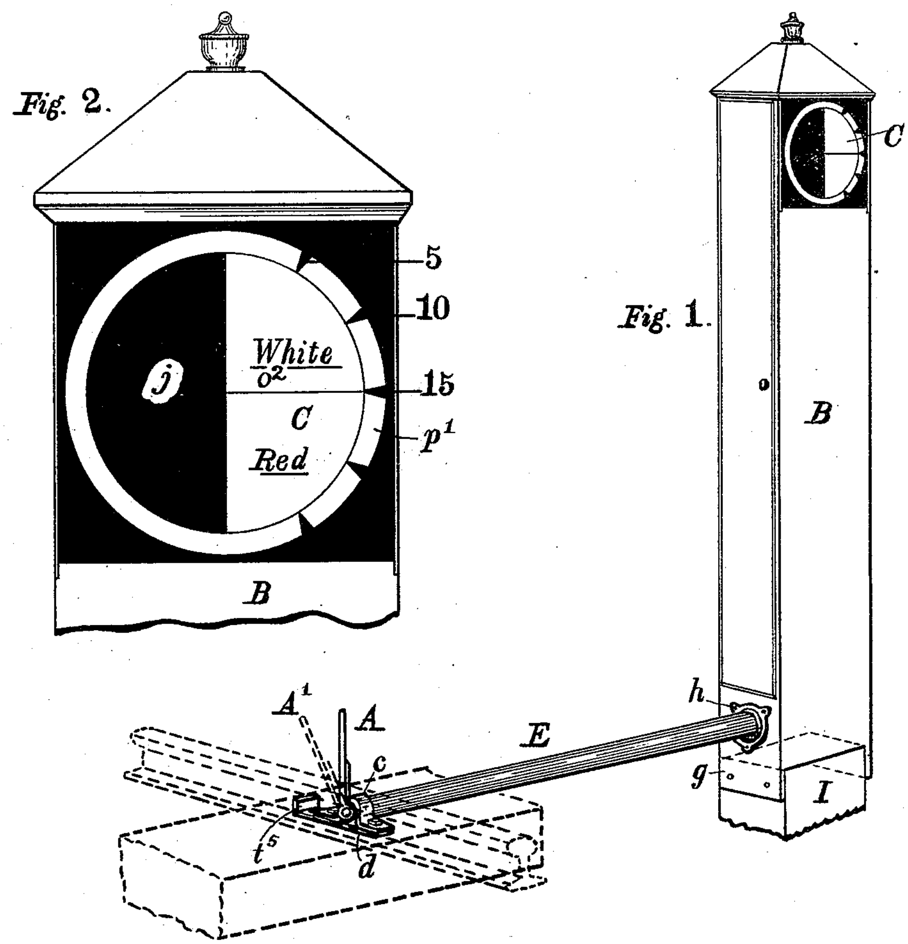
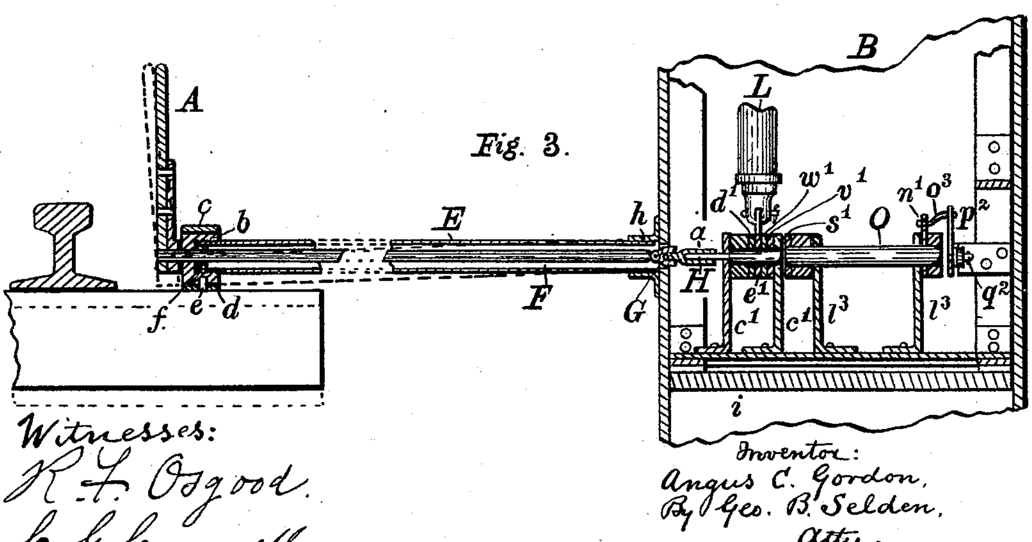
(No Model.) 4 Sheets—Sheet 1.

A. C. GORDON.

RAILWAY TIME SIGNAL.

No. 526,032. Patented Sept. 18, 1894.





Witnesses:
R. F. Osgood.
C. G. Craunell

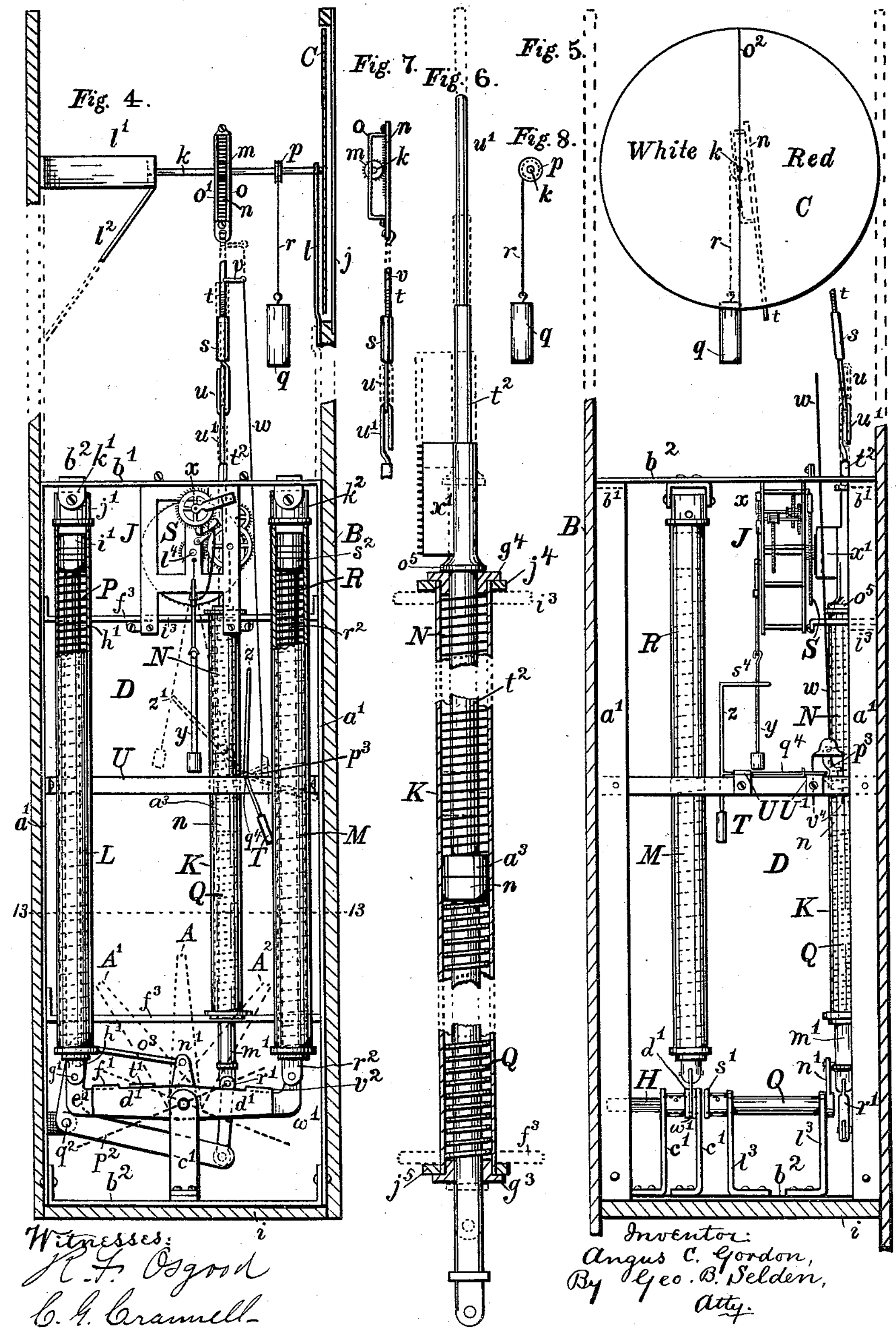
Inventor:
Angus C. Gordon,
By Geo. B. Selden,
Atty.

(No Model.) 4 Sheets—Sheet 2.

A. C. GORDON.

RAILWAY TIME SIGNAL.

No. 526,032. Patented Sept. 18, 1894.



Witnesses:
H. F. Osgood
C. G. Crannell

Inventor:
Angus C. Gordon,
By Geo. B. Selden,
Atty.

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A. C. GORDON.

RAILWAY TIME SIGNAL.

No. 526,032. Patented Sept. 18, 1894.

Fig. 9.

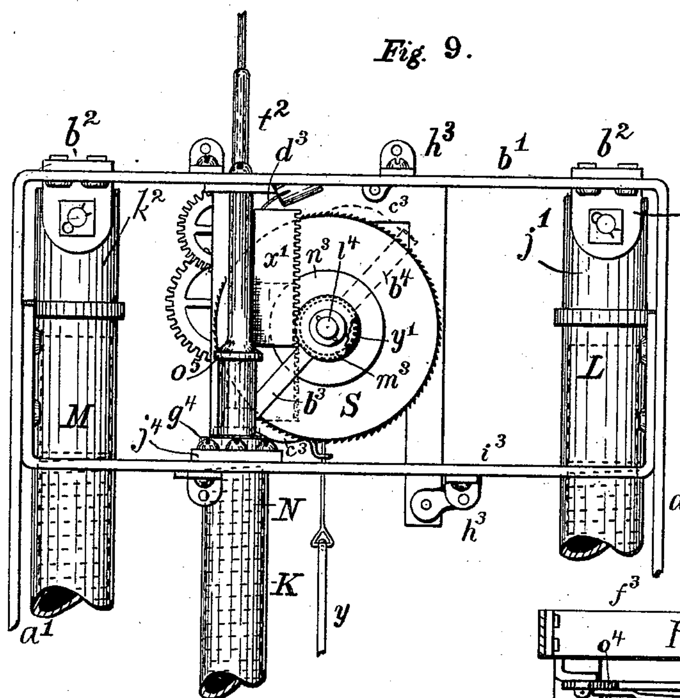


Fig. 10.

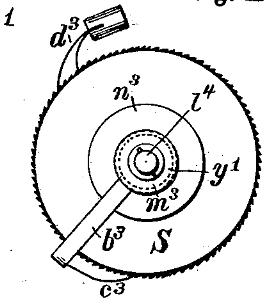


Fig. 11.

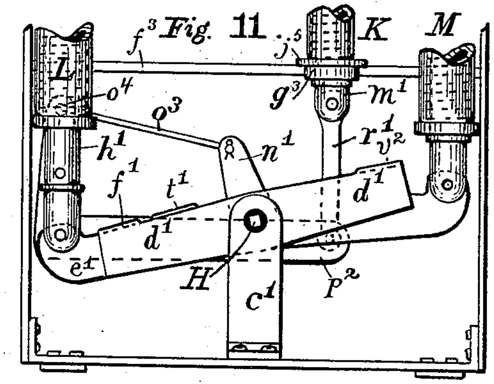


Fig. 13.

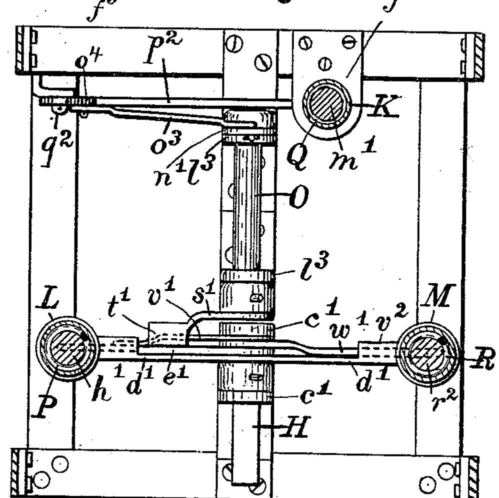
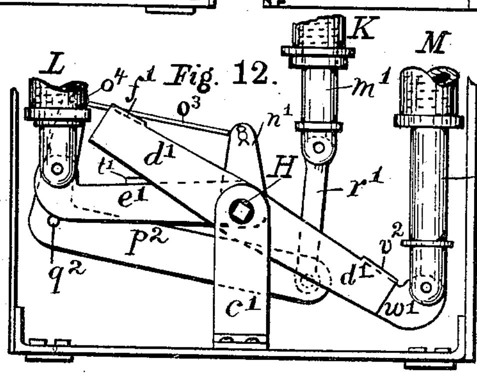


Fig. 12.



Witnesses:
R. F. Osgood
C. G. Crannell

Inventor:
Angus C. Gordon,
By
Geo. B. Selden,
atty.

(No Model.)

4 Sheets—Sheet 4.

A. C. GORDON.

RAILWAY TIME SIGNAL.

No. 526,032. Patented Sept. 18, 1894.

Fig. 14.

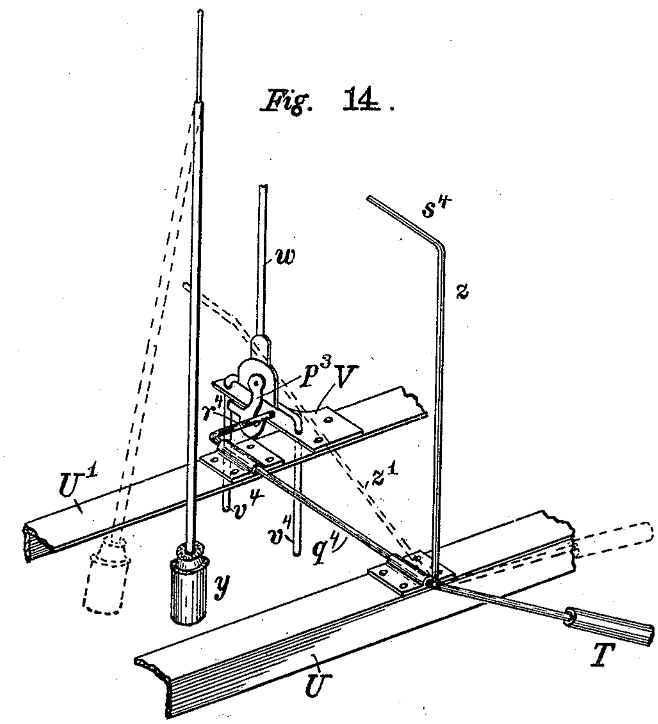
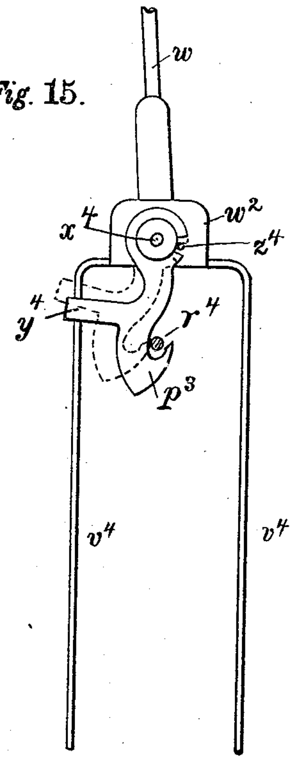


Fig. 15.



Witnesses:
R. L. Osgood.
C. G. Crannell

Inventor:
Angus C. Gordon.
By Geo. B. Selden,
Atty.

UNITED STATES PATENT OFFICE.

ANGUS C. GORDON, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE GORDON RAILWAY SIGNAL COMPANY, OF DENVER, COLORADO, AND ROCHESTER, NEW YORK.

RAILWAY TIME-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 526,032, dated September 18, 1894.

Application filed July 26, 1893. Serial No. 481,489. (No model.)

To all whom it may concern:

Be it known that I, ANGUS C. GORDON, a citizen of the United States, residing at Rochester, in the county of Monroe, in the State of New York, have invented certain new and useful Improvements in Railway-Signals, of which the following is a specification, reference being had to the accompanying drawings.

My present invention relates to certain improvements in that class of railway signals described in my Patent No. 493,083, dated March 7, 1893, which improvements are fully described and illustrated in the follow specification and the accompanying drawings,—the novel features thereof being specified in the claims annexed to the said specification.

In the accompanying drawings, representing my improved railway signal—Figure 1 is a perspective view. Fig. 2 is an elevation of the dial or indicator. Fig. 3 is a central longitudinal section of the connection between the operating lever and the signal post. Fig. 4 is a front view of the signal mechanism. Fig. 5 is a side view of the same. Fig. 6 is a vertical section showing the clock-spring and the intermediate spring. Fig. 7 is a side view of the rack and pinion for controlling the operation of the dial or pointer. Fig. 8 is a side view of the pulley and weight on the dial-shaft. Fig. 9 is a rear elevation of the clock-mechanism. Fig. 10 represents the ratchet detached. Fig. 11 is a front elevation of the signal mechanism, representing the position of the parts when the operating lever is moved by a passing train. Fig. 12 is a similar view, showing the position of the parts when the lever is moved in the reverse direction. Fig. 13 is a section on the line 13—13, Fig. 4, showing the parts below that line. Fig. 14 is a perspective view of the clock-starting mechanism. Fig. 15 is an elevation of the hook or latch.

My improved railway signal consists essentially of an arm or lever A, a suitable upright standard or support B, preferably made hollow, inclosing the signal operating mechanism D, and supporting a revolving disk, indicator or pointer C, and a suitable connection E, between the operating arm or lever and the signal mechanism. The arm A is arranged in suitable relation with the track so that it is struck and moved by the pilot or some other projecting part of a locomotive or train,—which movement is transmitted through the connection to the signal mechanism to operate the disk which is controlled by a clock mechanism so as to furnish to the engineer of the next succeeding train information as to the length of time that has elapsed since the preceding train passed the point at which the signal is located. These signals being arranged at suitable distances apart,—say one mile—along the line of track, will warn the engineer of a train by their successive indications if he is gaining on the preceding train, and enable him to keep at such a distance behind it as to preclude the possibility of accident. A suitable arrangement of the signal, connection and operating lever is represented in Figs. 1 and 3, in which the arm A is arranged in an upright or nearly upright position a short distance outside one of the track rails, being attached to the end of the rod F, the inner end of which is provided with a universal joint G, having a socket, *a*, Fig. 3, which fits the squared end of a shaft H, which transmits the movement of the operating lever and rod to the signal mechanism. The movement of the lever in operating the signal is represented by the dotted lines A′. Provision is made for allowing the lever to move in the opposite direction, as indicated at A^2, Fig. 4, without operating the signal, in case a train backs up past the signal. The rod F is inclosed within a tube E, which is supported at one end on one of the ties and at the other end is inserted in a suitable socket on the standard. The end of the rod F passes through a cap *b* screwed on the tube E and held in place by a strap *c* bolted or otherwise secured to the tie. A plate *d* is inserted between the strap *c* and the tie,—a pin *e* being employed to prevent the tube from turning on its axis. At the inside of the cap *b*, the rod is provided with a collar *f*, which prevents endwise movement of the rod. At the end of the tube next the box or standard the tube is inserted in a suitable socket *h*, which may be provided with any suitable packing, to exclude dust, rain or snow.

The universal joint G permits the settling of the track, as indicated by the dotted lines in Fig. 3, without interfering with the transmission of the movement of the lever A to the signal mechanism.

The standard, box or case B, which supports the signal mechanism proper, is mounted on a post I, inserted in the ground, at a suitable distance from the track. The sides g of the case project downward over the end of the post and are secured thereto by bolts or screws,—the base or partition i, Fig. 3, resting on the top of the post.

In Figs. 1 and 2 of the accompanying drawings the dial is represented as indicating that the preceding train has passed the station at which the signal is located fifteen minutes before the time of the observation. One half of the face of the disk is colored red, and the other half white. Any other suitable colors may be employed. The dial is protected by a glass plate j which is covered or partially rendered non-transparent, so that only one-half of the disk can be seen,—preferably the right hand side. The disk is given a constant tendency to turn from right to left by the weight q, Figs. 4, 5 and 8, cord r and pulley p on the disk shaft k. This tendency is overcome by the pull of the spring N, Figs. 4, 5, and 6, which pulls the rod t downward and revolves the disk by means of the rack n and pinion m on the disk shaft, Figs. 4 and 7. The spring N is strong enough to lift the weight q, to overcome the frictional resistance and also to drive the clock-work J. When a train passes the spring N is compressed, the weight q is permitted to turn the disk, so as to display the red portion thereof and the clock-work is set in motion so as to regulate the expansion of the spring N and the length of time required while the disk is changing from red to white. When the white portion of the disk is displayed but no portion of the red, the engineer knows that half an hour, (or other given limit of time) has elapsed since the last train passed the signal. If the disk shows both white and red, the engineer knows the time since the signal was operated, by the angular position of the dividing line, o^2, Fig. 3, between the differently colored portions of the disk. The determination of the time is facilitated by figures or other marks placed around the dial, or, as in the arrangement shown, by the notches 5, 10, 15 in the white circle p' surrounding the disk. The white sector shows very prominently between the black and red, and enables the engineer to ascertain the time at a glance. A ratchet mechanism is interposed between the spring N and the clock-mechanism, so that the latter is not affected during the compression of the spring.

The movement of the operating lever A is transmitted to the spring N in the following manner: The lever swings from A to A' and compresses the spring P, Fig. 4 which permits the spring Q, Figs. 4 and 6, to compress the spring N. The spring P is stronger than the spring Q, and, as soon as the lever is released from the pilot or other projecting part of the passing train, the spring P returns the lever to its normal position and compresses the spring Q. When the spring Q expands, it compresses the spring N,—and this remains compressed except as it is allowed to expand slowly under the control of the clock-work. Provision is made for starting the clock-movement at the time the signal is set.

Proceeding to a more detailed description of the mechanism employed in my improved railway-signal, it will be observed that the signal mechanism proper D is supported by a metallic frame a' b' b^2 contained within the standard or case B,—which frame may be made removable, if desired, being secured in place by screws or bolts. The shaft H, which receives the motion of the lever A through the rod F, is supported by suitable standards c', and is provided with an arm d' which extends outward and is provided with a lip f' which projects over the lever e', which is pivoted to turn on the shaft H and jointed at g' to the rod h', which extends inside the tube L, which incloses the spring P. At its upper end the rod h' is provided with a piston i' which slides freely in the tube and bears against the upper end of the spring. A head or cap j' on the upper end of the tube is pivoted to a lug k' attached to the frame-work so that the lower end of the tube can swing when the arm e' is turned on the shaft H. At its lower end the tube L is provided with a cap through which the rod h' slides,—a suitable stop or collar being provided on the rod. The cap j' may be provided with an air-valve opening inward and permitting the air in the tube to escape slowly when the piston i' rises,—thereby forming a cushion to control the expansion of the spring.

O is another shaft, arranged in the same axial line with the shaft H but independent of it. The shaft O is supported in the arms l^3. At one end the shaft O is connected with the rod m' which enters the tube K which incloses the springs N and Q, by the crank n', rod o^3, bell-crank lever p^2, and link r'. The rod o^3 is pivoted to the bell-crank lever p^2 at o^4, Fig. 11, and the bell-crank lever is pivoted to a suitable lug at q^2. At its other end, the shaft O is provided with an arm s', Fig. 13, which has a lip t' which projects over the arm v', which at its outer end is riveted to the lever e'. The arms v' and e' turn together on the shaft H. The arrangement is such that as the lever d' swings, (see Fig. 11,) the lug f' thereon forces down the arm e', compressing the spring P by the rod h', and the arm s' moves down with the lever d' until the rod m' has been drawn within the tube or barrel K by the spring Q, as far as it can go. This movement permits the spring Q to compress the spring N, but it will be perceived that as the operating arm A returns to its normal upright position, the spring P overcomes the resistance of the spring Q, and compresses it. The rod m' is provided with a head or plunger, n, Figs. 4, 5, and 6, against which the upper end of the spring Q bears. It will be also understood that the parts are so proportioned and the spring P is made of such a length, that the arm A can travel farther than is necessary to allow the spring Q to expand,—the arm s' moving only until the collar on the rod m' arrives at the head on the tube K. This arrangement permits the arm A to free itself from the pilot or other projection on the locomotive or train by which it is operated, since it can swing until it occupies a horizontal position. The release of the spring Q and the consequent compression of the spring N, which operates the signal, is effected during the first part of the movement of the lever A,—the further movement of the lever serving to adapt it to clearing itself from pilots of different heights from the rails. The spring P when it expands compresses the spring Q, operating through the lever e' and arm v', the lug t' on the arm s', the shaft O, and the arms, lever and connections n', o^3, p^2, and r'. The positions of these parts when the spring Q is compressed are shown in Figs. 4 and 12, and when the spring Q is expanded, by the compression of the spring P by the operating lever, are represented in Fig. 11. It will be understood, from the last mentioned figure, that the lip t' on the arm s', will be arrested in its movement when the collar on the rod m' comes in contact with the head q' on the tube K, while the lever e' can travel beyond its position as shown in Fig. 11, if the arm A receives sufficient motion to cause it to do so. The construction shown enables me to put the mechanism in a compact space, but it will of course be understood that any other suitable arrangement by which the spring P controls the spring Q may be adopted.

If a locomotive or train backs past the signal the operating lever will be moved from A to or beyond A^2, Fig. 4. To permit this movement and to restore the lever to its normal upright operative position, I employ the spring R in the tube or barrel M, Fig. 4. The arm d' extends in both directions from the shaft H, and is provided with a lip v^2 which reaches over the lever w' pivoted on the shaft. The lever w' is pivoted to the lower end of the rod r^2 which extends through the head into the tube M and is provided above the spring R with the piston s^2. When the lever A is moved in the direction of A^2, the arm d' moves with it, and the lug v^2 forces the arm w' down with it, drawing down the rod r^2 and compressing the spring R. This movement is represented in Fig. 12. At the same time it will be observed that the spring P is unaffected,—the lip f' lifting off the arm e'. The expansion of the spring R restores the lever A to its normal position. It will be understood that both the tubes L and M are pivoted at their upper ends, so that their lower ends can swing as required by the movements of the arms e' and w'.

As already stated, the expansion of the spring Q compresses the spring N, and this movement is utilized to change the signal-disk from white, or from red and white, to red, and to start the clock in operation,—the expansion of the spring N driving the clock for a limited period of time. The expansion of the spring Q raises the rod t^2, and the weight q is then permitted to turn the disk to display red only. This movement also operates the clock-starter z, Figs. 4, 5 and 14, through the rod w,—the power for this purpose being furnished by the weight q. The upward movement of the rod t^2 also raises the rack x', Fig. 9 which, by means of a pinion y', and ratchet wheel S, actuates the clock-movement during the descent of the rod t^2 caused by the expansion of the spring N. The rod t^2 is provided at its lower end with a piston, a^3, Fig. 6, against which the lower end of the spring N bears. When the spring N is compressed, the rod and piston rise upward in the tube, and the rack x' turns the pinion y', which through the arm b^3 and pawl or spring c^3, engages with the ratchet S, and so puts the spring N in connection with the clock-movement that it will be driven while the spring expands. The arm b^3 swings from b^3 to b^4, Fig. 9, as the rack descends and drives the clock. The pinion y' is independent of the ratchet-wheel S, except as it drives it when the rack descends,—by means of the arm b^3 and pawls c^3. The ratchet wheel is provided with a spring, springs or pawl, d^3, Fig. 9, to prevent backward motion. This device is supported by the frame-work in any suitable manner. The ratchet-wheel S transmits its movement, through a suitable train of gearing to the escapement wheel x, Figs. 4 and 5, and this through a suitable escapement, actuates the pendulum y. It should be observed that a clock-work provided with a balance wheel may be employed. The frame-work of the clock is supported from the frame of the signal mechanism in any suitable manner,—as by the arms or braces h^3, Fig. 9, attached to the cross-bar b', and at the lower part of the frame, to a cross-bar i^3, Fig. 9. The bar i^3 also supports the upper end of the tube K, which incloses the springs N and Q,—a head g^4 being screwed into the tube, bearing against the perforated lug j^4 attached to the bar. In a similar manner the lower end of the tube is supported by the bar f^3 by means of the head g^3 and perforated lug j^5, Fig. 6. The pinion y' revolves on a central stud l^4, Figs. 4, 9 and 10, which extends through the clock-frame. The pinion is provided with the circular plates m^3 and n^3, which project on both sides of the rack x' and serve to guide it in its up and down movements from turning axially with the rod t^2. The arm b^3 is attached to the pinion y', and rotates with it, shifting from b^4 to b^3, Fig 9, when the rack x' goes up, and back again when it goes down, turning the ratchet-wheel S at this time. The ratchet wheel is connected with the escapement wheel by any suitable train of gearing. There is no spring in the clock-work proper,—the train of gearing is driven by the expansion of the spring N, acting through rod t^2, rack x', pinion y', arm b^3, and ratchet-wheel S. In the construction shown, the parts are so proportioned that the spring N expands and the rack x' descends in one-half hour,—this amount of time being employed in changing the disk from red to white. The clock-work may be arranged for any other suitable limit of time. Such limit may be ten, fifteen, twenty minutes, or any other desired period. A collar o^5, Figs. 6 and 9, on the rod t^2 arrests the expansion of the spring N by coming in contact with the head g^4, on the end of the tube K. At its upper end the rod t^2 is provided with a hook u', Figs. 5 and 7. This hook engages with a corresponding hook u, on the lower end of the rod t, which is attached to the rack n, which meshes with the pinion m on the disk-shaft k. The effect of this arrangement is that when the rod t^2 is shoved upward, by the expansion of the spring Q, the hook u' moves upward in the hook u, and allows the weight g to change the disk gently, by means of the cord r and pulley p, which rotate the disk-shaft k, and raise the rack n, drawing the hook u upward as far as the hook u' will allow it to go. A turn-buckle or threaded socket s between the rod t and the hook u permits the length of the rod to be adjusted, so that the movement of the disk may be exactly regulated, and the line o^2 between the white and red portions caused to register accurately with the edge of the obscured portion j of the dial. The hooks u and u' are made of a length somewhat greater than the travel of the rod t^2, so that they cannot become disconnected.

The upward movement of the rod t is caused to operate the clock-starter and to give the pendulum its first impulse in the following manner:—The rod t carries an arm v to which the rod w, Figs. 4, 14 and 15, is attached, and this rod is provided with a hook or latch, p^3 at its lower end, which as the rod t rises, swings the clock-starter-arm z from z to z', Fig. 4, and sets the pendulum y into vibration. The arm z is provided with an offset s^4 which projects into the path of the pendulum. The arm z is mounted on a rock-shaft q^4, provided with an arm r^4, Fig. 14, with which the hook p^3 engages. As the hook rises, the arm r^4 is lifted, the rock-shaft q^4 turns, and the arm z swings to z', bringing the offset s^4 against the pendulum, which thus receives its first impulse. The arm z is provided with a counterbalance T, which restores it to place in its upright position.

The rock-shaft q^4 is supported in suitable boxes on the bars U U', or in any other suitable way. V, Fig. 14, is a table or platform, attached to the bar U' which serves to receive the rods v^4, and also to limit the return movement of the arm r^4, and consequently the movement of the starter arm z. The movement in the opposite direction is limited by the weight T coming against one of the cross-bars of the frame, as indicated by the dotted lines in Fig. 4. At its lower end the rod w is provided with a plate w^2, to which the guides v^4 are attached, and to which the hook p^3 is pivoted, at x^4, Fig. 15. The hook is provided with a counterweight y^4 Fig. 15, and a pin or stop z^4 serves to limit its movement in either direction. The action of the hook p^3 in engaging as it descends with the arm r^4, is represented by the dotted lines in Fig. 15. It will be understood that as the hook rises, the end of the arm r^4 swings out of its engagement with it.

To recapitulate the successive operations of my improved railway-signal; the lever A is swung towards A' by the passing train. This movement transmitted through the arm d', e', and rod h' compresses the spring P. This movement also allows the spring Q to expand, acting through the arm s', rock-shaft O, and the connections between the rock-shaft and the rod m'. The expansion of the spring Q compresses the spring N, raises the rod t^2, the hook u', and allows the weight q to shift the disk from white to red, such movement raising the rod t and fully engaging the hooks u and u'. The upward movement of the rod t^2 also swings the arm b^3 and engages the pawl c^3 with the ratchet wheel S, so that the spring N drives the clock during its expansion, and the upward movement of the rod t operates the clock-starter, by swinging the arm z into the path of the pendulum y, or into the path of a pin or projection on a balance-wheel, if the latter be used instead of the pendulum. The operating lever may also be placed close to the rail, so as to be actuated by that portion of the flange of the wheel which projects beyond the rail. I have used this construction for a considerable period of time with perfectly satisfactory results. In this case, the signal is operated by the front wheel of the locomotive,—the other wheels of the train simply depressing the lever without affecting the signal mechanism. In this case the lever may be inclined slightly in the direction in which the train passes, or its upper end is beveled, to facilitate the impact of the wheel. The arm may also be beveled on the opposite side, to provide for the case when the train backs up.

I claim—

1. In a railway signal, a clock operated by a spring, a spring arranged to be compressed by a passing train, a rotating signal-disk, a weight or spring to actuate the disk, and a jointed or sliding connection between the clock and the disk, substantially as described.

2. The combination, in a railway signal, of the clock-work D, its operating spring N, arranged to be compressed by a passing train, the signal-disk C, and the jointed or sliding connection t t^2 between the clock and the

shaft of the signal disk, substantially as described.

3. The combination, in a railway-signal of the clock-mechanism D, its operating spring N, arranged to be compressed by a passing train, the signal disk C, a weight or spring for actuating the same, and the jointed or sliding connection $t\ t^2$ between the clock and the shaft of the signal disk, substantially as described.

4. The combination, in a railway signal, of the clock mechanism D, its operating spring N, arranged to be compressed by a passing train, the signal disk C, a weight or spring for actuating the same, and the connecting rods $t\ t^2$ provided with interlocking hooks u u', substantially as described.

5. The combination in a railway signal of the clock-work operated by a spring, the spring arranged to be compressed by a passing train, a rotating signal disk, a weight or spring to actuate the disk, a jointed or sliding connection between the clock and the disk, and a clock-starting device operated by the mechanism which actuates the disk, substantially as described.

6. The combination, in a railway signal, of the clock work operated by a spring, the spring arranged to be compressed by a passing train, a rotating signal disk, a weight or spring for actuating said disk, a jointed or sliding connection, as $t\ t^2$, between the clock and the disk, a clock-starter z, and a connection, as w, between the clock-starter and the mechanism which operates the disk, substantially as described.

7. The combination, in a railway signal, of the clock work, a spring for operating the same arranged to be compressed by a passing train, a rotating signal disk, a weight or spring for actuating said disk, a jointed or sliding connection $t\ t^2$ between the clock and the disk, a pivoted clock starting arm z, the rod w attached to connection t, and having hook p^3, adapted to engage with and operate the clock-starting arm, substantially as described.

8. The combination, with the intermittently-running clock-work of a railway signal, of a movable signal and mechanism for operating the same, the clock starter, as z, arranged to be operated from the signal moving mechanism by a connection provided with a hook adapted to engage with the clock-starter, substantially as described.

9. In a railway-signal, a clock movement, a spring to operate it, a spring adapted to be compressed by a passing train, an intermediate spring stronger than the first named, and adapted to act against it, and to act with that compressed by the train, whereby said intermediate spring cooperates with the train and compresses the clock-spring, and an operating lever, arranged to move in one direction to operate the signal, and in the opposite direction without operating the signal, substantially as described.

10. The combination, with the clock movement and movable disk of a railway signal, of the operating lever A, the springs P Q and N, suitable connecting mechanism, and the spring R, which permits the reverse motion of the operating lever, substantially as described.

11. The combination, with the clock-movement and movable disk of a railway signal, of the operating lever A, spring P, levers d' and e', and spring R and lever w', substantially as described.

12. The combination, with the clock movement and movable disk of a railway signal, of the springs P, Q and N, the tubes K and L, and the spring R and inclosing tube M, substantially as described.

13. The combination, in a railway signal, of the clock-movement and its operating spring N the stronger spring Q, the spring R, operating lever A, and connection F, provided with universal joint G, substantially as described.

14. The combination, in a railway signal with the clock movement, and its operating spring N, the stronger spring Q, the spring R, operating lever A, connection F, tube E inclosing the connection, and the universal joint G, substantially as described.

15. The combination, in a railway signal, of the clock mechanism D, its operating spring N, arranged to be compressed by a passing train, the signal disk C, a weight or spring for actuating the same, the jointed or sliding connection $t\ t^2$ between the clock and the shaft of the signal disk, and means, as s, for adjusting the length of the connection, substantially as described.

16. The combination in a railway time-signal, of a clock-mechanism, a spring for operating the same arranged to be compressed by a passing train, a movable arm operated by the train and devices for transmitting the movement of the arm to the clock-mechanism, the revolving disk regulated by the said clock-mechanism and provided on its face with two different colors separated by a diametric line, and a fixed semicircular cover which permanently conceals one-half of the said disk, whereby the lapse of time is indicated by the progressive increase of the angle between the diametric line separating the different colors on the disk and the edge of the fixed cover, substantially as described.

ANGUS C. GORDON.

Witnesses:
GEO. B. SELDEN,
C. G. CRANNELL.