To all whom it may concern:

Be it known that I, HENRY A. HOESCHEN, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Railway-Signal-Actuating Mechanism, of which the following is a specification.

My invention relates to railway signal actuating mechanism of the class shown in United States Letters Patent No. 600,420, issued to me March 8, 1893.

It is the object of my present invention to provide certain improvements in the mechanical details of the mechanism shown in the said Letters Patent; to provide means for protecting the motor-spring from over-winding, and means adapting the mechanism to be controlled both mechanically and electrically from two or more points at a distance from the motor.

Further and minor objects of my invention will be pointed out hereinafter.

In the accompanying drawings, Figure 1 is a front view, partly diagrammatic, of the principal operating parts of a signal-actuating mechanism embodying my invention, and Fig. 2 is a partial side view of the same.

In the preferred embodiment of my invention, the power necessary for the operation of all the signaling mechanism is obtained either directly or indirectly by utilizing the weight of cars or engines which pass over the railway track, to depress certain portions of the track, and then, by means of suitable connecting mechanism, communicating to the signal mechanism such movement of the track. For this purpose, certain portions of the rails 1 at positions adjoining the signaling devices are arranged so as to lie normally slightly above the ties 2 which rest upon the roadbed. I have found that in practice a clearance space of about a quarter of an inch between the tie and the rail will give sufficient movement to the signal connections and will not appreciably impair the stability of the track. The amount of clearance between the rail and ties is reduced gradually at each side of the point from which the movement of the rail is transmitted to the signal mechanism, so that while a portion of the rail several feet in length will be normally out of contact with the ties, yet a bending of the rail sufficiently to force it into engagement with the ties will not cause a permanent flexure of it. A further advantage of such an arrangement is that when a car passes over the track, even at a very high speed, the depression of the rail is gradual, so that sudden hammer-like blows of the wheels upon the connecting mechanism is avoided.

Referring to Fig. 1, the movement of the rail 1 is received by the horizontal arm of a bell-crank 3 which is fulcrumed on suitable pendant lugs 4 near the end of a horizontally disposed tubular housing 5. The spring end of the housing 3 is connected with the ties 2, and the vertical arm of the bell-crank extends up through a slot in the lower side of the housing. The opposite end of the housing 5 is connected with the base portion of the hollow post or column 6 which supports the signal mechanism. The base portion only of said column is shown in Fig. 1, but it will be understood that the same is extended to a suitable height and supports the mechanism illustrated diagrammatically in said Fig. 3, as well as a housing or casing for said mechanism, and a bell, semaphore arm, or other elevated device which it may be desired to actuate by means of said mechanism.

The vertical arm of the bell-crank 3 is connected by means of a rod 7 with the short vertical arm of a bell-crank 8 fulcrumed in a lateral extension of the base portion of the column 6 on the side thereof opposite the housing 5. The end of said lateral extension is closed by a cap 9 which is removably disposed so as to provide access to the bell-crank. The horizontal arm of the bell-crank 8 extends in to about the center of the column, and from the end of said arm a connecting rod 10 extends up through the column to the motor-winding devices.

In the construction shown the motor has a spiral spring 11 of which the inner end is connected with the shaft 12 which is journaled in the motor-frame-plates 13 and 14, as shown in Fig. 2. The outer end of the spring is connected to the gear 15 which is revolvably mounted upon the shaft 12. A ratchet-wheel 16 is fixedly secured to the shaft 12, and adjoining the ratchet-wheel two sector-shaped pawl-plates 17 and 18 are pivotally mounted on the shaft. Each of the pawl-plates carries a plurality of spring...
pressed pawls 19 adapted to engage the ratchet teeth and having a vernier-like arrangement relative to the teeth so that when one of the pawls engages a tooth the others will be successively at increasing distances from engaging position. To the upper corner portions of the pawl-plates 17 and 18 are connected coil springs 20 and 21 which extend upwardly and are connected to the frame. The said springs are normally under a certain tension so as to exert a constant upward pull upon the pawl-plates. To the lower corner portions of the respective pawl-plates are connected the stems of pistons 22 and 23 which fit slidably in small cylinders 24 and 25. The said cylinders are connected with the upper ends of a V-shaped yoke 26 which, in turn, is connected at its lower end with the rod 10. A coil spring 27 is placed in the cylinder 25 between the piston 23 and the cap of the cylinder, said spring pressing the piston toward the bottom of the cylinder. The piston 22 normally engages the cap of the cylinder 24. The upward pull of the springs 20 and 21, being transmitted, through the connections described, to the bell-crank 3, normally holds the horizontal arm thereof in engagement with the rail 1. Now, when the rail is depressed its downward movement is transmitted to the pawl-plates, and the downward movement of the plate 18 is communicated to the ratchet-wheel to turn the same and the shaft 12 and wind up the spring 11; the pawls carried by the plate 17 meanwhile moving backwardly with respect to the ratchet teeth. When the rail 1 returns to its normal position the pawl-plates are pulled upwardly by the springs 20 and 21, and the upward movement of the plate 17 is communicated to and turns the ratchet-wheel, while the pawls on the plate 18 move backwardly with respect to the ratchet teeth.

The strength of the springs 20 is made such that when the motor-spring 11 has been wound to about the desired normal tension, the pull of the motor-spring exerted through the ratchet-wheel will be sufficient to balance the pull of the said springs 20 so that the pawl-plate 17 will not be raised thereby. As a result of this, the winding of the motor-spring will thereafter occur only during the downward movement of the pawl-plate 18, and the lessened winding action thus attained will tend to prevent overwinding of the motor-spring. As a further safeguard against overwinding of the motor-spring, the spring 27 is made of such strength that it will not be materially compressed during a normal winding of the motor, but should the motor-spring reach an abnormal tension then said spring 27 will be compressed during the downward movements of the yoke 26 and the pawl-plate 18 will not be actuated thereby.

The foregoing devices will ordinarily serve to automatically maintain the motor-spring at about a normal tension, since the entire mechanism is so proportioned that the passage over the track of a train of usual length will cause a winding of the motor-spring sufficient to compensate for the unwinding of the spring due to the causing thereby of one set of operations of the signal mechanism. In exceptional cases, however, it might occur that the motor-spring would become overwound as a result of the passage along the track of a number of trains of unusual length, or that the signal mechanism might be repeatedly released by the passage of short trains which would not sufficiently rewind the motor-spring to compensate for the unwinding caused by its actuation of the signals. To provide for such exceptional occurrences I arrange in connection with the motor mechanism a signal which is displayed whenever the motor-spring is placed under an abnormal tension, and also whenever the tension thereof has been lowered to an undesired amount below the normal.

The said signal comprises a disk 28 which is pivotally connected with the front-frame plate 13 and is adapted to fall, when released, through a suitable opening in the motor housing and thus become visible from the outside of the housing. The disk is normally held in a raised position by means of a latch-bar 29 which is pivoted on the frame-plate 13 and which has an upper portion 30 extending above the pivot-pin thereof, as shown. On the shaft 12 is secured a pinion 31 which is provided with a single tooth adapted to mesh with corresponding notches in a cam-disk 52 which is revolvably mounted on the side of the gear 15. Between the notches in the cam-disk are areuate concavities adapted to fit around the smooth portion of the pinion. The construction is such that by relative rotative movement of the shaft 12 and gear 15 the pinion will revolve the cam-disk upon its axis, the disk being advanced one notch for each revolution of the shaft relative to the gear. Thus, when the gear remains stationary and the shaft is turned to wind up the motor-spring the cam-disk will be turned in one direction, and when the shaft remains stationary and the motor-spring, by its unwinding, turns the gear 15, then the cam-disk will be turned in the opposite direction. The position of the cam-disk relative to the gear 15 is thus made to indicate, in effect, the tension of the motor-spring. The cam-disk at one side thereof has a large concavity or recess therein, and the disk is so disposed that when the motor-spring is wound to a normal tension the said recess will be at the side opposite the pinion and adjacent to the periphery of the gear 15. When in this position the gear 15 may turn without the cam-
The gear 15 meshes with a pinion 33 carried by the shaft 34 which is journaled in the frame-plates 13 and 14. The speed of rotation of the shaft 34 is controlled by means of a centrifugal governing device which is connected with the shaft 34 by means of a gear train comprising the gear 35 on the shaft 34, the pinion 36 and gear 37 on the shaft 35, and the pinion 38 on the governor-shaft 40. The governing device comprises a collar 41 fixed to the shaft, a collar 42 slideable on the shaft, weighted toggle-links 43 connecting the collars, a spring 44 disposed between the collars, and an adjusting screw 45 for varying the position of a friction disk arranged to engage a disk 46 carried on the slideable collar 42. The construction and operation of the device will be apparent by reference to Fig. 2.

When the actuating mechanism is to be used to operate a bell or other device requiring a vibrating or oscillating movement, the bell-clapper or the like is connected by means of a member 47 with the end of a lever 48 which is fulcrumed on the frame-plate 13.

The opposite end of the lever is arranged to be engaged by the teeth of a star-wheel 49 secured on the shaft 34, the lever being held in engagement with the star-wheel by means of a spring 50, as shown, and the rotation of the star-wheel imparting to the lever and the member 47 a reciprocating movement.

Upon the front end portion of the shaft 34 is secured a hub 51 and at the end of the hub the same has a radially extending crank-arm 52. The crank-arm is suitably connected, as by means of the flexible member 53, with a semaphore, crossing-gate, switch or other device to which it is desired to impart intermittent movements by means of the actuating mechanism. Several examples of devices which may be operated in the manner described are shown in my former Patent No. 600,420, hereinafore referred to.

Rotation of the shaft 34 is limited and the movements thereof controlled by means of releasable detent-levers 54 and 55 fulcrumed on the frame-plate 13 and adapted to be engaged by radial stop-arms extending from the hub 51. In the construction shown the said hub carries two arms, 56 and 57, which are adapted to engage the detent-lever 54, and a single arm 58 adapted to engage the detent-lever 55. The portions of the detent-levers below the fulcrum thereof are very short, in fact are mere lips on the hubs thereof, and it is these lips which are engaged by the stop-arms. The detent-levers are normally held in a vertical position, being pulled toward such position by means of springs 59 connected thereto and to the frame-plate. The strength of these springs, however, is such that, when the levers are not otherwise held and are engaged by the stop-arms, the pressure of the latter upon the lips will be sufficient to turn the levers upon their fulcrums far enough to allow the stop-arms to pass the lips. Displacement of the detent-levers from vertical position is normally prevented by means of the pivoted latches 60 and 61 which engage the upper ends of the levers, as shown, being held down against stop-pins 62 by means of springs 63. The latches have headed pins 64 and 65 extending upwardly therefrom, and beneath the heads of said pins are extended the ends of the armature-levers 66 and 67 which are pivoted on the standards 68 and are normally held down against the adjusting-screws 69 by means of the springs 70. Beneath the ends of the armature-levers 66 and 67 which are pivoted on the standards 68 and are normally held down against the adjusting-screws 69 by means of the springs 70. Beneath the ends of the armature-levers opposite the latch-pins are positioned the electromagnets 71 and 72 which, when energized, serve to pull down said ends of the levers, thus raising the other ends thereof which engage the latch-pins, lift the latches, and release the respective detent-levers. The armature-levers may be actuated mechanically by means of flexible connections 73 attached thereto, one of said connections being shown in Fig. 1 as extended to a bell-crank 74 similar to the bell-crank 32 and positioned so as to be moved by the depression of the rail 1 when a car passes over the track.

At a position adjoining the rear frame-plate 14 of the actuating mechanism is disposed a magneto-electric generator comprising the permanent magnets 75, coil-cores 76 extending from the poles of the magnets, coils 77 disposed around the said cores, and a pivoted armature 78 arranged so as to be normally in engagement with the ends of the cores 76. The coils 77 are connected in a line-circuit formed through the wires 79 and 80, and the coils are normally shunted by means of a conductor 81 electrically connecting the armature and the wire 79, and a conductor 82 extended from the wire 80 and normally energizing a contact-spring 83 carried by the armature. On the rearward end of the shaft 34 is secured a disk 84, upon the periphery of which are teeth adapted to engage the contact-spring 83 and the end of the pivoted armature 78. As the shaft 34 revolves, the teeth of the disk 84 successively engage and depress the contact-spring 83.
to open the shunt-circuit, and then force the armature away from the ends of the coil cores. This movement of the armature, by making a gap in the magnetic circuit, causes a rapid decrease in the magnetic flux and thus generates an electrical impulse in the coils which is transmitted over the line-circuit to any desired instrument or instruments which may be connected in said circuit. As each tooth of the disk passes out of engagement with the armature, and the same returns to engagement with the cores, a second impulse is generated in the coils, but as the shunt-circuit is reestablished by the releasing of the contact-spring 8 the main part of said second impulse passes through the shunt-circuit instead of the line-circuit. The teeth on the disk 84 may be spaced so as to give any desired sequence to the electrical impulses caused in the line-circuit, so that said impulses when received may constitute a distinctive signal and serve to indicate at the receiving station the operation of the particular actuating mechanism which produced them. The way in which the electrical impulses, produced as above described, may be utilized in practice is shown in detail in Letters Patent No. 1,111,287, issued to me Sept. 22, 1914, the application for said Letters Patent having been divided herefrom and filed Sept. 3, 1912.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a signal actuating mechanism, a spring-motor, a pawl-and-ratchet winding device for said motor, a lever arranged adjoining one of the rails of a railway track and movable by depression of said rail, and means connecting said lever with the motor-winding devices, the said connecting means including a resilient element adapted to yield under a stress sufficient to cause over-winding of the motor-spring.

2. In a signal actuating mechanism, the combination with a railway track, of levers operated by the passage of a load over the track, a spring-motor, pawl bearing means for winding the motor, connections between said means and the levers, and means on said connections for preventing undue winding of the motor-spring.

3. In combination with a depressible rail, a housing secured adjacent to the rail, a bell-crank pivoted on the housing and having one end extending under the rail and operated by the passage of a load over the rail, a second bell-crank operatively connected with the first, a spring-motor, pawl bearing means for winding the motor, a series of connecting devices between said means and the second bell-crank, certain of said devices being slidably joined, and means for automatically rendering the pawl bearing means inoperative when the spring has been wound to a predetermined tension.

4. The combination with a spring-motor shaft-carrying a ratchet-wheel, of a reciprocating element, pawl-bearing members arranged at diametrically opposite sides of the ratchet-wheel, springs by said members and engaging the respective sides of the ratchet-wheel, springs for moving said members in one direction, yielding means connecting one of said members with the reciprocating element, and telescoping means connecting the other member with the reciprocating element.

5. In a device of the class described, a shaft, a gear revolvably mounted thereon, a spiral spring having one end connected with the shaft and the other end connected with the gear, a cam-disk revolvably mounted on the gear, a pinion secured to the shaft and engaging the cam-disk to revolve the same intermittently during relative rotation of the gear and shaft, an indicating device, and a latch controlling said indicating device, the latch being positioned so as to be engaged and released by the cam-disk after the same has been revolved a predetermined amount in either direction from its normal position.

6. In combination with a depressible track-rail, a spring motor, motor-winding devices connected with the track-rail, a shaft driven by the motor, stop-arms carried by the shaft, a detent-lever, means normally holding the lever in position to engage the stop-arms, and means mechanically connected with the depressible rail for releasing the detent-lever from the holding means.

7. The combination in a railway signal actuating mechanism of a depressible track-rail, a motor-shaft, a motor-spring secured thereto, a ratchet-wheel carried on the shaft, a pair of pawl-plates pivoted on the shaft adjoining the ratchet-wheel, pawls carried by said plates and engaging the ratchet-wheel on opposite sides thereof, means connecting the pawl-plates with the rail whereby the depression of the rail will actuate the pawl-plates in one direction, springs connected with the pawl-plates for moving them in the opposite direction, the springs connected with one of the pawl-plates being proportioned so as to approximately balance the pull of the motor-spring when the same is wound to a normal tension, and a spring arranged in the connection between the rail and the other pawl-plate, said spring being proportioned so as to yield when the tension of the motor-spring exceeds the normal.

8. The combination in a railway signal actuating mechanism, of a depressible track-rail, a spring motor, motor-winding devices connected with the track-rail, a shaft driven by the motor, stop-arms carried by the shaft, detent-levers adapted to be engaged by the
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stop-arms to limit movement of the signal-actuating shaft, latches for retaining the detent-levers in fixed position, and electrically-controlled means for releasing each of the latches.

9. The combination with a depressible track-rail of a spring motor, motor-winding devices connected with the track-rail, a shaft driven by the motor, stop-arms connected with the shaft, a detent-lever normally engaging one of the stop-arms, releasing means for disengaging the detent-lever from the stop-arm, electrically controlled means for actuating said releasing means, and means mechanically connected with the depressible rail for actuating said releasing means.

Signed in the presence of two witnesses.

HENRY A. HOESCHEN.

Witnesses:

JOHN A. SCHENK,
ALICE McSHANE.

ALICE McSHANE.