(No Model.)

B. B. MORGAN.

RAILWAY TIME SIGNAL.

No. 494,509. Patented Mar. 28, 1893.

Fig. 2.

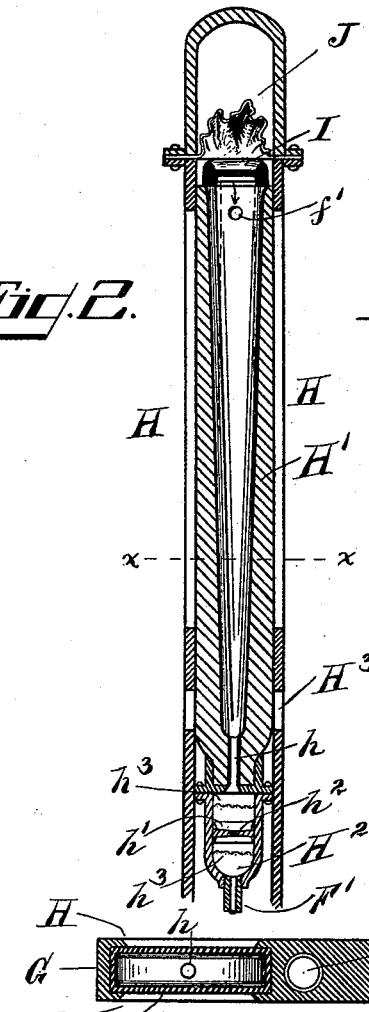
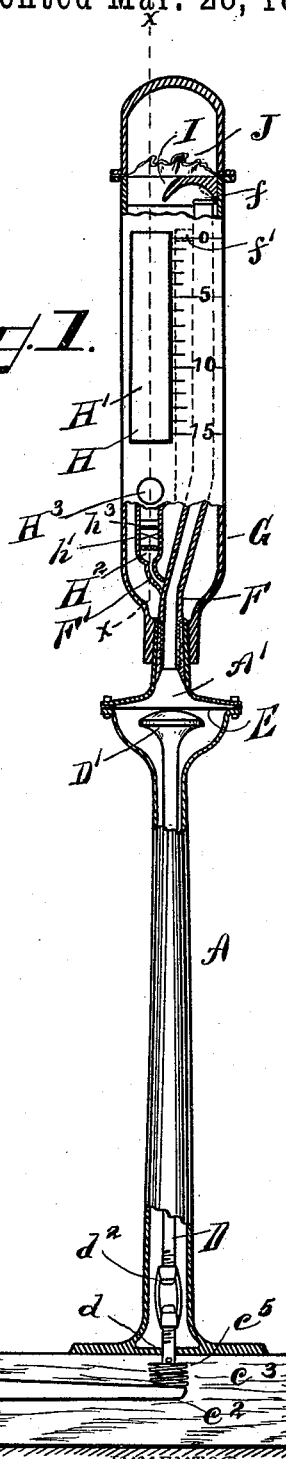


Fig. 3.

Fig. 1.



WITNESSES

Frances Clough.

W. T. Bradford

INVENTOR

Benjamin B. Morgan

by Parker & Burton

Attorneys.

UNITED STATES PATENT OFFICE.

BENJAMIN B. MORGAN, OF YPSILANTI, MICHIGAN, ASSIGNOR TO THE MORGAN ALCOHOL TIME SIGNAL COMPANY, OF SAME PLACE.

RAILWAY TIME-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 494,509, dated March 28, 1893.

Application filed May 12, 1892. Serial No. 432,741. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN B. MORGAN, a citizen of the United States, residing at Ypsilanti, county of Washtenaw, State of Michigan, have invented a certain new and useful Improvement in Railroad-Signals; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to time signals or indicators for railroads, and is intended to provide a simple, inexpensive and reliable indicator whereby the engineer of a succeeding train can readily observe and determine that a train preceding him passed a certain definite time prior to the passage of his own train; and it consists broadly in the employment of mechanism whereby a non-freezable, mobile, colored liquid is transferred from a lower chamber by means of suitable apparatus to the top of an upper transparent chamber by the action of the passing train, and in so proportioning and adjusting the flow from the transparent chamber that the outflow therefrom measures the time elapsing after the passage of the train; and also appropriate means whereby the observer stationed upon the following train can determine the length of time by observing the amount of the outflow; and also in various combinations and arrangements of the various parts.

In the drawings, Figure 1 is a vertical elevation, partly sectional, of the whole device. Fig. 2 is a vertical cross sectional drawing of a transparent chamber holding the indicating fluid, and also of the mechanism whereby the same is allowed to escape. Fig. 3 is a cross section of the same on the line $x\ x$ of Fig. 2.

Similar letters refer to similar parts.

In the drawings, A represents the signal post, which is preferably constructed hollow, as shown in the drawings, and secured to a solid foundation at a convenient distance from the track with which the signal is connected.

B is a sectional drawing of the operating rail, which may be a portion of the track, or an auxiliary rail located contiguous to the main rail.

C is a lever attached to the operating rail B at one end and extending substantially at right angles thereto, and pivoted at c to the fulcrum. The other end at c^2 carries a strong spiral spring c^3, erected thereon and firmly attached thereto. The upper end of the spiral spring has firmly attached thereto a rod or plunger D, which preferably passes up through the hollow signal post A, and is guided therein. The lower end of this rod D passes through a diaphragm at the lower end of the signal post at d, which is so adjusted that a collar c^5, attached to the plunger D, will impinge against the diaphragm d. The diaphragm d thereby prevents the plunger D from being thrown to a height greater than the distance between the collar c^5 and the diaphragm d. The spring c^3 is made sufficiently stiff so that the movement of the lever C will raise the plunger D without sensibly compressing the spring, until the collar c^5 comes in contact with the diaphragm d as before mentioned. By this means the unequal action of the rail B under varying weights, or due to slight changes in track level, is compensated for and prevented from producing other than uniform action in the signaling device hereinafter described.

An adjustment consisting of a turnbuckle, d^2, is provided, whereby the length of the plunger D may be changed. The upper end of the plunger D is enlarged, the extreme end being a segment of a sphere with the convex side uppermost, and is enlarged as shown in the drawings; the top of the post A, containing the same, is also enlarged and flanged. Upon this flanged top rests a hollow frustum of a cone, the lower end of which is flanged and fitted to join the flange formed on the post A. These flanges are bolted together, but between them is placed a diaphragm E, of rubber or other suitable elastic material. The upper end of the conical piece carries a pipe F, hermetically sealed therein. Surrounding this pipe is an air tight casing G, the cross section being a rectangle, the wider and opposite sides of which are cut through, forming oblong perpendicular holes in each side of

the casing, one of which is shown in Fig. 1, marked H.

Located in the casing and hermetically sealed therein is a strong glass case H′, which is so arranged within the casing as to be opposite to and close the holes H therein. This glass case is hollow and transparent, and unless it is filled with an opaque substance it virtually closes the orifice H, and forms a window within the case G, through which light may be transmitted. The hollow in the glass case H′ is preferably oblong in cross section, the shorter diameter being very much less than the longer. Perpendicularly, the hollow preferably widens out in its shorter diameter, making the hollow wedge shaped with the apex downward, opening into the hollow casing H^2, as more particularly shown in Fig. 2. Communication is had between the interior of the glass case H′ and the upper portion of the interior of the casing H^2 by means of the hole h in the bottom of the glass case. In the casing is located a diaphragm h', in which there is a very small perforation h^2. Above and below the diaphragm are strainers of fine wire gauze, h^3, h^3. The bottom of the case below the diaphragm communicates with the pipe F by means of the small pipe F′. The diaphragm h', together with the pipe F′, including the strainers, constitute virtually an eduction pipe with a very small orifice which may be proportioned to allow of any desired rate of flow of the inclosed indicating liquid. The pipe F extends nearly to the top of the case G and along the edge of and just above the glass case H′. The top is closed by a flap valve f. It opens opposite a semicircular groove cut in the lower side of the projection I, which groove leads over into the space in the interior of the glass case H′.

Near the upper end of the pipe F, there is located an aperture or apertures, f', the office of which is to take off the surplus liquid hereinafter described, and to reduce to a certain level fixed by the location of the aperture f', and from which the descent of the liquid as hereinafter described, is measured. Thus, the pipe F constitutes relatively to the indicating chamber, an induction pipe leading from the lower chamber to that portion of the indicating chamber above the indicating level.

The upper end of the glass case and the space between the walls thereof open into an elastic air bag J. The lower edges of this air bag are firmly fixed into the top of the case so as to be air tight at that point. Normally, the bag is closed or collapsed as shown in Fig. 2. If desired, the casing G has a round hole, H^3, cut through it above the lower end of the glass case H′. This affords opportunity of observing the condition of the apparatus at that point. Opposite the openings H there may be indicated upon the outside of the casing G, divisions with figures, as shown in Fig. 1.

The purpose of the various parts and openings will be understood in the description of the operation of the improvement of the device.

In practice, the space in the conical piece A′ above the diaphragm E, forming a reservoir, and the pipes and glass case up to the lower edge of the opening H, in the casing G, are filled with a colored non-freezable liquid, preferably wood alcohol colored red, which shows through the hole H^3 in the casing G.

The operation of the device is as follows: Upon the passage of a locomotive or train over the rail D, the rail is slightly depressed, carrying with it at that end the lever C, and raising the corresponding end, and also, through the connections and spiral spring, the plunger D, until the collar c^5 comes in contact with the diaphragm d, when any further motion of the lever C compresses the spiral spring c^3. The raising of the plunger D brings the head D′ against the diaphragm E, which, being elastic, is crowded upward and thereby partly fills the space in the conical reservoir A′. As these spaces are all filled with the fluid, the fluid is compelled to rise, and as the bore of the pipe F is much larger than the small aperture through the diaphragm in the brass casing H^2, an equivalent mass of the liquid is forced up the pipe F past the check valve f, over and through the groove in the projection I, where it falls into and fills the space in the glass casing H′. As this liquid is colored, the passage of the train thereby, by means of the mechanism injects the fluid into the glass case H′, which, occupying the relation it does to the opening H in the case G, is at once observable to any observer. The air that is in the glass case and in the pipe F being thus displaced, rises into and fills the air bag J. The aperture h^2 in the diaphragm h' in the casing H^2 below the glass case H′ is so proportioned that the fluid filling the glass case must descend from it very slowly, and the time which it occupies in descending is indicated by the properly spaced index marks heretofore described upon the case G. Inasmuch as the fluid exerts considerably more hydrostatic pressure and tends to flow from the aperture much faster when the glass case H′ is full than it does when it is nearly empty, I have preferably so proportioned the space in the glass case H′, by making it of an inverted wedge shape, as shown in Fig. 2, that the larger quantity that will descend in equal times, is shown on the index marks by equally proportioned spaces. As the fluid descends, the air bag J collapses as the air therein descends to fill the space in the case H′ vacated by the retreating fluid. The two fine gauze diaphragms in the brass casing permit the flow of the fluid freely, yet they prevent any particles of dirt to be carried either way into the aperture h^2, in the diaphragm h' in the brass casing H^2, which would tend to choke the aperture and prevent the descent of the colored fluid. It will thus be seen that the essential principle of this device is the employment in an air tight casing of a transpar-

ent upper chamber, and a lower chamber separated therefrom, by a perforated diaphragm, in combination with a non-freezable liquid normally filling the lower chamber, means for transferring a sufficient portion of the liquid from the lower chamber through an unobstructed induction pipe to that portion of the upper or indicating chamber above the level where the liquid begins to descend and indicate time by the passage of a train, thus filling the upper or indicating chamber by an overflow through the by pass into the upper portion of it and above the means for bringing the liquid to a given level. This avoids the necessity of any opening in the upper chamber below the assigned level or index point other than that which gages the flow of the liquid therefrom, and relieves the apparatus of any necessity of relying upon check valves to prevent the liquid from passing backward through the induction pipe leading to the upper chamber, means for bringing such liquid to a given level, and an index whereby the time of the descent of the liquid from such level through the diaphragm is indicated.

It is obvious that very many different forms of this principle can be employed, and I do not desire to confine myself to this form merely of such an apparatus, as I am not aware and I do not believe that a time indicator employing this principle of filling the indicator chamber with the indicating liquid at the top or above the indicating level was ever before invented or used.

I am aware that time signals have been devised wherein a colored liquid inclosed in a transparent indicating chamber has been employed combined with means for transferring the liquid from a lower receiving chamber to the indicating chamber, and allowing it to gradually descend. This is shown in a patent to Scrannage, May 31, 1881, No. 242,228, and I do not claim the same generally. However, in the Scrannage patent, the passage through which the liquid is forced in ascending enters the indicating chamber below the indicating level, and is necessarily held therein by a check valve in or at the top of the induction tube. It is also drawn from the receiving chamber by suction through another check valve into an intermediate chamber, from whence it is forced through the passage mentioned into the lower portion of the indicating chamber. It is manifest that the proper action of the device must depend upon the continued efficiency of the check valves, especially that which holds the liquid in the indicating chamber. If this check valve becomes in the slightest degree inoperative for any reason, it is manifest that leakage would render the signal misleading and dangerously inaccurate. This defect has been so great that the device never has gone into use. It is also obvious that Scrannage necessarily has three chambers, a lower receiving chamber, an intermediate pumping chamber with check valve between, through which the liquid is drawn by suction, and an upper indicating chamber. He also necessarily has three communicating tubes, an induction tube leading from the pumping chamber to the indicating chamber, an eduction tube leading from the top of the indicating chamber to the lower or receiving chamber, which is really an air tube although some liquid may pass over it, and a measuring eduction tube leading from the bottom of the indicating chamber to the lower portion of the air tube, thence to the receiving chamber. I have dispensed with one chamber, with Scrannage's induction tube and both of his check valves, by making the forcing and receiving chambers in one, leaving my induction tube with a free, unobstructed passage way leading to the indicating chamber above the indicating level, and leading my eduction measuring tube from the bottom of the indicating chamber directly to the pumping or receiving chamber. While, therefore, I do not claim broadly a time signal constructed with a transparent indicating chamber, a receiving chamber and a colored indicating liquid, I do desire to claim broadly the principle of transferring the indicating liquid from the receiving chamber by an exterior passage to a point in the indicating chamber above the indicating level, as it is by this means that I obtain a different mode of operation, dispense with much of the mechanism and obviate the inherent faults of construction of previous devices. It will be noted, also, that my tubes are both unobstructed by valves, as there is free communication from the top of the indicating chamber at the point of the indicating level with the induction pipe, and hence that the valve f' described does not operate in any sense as a check valve analogous to the check valve shown by Scrannage, and that, on the diminution of the contents of the receiving chamber, the indicating liquid is simply forced up through the passage ways theoretically in proportion to their capacities to carry it, although practically little or none will pass through the meansuring eduction tube, the circulation being practically to the top of the indicating chamber, thence downward on the return through it and the eduction tube, to the receiving and pumping chamber.

Having thus described my invention, what I claim is—

1. In a railway time signal, the combination of a chamber of variable capacity, means whereby the capacity thereof may be diminished by the passage of a moving train, an upright looped tube furnishing a free unobstructed passage way leading from and returning directly to said chamber, the return portion of said tube being provided with a transparent section, and having a restricted portion between said transparent section and the variable chamber, substantially as described.

2. In a time signal, the combination of a

chamber of variable capacity, means whereby the capacity thereof may be diminished by a passing train, an upright looped tube rising from its upper side, and substantially returning upon itself and unobstructed by valves throughout its extent, its discharge end arranged to discharge into the chamber the return portion having a transparent section and a restricted section between such transparent portion and the return connection, and an indicating liquid, all so arranged that the indicating liquid is forced upwardly quickly through the larger portion of the loop to the top of the transparent section and descends slowly through such section and the restricted portion, substantially as described.

3. In a time signal, the combination of a variable chamber, means whereby its capacity may be diminished by a passing train, an upright looped unobstructed tube connected therewith and returning directly thereto, said tube having an air chamber at its extreme upper end, a transparent section below the enlargement, and a restricted portion between the transparent section and the variable chamber, and an indicating liquid, substantially as described.

4. The combination and arrangement of two chambers, one elevated above the other, said chambers communicating by passageways, one of which is relatively small and leads from the bottom of the lower chamber directly to the upper chamber, and the other of which is relatively large and constitutes an unobstructed passage way leading from the top of the upper chamber to the top of the lower chamber, an elastic diaphragm forming the under portion of the walls of the lower chamber, and a system of levers and plungers adapted to impinge against said diaphragm on the passage of a train, whereby the capacity of said lower chamber is decreased and the liquid contained therein is compelled to be transferred to the upper chamber, through the large passage way leading to the top thereof substantially as described.

5. In a railway liquid time signal, the combination of a hopper shaped indicating chamber, a liquid contained therein, an indicator scale, and means for permitting gradual descent of the liquid by gravity, whereby the decreased quantity descending due to decreased hydrostatic pressure is substantially indicated by uniform spaces on the indicator, substantially as described.

6. In combination with two chambers, one placed above the other, the lower end of the upper one communicating by a relatively small aperture with the lower chamber, and the upper end of the upper chamber communicating by a large aperture with the lower chamber, and the collapsible air bag forming the upper wall of the upper chamber, substantially as and for the purpose described.

7. The combination of an upper and a lower chamber, unobstructed passageways substantially as described connecting the two, means whereby the capacity of the lower chamber may be decreased on the passage of a train, a collapsible air bag inclosing the upper end of the upper chamber, and the upper end of the passage from the lower chamber and adjustable connections between said means and the movable track whereby the variations in the adjustment of the track are prevented from unduly varying the capacity of the lower chamber, substantially as described.

8. The combination of an upper chamber, a lower chamber connected therewith by two passage ways one relatively small leading from the lower chamber, the other from the lower chamber to the top of the upper chamber, a collapsible air bag inclosing the top of the upper chamber and the top of the larger passage, and means whereby the capacity of the lower chamber may be diminished, substantially as described.

9. The combination of a lower and upper chamber connected by a relatively small passage way leading from the bottom of the upper chamber, a larger passage way leading from the interior of the lower chamber to the top of the upper chamber, a check valve on the upper end of the larger passage way, and a passage way leading into the upper passage way below the check valve from the upper chamber, whereby the liquid in the upper chamber is quickly brought to a uniform level coincident with an indicator, substantially as described.

10. The combination of the signal post A, the movable rail B, the lever C, the plunger D carrying a convex head, the diaphragm E, the coil spring c^3, the collar c^5, and the diaphragm d, substantially as described.

11. The combination of the movable rail B, the lever and plunger C, D, the diaphragm E, the case H′, the pipe F, the air bag J, and the perforated diaphragm h', substantially as described.

12. In a signal, the combination with a casing having a liquid holding chamber therein and means for varying the capacity of the chamber, of a circuit leading from and returning to the chamber its out going and return ends being on a plane above the chamber, and a transparent section in the circuit, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

BENJAMIN B. MORGAN.

Witnesses:
W. M. ROBERTS,
A. A. BEDELL.