

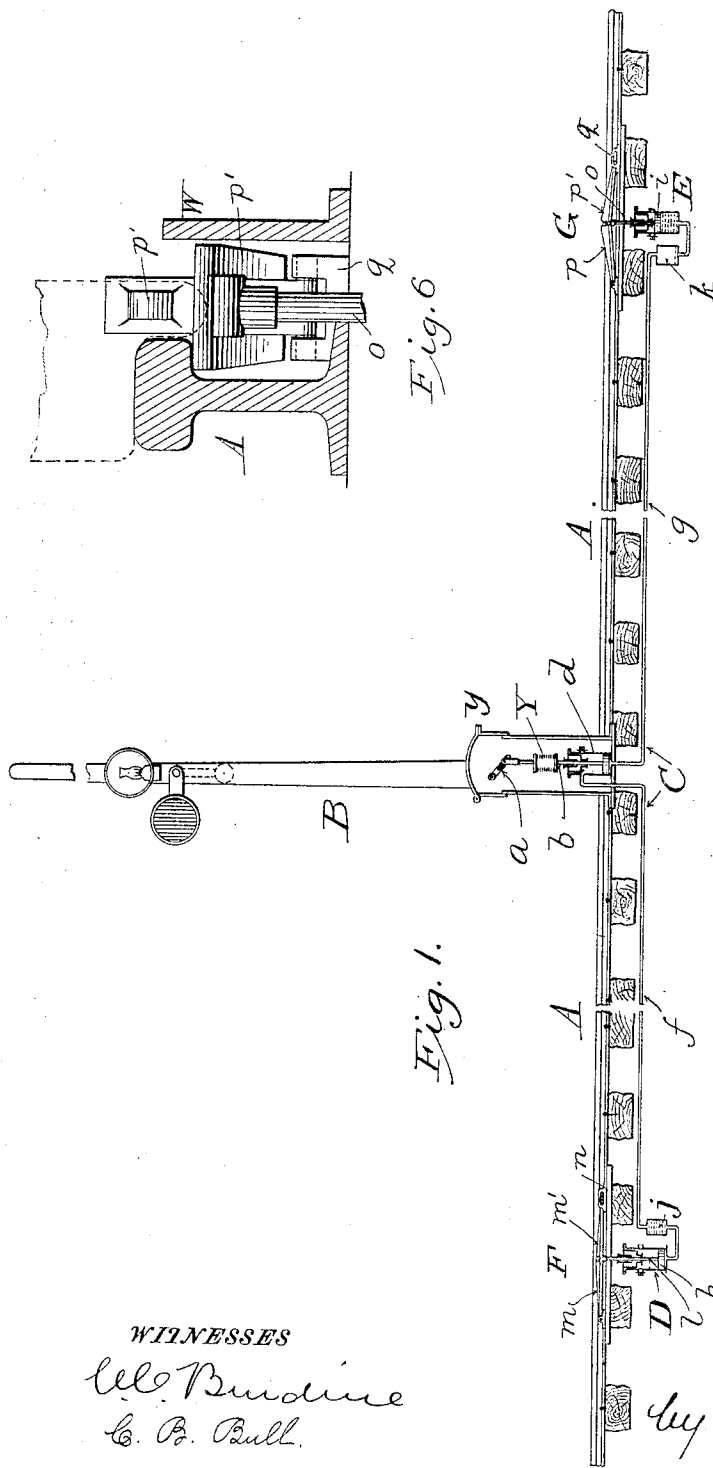
(No Model.)

2 Sheets—Sheet 1.

C. A. BALL.
RAILWAY GATE.

No. 531,087.

Patented Dec. 18, 1894.



WITNESSES
Chas. B. Buidine
C. B. Bull.

Chas. A. Ball,
INVENTOR
by Dodge & Sons,
Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES A. BALL, OF WASHINGTON, DISTRICT OF COLUMBIA.

RAILWAY-GATE.

SPECIFICATION forming part of Letters Patent No. 531,087, dated December 18, 1894.

Application filed July 2, 1894. Serial No. 516,370. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. BALL, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Railway Gates, Signals, &c., of which the following is a specification.

My invention relates to a novel means for operating rail-way gates, signals, &c., by the movement of a passing train.

In order that air may be used successfully the construction and arrangement of the mechanism must be such that the gate or signal arm shall be actuated practically at the same time that the train acts upon the trip devices located adjacent to the track; otherwise a train running at a high rate of speed would travel the half mile between the trip mechanism and the crossing to be protected, before the gate or signal arm could be actuated. To secure this result, and to produce an apparatus which shall be unfailing and prompt in action, I employ a previously-compressed fluid,—preferably compressed air,—which fluid body remains constant and unchanging for an almost indefinite time. The fluid or body of air is intercepted or divided by a piston connected with the gate or signal arm to be operated, so that the said gate or arm may be positively opened and positively closed by causing the confined fluid to move the piston first in one direction and then in the other. In order to set the confined body of air in motion, I employ preferably two trips adapted to be depressed by the passing train, and which in being thus depressed, give motion each to a piston mounted in a cylinder, which cylinders have communication with the cylinder carrying the gate piston. The trips are located on opposite sides of the gate, and they are so arranged as to alternate in their movements; that is to say, when one is depressed by the passing train to set the column of air in motion, the other will be elevated, and vice versa. The depression of one trip causes the air or other confined fluid to act upon one face of the gate piston and open the gate, but the depression of the other trip will cause the air to act upon the opposite face of the same piston and close the gate, and at the same time cause the trip that was first depressed to be raised or elevated to working position.

The present invention consists essentially

of the following elements: First, a closed main or pipe containing air or other fluid under pressure which body of air shall remain constant for a long time; second, a cylinder which intersects the main and whose piston divides the column of air in the main and thereby becomes balanced,—the pressures upon opposite faces of the piston being equal; third, a railway gate or signal arm operatively connected with the aforesaid piston so as to be moved thereby when the column of air is set in motion; and, fourth, a pair of cylinders located, one at or near each end of the main or pipe, said cylinders being each connected with the main and provided with a piston to be operated by a passing train.

The invention further consists in various features of construction whereby leakage is prevented and the maintenance of a constant column of compressed air is insured, and whereby also the operation of the mechanism is rendered easy and free from shocks and sudden jars, and the danger of breakage avoided.

In the drawings,—Figure 1 is a diagrammatic view of a portion of a railway track showing my invention adapted to the actuation of a railway-gate; Fig. 2, a sectional view of a portion of the same apparatus on a larger scale; Figs. 3 and 4, views illustrating the connection between the gate and its piston; Fig. 5, a vertical sectional view of one of the trip cylinders; and Fig. 6, a transverse sectional view through the rail and trip.

A represents the track, and B an ordinary pivoted railway crossing gate, suitably mounted in the customary post or support *y*. On the shaft or pivot *x* of the gate B is a radial arm *a* which is connected by means of the spring devices shown in Figs. 2, 3 and 4, to the rod *b* of piston *c*,—the said piston working within the vertical cylinder *d* mounted preferably inside the post *y*.

The spring devices between the piston *c* and the arm *a*, comprise two plates *X X* which are connected with each other by means of coiled springs *Y Y*, Figs. 2, 3 and 4,—the upper plate having a short stem or rod *Z* which is attached by a sliding connection with the radial arm *a*, while the lower plate is attached directly to the piston rod. When the piston moves upward the gate will not be thrown over suddenly and violently, but will begin to move only after the springs have been compressed slightly,

the jar or shock due to the sudden movement of the piston being taken up and cushioned by the springs. So too, when the piston is depressed, the initial movement and jar is taken up by the springs, which in this instance are slightly extended before communicating motion to the gate. From this it will be seen that these springs will receive the sudden shock incident to the sudden rise of the piston, by their compression, and will then force the gate over leisurely by their expansion. The tension placed on the springs by the reverse movement of the piston will restore the gate to its vertical position. If in closing, the gate should acquire sufficient impetus to carry it beyond the horizontal, the tension on the springs will restore it to proper position.

Cylinder *d* is placed in communication with the main C containing the compressed air, one branch, *f*, of said main entering the upper part of the cylinder, and the other branch *g* entering the lower part, as shown in Figs. 1 and 2.

Branch *f* of the main or pipe C is provided with or communicates with a cylinder D having a piston *h*, while branch *g* communicates at its end with a similar cylinder E in which works a piston *i*, as shown in Fig. 1. As a matter of fact, the main C does not communicate directly with the cylinders D and E, but with supplemental chambers *j* and *k*, which are in effect a part of the respective cylinders D, E. While I prefer to employ these supplemental chambers *j k*, it is to be understood that they are not essential, as it is obvious that the pipes *f g* may be connected directly to the cylinders D E. Within these chambers *j k*, I place a small quantity of mercury which precludes the compressed air which is within the main from coming into contact with the pistons *h, i*, thereby preventing leakage of air around the pistons, which would be possible were the air allowed to come into direct contact with the pistons. By using the supplemental chambers, the mercury expelled from the cylinders as the pistons descend, is prevented from getting into the branches of the main C.

Resting upon the upper end of rod *l* of piston *h*, Fig. 2, is a trip F, composed of two bars *m m'* hinged or pivoted together at their meeting ends, and secured at their outer ends to a plate *n* or suitable brackets fastened to the ties. The bar *m* is pivotally secured to the plate or bracket, while the bar *m'* is provided with a pin engaging a slot in the plate or bracket as shown in Fig. 2. Upon the rod *o* of piston *i* rests a similar trip G, composed of the arms or bars *p p'* secured to a plate or bracket *q*. These two trips are placed alongside the rail to be acted upon by the wheels of a passing train, and to protect them against injury, there will be employed, advisably, a guard plate W, Figs. 2 and 6, which shall inclose the trips to a greater or less extent.

The operation is as follows: Starting with the parts in the position shown in Fig. 1, a

train traveling to the left strikes the trip G and depresses it, and the piston *i* upon which it is supported. As the piston descends, it sets in motion the air within the branch *g*, which motion is transmitted to the lower face of the piston *c* and causes the latter to rise; and of course when the piston rises, it, acting through the connections *b a*, causes the gate, signal, or arm B to be moved from a vertical to a horizontal position. Of course when the piston *c* rises, the air above the same is expelled from the upper part of the cylinder or set in motion, and this moving body of air acting upon the lower face of piston *h*, raises the latter and brings the trip F resting upon the piston, up into position to be acted upon by the train. After the train has passed the crossing, it acts upon and depresses the trip F, and the body of confined air is then moved in the opposite direction through the depression of the piston *h*. The depression of piston *h* causes a depression of piston *c*, and a consequent return of the gate arm B to its normal position, besides causing an elevation of piston *i* and a resetting of trip G. After the mechanism is set in place, the pipe C is charged with compressed air or other suitable fluid, (at from two to four atmospheres, more or less,) by means of a pump or in any other suitable manner, and the pipe then closed, or cut off from communication with the atmosphere. This gives me a practically constant or unchanging medium for transmitting motion from the pistons *h* and *i*; and as these pistons do not have to compress the whole column of air, but merely set it in motion, after compression it will be seen that the work thrown upon them is very slight.

The air within the main or pipe C should be compressed to such an extent when the apparatus is set up, as that upon the depression of either of the pistons *h* or *i*, the air will be moved bodily within the pipes, without further material compression. The pressure upon both faces of the gate piston *c* being the same, the said piston becomes balanced, and partakes of a movement corresponding to the movements of the pistons *h i* by reason of the interposition of the constant, unchanging, and previously compressed body of air.

From the foregoing it will be noted that when the trip F is depressed the pistons *h, c* and *i* all move simultaneously, and that when the trip G is depressed, the pistons also move simultaneously,—the previous compression of the air rendering the immediate actuation of the gate-piston possible and certain upon the depression of either of the trip-pistons. It will be observed upon reference to Fig. 2 that the piston *c* does not strike, and is not limited in its movements by the ends of its cylinder, but has a movement equal only to that of the trip pistons. In practice the movement of the trip pistons is but four inches and the depression of either has the effect merely of raising or lowering the gate piston

the same distance. If, therefore, the gate in swinging down, should acquire (for any reason) an undue impetus, its movement would be retarded and cushioned by the body of compressed air within the branch *f*; and any strain or shock which would otherwise come entirely upon the cylinder head will be thrown upon or distributed through the large body of air within the said branch *f*, thereby preventing injury to the cylinder.

In order that the body of air within the main *C* may be kept constant, I form the gate cylinder as shown in Fig. 5. In the first place, the cylinder is provided with four threaded holes in its sides, so that the cylinder may be connected with pipes extending from most any direction,—the holes not used being closed by plugs *e* as shown. Where this style of cylinder is used also for the trip cylinders, one hole will be left open to relieve the pistons *h i* from pressure and permit them to rise freely. In the gate-cylinder where the compressed air has access to the upper face of the piston, care must be taken to prevent the escape of the air around the piston rod, and to secure this result I provide the cylinder with a head *r* which is formed with a depending cup *s*, fitting accurately within the cylinder,—the head being provided with a flange *t* which is ground nicely to fit upon the end of the cylinder where it is fastened by the bolts or screws *u*. By making the joints between the flange *t* and the cylinder, and between the cup *s* and the cylinder, true by grinding or turning, or both, the cylinders will withstand a pressure far in excess of that required, without leakage. Cup *s* is hollow and is provided with upper and lower glands *v* and *v'* and suitable packing nuts *w* and *w'*, the upper gland *v* being elongated to form a guide for the piston rod, and being grooved internally as shown. Within the cup I place a quantity of mercury and upon the latter a quantity of oil. Now, if any air should pass the lower gland *v'* it will pass through the mercury and oil and collect in the top of the hollow cup, and when the pressure of the air within the cup exceeds that within the cylinder, the only relief it can have is to displace the oil and force it up the spiral groove in the upper gland *v*, thereby insuring a certain and desirable lubrication of the piston rod. As the packing under the nut *w* will wipe off all excess of oil at each movement of the piston rod, and as the loss of this oil is the only means afforded for the escape of the air from the cylinder below, it will be seen that a long time must elapse before sufficient air will escape to render the signal or gate unreliable and re-charging of the main necessary.

While I prefer to employ cylinders of the construction shown, under the trips, it is not essential, as there is no occasion to prevent the escape of air from above the pistons of the trip cylinders.

Having thus described my invention, what I claim is—

1. In combination with an arm *B*; a cylinder; a piston mounted therein and connected with the arm; a main closed to the outside atmosphere, connected with the cylinder, and containing a fluid under pressure to act upon both faces of the piston; and means operated by a train for setting the fluid in motion.

2. In combination with a main or pipe closed to the outside atmosphere and containing a fluid under pressure; a cylinder and piston at each end thereof for transmitting motion to the fluid; an arm *B*; and a piston mounted within a cylinder and interrupting or dividing the fluid; the main connecting with the latter cylinder above and below the piston, whereby the piston and the arm *B* connected therewith are balanced.

3. In combination with a main or pipe and the cylinders arranged at the ends thereof, and constituting with the main, a closed air-tight chamber containing a fluid under pressure; a cylinder connected with the main at a point between the ends of the latter and containing a piston which is subjected on both faces to the action of the fluid in the main, and which piston divides the fluid into two distinct bodies, between or by which the piston is balanced; an arm *B* operatively connected with the said piston; pistons *h i* mounted within the cylinders at the ends of the main; and trips actuated by the train to depress the pistons in the end-cylinders, whereby when either trip is depressed the other is elevated, and the arm is moved positively by the confined fluid.

4. In combination with the gate *B* and its actuating piston and cylinder, the springs *Y* interposed between the arm and piston.

5. In combination with gate *B* and its arm *a*; a cylinder and piston; the plates *X X* connected respectively with the arm *a* and the rod of the piston; and springs *Y Y* connecting the plates.

6. In combination with a cylinder and piston; a cylinder head *r* provided with cup *s*, fitting within the cylinder and having the glands *v v'* and packing nuts *w w'*.

7. In combination with a cylinder and a piston; means for supplying a compressed fluid to the one side of the piston; a cylinder-head *r* applied to the cylinder at that end at which the fluid is admitted; a cup *s* carried by the head and projecting into the cylinder and containing a mercury seal and oil, and suitable glands.

8. In combination with a cylinder and piston; a cylinder head *r* provided with flange *t*; bolts *u* connecting the head to the cylinder; a cup *s* projecting into the cylinder; glands *v v'*; and nuts *w w'*.

In witness whereof I hereunto set my hand in the presence of two witnesses.

CHARLES A. BALL.

Witnesses:

WALTER S. DODGE,
HORACE A. DODGE.