signal 50 is switched out and signal 51 cut in, and in a similar manner, when contact 4 is passed, signal 51 would be cut out. As the signals upon the section of track shown in the drawing have then all been passed, it is evident that they will be no longer affected by the passage of the train, as there are only four contact pins 37, 38, 39 and 40, so that when contact 5 is passed only the switching apparatus is operated, which, after the proper movement thereof, hereinbefore described, will be again held in a position ready for another series of alternate releases and engagements.

In the present case a comparatively simple illustration of the use of my improved switching apparatus has been given, but it is evident that it can be applied to much more complicated questions of railway signal operation. For instance, instead of the single contact wheel 12 any desired number of such wheels can be used, so that when a contact is passed a whole series of different circuits can be closed and broken in succession, instead of a single circuit, as hereinbefore described. The gear wheel or clock train mechanism can also be so arranged that it need not be operated by a spring or a gravity motor, but it can be actuated by the passage of the current itself so that it will be unnecessary to attend to the winding of a weight, a spring or a similar device.

I claim—

1. In a train-operated signaling system, a series of track contacts; a series of circuits controlled thereby; a switching device adapted to successively close said circuits synchronously with the actuations of the track contacts; a series of signal devices; a series of circuits thereto; and means for controlling the closing of said circuits successively synchronously with the actuations of the track contacts.

2. In a train operated signaling system, a series of simplex track contacts; a series of single circuits controlled thereby; a series of signal devices; means controlled by said track contacts for actuating a signal device upon each closing of a circuit; and automatic circuit-selecting means also controlled by said contacts for closing a circuit to the advance signal corresponding with the position and direction of movement of the train.

3. In a train-operated signaling system, a series of simplex track contacts; a series of single circuits controlled thereby; a common switching device for all of said circuits adapted to successively break a circuit after the closing thereof by the corresponding track contact and make the subsequent circuit and signal devices corresponding to the track contacts and controlled respectively from the preceding contacts.

4. In a train-operated signal system, a series of simplex track contacts; a series of single circuits controlled thereby; an electro-magnet; a common switching device for all of said circuits actuated by said electro-magnet and adapted to break and make the circuits of said series successively and signal devices corresponding to the track contacts and controlled respectively from the preceding contacts.

5. In a train-operated signal system, a series of track contacts; a series of circuits controlled thereby; an electro-magnet; a switching device actuated by said electro-magnet and adapted to break and make the circuits of said series successively; a series of signal devices; a series of circuits controlling the same; and a second switching device controlled by the first switching device and adapted to switch said signal devices into circuit successively synchronously with the closing of the track contacts.

6. In a train-operated signal system, a series of simplex track contacts; a series of single circuits controlled thereby; an electro-magnet; a switching device actuated by said electro-magnet and adapted to break and make the circuits of said series successively; a series of signal devices; a series of circuits controlling the same; and a pair of electro-magnets, controlled by the terminal track-contacts, and adapted to make circuit with the signal devices in the order corresponding to the direction of movement of the train.

7. In a train-operated signal system, a series of track-contacts; a series of circuits con-