

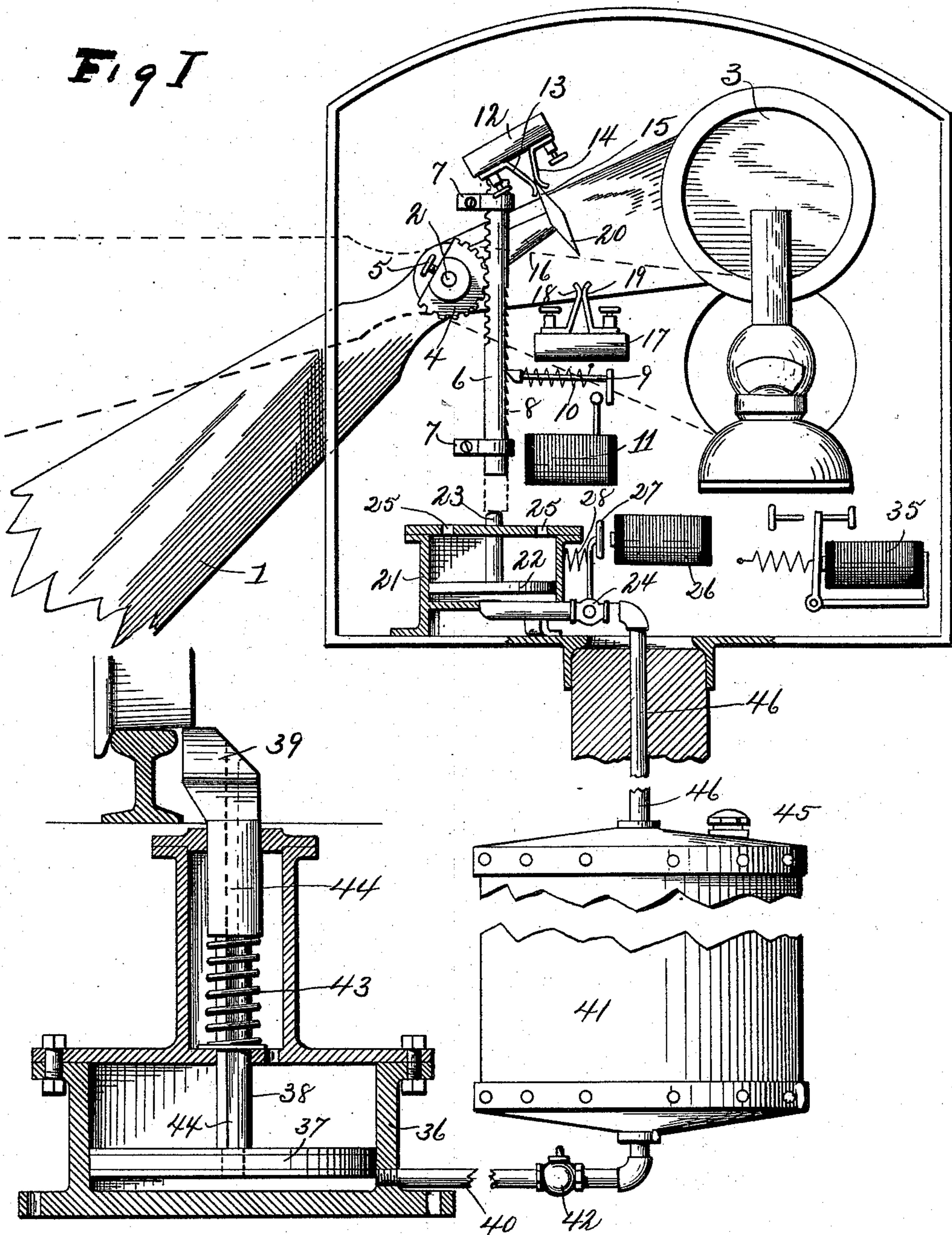
(No Model.)

2 Sheets—Sheet 1.

A. H. THORP.
ELECTROPNEUMATIC BLOCK SIGNAL SYSTEM.

No. 573,932.

Patented Dec. 29, 1896.



WITNESSES

Carroll J. Webster
Maud Schumacher

INVENTOR

Adelbert H. Thorp
By William Webster *Att.*

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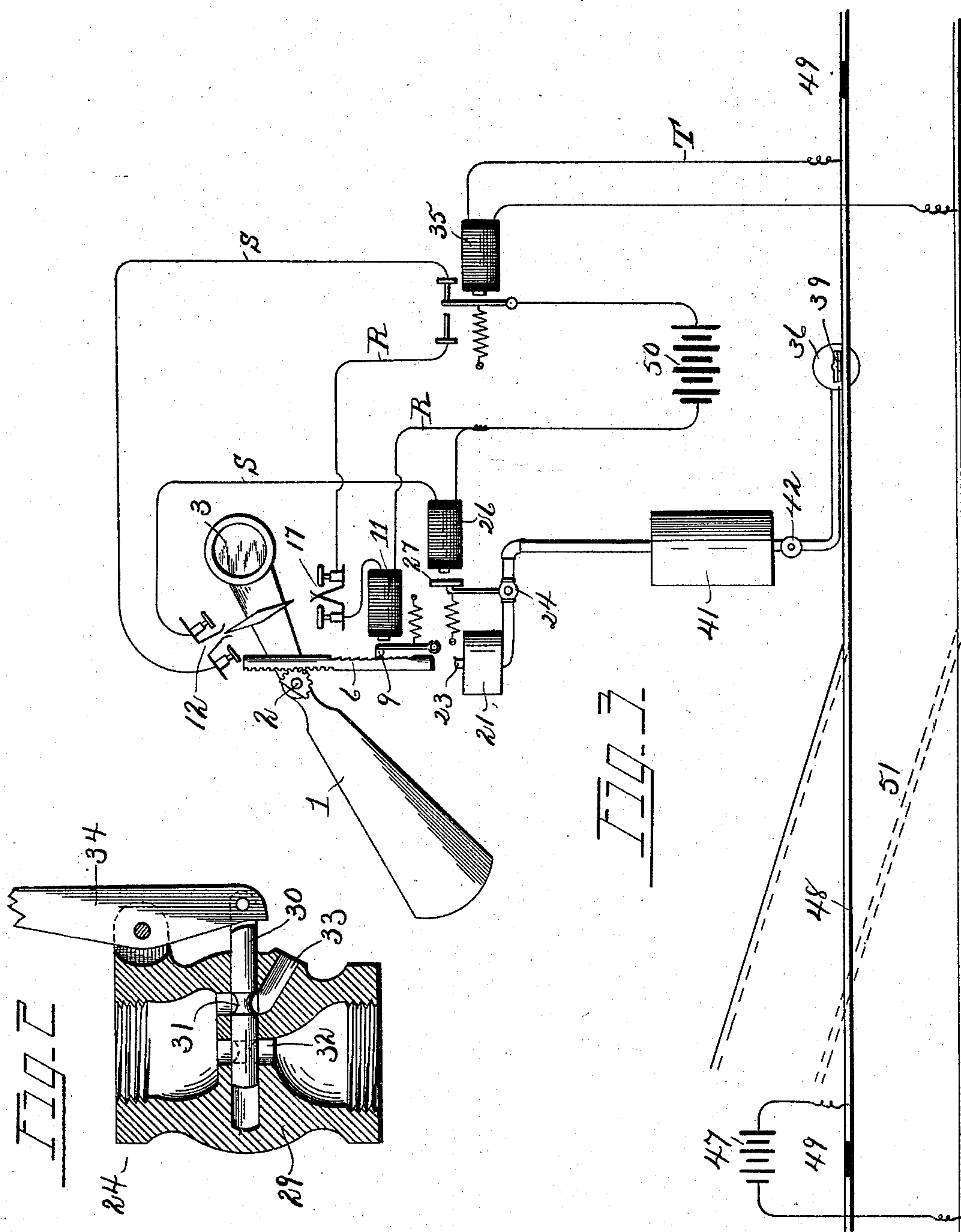
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UNITED STATES PATENT OFFICE.

ADELBERT H. THORP, OF TOLEDO, OHIO.

ELECTROPNEUMATIC BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 573,932, dated December 29, 1896.

Application filed April 10, 1896. Serial No. 586,961. (No model.)

To all whom it may concern:

Be it known that I, ADELBERT H. THORP, of Toledo, county of Lucas, and State of Ohio, have invented certain new and useful
5 Improvements in Electropneumatic Block-Signal Systems; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable
10 others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification—

My invention relates to an electropneumatic railway block-signal system, and has for its object to provide a positive automatically-operated means for displaying danger and clear signals in a plurality of sections or blocks intermediate the terminals of the road.

20 A further object is to employ an electric circuit in connection with a force of compressed air absolutely controlled by a passing train, whereby the proper make and break of the circuit is established to display the proper
25 danger or clear signals, respectively.

A further object is to provide positive means for displaying a "danger-signal" electrically through the medium of the force of compressed air, with automatic means for
30 controlling the circuit to display a clear signal.

With these objects in view the invention consists, broadly, in an electropneumatic system of displaying danger and clear signals in
35 blocks or sections of a railway-track actuated initially by a moving train.

In the drawings, Figure 1 is a view showing the semaphore-arm with magnets for releasing and setting the same and track-circuit relay and circuit-breakers for controlling
40 said magnets, also showing the track air-pump in section and the reservoir for maintaining a constant supply of air under pressure. Fig. 2 is a sectional detail view of the air-controlling valve. Fig. 3 is a diagrammatic view of
45 my system, showing the means of controlling the air and electric circuits.

1 designates a semaphore-arm, having a shaft 2, the end 3 being overweighted and
50 having a tendency to drop by gravitation.

On shaft 2 and moving with semaphore-arm 1 is a gear 4, fastened by a set-screw 5 and meshing with a rack-bar 6, held in sliding contact by guides 7. On one side of rack-bar 6 and longitudinal therewith are ratchet-
55 teeth 8, catch 9 being held in contact therewith by spring 10 and away therefrom by magnets or a vibrator 11.

12 is a circuit-breaker composed of parts 13 and 14 normally in contact but held apart
60 when semaphore-arm is raised by the insulated wedge-shaped end 15 normally therewith, being integral with arm 16 on shaft 2.

17 is a similar circuit-breaker made up of parts 18 and 19, also normally in contact but
65 held apart by the insulated wedge 20 when semaphore-arm falls.

21 is an air-cylinder having a plunger 22 connected to the lower end of a piston 23 in direct alinement with rack-bar 6, so that
70 when air is admitted to cylinder 22 by opening valve 24 piston 23 is raised, thereby also raising rack-bar 6.

25 are vents in the head of cylinder 21 to allow the confined air therein to escape. 75 Valve 24 is operated by magnets 26, attracting armature 27 and by tension of spring 28 when armature 27 is released. Armature 27 may be connected direct, as shown, or a series of levers may be employed to perform the
80 same operation.

Valve 24 is of novel construction, and consists of valve-body 29, valve-stem 30, having a circumferential groove 31, port 32, to admit compressed air, port 33, to permit the
85 escape of air in cylinder 22, and operating-lever 34, connected to stem 30. The circumferential groove 31 is in line with the escape-port 33, but when lever 34 acts it takes a position shown in dotted lines, thereby admit-
90 ting compressed air to cylinder 22. It will be seen that the entrance and escape ports cannot be open at the same time.

35 is a double contacting-relay which controls the circuits, a description of which will
95 be given later.

36 is the cylinder of the track air-pump, in which is a plunger 37, connected to piston 38, having a shoe 39 upon the upper end thereof. Shoe 39 takes a position just beside the track
100

and normally somewhat elevated with respect thereto, so that as the train passes along the rail the projecting rim of the wheel comes in contact with shoe 39 and depresses it forcibly, thereby compressing the air in cylinder 36, which passes by a proper conduit 40 to pressure-tank 41 and is held from returning by an ordinary check-valve 42. Shoe 39 again assumes an elevated position through the action of spring 43 in piston 38.

44 is a longitudinal groove on piston 38 to permit the air in the upper end of cylinder 36 to escape and also to admit air to the interior thereof. Pressure-tank 41 is equipped with an ordinary safety-valve 45 to relieve it from undue pressure. From the pressure-tank 41 the air is carried by a proper conductor 46 to the air-cylinder 21, being controlled by valve 24, as heretofore described. I may also intervene a pressure-regulating valve, so that air of any desired pressure may be admitted to cylinder 21, irrespective of the pressure in pressure-tank 41.

T is the closed track-circuit controlled by battery 47 and containing therein the block or insulated section of rail 48, having insulated joints at 49, and the magnet of double contacting-relay 35. 50 is a local open-circuit battery with setting-circuit S and releasing-circuit R leading therefrom and controlled by double contacting-relay 35. Setting-circuit S contains circuit-breaker 12 and the controlling-magnet of air-valve 24. Releasing-circuit contains circuit-breaker 17 and the magnet of vibrator 11.

The operation is as follows: A train entering block from either direction in which a signal is located short-circuits battery 47, thereby removing the current through magnet of relay 50, which releases the armature thereof and closes releasing-circuit R, which operates vibrator 11, thereby withdrawing latch 9 and allowing semaphore-arm to rise by gravitation to a position shown in dotted lines, Fig. 1, and to display a danger-signal. By this operation the circuit-breaker 12, controlling the setting-circuit S, is closed, and the circuit-breaker 17, controlling releasing-circuit, is opened. As the train leaves the block the circuit is restored through relay 35, thereby establishing the circuit through magnet 26 of air-valve 24, which operates plunger 22, and consequently rack-bar 6, thereby lowering semaphore-arm to "clear," air-valve 24 remaining open until the circuit through circuit-breaker 12 is opened by the insulated wedge-shaped end 15. When the rack-bar reaches its proper elevation, it is held there by latch 9 until succeeding train enters the block and the operation is repeated. The semaphore-arm will also go to "danger" if a rail is broken, or if by any means a short-circuit occurs in the track-circuit, or if a switch is left open in the block, as shown in Fig. 3, when the section of track 51 will short-circuit battery 47 and operate the danger-signal.

For a single track two signals, as herein described, are located at each end of the block, one of them being connected with the track, as has been shown, the other being controlled by this one through a circuit-breaker on shaft 2 of semaphore-arm 1, thereby accomplishing the operation of both in unison by means of line-wire connection.

If a time-signal is desired in connection with the signal herein described, the appliance as described in my Patent No. 481,723 can be placed in the same signal, using a special air-circuit leading from pressure-tank 41, the valve being controlled by a circuit-closer operated by the passing train.

What I claim is—

1. In an electropneumatic block-signal system, a weighted semaphore-arm normally indicating a clear-signal, a catch normally engaging with devices to hold the semaphore-arm in a position to indicate a clear-signal, a normally-closed track-circuit, a catch-releasing circuit and a setting-circuit controlling pneumatic means for returning the semaphore-arm to a point to indicate "safety," circuit-breakers upon the releasing-circuit and upon the setting-circuit controlled by the movement of the semaphore-arm whereby when the track-circuit is opened by the passage of a train into the block, the releasing-circuit is closed and the catch retracted and the semaphore-arm allowed to rise by gravitation to a point to indicate a danger-signal, the releasing-circuit being opened by the circuit-breaker thereon, when the semaphore-arm has completed its movement which releases the catch to normally be in position to hold the semaphore-arm when it is returned pneumatically under the action of the setting-circuit when the track-circuit is closed, due to a train leaving the block.

2. In a block-signal system, a semaphore-arm, a vertically-movable rod lowered thereby, a catch for holding the same in a raised position, a track-circuit normally closed but opened by a moving train, a semaphore-releasing circuit controlled by the track-circuit having circuit-breakers controlled by the movement of the semaphore-arm, and a pneumatic means for resetting the semaphore-arm, each primarily operated by the track-circuit and then operated by the movement of the semaphore-arm to either release the catch and allow the semaphore-arm to rise by gravitation or to open a valve in the pneumatic means to pneumatically set the semaphore-arm to indicate clear-signals.

3. In an electropneumatic block-signal system, a semaphore-arm, a rod lowered thereby, a cylinder, a piston secured therein in vertical alinement with the rod, a tank, means for forcing air therein under pressure by means of an air-compressor located adjacent to the track, a pipe connecting the tank and the cylinder having a valve interposed thereon, having a conduit and separate exhaust-conduit

leading into the open air, a valve-stem arranged to alternately open or close the two conduits, an armature arranged upon the valve-stem, an electromagnet arranged upon
5 a setting-circuit and a track-circuit for closing the setting-circuit when the track-circuit is closed, due to a train leaving the block.

In testimony that I claim the foregoing as my own I hereby affix my signature in presence of two witnesses.

ADELBERT H. THORP.

Witnesses:

JNO. O. BULLOCK,
E. W. WARNICK.