(No Model.)

3 Sheets—Sheet 1.

# R. T. BOWNE.

## RAILROAD SIGNAL.

No. 479,395.

Patented July 26, 1892.

Fig. 1.

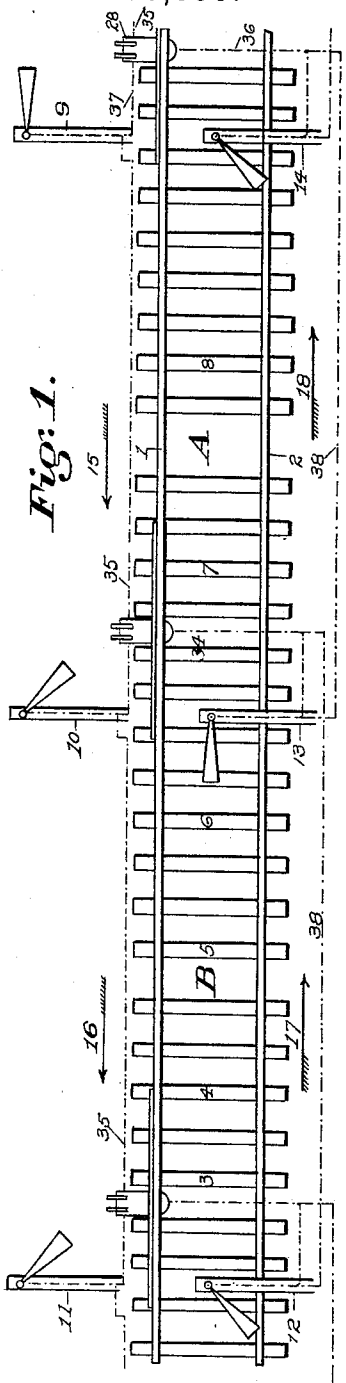


Fig. 2.

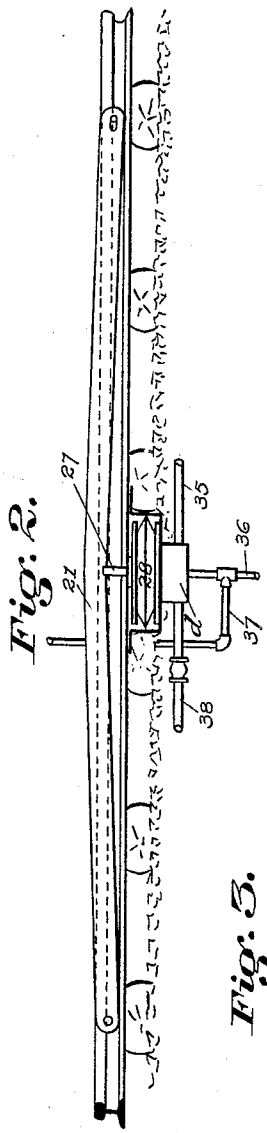


Fig. 3.

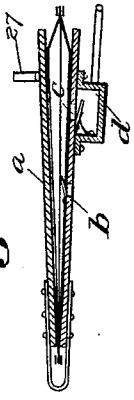


Fig. 4.

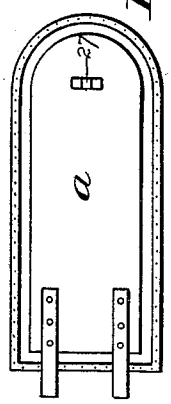


Fig. 5.

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(No Model.)

3 Sheets—Sheet 2.

# R. T. BOWNE.

## RAILROAD SIGNAL.

No. 479,395. Patented July 26, 1892.

Fig: 6.

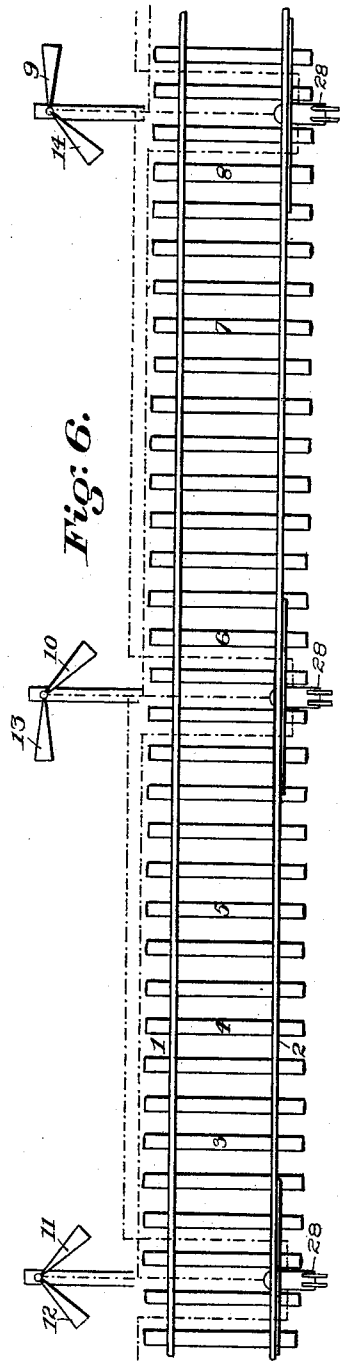



Fig: 9.

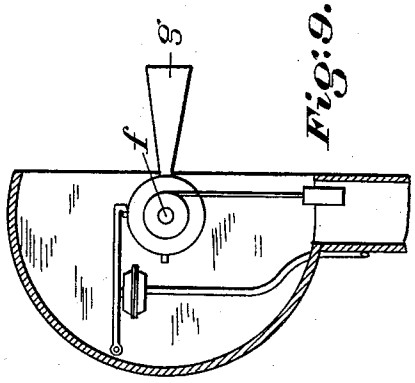



Fig: 8.

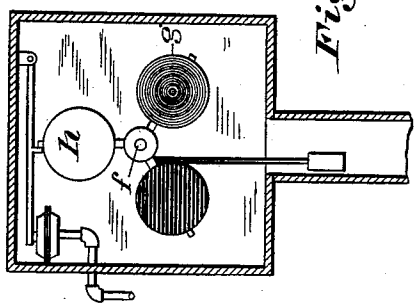



Fig: 10.

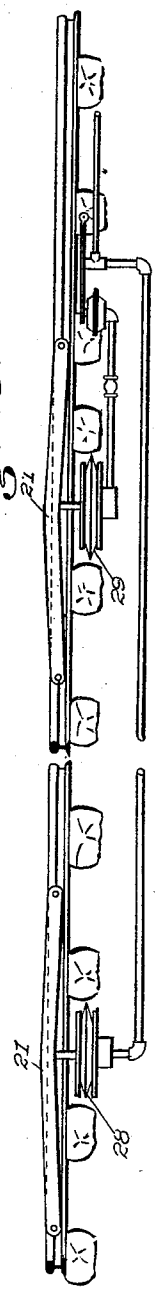
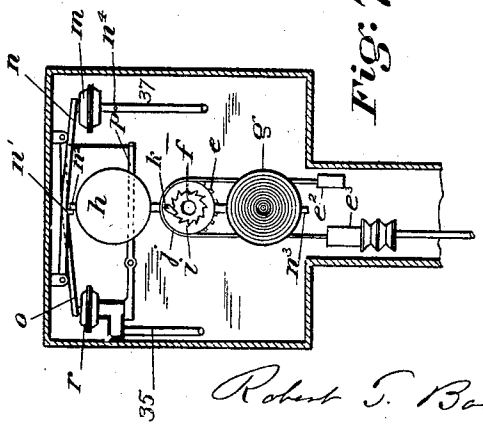



Fig: 7.

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(No Model.) 3 Sheets—Sheet 3.

# R. T. BOWNE.

## RAILROAD SIGNAL.

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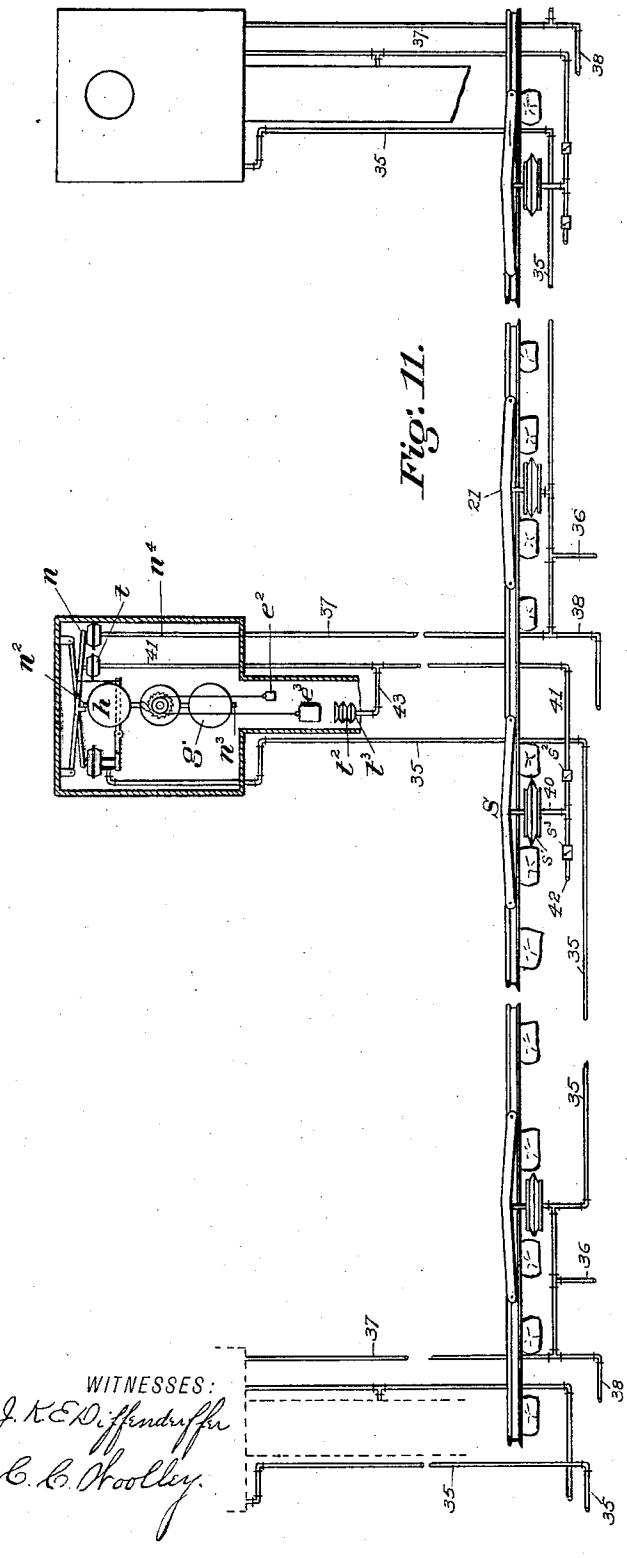

Fig: 11.

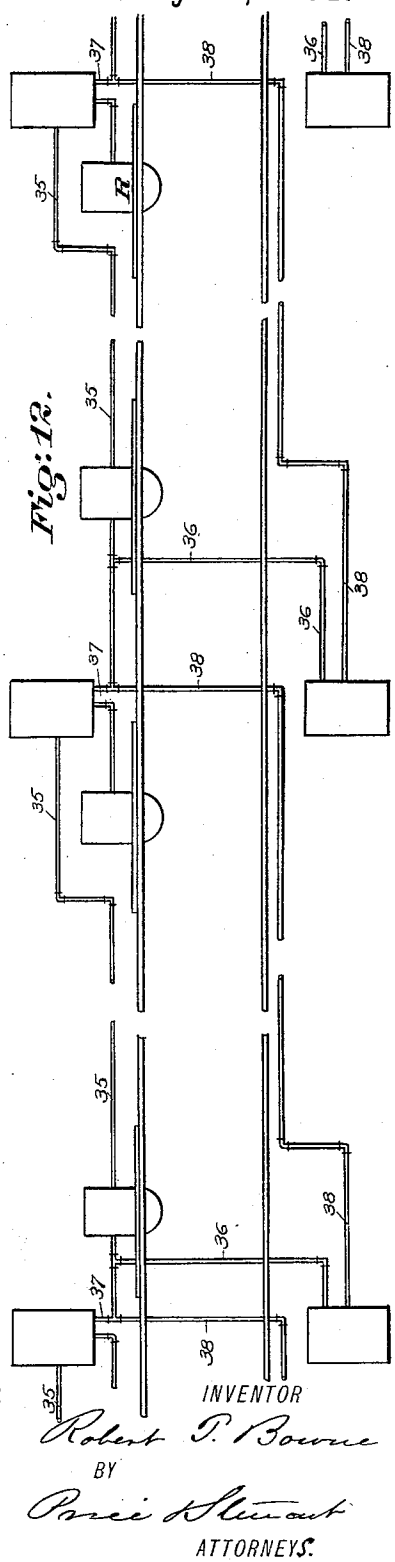

Fig: 12.

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# UNITED STATES PATENT OFFICE.

ROBERT T. BOWNE, OF BENSON, MARYLAND, ASSIGNOR TO THE BOWNE PNEUMATIC SIGNAL COMPANY, OF WEST VIRGINIA.

## RAILROAD-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 479,395, dated July 26, 1892.

Application filed March 26, 1891. Serial No. 386,429. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT T. BOWNE, a citizen of the United States, and a resident of Benson, in the county of Harford and State of Maryland, have invented certain new and useful Improvements in Railroad-Signals, of which the following is a specification.

My invention relates to railroad-signals which are employed to protect sections of road under the well-known block system.

Its object is to indicate to trains approaching in either direction that the block or section of track is or is not occupied, as the case may be, and has for its further object to improve and perfect the mechanisms and combinations of mechanisms used therewith.

With these objects in view my invention consists in the construction, arrangement, and combination of parts hereinafter described and set forth.

In the accompanying drawings, Figure 1 is a top plan view of a section of track, representing two full blocks and small portions of adjoining blocks, the position of the signal-boxes being indicated by outlines thereof only in dotted lines. Fig. 2 is a view of a track, showing the operating-lever, air-chamber, and portions of pipes leading to signal-boxes. Fig. 3 is a vertical section of an air-chamber provided with a projection to be operated by the actuating-lever. Fig. 4 is a top or plan view of the same. Fig. 5 is a view of a portion of track in side elevation, showing one of the tubes bent between the cross-ties to compensate for the expansion and contraction of the pipes due to changes of temperature. Fig. 6 is a view of track having signal-boxes arranged on one side and showing the arrangement of tubes connected therewith. Fig. 7 is a view of the interior of a signal-box, looking from the front, and signals of two colors. Fig. 8 is a view of the interior of signal-box, showing three colors; Fig. 9, a modification of the same; Fig. 10, a view of two sections of track, showing levers, air-chambers, and tubes. Fig. 11 is a side elevation of my apparatus, showing the various parts of the apparatus in their relative position. Fig. 12 is a plan of the same, showing the duplication of apparatus as used.

Like numerals and letters of reference mark the same parts whenever they occur in the various figures of the drawings.

Referring to the drawings by letters and numerals, 1 and 2 are the rails, 3, 4, 5, 6, 7, and 8 the cross-ties of the track, and 9, 10, 11, 12, 13, and 14 indicate the position of the signal-boxes, 9, 10, and 11 being on one side of the track and 12, 13, and 14 on the other side, as shown in the outline sketch, Fig. 1, the construction of the operating mechanism being shown in detail on larger scales in the other figures.

As will be more fully described hereinafter, the signal-boxes may all be placed on one side of the track, if desired. From box 9 to 10 indicates one section of block of the track marked A and from 10 to 11 another block marked B, the arrows in Fig. 1 indicating the direction the trains are running when facing the various signals, the arrangement of the faces of the signals being such as to bring them in front of the engineer when watching out of the right-hand lookout of the cab of the engine when the boxes are on both sides of the track or from either side when all are placed on one side of the track.

The general plan of operation of my invention is such that a train advancing from the right in the direction of arrows 15 and 16 and facing signals 9, 10, and 11 when it reaches signal 9 will, by passing over an operating bar or lever, hereinafter described, cause a danger-signal to be displayed in box 9 at that end of the block A and a similar danger-signal in box 13 at the other end of block A, the danger-signal in box 9 being for the purpose of indicating to trains following that block A is occupied and the danger-signal in box 13 indicating the same to trains approaching over block B in the opposite direction. When the train has passed on over block A and has reached box 10, it actuates another set of operating devices, which causes the danger-signal in boxes 9 and 13 to be changed to safety-signals (showing at both ends of block A that said block is clear) and at the same time causes danger-signals to be displayed in boxes 10 and 12, thus showing in both directions that block B is occupied. A train coming in the direction of arrows 17 and 18, facing signal-boxes 12, 13, and 14, will, supposing the

block B is clear, see a safety-signal in box 12. Box 10 at the other end of block should also show a safety-signal. When this train has reached box 12, it will cause the safety-signals in boxes 12 and 10 to be changed to danger-signals, and when it reaches box 13 it will change the danger-signals in boxes 12 and 10 to safety-signals and cause danger-signals to be displayed in boxes 13 and 9, showing, in both directions, that block B is clear and block A occupied.

The devices for operating the boxes 9 10 11 from the track are located beside the rail 1, and may be utilized, by connections to be hereinafter described, to operate boxes 12, 13, and 14 of the other side of the track.

I intend my system to apply to either double or single track roads.

The signaling apparatus which I use is the same in construction for all cases, and will therefore require but one description. The connections, compressors, and track arrangement for double and single tracks differ considerably, and will therefore be described in detail.

I intend to use either a color or a position signal, as I may elect, and to use in connection with these sight-signals an audible signal, such as mechanical or electrical bells, to be operated by the signal-operating mechanism, if such audible signal is deemed necessary or desirable. The mechanism shown is operated through the medium of the engine or car wheels passing over and depressing levers placed by the side of the tracks.

The devices by which I operate my signals are spring-levers, as shown at 21, Fig. 2, each lever being properly retained at its ends on the rail and cross-ties at the side of the track, so that it may slide when compressed by the train, and being of considerable length and reaching above the rail forms a gradually-inclined track from each end to the center, where it is highest. When the wheels pass over these levers, they are depressed to the level of the track, and when they have passed the levers spring back to their original position. A projection or stud, as at 27, Figs. 2, 3, and 4, pressing downward upon a compressible air-chamber, as shown at 28, compresses the air in such chambers and sends impulses through lines of pipe to the various signal-boxes, as hereinafter described. These lines of pipes are outlined in Fig. 1, and are located and connected as follows: Below the chamber 28 and connected therewith is a receiver, as *d*, and between the chamber and receiver an aperture *c*, opened and closed by a valve *e*, which opens when the air-chamber is compressed and then closes to prevent the air from returning to the chamber. It may be provided with a suitable spring to close it. From this receiver emerges a series of pipes conveying the air for operating the signals in the boxes—that is to say, the pipes 35, 36, 37, and 38. The pipe 35 extends backward to the signal-box at the beginning of the block to the right to change the danger-signal to "safety," the pipe 36 to the signal-box 14 on the opposite side of the track to change "danger" to "safety" in that box, the pipe 37 to box 9, and the pipe 38 to box 13 to display danger-signals in those boxes.

The operation as the train passes over each lever and compresses an air-chamber is a repetition of that just described, there being four pipes leading from each air-chamber—one, as 35, leading back to the box at the opposite end of the block on the same side of the track; another, as 36, leading to the box across the track; a third, as 37, leading to the box at the lever, and a fourth, as 38, leading to the box at the end of the block just entered upon on the other side of the track.

By reference to the drawings it will be seen that it is not necessary to arrange the signal-boxes on both sides of the track, but that the same may be arranged all on one side of the track, each box having two faces and the signals arranged upon both faces. It would also be necessary in such cases to arrange the piping to correspond with the double service to be performed on one side of the track only—that is to say, the piping and mechanism which, as heretofore described, were arranged on both sides of the track are brought over and the whole arranged on one side to suit one signal-box, with two signals facing in opposite directions, instead of two signal-boxes which have each a signal arranged to face only in one direction. The signals may be arranged upon opposite faces of a blade, and one movement will show opposite signals on the two faces. Fig. 6 of the drawings illustrates this.

In Fig. 2 I have shown how my air-chambers are placed and operated, and in Figs. 3 and 4 I have shown a form in which these chambers may be constructed. In such figures, *a* is the top, *b* the bottom of wood or metal, and between them is placed a diaphragm.

In Figs. 7 and 8 I show the manner in which my signal-boxes are constructed and operated. The signals are shown through a hole in the face of the box. Upon a shaft *f* is mounted in different vertical planes a red or danger signal *g* and a white or safety signal *h*, as shown in Fig. 7, the two standing out at opposite sides of the shaft, so that when one is up the other will be down, each being of a size to fully cover the hole in the box. In Fig. 8 are shown three signals of different colors, and in Fig. 9 but one signal is shown in the form of a paddle, which is usually red and means "danger" when it is up and "safety" when down. Viewing Fig. 7, a shaft *f* is suitably arranged and supported upon bearings in the box. Upon this shaft are rigidly attached the signals *g* and *h* and a ratchet-wheel *i*, and upon the same shaft a loose sleeve or collar *j*, to which is pivoted the pawl *k*. Around this collar may be arranged sprockets *l* to co-operate with the chain *l'*,

upon each end of which are attached the weights $l^2$ and $l^3$, the latter heavier than the former, so that when the weight $l^3$ is lifted the collar $j$ may be turned without moving the shaft $f$ for the signals; but when the weight descends the pawl and ratchet engage and turn the shaft and signals. The signals are always operated by the weight $l^3$, the light weight $l^2$ being supplied as a counter-balance to keep the chain taut. The weight $l^3$ may be wound up by hand, and when so wound descends to operate the signals a short distance at a time until stopped by the detents hereinafter described, and when once wound up will perform its work for several hours until it becomes necessary to wind it again. Fig. 11 shows a modified form of the same.

Having already described the air-chambers and pipes operated by the train passing over the levers 21, I will now describe the action which takes place within the boxes in operating the signals. Viewing Figs. 1 and 7 the operation will be readily understood. Beginning with box 9, for example, we have already seen that the pipe 35 extends backward to change the danger-signal to "safety" at the beginning of the block on the right, pipe 36 to box 14 at the other side of the track, pipe 37 to box 9, and 38 to box 13 to make danger-signals.

I will now describe the action of the compressed air in pipes 37 and 38, acting upon the danger-signals in boxes 9 and 13. The description of one is the counterpart of the other. In Fig. 7 I have marked the pipe 37. When the pressure is made upon the air-chamber, the air passing through pipe 37 inflates the air-chamber $m$, lifting the pivoted lever $n$, releasing the detent $n'$ from the stud $n''$ on the safety-signal $h$. The weight $l^3$ in descending turns the safety-signal down and the danger-signal up until the stud $n^3$ on that signal is stopped by a detent on the lever $o$. At the same time the lever $p$ is raised, being connected with lever $n$, opening an aperture communicating with air-chamber $r$, thereby releasing any surplus air in that chamber. The train passing onto the end of the block operates an air-chamber, which forces the air back through pipe 35, expanding the air-chamber $r$, lifting the lever $o$, detaching the detent on that lever from the stud $n^3$ on the danger-signal, when the weight $l^3$ again turns the shaft and exposes the safety-signal at the top until stopped by detent on lever $n$, which has returned to its original position by means of a pin-hole $n^4$ in pipe 37 and has closed the aperture communicating with air-chamber $r$ before the air returns through pipe 35 to inflate the chamber $r$ and lift the lever $o$.

The foregoing description explains the operation of my invention in turning the signals from "danger" to "safety," and vice versa. Weight $l^3$ is described as being wound up by hand; but I have provided an automatic device for winding said weight, which is shown in Figs. 7, 11, and 12. Viewing said last two figures, I have illustrated a track in connection with the signal-box. Upon this track is arranged the lever 21, as hereinbefore described. I have placed a short distance from the lever 21 another lever S.

The operation of the train in passing over the lever 21, lifting the detent upon the lever $n$ by the air conducted through the pipe 37, and changing the safety-signal $h$ to the danger-signal $g$, as well as the movements caused by the air passing through the return-pipe 35, is the same as that already described. The train after actuating the lever 21 passes over the lever S, compressing the air in the air-chamber S', and from thence into pipe 40, which is provided with branches 41 and 42. In each of these branches I have placed valves $S^2$ $S^3$. The valve $S^2$ is opened by the compression of the air-chamber and the valve $S^3$ is closed. The compressed air passing through the pipe 41 reaches the air-chamber $t$, and is intended as a safeguard to hold up the lever $n$ and provide an additional security in case there should be a leakage in pipe 37 or its connections. When the pipe 41 is filled, the compressed air passes into the branch 43 and into an accordion-diaphragm $t^2$, lifting the weight $l^3$. As there is some distance between the trucks on the cars, they pass over the lever S successively and keep up a pumping action, causing the entrance of air through the valve $S^3$ and forcing it out through the valve $S^2$, and at each impulse giving an increased extension to the accordion-diaphragm $t^2$, thereby lifting the weight $l^3$ and automatically winding it. A small perforation, as $t^3$, communicates with the interior of the accordion-diaphragm, which allows it to collapse, and the weight $l^3$ is left suspended and ready to do its work in changing the signals when the studs $n^2$ $n^3$ are released, and as this automatic winding up of the weight occurs with the passage of each train the weight need not be lifted so high as when wound by hand.

What I claim, and desire to secure by Letters Patent, is—

In a signaling system for rail or tram ways, a track divided into a series of blocks, and a lever or bar located at the end of each block, operated by a passing train or car, in combination with an air-chamber in which the air is compressed by the passage of the train over the lever, a series of pneumatic pipes for setting the signals and power driving mechanism for operating the signal-shaft, and an independent air-receiver connected with the power mechanism, whereby said power mechanism is rewound by the pulsation of air from a track-compressor.

Signed at Baltimore city, in the State of Maryland, this 25th day of March, A. D. 1891.

ROBERT T. BOWNE.

Witnesses:
M. TURNER,
H. MACCARTHY.