R. B. ROBINSON.

AUTOMATIC COMPRESSED AIR TRAIN SIGNAL AND STOPPING SYSTEM.

APPLICATION FILED JULY 29, 1908.

911,161.

Patented Feb. 2, 1909.

3 SHEETS—SHEET 1.

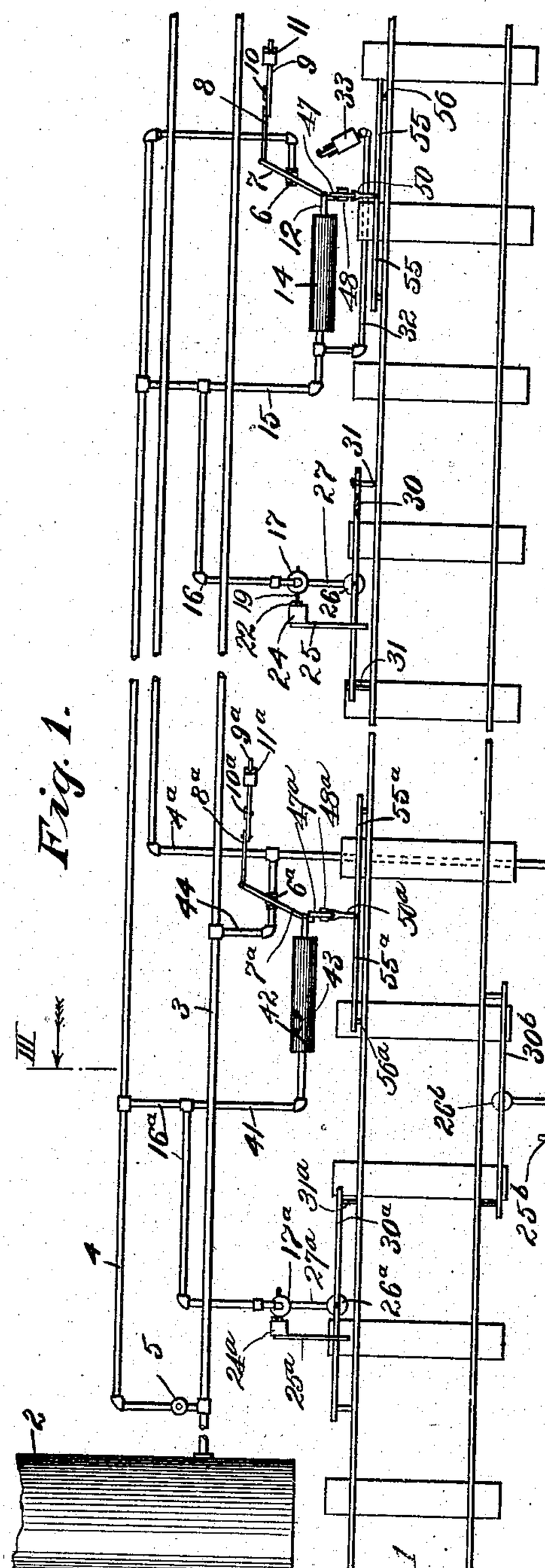

Fig. 1.

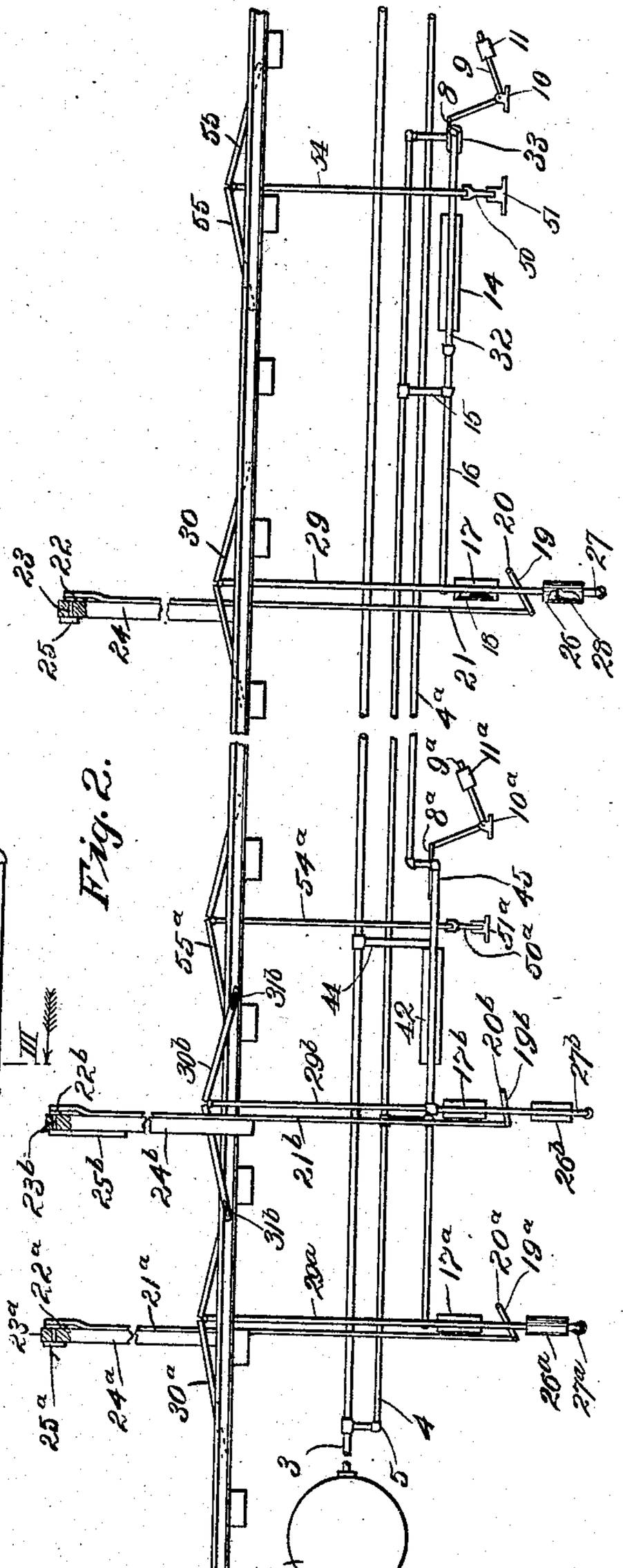

Fig. 2.

Witnesses:

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Fig. 5.

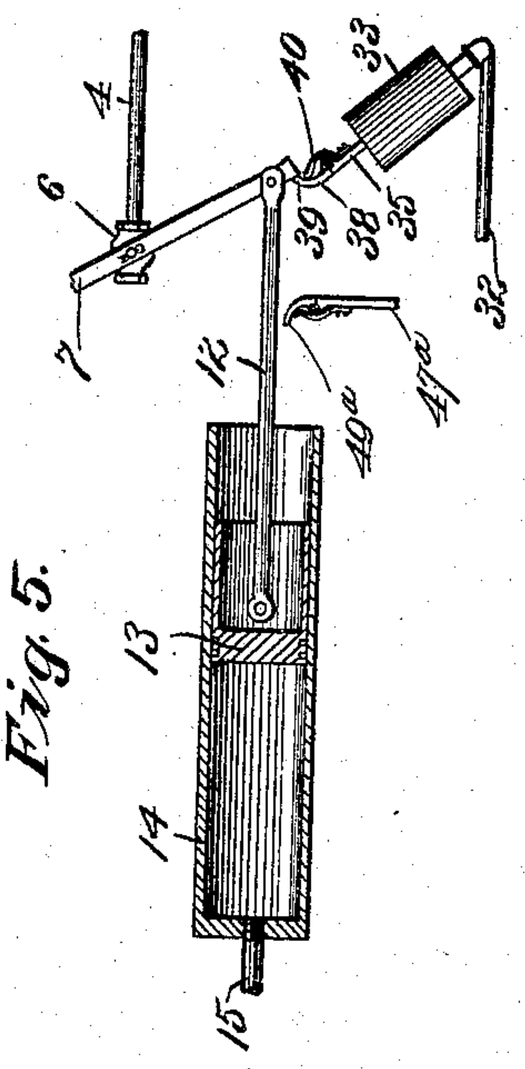


Fig. 6.

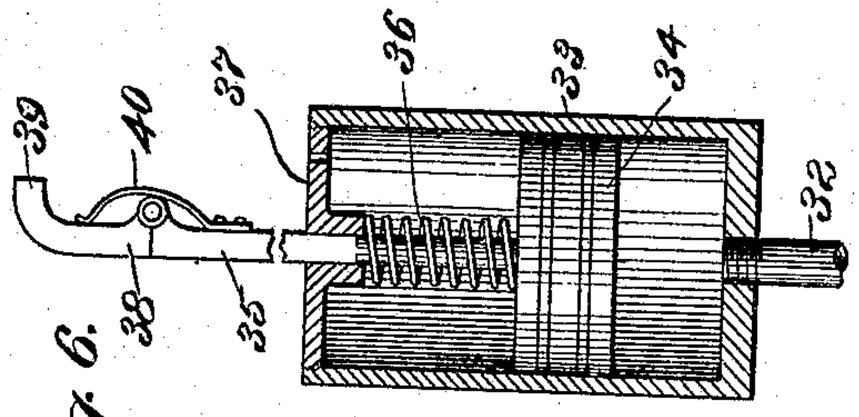


Fig. 7.

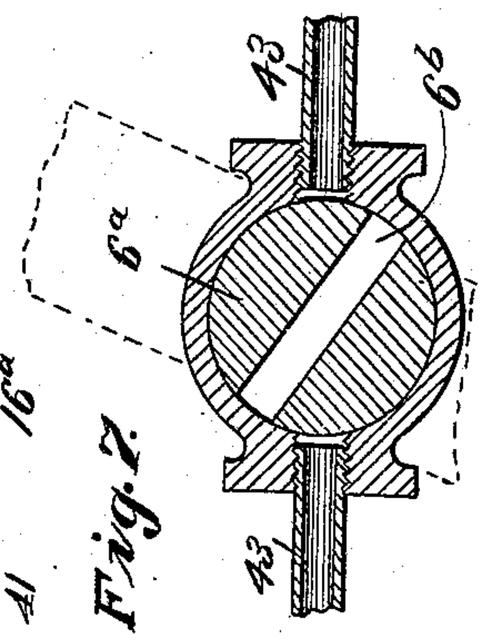
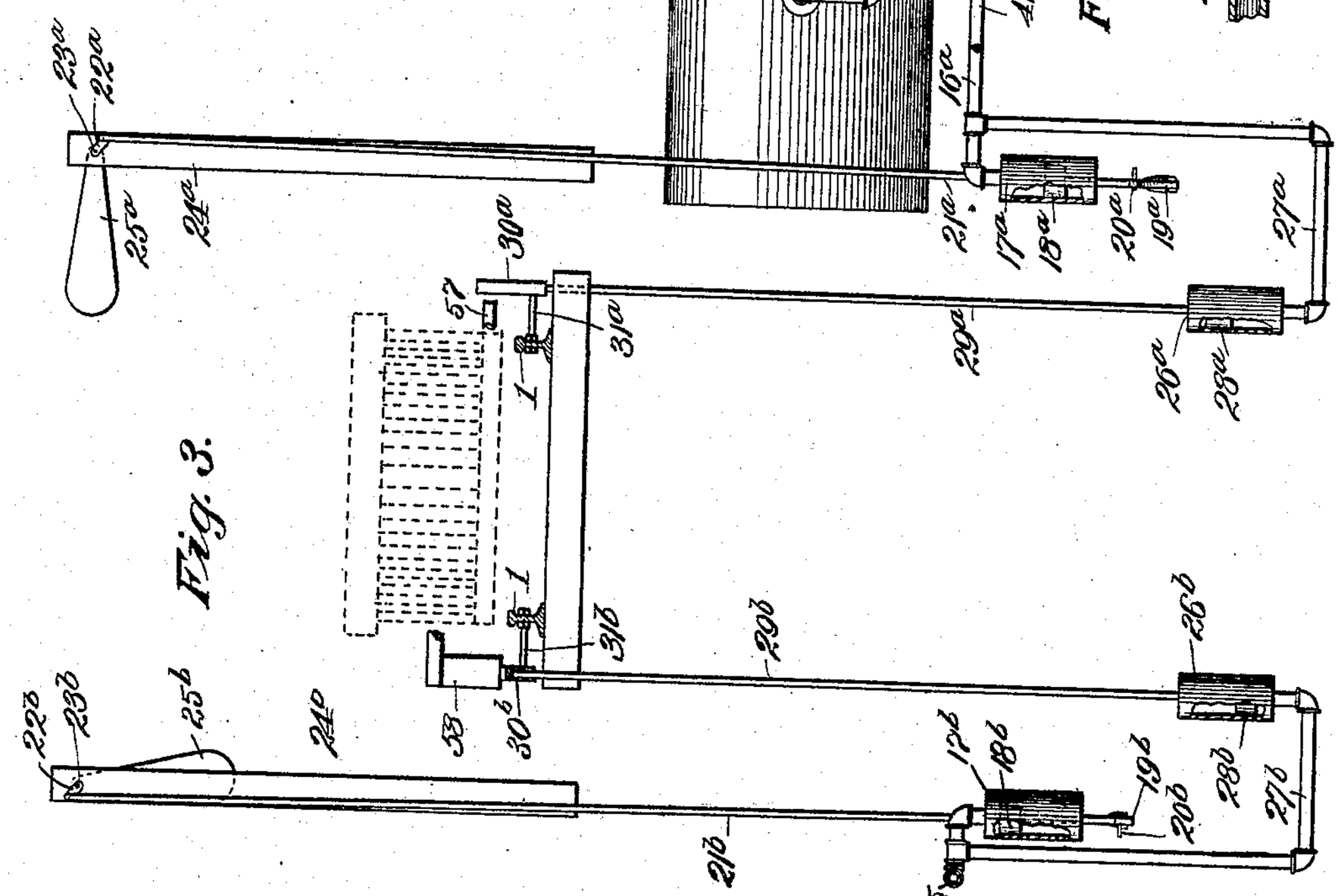


Fig. 3.



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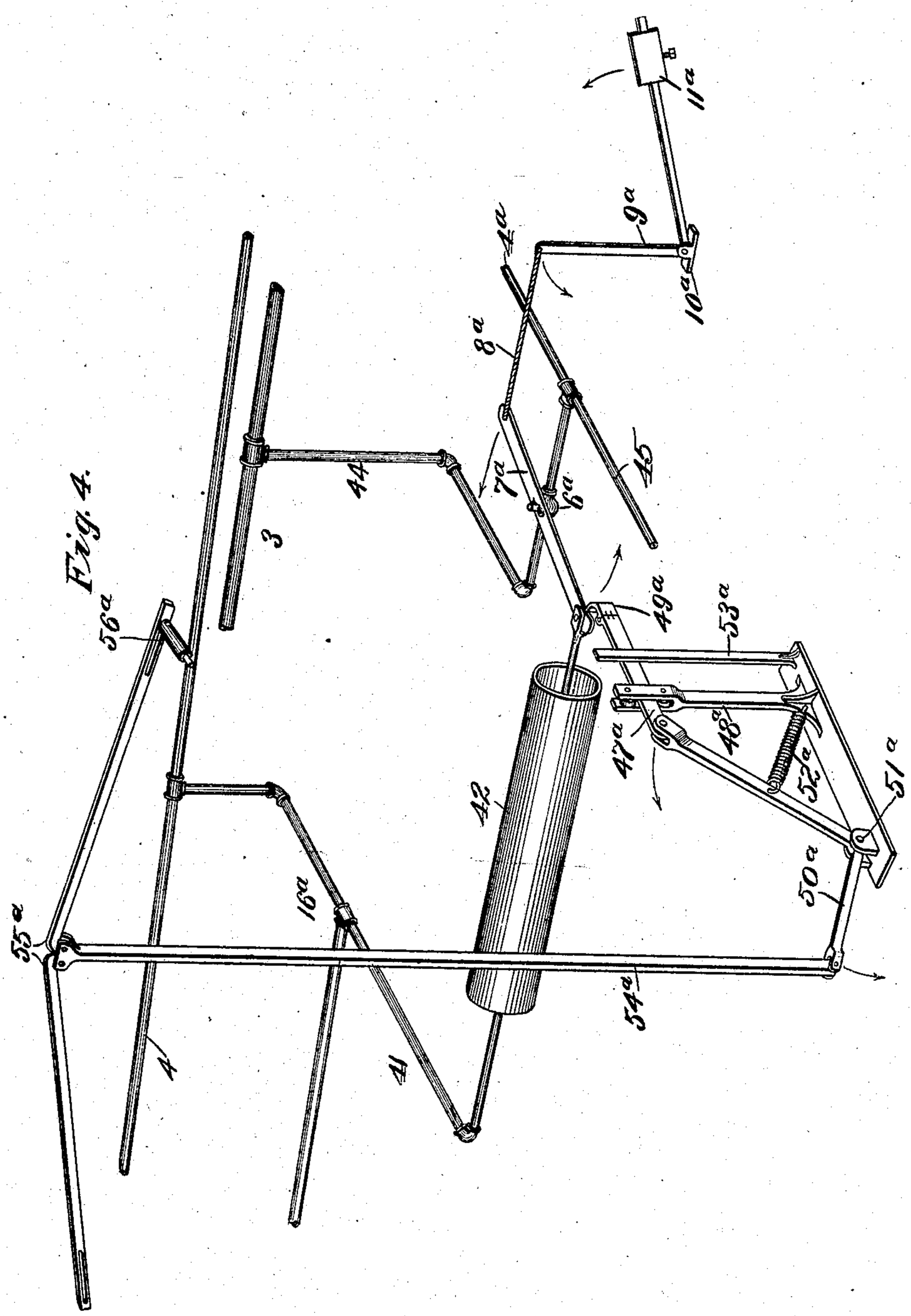
3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT B. ROBINSON, OF KANSAS CITY, MISSOURI.

AUTOMATIC COMPRESSED-AIR TRAIN SIGNAL AND STOPPING SYSTEM.

No. 911,161. Specification of Letters Patent. Patented Feb. 2, 1909.

Application filed July 29, 1903. Serial No. 446,018.

To all whom it may concern:

Be it known that I, ROBERT B. ROBINSON, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Automatic Compressed-Air Train Signal and Stopping Systems, of which the following is a specification.

This invention relates to automatic compressed air train-signal and stopping systems, and has for its object to produce means whereby air pressure may be utilized for operating semaphores or other signals.

A further object is to produce means whereby the passage of a train over the track is utilized to trip certain devices and thus permit compressed air to effect the operation of the signals and to trip certain other devices to effect the restoration of the signals to their original inoperative positions.

Another object is to produce means whereby a train entering a protected section or block shall be automatically arrested through the action of mechanism not under control of the engineer of such train.

With these general objects in view and others as hereinafter appear, the invention consists in certain novel and peculiar features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a plan view of a part of the signal mechanism embodying my invention. Fig. 2 is a side view of the same. Fig. 3, is a section on the line III—III of Fig. 1. Fig. 4, is an enlarged perspective view of a part of the system. Fig. 5, is a plan view of part of the system with one of the air cylinders in horizontal section. Fig. 6, is an enlarged horizontal section of a valve-locking mechanism forming part of the system. Fig. 7, is an enlarged horizontal section taken through one of the valves of the system.

In carrying out the invention as applied to a single-track railway, 1 indicates the railway track, and near the depot or starting end of said track is a compressed air tank or reservoir 2, from which extends a pipe 3 for the full length of the trackway. At the left-hand side, by preference, of the trackway is a pipe 4 connected at one end to pipe 3 and controlled by a valve 5, its opposite end being connected to an exhaust valve 6, which valve is located at the opposite end of the first section or block of the trackway from the supply tank 2, the valve being of the ordinary globe type, by preference, and provided with a double arm handle 7, connected by a flexible or other suitable link 8 with a bell crank lever 9, mounted on a suitable bearing 10, and provided with an adjustable weight 11. The opposite end of the handle is pivotally connected to the piston stem 12 of the piston 13 arranged to reciprocate in cylinder 14 connected by a branch pipe 15 to pipe 4 and connected to said pipe 4 through the medium of its branch 15, if desired, is a branch pipe 16, leading to the upper end of a vertical cylinder 17 provided with a piston 18 having its stem extending downward through the cylinder and connected to a rock-arm 19, suitably fulcrumed as at 20 at one end, the opposite end of said rock arm being pivotally connected by a rod 21 with the crank arm 22 of a short shaft 23 journaled in an upright 24, a semaphore 25 also forming a crank for said shaft and extending at such an angle to crank 22 that when the latter is pulled downward by rod 21 the semaphore is brought to a horizontal or operative position as hereinafter explained.

26 is a vertical cylinder connected at its lower end by a pipe 27 to pipe 16 and provided with a piston 28, having a stem 29 extending upward and pivotally connected to the adjacent ends of a pair of alined levers 30, arranged outward of and adjacent to the left-hand rail of the trackway, said levers having pin and slot connections at their depressed ends as at 31, with the said track rail.

17^a, 18^a, 19^a, 20^a, 21^a, 22^a, 23^a, 24^a, 25^a, 26^a, 27^a, 28^a, 29^a, 30^a, and 31^a, indicate parts corresponding to parts 17 to 31 inclusive and located at the same side of the track rail but nearer the compressed air tank 2, by preference, and 16^a indicates a pipe connecting pipe 4 with the upper end of the cylinder 17^a.

It will be seen that the parts 16 to 31 and 16^a to 31^a inclusive are in duplicate, the semaphores of such parts being adapted to signal the engineer of a train traveling in the direction indicated by the arrow Fig. 1, that the track is "clear" or not accordingly as the semaphores occupy their inoperative or operative positions.

32 indicates a pipe connecting pipe 15 with

the cylinder 33, provided with a piston 34 having its stem 35 projecting through the opposite end of the cylinder from pipe 32, the spring 36 mounted on the piston stem and interposed between the piston and the perforated head 37 of the cylinder being employed to return the piston to the end of the cylinder connected to the air pipe 32, under certain conditions hereinafter explained, it being desirable to state in this connection, that the spring 36 is adapted to yield under less pressure on piston 34 than is required to set the semaphores and operate the valves. The piston stem is provided with a pivoted extension 38 having its front end curved by preference, as at 39, a spring 40 secured to the stem 35 of the piston tending to hold the extension 38 as shown most clearly in Figs. 5 and 6.

41 indicates a pipe connecting pipe 4 through pipe 16^a as shown, if desired, with a cylinder 42 provided with a piston 43, having its stem pivotally connected to the adjacent end of the lever 7^a of a valve 6^a, the opposite end of the lever being connected by a link, preferably a flexible link 8^a, to a bell-crank lever 9^a, pivoted to a bracket 10^a and equipped with an adjustable weight 11^a, the parts 6^a to 11^a corresponding in construction to the parts 6 to 11 inclusive. The valve 6^a is mounted upon a pipe 44 connected to pipe 4^a leading to the next section of the track to be protected, and provided with the same equipment as pipe 4, and differing from the latter only in the fact that valve 6^a controls the passage to it from pipe 3, whereas pipe 4 by preference has a hand-operated controlling valve 5.

45 is a branch pipe from pipe 4^a leading to the upper end of a cylinder 17^b equipped with a piston 18^b having its stem projecting downward through the cylinder and pivotally connected to a rock lever 19^b suitably fulcrumed as at 20^b and connected by a link 21^b to the crank arm 22^b of a shaft 23^a journaled in a standard 24^b and equipped at its opposite end with a semaphore 25^b, the parts 17^b to 25^b inclusive being disposed at the opposite side of the trackway from the other semaphores and their connections as hereinbefore referred to, and being adapted as a signal for the rear train of two traveling in the direction opposite to that indicated by the arrow Fig. 1. At the same side of the trackway as said signal is a signal-operating mechanism corresponding in all respects to those identified by reference characters 26 to 31 inclusive and numbered from 26^b to 31^b inclusive, the inclined levers 30^b being adapted to be depressed by a projection 46 of a train, for a purpose hereinafter described, the train or car from which said part projects being omitted.

Normally the valves 6 and 6^a are held closed against the pressure of air imposed on the pistons of cylinders 14 and 42, as hereinafter explained, by means of similar bars 47 and 47^a, mounted slidingly and also capable of pivotal movement in standards 48, 48^a, said bars being provided with pivoted spring-pressed extensions 49, 49^a, corresponding to extensions 39 (see Figs. 5 and 6) except that the curved ends are reversed, that is curve toward the adjacent cylinders. The opposite ends of said slide bars are pivotally connected to the bell-crank levers 50, 50^a, fulcrumed at 51, 51^a, and connected by springs 52, 52^a, with standards 48, 48^a, so as to hold bars 47, 47^a, normally in the path of the adjacent end of valve levers 7, 7^a, standards 53, 53^a, being employed as braces and guides for bars 47, 47^a. The bell-crank levers 50, 50^a, are pivotally connected by rods 54, 54^a, with the adjacent ends of pairs of normally inclined levers 55, 55^a, having pin and slot connections 56, 56^a, with the adjacent track-rails.

From the foregoing it will be seen that as soon as valve 5 is opened, air rushes from pipe 3 through pipe 4 to the normally closed exhaust valve 6, and to cylinder 33, and operates its piston to dispose the extension 38 of stem 35 in the path of rotary movement of valve handle 7. It also passes through pipes 16 and 16^a to cylinders 17 and 17^a to depress their pistons and consequently elevate or set the semaphores 25, 25^a, at the left-hand side of the track, air also passing into the lower ends of cylinders 26, 26^a, so as to force the pistons thereof and the levers 30, 30^a, upward. At the same time air passes to and applies pressure upon the pistons of cylinders 14 and 42. In this connection it is to be understood that it requires considerably less pressure to advance the piston 34 than to raise the semaphore or operate the valves and conversely, when the pressure is removed from such parts, the piston 34 will be the last to respond, that is return to its original position, this result being desirable for a reason hereinafter explained. Now as a train passes along the track in a direction opposite to that indicated by the arrow, its projection 57 will strike one of the inclined levers 55^a, and depress the same and its companion lever and through the instrumentality of the connected rod 54^a will rock the bell-crank lever 50^a as indicated by the arrows Fig. 4, and withdraw the slidable locking bar 47^a, from the path of valve handle 7^a. The instant the slidable locking bar is thus tripped through the instrumentality of the passing train, the compressed air in pipe 4 and the connected pipe 41 rushes into cylinder 42 and forces its piston toward the opposite end of the cylinder and thus turns the valve 6^a until its port 6^b opens up the passage through pipe 44, so as to permit air from the main supply pipe 3 to pass into pipe 4^a corresponding to pipe 4, connected to the protective mechanism of the second or next section or

block of the trackway, which mechanism is a duplicate of that shown and described. At the same time air passes through pipe 45 to the top of cylinder 17^b and forces the piston thereof downward and the semaphores 25^b upward so as to advise the engineer of the following train that the section or block is occupied. At the same time air passes from pipe 45 through pipe 27^b to the lower end of cylinder 26^b and forces the piston thereof upward if depressed and also raises the connected levers 30^b if depressed. After the train clears levers 55^a, the spring 52^a returns the slidable locking bar 57^a and hence said levers 55^a to their original positions, it being further noted in this connection that when said valve handle was operated by the air pressure on the piston of cylinder 42, the yielding resistance of weight 11^a was overcome and the bell-crank lever was rocked so as to raise said weight. As the first-named train or that which set the signals, passes the levers 55, it depresses them through its engagement with one of them, and trips the connected slidable locking bar 47 from the path of the exhaust-valve handle 7, so as to permit the compressed air in pipes 4 and 15 to force the piston of cylinder 14 toward the opposite end of the latter, and open said valve against the resistance of weight 11. The lever 7 is operated a sufficient distance to cause it to press against the extension 38 of piston stem 35 and force said extension out of its path, the extension immediately snapping back behind said handle so as to lock the same in its opened position, it being understood in this connection that valve 5 is closed immediately after pipe 4 is charged with air so as to prevent waste of air from pipe 3 when the exhaust valve 6 is opened. Immediately said exhaust valve is opened, the air in cylinders 14, 33, 17, 26, 42, 17^a and 26^a all connected to said exhaust valve, escapes through the latter to the atmosphere, so as to permit the semaphores 25 and 25^a to drop to inoperative positions. By the time the air is exhausted from the cylinders 14 and 42 it is also exhausted from cylinder 33 but the piston stem extension is not withdrawn because of the relative weakness of spring 36, until all of the movable parts except valve 6 and the parts connected directly thereto have attained their original positions, the said valve 6 and the connected parts being returned to their original positions by weight 11 as soon as said extension 38 is withdrawn, it being of course undertsood that the weight 11^a through the connections described, effects the reclosure of valve 6^a and the return of the piston 43 to its original position, the pivoted extensions 49 and 49^a of the slidable locking bars 47, 47^a, respectively, yielding to permit valve handles 7 and 7^a to return to their original positions and then snap back to prevent such valves being operated again until a passing train effects the withdrawal of said bars as hereinbefore explained. It will thus be seen that the function of what I prefer to call the supplemental locking mechanism shown in Figs. 5 and 6, and identified by reference characters 32 to 40, inclusive, is employed simply as a means of holding the exhaust valve wide open until all of the parts except those to be returned to their original positions by weight 11, have attained their original positions as will be readily understood.

When the train which operated the signals enters the next protected section or block of the trackway, it successively depresses the levers 55^a and 55 thereof, the depression of levers 55^a operating the corresponding valve 7^a so as to supply air through a second pipeway 4^a to the protecting mechanism of the third protected section or block, the depression of the levers 55 of such second section opening the exhaust valve 6 of said section so as to perform the various functions described with relation to the protected mechanism of the first section or block and in addition, to exhaust air from cylinders 17^b, 26^b to restore the semaphore 25^b to inoperative position and effect the depression of levers 30^b. It will thus be seen that when the charging valve 6^a of each section is opened, it supplies a charge of air from the main supply pipe 3 to the supply pipe 4^a of the next section and that when the exhaust valve 6 of such section is opened, it not only exhausts the air from the cylinders named of such section but also exhausts the air from the cylinders 17^b and 26^b of the section from which the train has last passed.

Each section is preferably provided with the semaphore 25^a in addition to the semaphore 25 as a precautionary measure, that is to say in order to warn the engineer of a train passing in the direction indicated by the arrow, Fig. 1, in the event that he passes the first "set" semaphore without observing it, it being understood of course that as soon as the air is permitted to pass from the main supply pipe 3 to the connected pipe 4^a of the next section, that the semaphores 25 and 25^a of such section as well as the semaphore 25^b of such section is "set."

The mechanism described with the exception of the compressed air tank 2 and main supply pipe 3 is duplicated on the single track system though not so shown, for a train traveling in the direction indicated by the arrow, so that such train shall warn trains traveling in the opposite direction. For double track systems each trackway is equipped with mechanism corresponding to that shown in Fig. 1, except that it is necessary to use the rear signals only, and is also unnecessary to duplicate the compressed air tank and the main supply pipe as

the protective mechanism for double trackways can be supplied from a single tank and main supply pipe.

In the event that the engineer of a following train fails to observe the "set" semaphore at the right-hand side of the track a movable projection 58 on the engine is adapted to be struck and operated by the levers 30^b, the said projection being adapted through certain instrumentalities to close the throttle of his engine and apply the brakes of his train—the mechanism for accomplishing this purpose being such for instance, as that illustrated and described in patent for automatic engine-controlling device No. 740,454, issued Oct. 6, 1903, H. J. Mohlenhoff, inventor, reference to which is herewith made to avoid the necessity of showing and describing mechanism in this application to which no claim is made. The levers 30 are adapted for a similar purpose, that is to arrest a train traveling in the direction indicated by the arrow Fig. 1, in the event that the engineer of such train fails to observe the semaphore 25, if "set." If the engineer of such train passes such semaphore before it is "set" and hence before the levers 30 controlling it are elevated, and if he also fails to observe the "set" semaphore 25^a, the levers 3^a, 30^a, will engage such projection at the right-hand side of his train and cut off his supply of steam and apply his brakes as hereinbefore explained with respect to the mechanism at the opposite side of the track.

It will be apparent that by transposing valves 6 and 6^a and the parts connected directly thereto and by adapting the semaphores to yieldingly occupy their elevated instead of their depressed positions and by reversing the points of connection of the various pipes with relation to the piston containing cylinders, the semaphores will be adapted to occupy their "clear" or depressed positions under the pressure of the air and to assume their operative or "danger" positions when the air is exhausted therefrom through the escape of air due to a break or leakage in the pipeways. It will be understood that owing to the fact that the train-actuated levers 55 and 55^a are nearer the track than the train-stopping levers at the same side of the track, the movable device carried by the train for engagement with the last-named levers, must arch over the levers 55 and 55^a to avoid conflict therewith.

It will be apparent that all of the parts of the system except the compressed air tank, the train-operated levers, the levers for effecting the stoppage of the train, and the signals and posts, are by preference arranged within a covered trench, not shown, in the ground.

From the above description it will be apparent that I have produced a system embodying the features of advantage enumerated as desirable in the statement of invention and I wish it to be understood that I reserve the right to make such changes as properly fall within the spirit and scope of the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters Patent, is:—

1. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, and train-operated means for tripping said locking means to permit the pressure of air on said piston to move the same and thereby open the valve.

2. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, train-operated means for tripping said locking means to permit the pressure of air on said piston to move the same and thereby open the valve, and means to restore the train-operated means to its original position after the train has passed.

3. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and

the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, train-operated means for tripping said locking means to permit the pressure of air on said piston to move the same and thereby open the valve, means to restore the train-operated means to its original position after the train has passed, and a movable extension for said locking means to yield to permit the said piston and valve handle to be returned to their original positions after the exhaust valve is opened and then return to its original position to relock the piston in its original position and the valve closed.

4. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, an inclined lever suitably fulcrumed and adapted to be pivotally operated by a passing train, a bar pivotally depending from said lever, a lever suitably fulcrumed and pivotally connecting said bar with said locking means, and yielding means for causing the last-named lever to hold one end of the inclined lever elevated and the locking bar in locking position.

5. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said pitson near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, an inclined lever suitably fulcrumed and adapted to be pivotally operated by a passing train, a bar pivotally depending from said lever, a lever suitably fulcrumed and pivotally connecting said bar with said locking means, yielding means for causing the last-named lever to hold one end of the inclined lever elevated and the locking bar in locking position, and a movable extension for the locking bar which is adapted to yield to the return of the piston and valve handle to their original positions when the air is exhausted through the exhaust valve and then return to its original position to relock said piston and valve handle in their last-named positions.

6. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, train-operated means for tripping said locking means to permit the pressure of air on said piston to move the same and thereby open the valve, and a supplemental locking means engaged by the valve handle when the valve is opened and to hold the same open until the pressure in said air-controlled pipe is reduced sufficiently to permit the signal to return to its inoperative position and then withdraw to permit the exhaust valve and the piston connected thereto to be returned to their original positions.

7. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston is said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, train-operated means for tripping said locking means to permit the pressure of air on said piston to move the same and thereby open the valve, a supplemental locking means engaged by the valve handle when the valve is opened and to hold

the same open until the pressure in said air-controlled pipe is reduced sufficiently to permit the signal to return to its inoperative position and then withdraw to permit the exhaust valve and the piston connected thereto to be returned to their original positions, and means whereby the first-named locking mechanism shall permit of the return of said valve handle and piston to their original positions and then relock the same in such positions.

8. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said air-controlled pipe, train-operated means for tripping said locking means to permit the pressure of air on said piston to move the same and thereby open the valve, and a supplemental locking mechanism connected to the said valve-controlled pipe and adapted to be disposed in operative position by air therein before such air attains sufficient pressure to "set" said signal, and embodying a spring-actuated portion to yield to the opening movement of the valve handle and then return to its original position to lock said valve handle open until sufficient air has been exhausted to permit the signal to return to its original position and provided also with means after the signal has been thus permitted to return to its original position, to release said handle and permit the exhaust valve to be reclosed and the connected piston to return to its original position.

9. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to said air-supply pipe and equipped with a discharge valve, a cylinder connected at its headed end to said valve-controlled pipe, a piston in said cylinder, a handle for the discharge valve, pivotally connected to the stem of said piston, means tending to hold said valve closed and the said piston near the headed end of its cylinder, a signal at one side of the trackway, suitable connections whereby air from the valve-controlled pipe shall "set" the signal, means for locking said piston against movement under the pressure of the air from said valve-controlled pipe, and means to be disposed by air pressure when the said first-named valve is opened, in the path of a train moving in the opposite direction as that for effecting the tripping of the locking means.

10. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to the air supply pipe, means for holding the said valve normally closed, yieldingly actuated means to hold the valve locked, a cylinder provided with a piston movable with said valve and held near one end of the cylinder by said locking means, means for supplying air under pressure to said piston to operate the same and open the valve, a signal near one side of the track, connections whereby the opening of said valve shall supply air to and operate said signal, and train-actuated means for tripping the locking means to permit the valve to be opened under the pressure of the air on the piston to supply the air for setting said signal.

11. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to the air supply pipe, means for holding the said valve normally closed, yieldingly actuated means to hold the valve locked, a cylinder provided with a piston movable with said valve and held near one end of the cylinder by said locking means, means for supplying air under pressure to said piston to operate the same and open the valve, a signal near one side of the track, connections whereby the opening of said valve shall supply air to and operate said signal, train-actuated means for tripping the locking means to permit the valve to be opened under the pressure of the air on the piston to supply the air for setting said signal, and train-operated means for exhausting the air from said cylinder to permit said valve and the connected piston to be returned to their original positions.

12. In a system of the character described, the combination of a trackway, a pipe extending along the trackway and containing air under pressure, a valve-controlled pipe connected at one end to the air supply pipe, means for holding the said valve normally closed, yieldingly actuated means to hold the valve locked, a cylinder provided with a piston movable with said valve and held near one end of the cylinder by said locking means, means for supplying air under pressure to said piston to operate the same and open the valve, a signal near one side of the track, connections whereby the opening of said valve shall supply air to and operate said signal, train-actuated means for tripping

the locking means to permit the valve to be opened under the pressure of the air on the piston to supply the air for setting said signal, train-operated means for exhausting the air from said cylinder to permit said valve and the connected piston to be returned to their original positions, and means to be disposed by air pressure when the said valve is opened, in the path of a train moving in the same direction as that for effecting the tripping of the locking means.

In testimony whereof I affix my signature, in the presence of two witnesses.

ROBERT B. ROBINSON.

Witnesses:
H. C. RODGERS,
G. Y. THORPE.