(No Model.) 2 Sheets—Sheet 1.

F. W. MALCOLM.

AUTOMATIC HYDRAULIC SIGNALING APPARATUS FOR RAILROADS.

No. 301,614. Patented July 8, 1884.

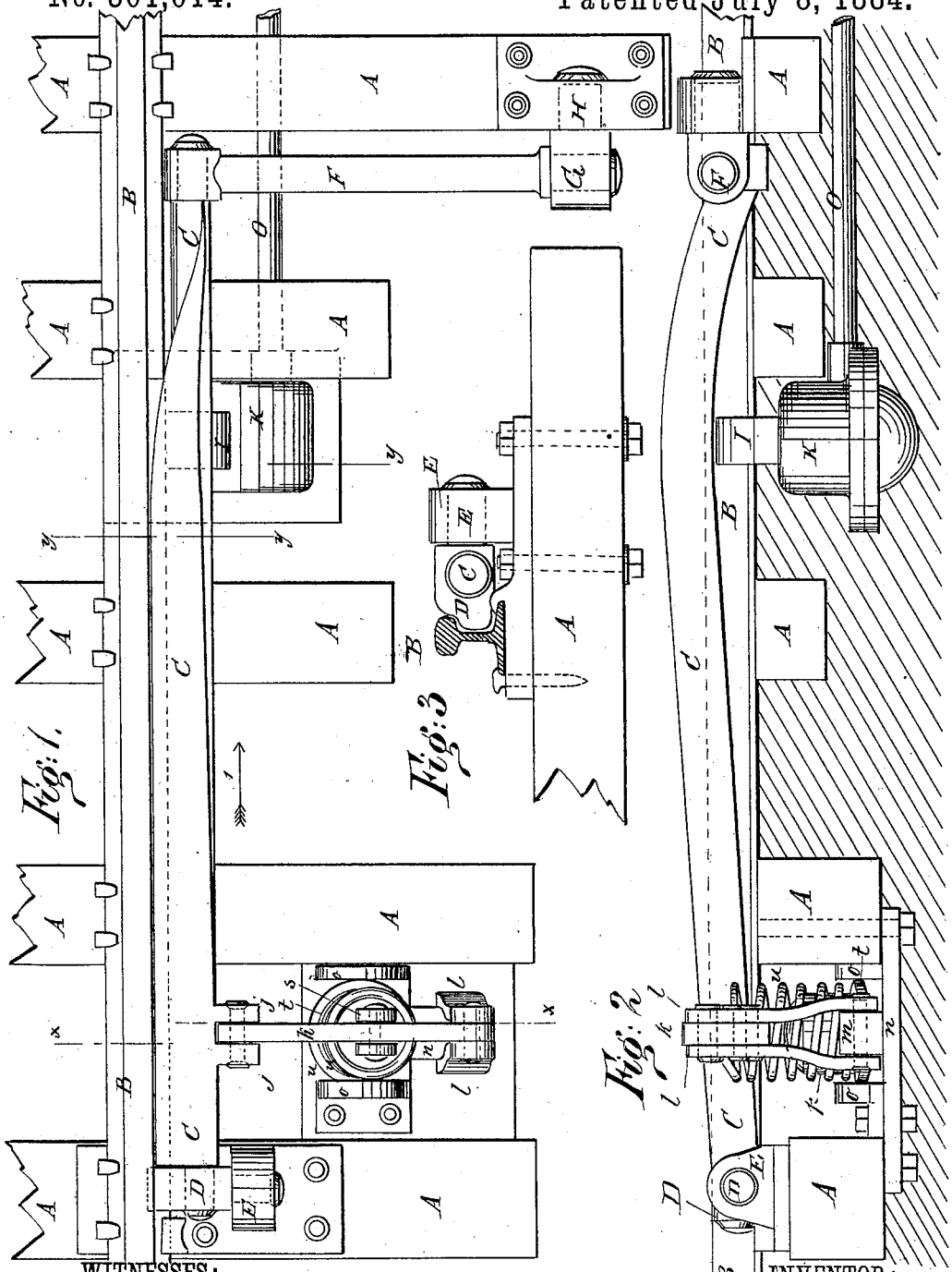

Fig. 1.

Fig. 3

Fig. 2

WITNESSES:

Chas. Nicol

B. G. Underwood.

INVENTOR:

F. W. Malcolm

BY Munn & Co

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

F. W. MALCOLM.

AUTOMATIC HYDRAULIC SIGNALING APPARATUS FOR RAILROADS.

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Fig: 7.

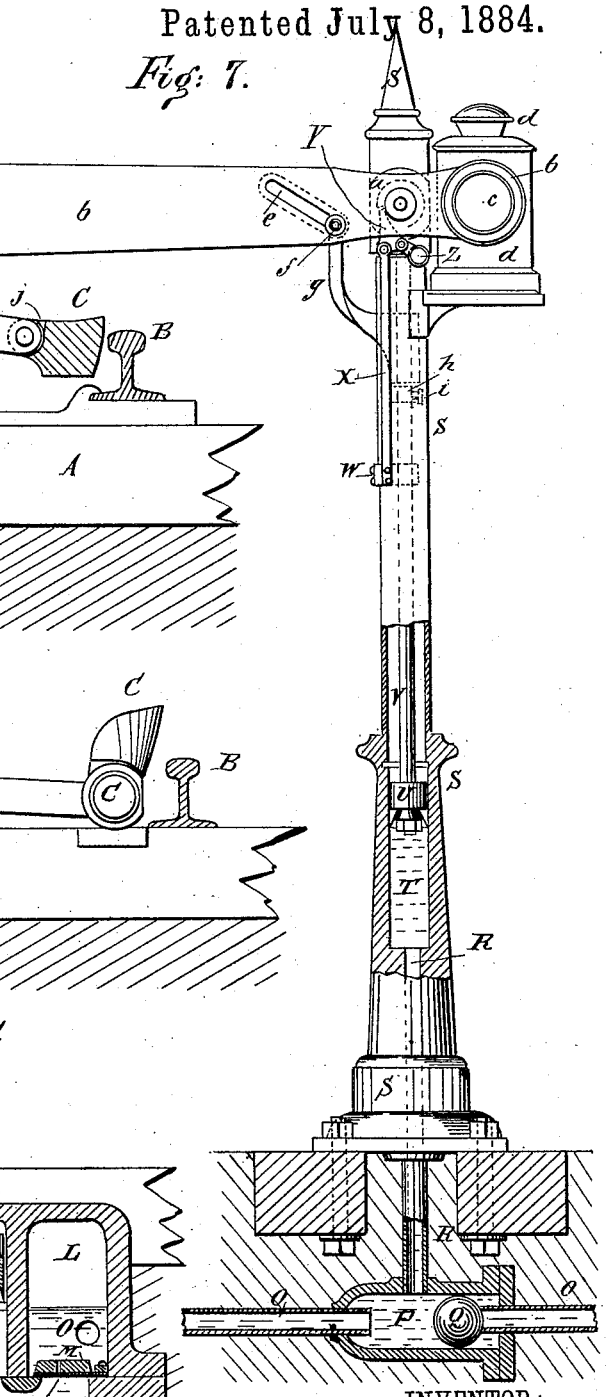


Fig: 4.

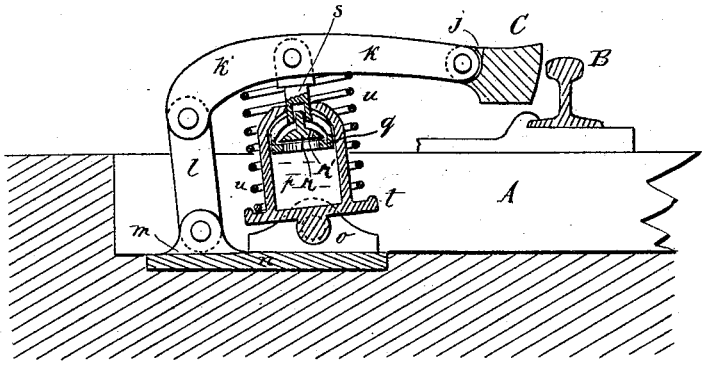


Fig: 6.

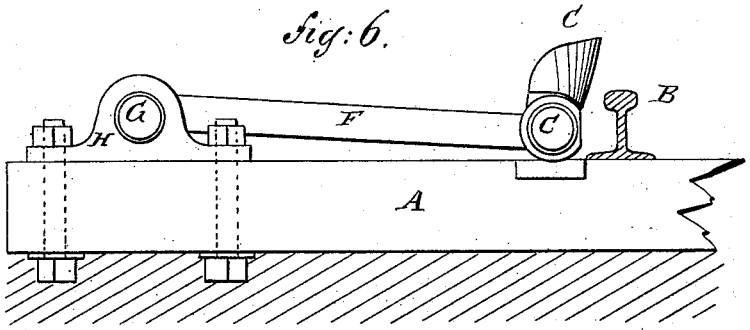
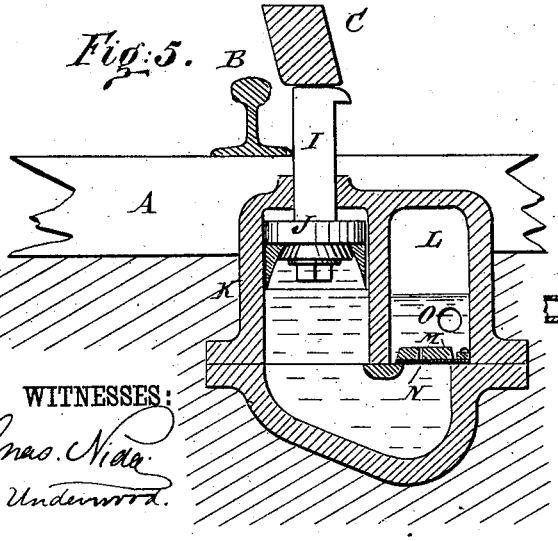


Fig: 5.



WITNESSES:

Chas. Nida

B. G. Underwood.

INVENTOR:

F. W. Malcolm,

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FREDERICK WILLIAM MALCOLM, OF CINCINNATI, OHIO.

AUTOMATIC HYDRAULIC SIGNALING APPARATUS FOR RAILROADS.

SPECIFICATION forming part of Letters Patent No. 301,614, dated July 8, 1884.

Application filed December 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK WILLIAM MALCOLM, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and Improved Automatic Hydraulic Signaling Apparatus for Railroads, of which the following is a full, clear, and exact description.

Reference is be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1, Sheet 1, is a plan view of a part of my improvement. Fig. 2, Sheet 1, is a side elevation of the same. Fig. 3, Sheet 1, is a rear end elevation of the same. Fig. 4, Sheet 2, is a sectional end elevation of the same, taken through the line *x x*, Fig. 1. Fig. 5, Sheet 2, is a sectional end elevation of the same, taken through the line *y y*, Fig. 1. Fig. 6, Sheet 2, is a front end elevation of the same. Fig. 7, Sheet 2, is a front elevation of the other part of the improvement, partly in section.

This invention relates to that class of signaling apparatus which is used on railroads to give warning of the approach of trains at crossings and other places, and has for its object to secure reliability in the operation of such apparatus.

The invention consists in an automatic hydraulic signaling apparatus constructed with a hinged bar, a signaling-post, and a slotted semaphore-arm, the bar being connected to the arm by a piston and piston-chamber, an air-chamber having perforated valve, pipes connecting the air-chamber with a piston-chamber having a piston and a piston-rod provided with a collar to act upon a sliding bracket-arm connected with the slot of the semaphore-arm, whereby the said semaphore-arm will be displayed by the expansion of air compressed by the weight of the advancing train. The semaphore-arm is further connected with the piston-rod that raises it and the collar attached to the said piston-rod by a ratchet-wheel and weighted pawl, a connecting-rod, and a loose collar, so that the said semaphore-arm will be released by the descent of the said piston-rod and allowed to drop out of view. The inclined bar is secured at its rear end by pivoted bearings and at its forward end by a swinging bar and pivoted bearings, so that the said bar can have a vertical movement at its forward end, and can turn upon its axis. With the inclined hinged and rotating bar is connected a lever hinged to the said bar and to hinged supporting-bars, and connected with a piston having a perforated valve, and working in a hinged chamber provided with a spiral spring pressing against the said lever, whereby the said bar, after being turned or depressed, will be compelled to return slowly to its former position, as will be hereinafter fully described.

A represents the ties, and B a rail, of an ordinary railroad-track.

C represents a bar placed at the outer side of a rail, B, and pivoted at its rear end to a bearing, D, which is pivoted to a standard or support, E, secured at its base to a tie, A. The bar C inclines upward toward its forward end, and its forward part is curved or inclined downward, as shown in Fig. 2. The forward part of the bar C is made in spiral form, as shown in Fig. 1, and its forward end is pivoted in a bearing in the inner end of a bar, F, placed at right angles with the bar C and rail B, and pivoted at its outer end to a bearing, G, which is pivoted to a bearing, H, attached to a tie, A, so that the forward end of the bar C can have an upward and downward movement and the entire bar a rocking movement. The forward parts of the bar C rests upon the upper end of the stem I of a piston, J, which moves up and down in a chamber or pump-barrel, K. The lower end of the chamber K is connected with the lower end of a second chamber, L, in the lower part of which is placed a hinged valve, M, opening upward, and having a small hole, N, formed through it.

With the chamber L, a little above the valve M, is connected the end of a pipe, O, the other end of which is connected with the end of a tubular chamber, P. With the other end of the chamber P is connected the end of the pipe O′, leading to a corresponding mechanism, but arranged in a reversed position at the opposite side of the signal-post. Within the chamber P is placed a ball, Q, fitting the interior of the said chamber, and serving as a valve to close the end of one or the other of the pipes O O′, according as the pressure comes from one or the other direction.

With the middle part of the chamber P is

connected the lower end of a pipe, R, which passes up into the signal-post S, secured to suitable supports set in the ground at the side of the track. The upper end of the pipe R is connected with a cylindrical chamber, T, in the lower part of the post S. Within the chamber T is placed a piston, U, the end V of which passes up through the upper part of the post S. The middle part of the rod V passes through a collar, W, loose on rod V, which collar projects through a vertical slot in the side of the post S, and to it is attached the end of the rod X. The upper end of the rod X is pivoted to the forward part of the pawl Y. The rear end of the pawl Y has a weight, Z, formed upon or attached to it, which weight is made of sufficient gravity to support the weight of the rod X and collar W and hold the engaging end of the pawl Y against the ratchet-wheel *a*, formed upon or attached to the hub of the semaphore-arm *b*, pivoted to the side of the post S, in such a position that when the said arm is raised into a horizontal position the red glass disk *c*, secured to one end of the said arm, will cover the lens of the lantern *d*, and thus display a danger-signal at night. In the other part of the semaphore-arm *b* is formed an inclined slot, *e*, to receive a pin, *f*, attached to the upwardly-projecting outer end of the arm *g*, the shank of which passes in through a vertical slot in the upper part of the post S, and has a long bearing formed in it for the passage of the rod V.

Upon the rod V, between the collar W and the arm *g*, is placed a collar, *h*, which is secured in place by a set-screw, *i*. With this construction, when the piston U and rod V are forced upward by the pressure of the liquid in the chamber T, the collar *h* will strike the shank of the bracket-arm *g* and force the said arm upward, raising the semaphore-arm *b* into a horizontal position, where it is held by the action of the pawl Y upon the ratchet-wheel *a*. As the piston U and rod V move downward with the outflow of the liquid from the chamber T, the collar *h* strikes against the collar W and forces it and the rod X downward, withdrawing the pawl Y from the ratchet-wheel *a* and allowing the semaphore-arm *b* to swing down into a vertical position, concealing the signal.

Upon the outer side of the bar C, at a little distance from its rear end, are formed, or to it are attached, lugs *j*, to which is pivoted the inner end of the lever *k*. The outer end of the lever *k* is pivoted to and between the upper ends of two bars, *l*, the lower ends of which are pivoted to a support, *m*, formed upon or attached to a bed-plate, *n*, secured to ties or other supports set in the ground.

To the bed-plate *n*, at the inner side of the support *m*, are attached bearings *o*, to which is journaled the base of a chamber, *p*, into the upper part of which is fitted a piston, *q*, provided with a valve, *r*, opening upward. The rod *s* of the piston *q* passes up through an opening in the top of the chamber *p*, and is hinged to the lever *k*. The base of the chamber *p* projects as an annular flange, *t*, and upon it rests the lower end of a spiral spring, *u*. The spiral spring *u* incloses the chamber *p* and its upper end rests against the lower side of the lever *k*.

In preparing the apparatus for use the chamber *p* is filled with oil or other suitable liquid, and so much of the same liquid is poured into the chamber K as will fill the chambers K P, partly fill the chamber L, and fill the pipes O R. As a train approaches the signal-post S in the direction of arrow 1 the wheels of the engine run upon the inclined bar C and depress the forward end of the said bar, pressing the piston J downward, forcing the liquid in the chamber K into the chamber L and compressing the air in the said chamber. As the piston J completes its stroke the valve M closes, and the expansion of the air in the chamber L forces the liquid through the pipe O, the chamber P, and the pipe R into the chamber T, forcing the piston U and rod V upward and displaying the signal, as hereinbefore described. As the wheels of the train leave the bar C the said bar is forced upward slowly by the action of the spring *u*, allowing the liquid to flow back slowly through the hole N in the valve M, raising the piston J and lowering the piston U and rod V until the collar *h* strikes the collar W, drawing back the pawl Y, and allowing the semaphore-arm *b* to drop into a concealed position, as hereinbefore described. The length of time during which the signal is displayed depends upon the size of the hole N, and the consequent time required for the liquid to flow back into the chamber K. As the bar C is depressed by the wheels of the engine, the downward movement of the said bar depresses the lever *k*, compresses the spiral spring *u*, and forces the piston *q* downward in the chamber *p*. As the piston *q* is forced downward the valve *r* opens and allows the liquid in the chamber *p* to pass to the upper part of the said chamber *p*, above the piston *q*. As the bar C is released from the pressure of the car-wheels the spring *u* tends to force the said bar C upward; but the upward movement is resisted by the liquid in the upper part of the chamber *p*, which holds the valve *r* closed and the piston *q* down until the liquid has time to flow through the hole *r'* in the valve *r* into the lower part of the said chamber *p*. This construction prevents the bar C from jumping upward between the successive wheels of the cars and holds it down until the train has passed. As the train leaves the signal-post S and meets the duplicate reversely-set mechanism at the other side of the post, the tread of the engine-wheels strikes the edge of the spiral forward part of the bar C upon the side of the post S and turns the said bar upon its axis without depressing it, and thus prevents the bar C from forcing its piston J downward, as in setting the sig-

nal. At the same time the turning of the bar C depresses the piston *q*, so that the said bar C will be held from turning to its normal position between the passing of the successive car-wheels.

The duplicate mechanism is only required on a single-track road, where the cars use the same track for passing in both directions. On a double-track road each track has its own apparatus, as shown in the drawings, except that the pipes O R are directly connected, and the chamber P and its ball Q and attached pipe O′ are dispensed with.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an automatic hydraulic signaling apparatus, the combination, with the inclined hinged bar C, the signal-post S, and the semaphore-arm *b*, having inclined slot *e*, of the piston J, the piston-chamber K, the air-chamber L, having perforated valve M N, the pipes O R, the piston-chamber T, having piston U and rod V, provided with collar *h*, and the sliding bracket-arm *g*, substantially as herein shown and described, whereby the said semaphore-arm will be displayed by the expansion of air put under compression by the weight of the advancing train, as set forth.

2. In an automatic hydraulic signaling apparatus, the combination, with the signal-post S, the semaphore-arm *b*, and the piston-rod V, having collar *h*, of the ratchet-wheel *a*, the weighted pawl Y, the connecting-rod X, and the loose collar W, substantially as herein shown and described, whereby the descent of the said piston-rod will release the said semaphore-arm and allow it to drop out of view, as set forth.

3. In an automatic hydraulic signaling apparatus, the combination, with the inclined bar C, of the connecting-bar F, the bearings G H, and the bearings D E, substantially as herein shown and described, whereby the said bar can have a vertical movement at the forward end, and can turn upon its axis, as set forth.

4. In an automatic hydraulic signaling apparatus, the combination, with the inclined hinged and rotating bar C, of the lever *k*, the hinged supporting-bars *l*, the journaled chamber *p*, having flange *t*, the piston *q*, having perforated valve *r r′*, and the spiral spring *u*, substantially as herein shown and described, whereby the said bar, after being turned or depressed, will be compelled to return slowly to its former position, as set forth.

5. In an automatic signaling apparatus for railways, the combination, with the signal-post S and its semaphore-arm *b*, and operating mechanism, as specified, of a pivoted bar, C, having both a vertical and axial movement, and connections arranged along the track at each side of the signal-post, and the chamber P, with valve or ball Q and pipes O O′, substantially as shown and described.

FREDERICK WILLIAM MALCOLM.

Witnesses:
RALPH PETERS,
H. W. BROWN.