(No Model.) 2 Sheets—Sheet 1.

H. A. BUCK.

APPARATUS FOR OPERATING RAILWAY DANGER SIGNALS.

No. 333,919. Patented Jan. 5, 1886.

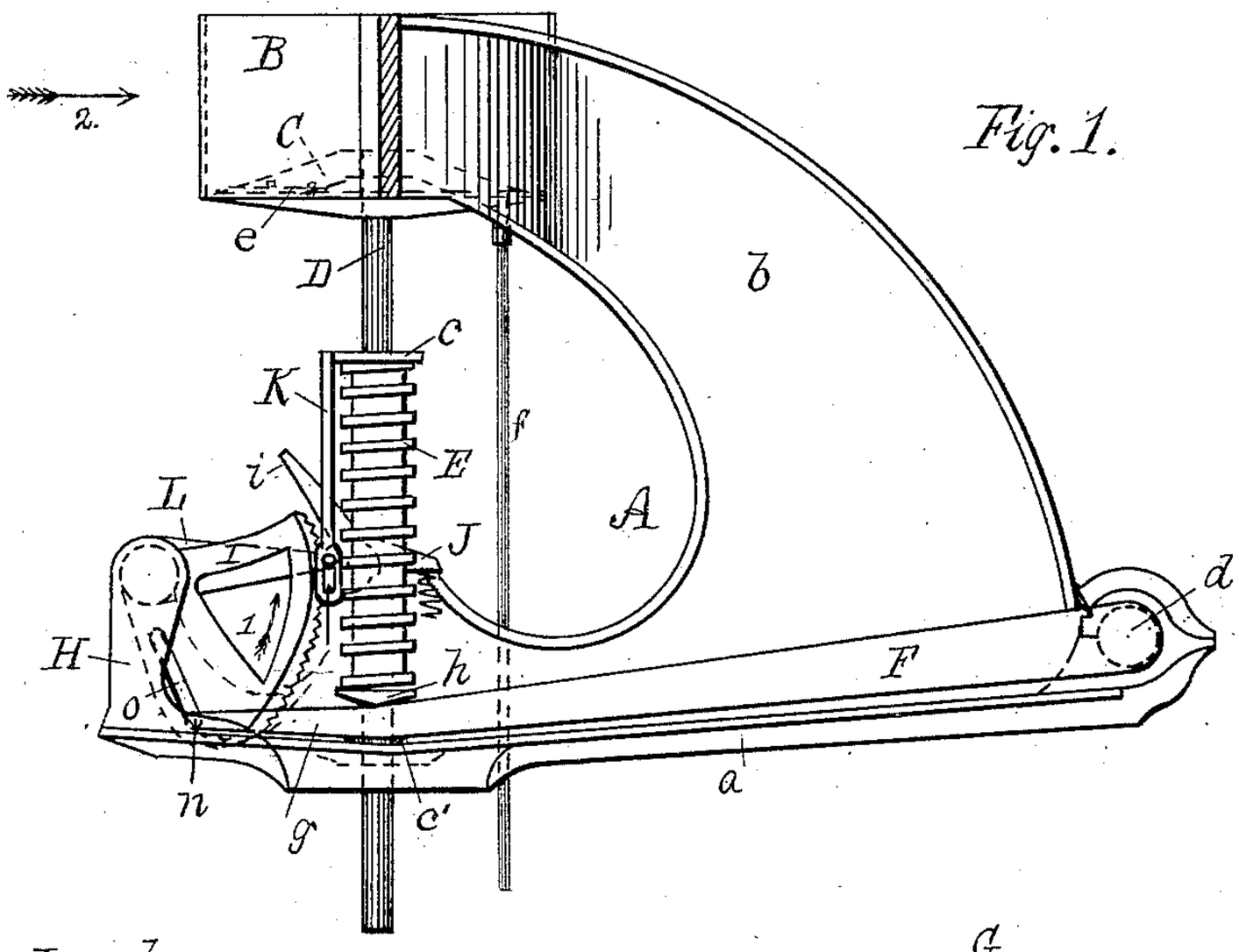


Fig. 1.

Fig. 15.

Fig. 2.

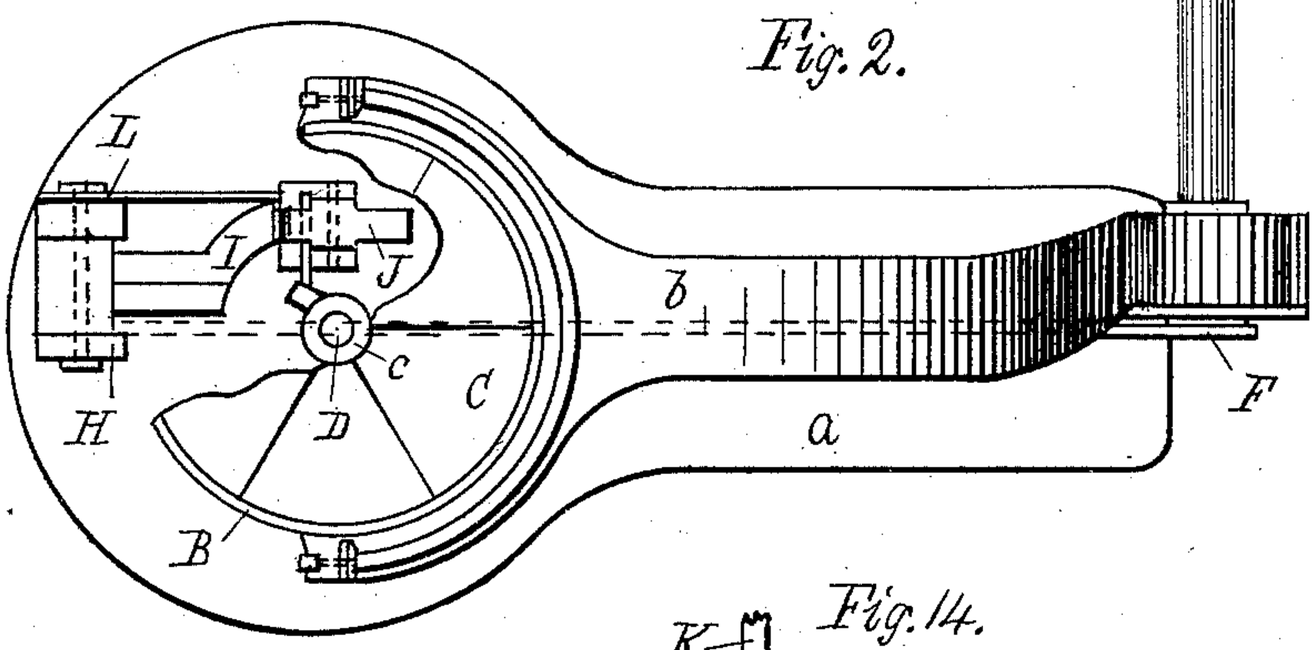
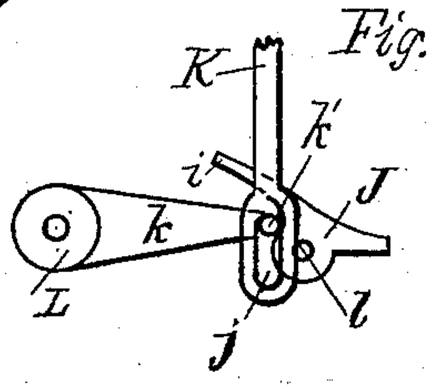


Fig. 14.



Witnesses.
Chas. L. Mott
H. C. Lodge

Inventor.
Henry A. Buck.
F. Curtis. Atty.

(No Model.) 2 Sheets—Sheet 2.

H. A. BUCK.

APPARATUS FOR OPERATING RAILWAY DANGER SIGNALS.

No. 333,919. Patented Jan. 5, 1886.

Fig 3.

Fig 4

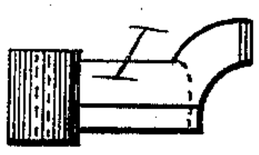
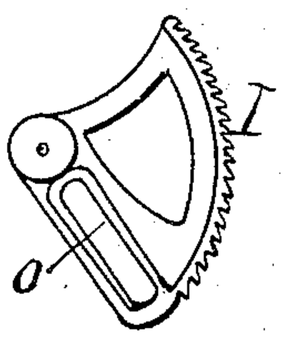


Fig. 8.



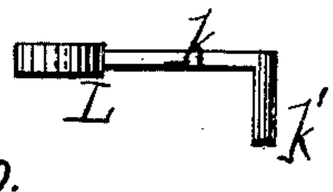


Fig 10.

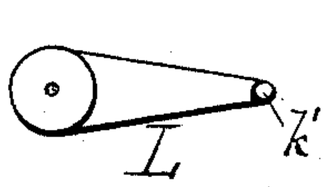
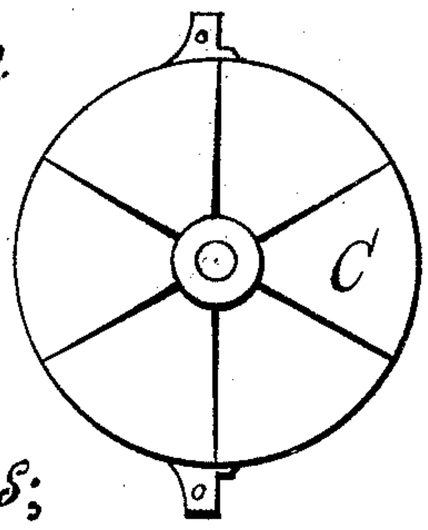
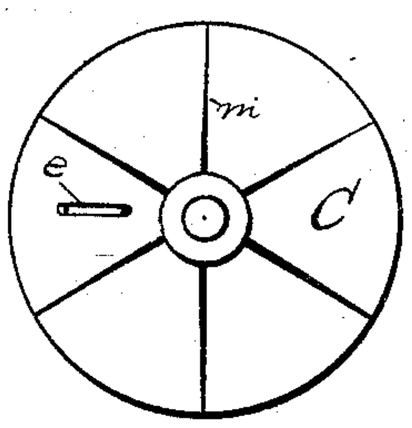


Fig 12.



Witnesses;
Ellis L. Motte.
H. C. Lodge.

Fig. 5.



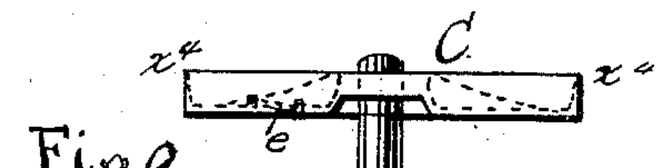


Fig. 9.

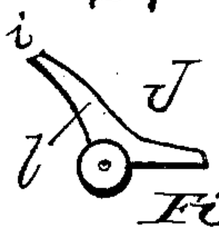
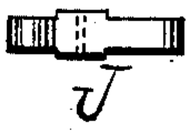


Fig 6.



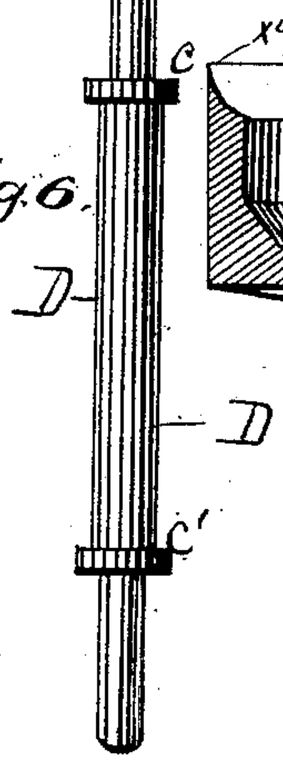


Fig. 11.

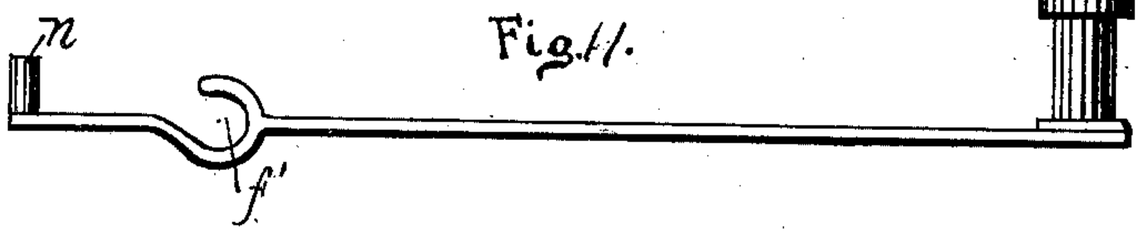


Fig. 7.

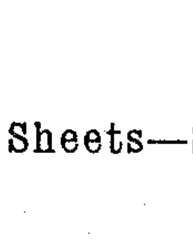
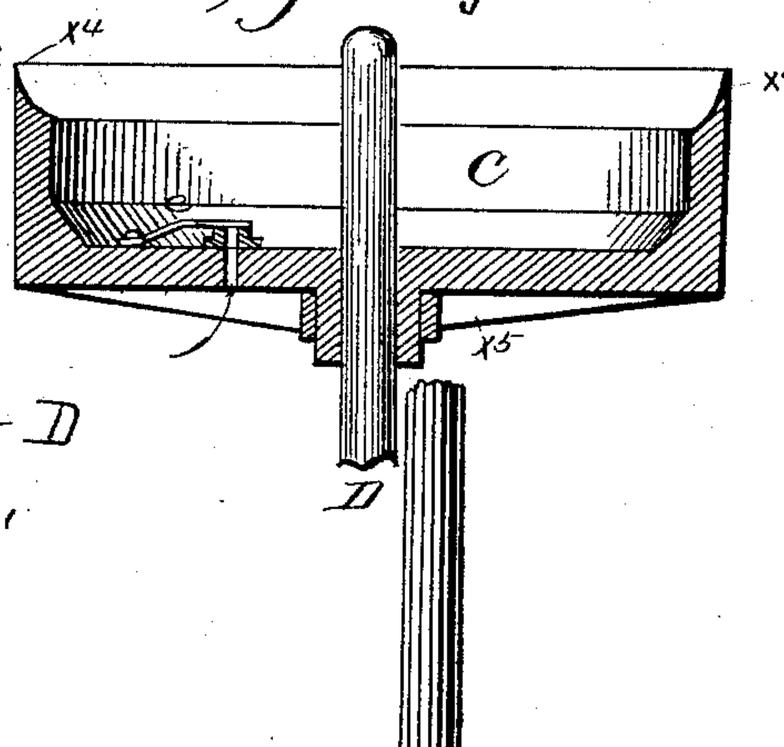


Fig 16.



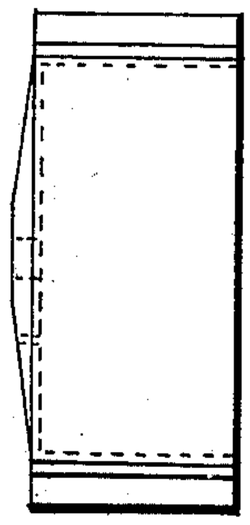


Fig 13.

Fig. 17.

Inventor
Henry A. Buck.
F. Curtis, atty.

UNITED STATES PATENT OFFICE.

HENRY ALONZO BUCK, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO ELLIS L. MOTTE, OF SAME PLACE, AND JAMES MURRAY KAY, OF ST. JOHN, NEW BRUNSWICK, CANADA, TRUSTEES.

APPARATUS FOR OPERATING RAILWAY DANGER-SIGNALS.

SPECIFICATION forming part of Letters Patent No. 333,919, dated January 5, 1886.

Application filed March 7, 1885. Serial No. 157,997. (No model.)

To all whom it may concern:

Be it known that I, HENRY ALONZO BUCK, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Operating Railway Danger-Signals; and I do hereby 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to mechanism for operating "pneumatic signal apparatus," so called; and it consists in an arrangement of co-operative parts, whereby a vacuum is produced to actively effect the same.

The mechanism now generally in use for operating pneumatic railway-signal apparatus is faulty in many respects, chief among them being their complicated structure, cost of manufacture, and consequent frequent liabilities to become deranged and broken, as well as their failure to produce sufficient motive power.

The essential purpose of my present invention is to obviate the objectionable features above alluded to; and it consists in simplifying and improving the general construction of the whole apparatus, reducing the number of pieces, and introducing a more efficient and mechanical combination of component parts, whereby the requisite power and strength and consequent durability are secured.

In the drawings accompanying this specification, Figure 1 represents a side elevation, and Fig. 2 a plan, of a device embodying my invention. Figs. 3 and 4 show, respectively, a plan and side view of the rocking collar. Fig. 5 is a plan of the reciprocating piston, and Fig. 6 a side view of the same with piston-rod attached. Fig. 7 is a side and end view of the connecting-rod. Fig. 8 is a plan and side elevation of the toothed sector, while Fig. 9 represents similar views of the pawl thereof. Fig. 10 shows likewise views similarly taken of the throw-off lever. Fig. 11 is a plan of the piston-lever detached. Fig. 12 is a detail top plan view of the vacuum-chamber; and Fig. 13 is a detail view of the same, taken from the position indicated by arrow 2 in Fig. 1—that is to say, as though the said chamber were standing on its periphery and presenting the same to the observer, the bottom of said chamber being at the right of the view. The lugs *o*, shown at the sides of the cylinder, Fig. 12, are for convenience in attaching it to the supporting-arm A, hereinafter described. Fig. 14 represents a detail side view of the pawl J, part of bar K, and the arm *k*, hereinafter described; and Fig. 15 represents a detail plan view of the piston-rod and the proximate parts, *c* I J K L, hereinafter described. Figs. 16 and 17 represent vertical sections of the piston, Fig. 16 showing a slightly-modified form, which is thinned at the top of the side walls, while Fig. 17 shows the entire side wall thinned as in Fig. 6.

This apparatus as an entirety is to be operated by the tread of a passing wheel or series of wheels of a train moving upon the rail, pressing upon a lever which transmits a reciprocating rocking motion to its connecting operative parts to actively affect the apparatus and alter the signals along the track.

This apparatus is shown as consisting of a metal casting, A, formed in the present instance with a suitable base, *a*, and a vertical support or web, *b*, to the end of which is cast or attached a hollow cylinder, B, open at one end and closed at the other. Within said cylinder is contained a reciprocating disk or piston, C, attached to the upper part of a piston-rod, D, the lower end of the latter being guided by and moving through the plate *a*. This rod is provided with two collars or shoulders, *c c'*, between which is retained a coiled spring, E, with its actuating-lever.

To actively operate the disks C within the cylinder or vacuum chamber, I have secured a lever, F, suitably mounted at one end and connected with or forming part of the shaft *d*, which is operated by the incline bar *d'*, arranged in close proximity to the rail G. This lever is formed with an eye or offset, *f'*, to permit passage of the piston-rod, and thus make the device compact.

It will be seen upon reference to Figs. 5 and 6 that the disk C is shown by the dotted lines to be very much reduced or thinned at its outer edge, so much so that it is somewhat

flexible, and is strengthened with ribs to secure strength with lightness, and supplied with an air-valve, *e*. This valve is an ordinary clapper-valve secured to the thick part of the disk C in any manner, and is provided with a spring, which tends to keep it closed by a downward pressure. The lower or closed end of the vacuum-chamber connects with the main pipe *f* of the signal system. Thus it will be seen that the passing of trains upon the track depresses the incline bar *d'*, and causes the lever F to raise and compress the spring E, which in its turn exerts an upward pressure upon the piston-rod, causing the disk C to travel within and upon the cylinder B. The action of the valve is such that upon rise of the disk C said valve is closed and prevents entrance of air, to thereby produce a vacuum or suction throughout the main system of pipes, while, on the contrary or downward movement of the disk, the air is drawn through the pipes to produce a vacuum, and permitted to escape in order not to retard the rapid fall of the disk or its return to a normal position.

I have mentioned the fact that the outer edge of the disk C is very much reduced or thinned, and this I consider a very important feature for the following reason: Owing to the flexibility of the disk consequent upon the reduced thickness, it will be evident that immediately upon an upward movement of the disk C the valve *e* closes, while a tendency to a vacuum is induced between the bottom of the cylinder B and the disk C; hence, owing to this vacuum, atmospheric pressure is at once created upon the top or upper side of said disk, which is crowded down, causing the periphery of said disk C to cling and adhere to the sides of the piston, thereby making a close tight joint. Upon the return movement of the disk C the valve *e* at once opens and the atmospheric pressure upon both sides of the disk is balanced and the close contact between the disk and its cylinder thereupon ceases, and no friction, or but very little, ensues; hence the disk C is free to drop without hinderance.

In Fig. 16 I have shown a modified form of piston having strengthening-ribs x^5 underneath, and the upper part, x^4, of its side wall thinned to a knife-edge. In Figs. 6 and 17 the thinned side wall, x^4, gradually tapers from the bottom to the upper edge.

Upon reference to the drawings it will be seen that the piston-rod D passes through the end of the lever and rests, when in position, upon the top side of the shoulder *c'*, while between the lower portion of the spring and its lever F is secured a rocking collar, *h*, which reduces friction upon the lever and keeps the base of the spring in a horizontal position. Furthermore, upon the base-plate *a*, I have constructed a standard, H, to which is pivoted a segment, I, toothed eccentrically of its pivot, the eccentricity of its operating-face increasing downward. Oppositely disposed upon a suitable bearing is arranged a pawl, J, spring-actuated at its rear, while its nose *i* or active part engages at proper intervals of time the teeth of the segment.

To disengage the pawl J from the teeth upon the segment, I have attached or pivoted to the upper hub, *c*, upon the piston-rod D a connecting-rod, K, slotted at *j* at its lower extremity. Within this slot I have disposed a pin or arm, *k'*, secured to the outer end, *k*, of the throw-off lever L, which is pivoted upon the same pin as the toothed segment, but independently thereof; and I have so disposed the end *k* of the lever L that it shall always exert a wiping motion upon the under cam side, *l*, of the pawl for purposes hereinafter described. As shown in Fig. 1, when the device is in its normal or inactive position, the lever rests upon a collar, *c'*, attached to the piston-rod D, with the spring relaxed, the toothed segment in its lowered position, and the pawl projecting over the top end thereof, while the pin *k'* rests in the top of the slot *j* in the connecting-rod K. (See Fig. 14.)

To prevent strains and shocks to the toothed segment I, which would result from the action of the wheels of the train upon the incline bar *d'*, transmitted through the shaft *d* and its co-operative lever F, provided the latter were pivoted thereto, I have adopted the following plan in order to effect a rocking motion of the segment upon the lifting or upward motion of the piston-lever: Upon the end of the lever I have inserted a pin, *n*, at right angles to the axis of said lever, and have radially slotted at *o* the toothed segment, within which slot said pin plays; hence no matter how severe the blow upon the incline bar or rapid the action of the lever E may be, still no direct jar is received upon the segment, since there is merely a cam or wiping motion produced between the pin *n* of the lever and the slot *o* of the segment I.

The active operation of this device in order to produce a vacuum throughout the system of pipes with which it is connected in order to actively operate the signals is as follows, supposing all the parts to be in their normal or inactive position, as heretofore premised, prior to the passage of a train: The impact of the wheel-tread upon the incline bar *d'* depresses the latter, rocks the shaft *d*, and transmits its motion to the lever F, the free end *g* of which is raised simultaneously, compressing the spring E, which it lifts, compressing it thereby, and rocks the toothed segment upward in the direction of arrow 1 by the cam or wiping movement of the pin *n* along the radial slot *o*, when the pawl J engages the teeth, and the spring is now held in a compressed state. While the segment is so upheld locked the lever F is raised and the incline bar now maintained depressed, so that it is inoperative to any passing train for a certain interval of time. Immediately upon compression of said spring E the latter endeavors to reduce its increased tension, which latter is exerted upon the now

fixed and locked lever F, and the piston at once begins to rise, forming a vacuum as it progresses upward, owing to the downward closing of the valve *e*, which prevents air from the outside flowing in to occupy the space created between the bottom of the cylinder B and its disk C consequent upon the upward movement of the latter. During this movement the stud *k'* of the throw-off lever L has passed to the lower end of the slot *j* in the connecting-rod. The piston still continues its upward active stroke, which creates the vacuum, and, as before premised, the stud *k'* having reached the end of the slot *j'*, formed in the rod K, attached to the piston-rod D, the lever L and the rod K, by means of their co-operating parts, act as a unit, and rise together with the piston-rod; but since the stud *k'* is prevented from further motion downward its outer extremity engages beneath the nose *i* of the pawl J upon the cam-surface *l*, and the latter is forced upward and away from the periphery of the segment, and disengaged and released from the teeth thereon by the upward movement of the throw-off lever L, induced by the action of the spring.

The above mechanism is so arranged that the release of the lever F and its toothed segment is not effected until the completion of the full stroke of the piston. Such action always secures a proper vacuum and positive efficient motive power in order to operate all the desired signals connected therewith. Thus the toothed segment, which is held in engagement with the pawl, is retained in that position, effected by this special passing of a train, until the piston, gradually rising, impelled by the spring E, has completed its stroke, which movement has caused the various operative parts, hereinbefore described, to release said pawl, when the final tension upon the spring is relaxed and the segment, lever, piston-rod, and piston fall and return again, to be operated by the next passing train. This last movement has again restored the incline bar to its normal position.

By the peculiar construction of the piston it will be readily understood that friction between the disk C and its cylinder B occurs only at the time needed—during the upward stroke—owing to the sudden and complete closing of the valve *e*, the pressure upon the disk resulting from the tendency to form a vacuum between the disk and its cylinder; and, furthermore, such friction has ceased owing to the opening of said valve *e* upon the return-stroke of said disk and the cessation of the cause of said friction—viz., a vacuum which caused it upon the upward stroke, as before premised.

I claim—

1. The metallic piston C, thinned near its periphery, and provided with radial strengthening-ribs *m*, in combination with the vacuum-chamber in which it operates, the lever and connections whereby said piston is actuated on the passage of a train, and the pipe extending from said vacuum-chamber to the signaling devices, substantially as set forth.

2. The piston-supporting rod D, provided with shoulders *c c'*, the rocking collar *h*, the lever F, which is arranged to be actuated by a passing train to raise said collar, a replacing-spring, E, interposed between said collar and stop *c*, and devices which prevent the descent of the rod and piston to the normal position until tripped by the action of said spring and interposed mechanism, substantially as set forth.

3. The combination, with the lever F, segment I, and pawl J, by which the segment and lever are locked upon the passing of a train, of the slotted rod K and the throw-off lever L, operating automatically by the action of the spring E″ to release said pawl, substantially as herein described.

4. The combination, in railway-signals, of the lever F, provided with a lateral stud, segment I, having a radial slot which receives said stud, pawl J, and spring E, by which the lever is rendered active upon the passage of a train, and so maintained to actuate a piston until a vacuum is produced, and slotted rod K, for freeing said segment, as and for purposes herein described.

5. The combination, with the reciprocating piston-rod D and its rod K, slotted at *j*, of the throw-off lever L, provided with the arm *k'*, by which release of the pawl is effected, as and for the purposes described.

6. In a signal-operating device for railways, the standard formed with a vertical web and horizontal base-plate, substantially as described, the vacuum-chamber supported thereby, a piston working freely in said chamber, and operative mechanism, all co-operating to produce a vacuum by the passing of a train, as and for purposes herein set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY ALONZO BUCK.

Witnesses:
H. E. LODGE,
A. F. HAYDEN.