J. F. KETTELL & A. H. HOWLAND.

Pneumatic Railroad-Signals.

No. 196,022. Patented Oct. 9, 1877.

Fig. 3.

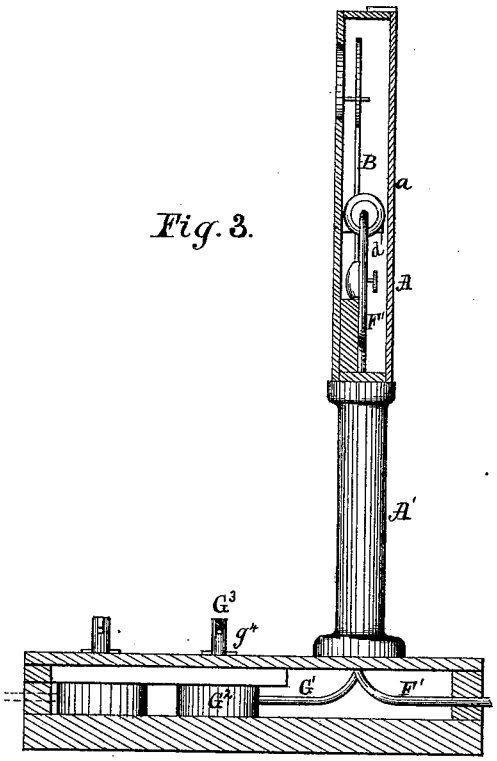


Fig. 2.

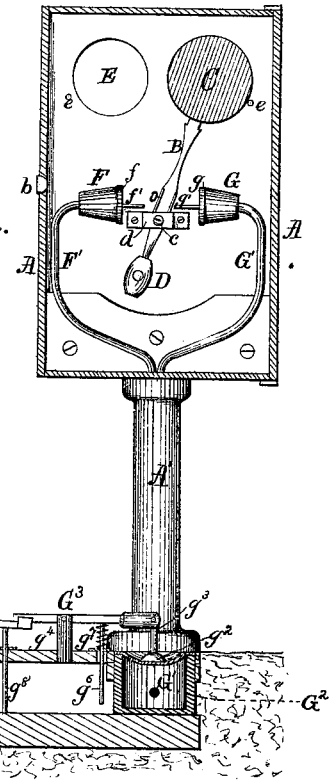
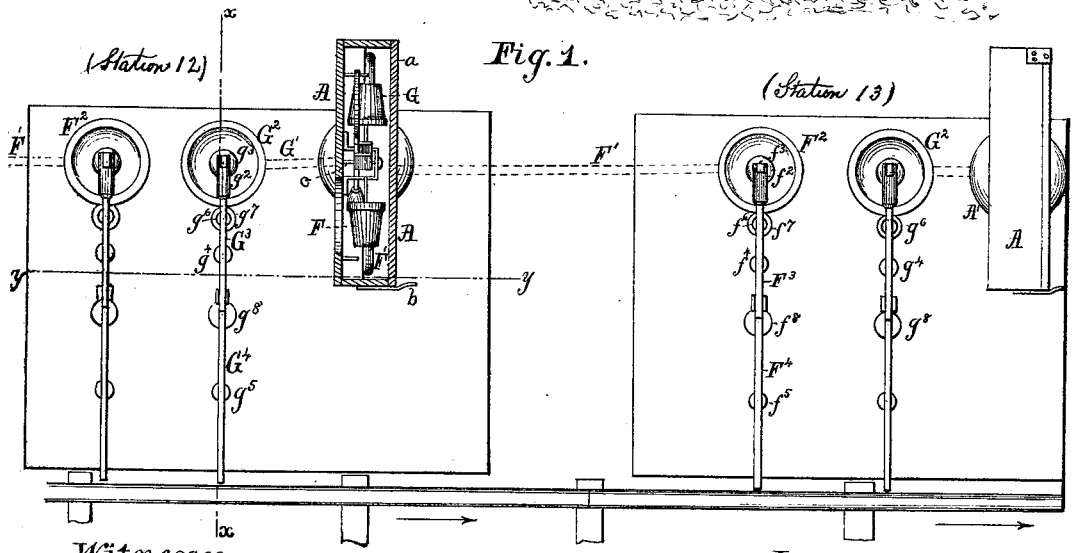


Fig. 1.



Witnesses:

A. M. Wallum

D. G. Stuart

Inventors:

James F. Kettell

Arthur H. Howland

by S. Hanway atty.

UNITED STATES PATENT OFFICE.

JAMES F. KETTELL AND ARTHUR H. HOWLAND, OF WORCESTER, MASS.

IMPROVEMENT IN PNEUMATIC RAILROAD-SIGNALS.

Specification forming part of Letters Patent No. **196,022**, dated October 9, 1877; application filed May 26, 1877.

To all whom it may concern:

Be it known that we, JAMES F. KETTELL and ARTHUR H. HOWLAND, of Worcester, in the county of Worcester and State of Massachusetts, have invented a certain new and useful Pneumatic Railroad-Signal; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable 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 a part of this specification, in which—

Figure 1 represents a plan of our improved railroad signaling devices, the top of one of the signal-boxes being removed to show the mechanism within. Fig. 2 represents a cross-section of one of the signal-stations as taken through the line *x x* of Fig. 1, and looking toward the box, one side of which is removed. This view shows the position of the signal-opening, but which should be in the side removed instead of the side in which it is shown, although, if desired, an opening may be made on both sides, and which we prefer, as it enables the engineer of the train or other person to see directly through the box when the danger-signal is removed. Fig. 3 represents a longitudinal vertical section taken through the line *y y* of Fig. 1.

Our invention relates to a new and improved mode of automatically operating the danger-signals of railroads by the trains as they move along the road.

The invention consists in the employment of confined air as the transmitting force for operating the signals through the instrumentality of suitable mechanism for that purpose.

Previous to giving the detailed description of our mechanism, we wish to remark that in carrying our improvement into practical operation we propose to apply it to any suitable system and arrangement of signal-stations, whether for single-track roads or for roads having two or more tracks.

When applied to a single-track road there should be two systems of stations, one on each side of the track, and when applied to a road having two or more tracks, then there should be at least one system of stations to each track. Moreover, as the improvement is applied in like manner to each of these systems, it will simply be necessary to describe it in connection with a single system of stations on one side of the road, and which we will now proceed to do, here premising that we hereby reserve to ourselves the right, should it be necessary or desirable, of making a separate and distinct application for Letters Patent for our improved method of arranging and operating our entire system of signal-stations.

In the drawings but one line of rail of a road-bed and only two stations are shown, the others being unnecessary for the illustration of the invention. Alongside of this line two adjoining signal-stations, A A, are shown, they being arranged at such distance apart from each other as may be deemed most advisable—as, for instance, a half-mile or a mile, or such other distance as may be determined upon.

Similar stations are arranged all along the road at like distances apart; and as each adjoining pair, in their relations to each other, are alike in all respects to the pair depicted in the drawings, a description of one pair and their connecting mechanism will answer for a description of the whole along the line.

In this connection we also wish to add that the mechanisms for operating the signal-stations shown are arranged, with relation to the latter, for cars moving along the road in the direction of the arrows, and that a similar system of stations would be placed, but in inverse order, on the other side of the track for cars moving in the opposite direction, as in cases of single tracks, where two systems are used, one on each side of the track. In this case, however, the mechanism is shown in connection with but one system of stations, as when applied to one of the tracks of a double-track road, and in which the wheels of the moving train operate the signal-levers. This method, however, of operating the levers would not act so well on the single-track roads as would a cam-bar arranged and secured to the side of the engine, for obvious reasons.

Each signal-station consists of a house or box, A, having a door, *a*, hinged at one side, and fastened at the other by a spring, *b*, or other suitable device, through which access is had to the mechanism within. The mechanism consists of a lever, B, pivoted, at a point between its two ends, on a fulcrum-pin, *c*,

mounted at one end in a bracket, *d*, and at the other in the wall of the box, in the manner shown in Figs. 1 and 2. Lever B, at its upper end, carries a disk, C, and at its lower end an adjustable counterpoise, D.

The disk C constitutes the danger-signal proper, and which for that purpose may be painted of any suitable color (such as red) on its outer face—that is to say, the face next the opening E, made in the wall of the house A, and through which it is to be seen; or the signal-disk C may be made of transparent material, such as glass or mica, stained or tinted of any required color to give the danger-signal, in which case two openings, E E′, must be used, one in each side of the box, and directly opposite each other, by means of which the signal will be better illuminated when set, and by which, when removed, the engineer or other party approaching it can see directly through it, and thus know that no danger is indicated.

The lever B turns freely on its pivotal pin *c* to either side, and is prevented from falling below a certain point by stop-pins *e e*. Thus constructed, two air-reservoirs, F and G, are secured in any suitable manner to the box A, one being arranged on one side of lever B, and the other on the other. Each of these reservoirs is provided with a flexible or elastic diaphragm and with a plunger—the one, F, with diaphragm *f* and plunger f^1, and the other, G, with diaphragm *g* and plunger g^1.

To air-chamber F is secured a pipe, F^1, and to reservoir G a pipe, G^1. Pipe F^1 communicates at one end with the reservoir F, and at the other with another reservoir, F^2, and pipe G^1 at one end with the reservoir G, and at the other with another reservoir, G^2. Each of the reservoirs F^2 and G^2 consists of a vessel permanently closed at the sides and bottom, and covered at top with a flexible or elastic diaphragm carrying a plunger-stem—the vessel F^2 with the diaphragm f^2 and plunger-stem f^3, and vessel G^2 with diaphragm g^2 and plunger-stem g^3.

The air-tubes F^1 and G^1 lead respectively from the reservoirs F and G in box A down through its hollow standard A^1 to the vessels F^2 and G^2, and form the channels of communication between each pair—that is to say, pipe F^1 connects reservoirs F and F^2, and pipe G^1 reservoirs G and G^2.

The plunger-stems f^1 g^1 of vessels F and G are arranged so that there shall be one on each side of lever B, and at a point a little above its pivotal pin *c*, and are intended to strike against its sides, and which, for this purpose, if deemed advisable, may be widened at that point, or, if desirable, provided with small metal plates *o*.

The diaphragms f^2 and g^2 of vessels F^2 and G^2 are each provided with similar plunger-stems, f^3 and g^3. To the upper end of stem f^3 is pivoted a lever, F^3, and to g^3 a similar lever, G^3. The free end of each of these levers projects toward the rails, and rests or bears upon the upper side and inner end of another lever—the one, F^3, upon lever F^4, and lever G^3 upon lever G^4.

The outer ends of levers F^4 and G^4 project forward to the outer edge of the rail, and in their normal position are held slightly above it, so as to be depressed by the passage of the wheels of the engine, and thus operate the diaphragms f^2 and g^2 of the air-vessels F^2 G^2. For this purpose each lever has its fulcrum at a point between its ends, each being mounted upon a stud or standard—lever F^3 upon standard f^4, and lever F^4 upon standard f^5, lever G^3 upon standard g^4, and lever G^4 upon standard g^5. To the under side of levers F^3 and G^3, between their pivotal standards and their ends attached to the plunger-stems f^3 and g^3, are respectively secured guide-pins f^6 and g^6, around which are arranged spiral springs f^7 and g^7, the lower ends of which abut against the platform-bed of the station, and their upper ends against the under sides of their respective levers. These springs serve to raise the plunger end of these levers after the diaphragms f^2 and g^2 have been depressed by the passage of the train, and in so doing to reset the outer end of levers F^4 and G^4, ready for operation by the next train. To prevent the outer ends of levers F^4 and G^4 from being raised too high above the rail to permit the wheels to roll over them, stop-standards f^8 and g^8 are secured to the platform immediately below the inner ends of these levers—f^8 below lever F^4, and g^8 below lever G^4.

As the systems of devices connected with each of the reservoirs F F^2 and G G^2 are identical, a description of the operation of one will suffice for the whole.

As the train advances, the wheel I of the engine rolls over the outer end of, say, lever F^4, depressing that end, and, in so doing, raising its inner end, and, through the latter, the free end of lever F^3, depressing its inner end, and with it, through plunger-stem f^3, the diaphragm f^2, thereby compressing the air in chamber F^2, and forcing it into the tube F^1 and air-vessel F, and thereby forcing outward diaphragm *f* and its plunger f^1, and which, being thus forcibly pressed against the side of lever B, causes it to tilt and remove the disk D, forming the danger-signal, away from the opening E, to indicate that the way is clear. The same operation is gone through with when the wheel is brought in contact with lever G^4, only that it sets, through the diaphragm *g* and its plunger g^1, the danger-signal, by throwing the disk D over in front of opening E.

As soon as the train passes, the springs f^7 and g^7 again raise the levers F^3 and G^3, and with them plungers f^3 and g^3 and diaphragms f^2 and g^2, and thus prepare them for the passage of the next train; or, instead of springs f^7 and g^7, the diaphragms themselves may be made sufficiently elastic for that purpose.

Instead of using the wheels of the train as the medium of operating the signals, we prefer to use a cam-bar attached to the side of the engine-tender or car, its lower end being prop-

erly shaped for the purpose and used as the cam to depress the lever; or, instead of using two levers, but one may be used, and the same effect produced by a proper arrangement of the diaphragms f^2 and g^2 with respect thereto; or both pairs of levers, F^3 F^4 and G^3 G^4, may be dispensed with, and the air-vessels F^2 and G^2 arranged alongside of the track, so that the cam-bars, before referred to as being secured to the side of the locomotive or cars, may act upon the plunger-stems f^3 and g^3, and thereby operate, through the tubes F^1 and G^1, the signal-lever B, as before. Under such circumstances the diaphragms f^2 and g^2 should either be strongly elastic, or suitable springs should be arranged underneath them, within the vessel, to throw them back to their original position, ready for the next train; or a traction or forcing spring, for the same purpose, may be applied in any suitable manner to the plungers on the outside of the diaphragms.

Again, instead of air-vessels provided with a diaphragm and plungers, the air-vessels F and G, F^2 and G^2, a similar system of suitable cylinders and pistons may be used; but we prefer the former devices.

In either case air-reservoirs F^2 and G^2 should be relatively of considerably greater size than air-vessels F and G, in order to insure perfect operation of the devices.

The mode of operating the signaling devices is as follows: Let us say, for the purposes of illustration, that the two stations depicted in the drawings are stations Nos. 12 and 13, station 11 being to their left and station 14 to their right, and the train advancing in the direction of the arrows—that is to say, from left to right. Now, as it reaches signal-station 12 it first comes in contact with the system of levers F^1 F^3, which operate the plungers f^3 and f^1 of air-vessels F^2 and F, and thereby turns the signal-lever and danger-signal disk away from the signal-opening in the station last past, (station 11,) showing that the road so far is clear. Immediately thereafter the train comes in contact with the next system of levers, G^4 and G^3, and, through them and their system of reservoirs G^2 and G, throws the lever B and the danger-signal D of the station (12) then being passed over immediately in front of the signal-opening E. Here it will remain, indicating danger to any following train until the next station, (13,) a half-mile or so beyond, is reached, when the same operations are repeated, for, as the engine first comes in contact with the system of levers F^4 and F^3 and reservoirs F^2 and F and pipe F^1 of that station, it thus first throws the danger-signal back from opening E of the last station (12) passed, and then, as it comes in contact with the lever G^4 of the station (13) just being passed, thereby, through its connecting mechanism, sets its danger-signal, and which is again thrown back on the arrival of the train at the next station, (14,) and so on throughout the entire length of the road.

It will be apparent that the same mechanism can be applied and operated to give warning of danger at road-crossings, switches, bridges, &c.; and as the manner of applying and using such signals is well understood among those skilled in the art, it is deemed unnecessary to enter into a detailed description of the mode of doing so.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

In a railroad signal-station, the combination of a lever, B, and signal-disk C, constructed substantially as described, with the air-reservoirs F and G, diaphragms f and g, plungers f^1 and g^1, pipes F^1 and G^1, reservoirs F^2 and G^2, diaphragms f^2 and g^2, and their plunger-stems f^3 and g^3, the whole arranged and operating in the manner and for the purposes set forth.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

JAMES F. KETTELL.
ARTHUR H. HOWLAND.

Witnesses:
JONAS HEALD,
S. B. WHEELER.