(No Model.) 3 Sheets—Sheet 1.

G. F. FORBES.

AUTOMATIC RAILWAY GATE.

No. 292,641. Patented Jan. 29, 1884.

Fig. 1.

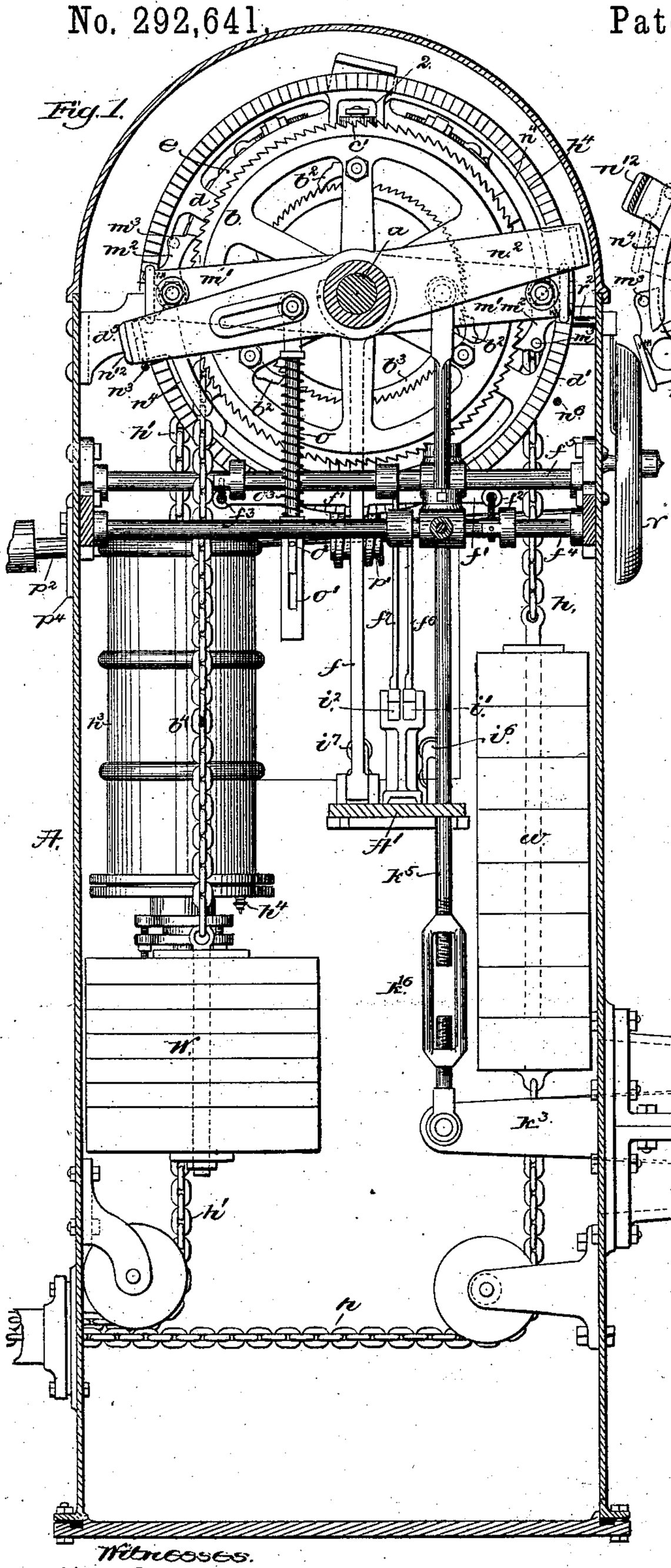


Fig. 6.

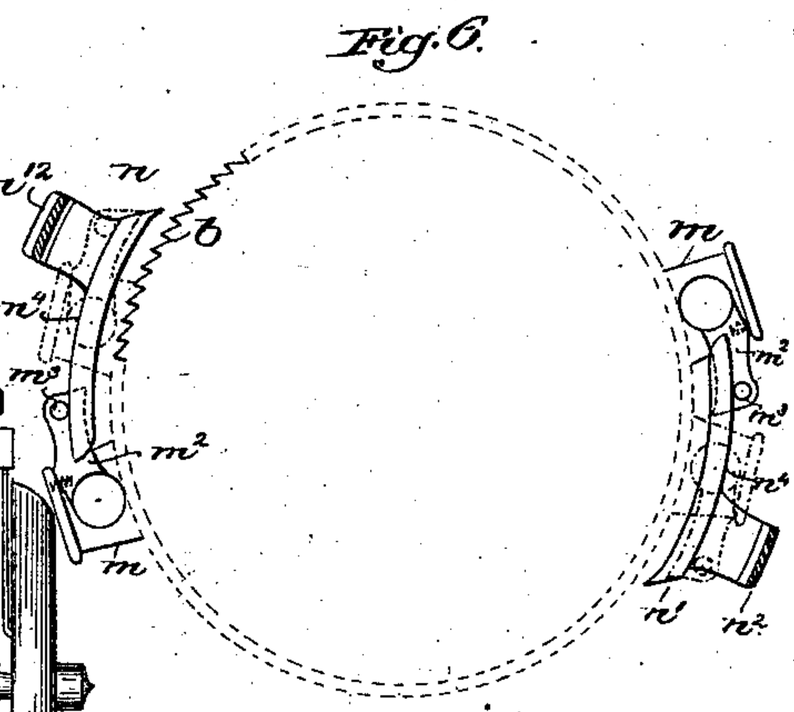
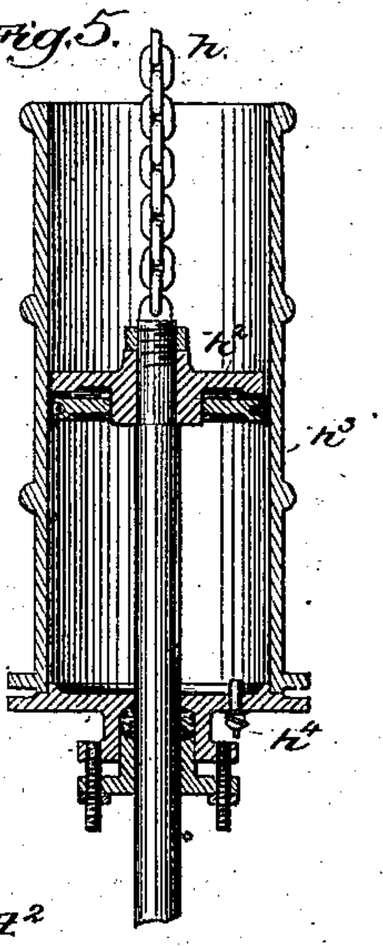


Fig. 5.



Witnesses.
John F. C. Preinkert
Fred A. Powell.

Inventor:
George F. Forbes.
by Crosby & Gregory Attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

G. F. FORBES.

AUTOMATIC RAILWAY GATE.

No. 292,641. Patented Jan. 29, 1884.

Fig. 2.

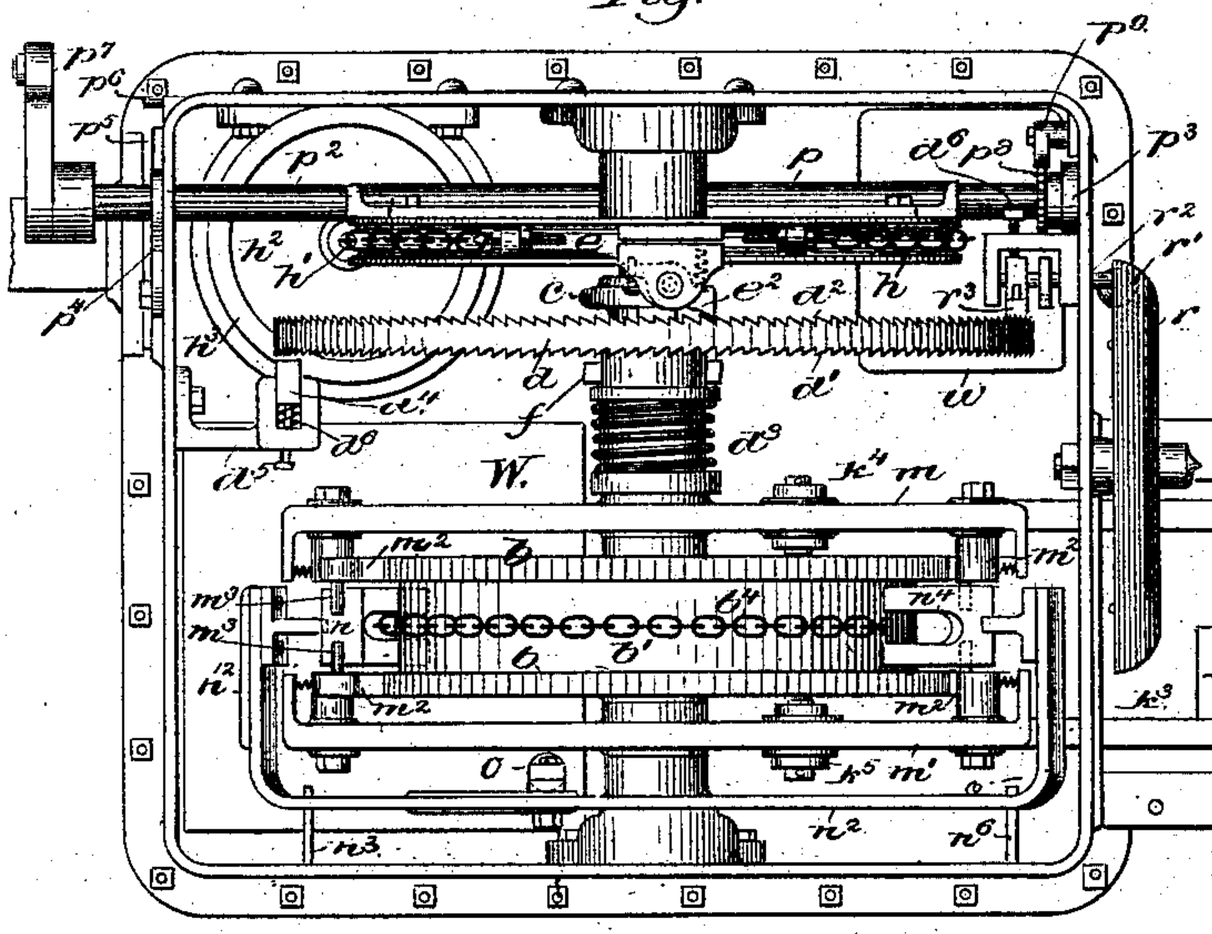
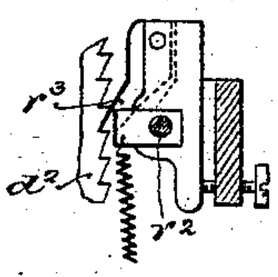


Fig. 10.



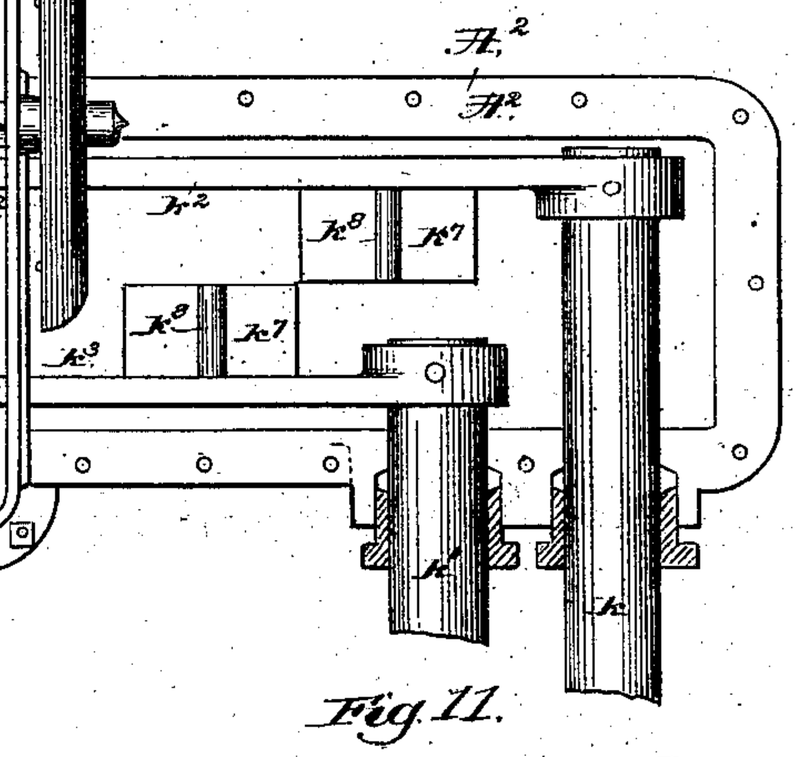
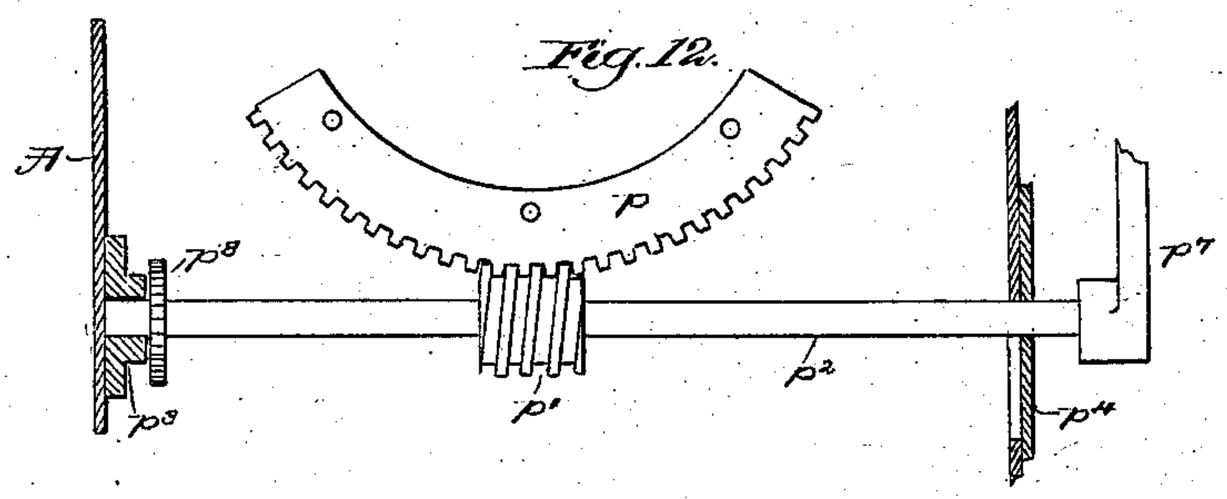


Fig. 11.

Fig. 12.



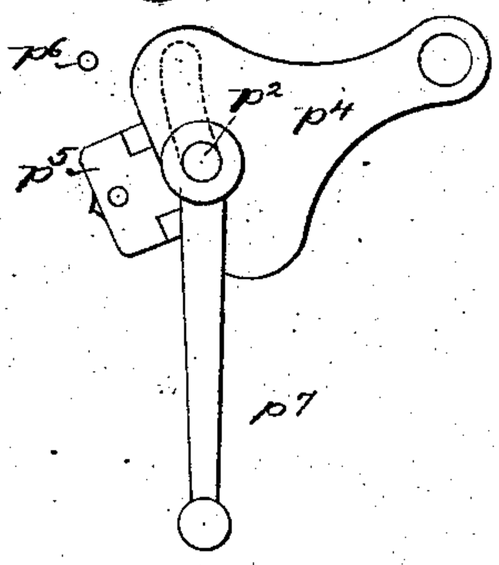
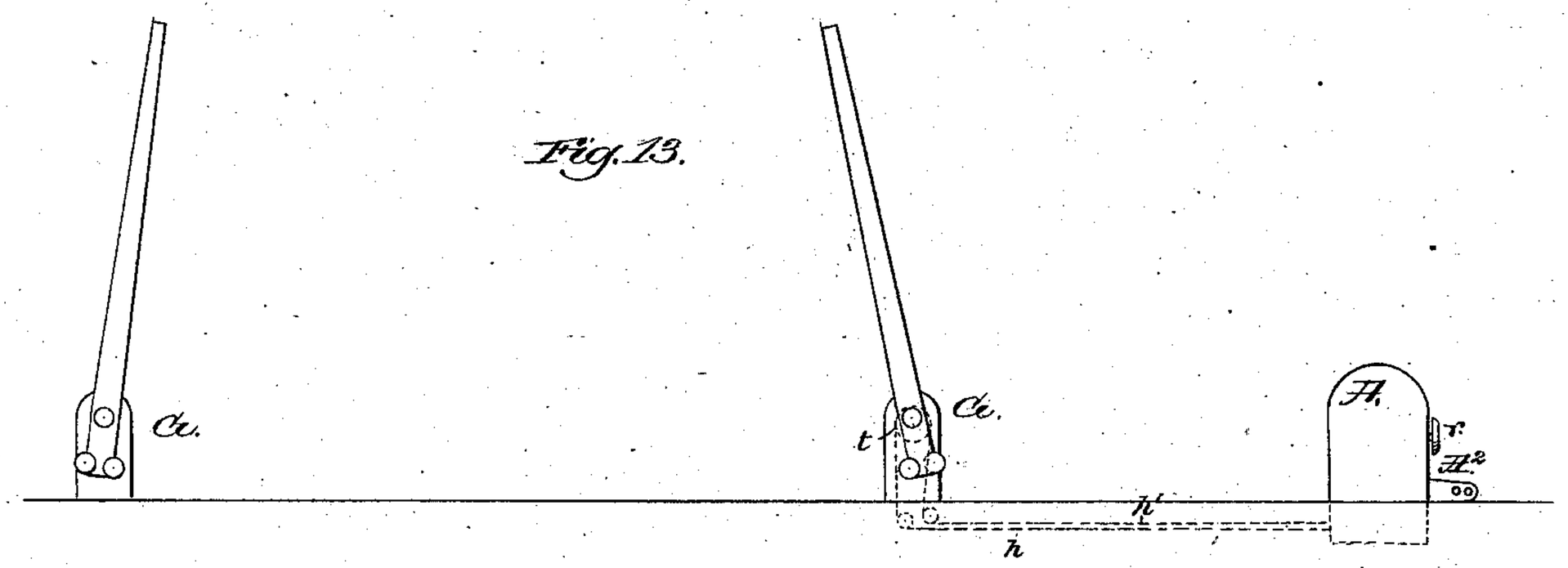


Fig. 13.



Witnesses.
John F. C. Printkert
Fred A. Powell.

Inventor.
George F. Forbes.
by Crosby & Gregory.
Attys.

(No Model.) 3 Sheets—Sheet-3.

G. F. FORBES.

AUTOMATIC RAILWAY GATE.

No. 292,641. Patented Jan. 29, 1884.

Fig. 3.

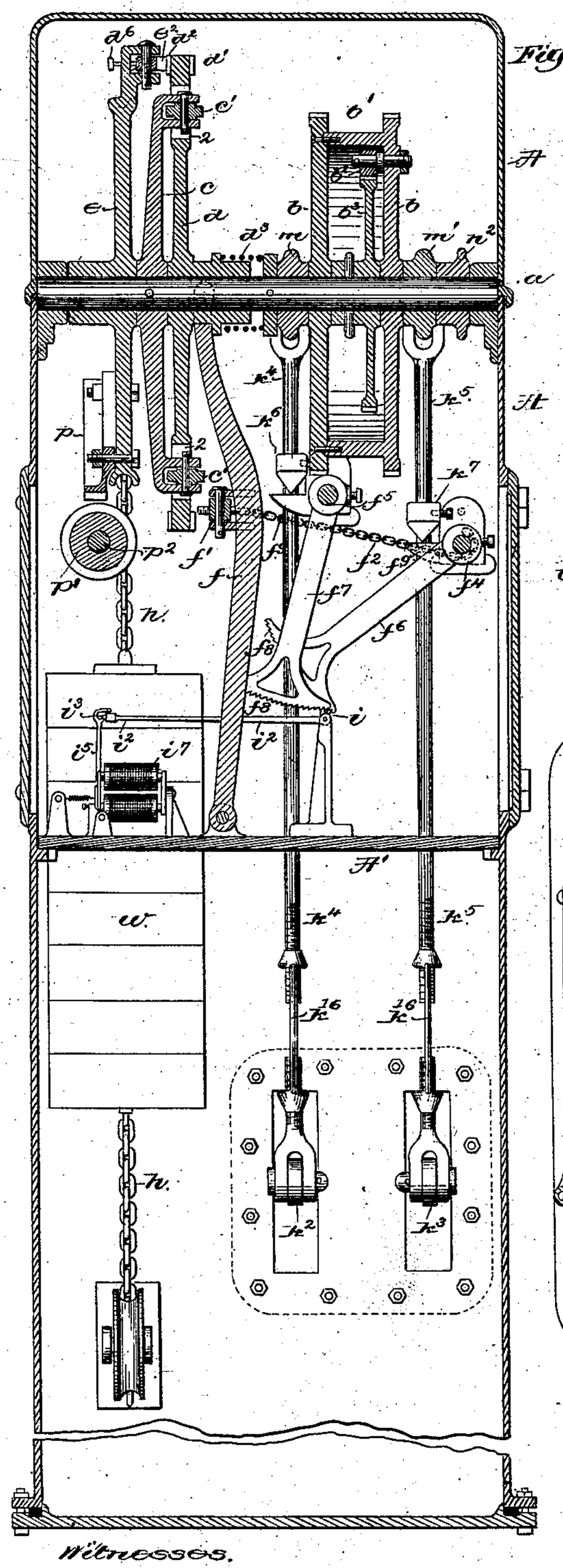


Fig. 7.

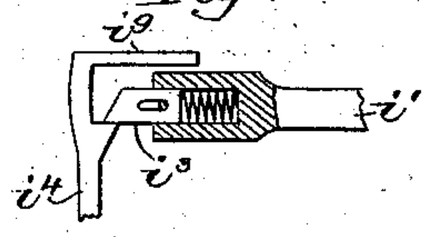


Fig. 8

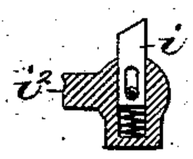


Fig. 9.

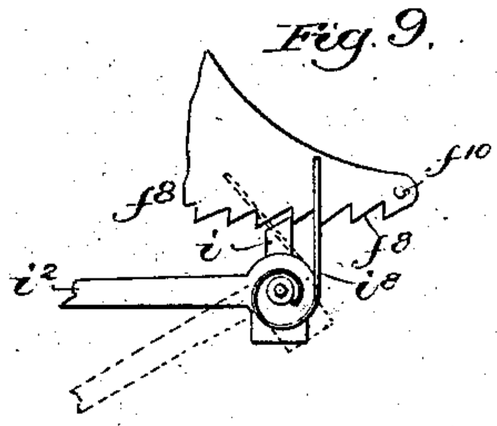
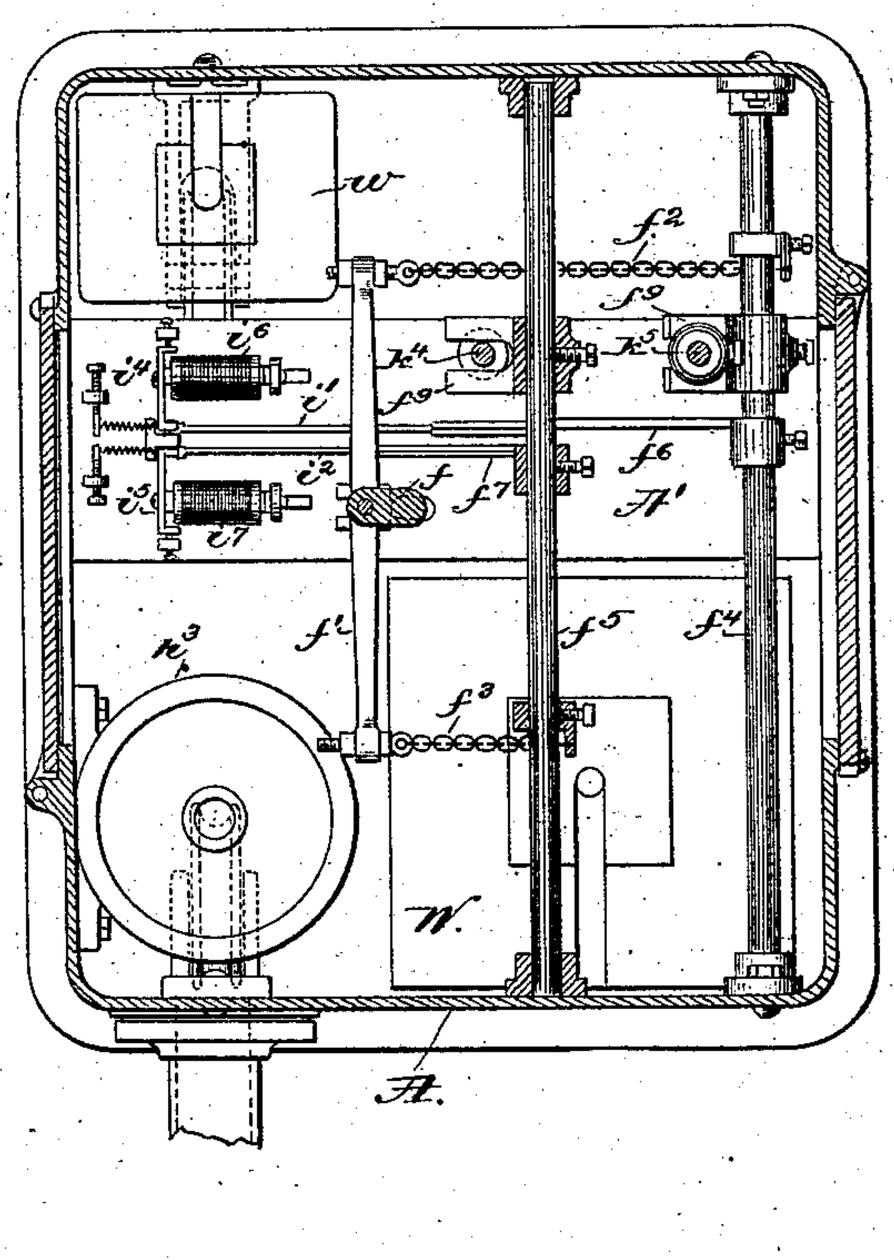


Fig. 4.



Witnesses.
John F. C. Pyxinkert
Fred A. Powell.

Inventor:
George F. Forbes.
by Crosby & Gregory attys.

UNITED STATES PATENT OFFICE.

GEORGE F. FORBES, OF HYDE PARK, MASSACHUSETTS.

AUTOMATIC RAILWAY-GATE.

SPECIFICATION forming part of Letters Patent No. 292,641, dated January 29, 1884.

Application filed April 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. FORBES, of Hyde Park, county of Norfolk, State of Massachusetts, have invented an Improvement in Automatic Railway-Gates, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to an automatic railway-gate-actuating mechanism, and is intended as an improvement on the gate shown in Letters Patent No. 245,618, granted to me August 16, 1881. In the said patent an apparatus was shown in which a gate is mounted upon a shaft, which also sustains the main portion of the gate-actuating mechanism, consisting, mainly, of an actuating-weight of sufficient power to close the gate, a clutch mechanism controlled by a trigger or detent operated by an electro-magnet the circuit of which is governed by an approaching train, and means to disengage the said weight from the gate and rewind it when the train passes. As shown in the said patent, when a gate is to be used in connection with a double-track road, two connected gates are employed, each having independent actuating mechanism sufficiently powerful to move both gates, one being controlled by trains on one track and the other by trains on the other track. In the present invention a single gate-actuating mechanism is inclosed in an independent case, from which the power is transmitted to any desired number of gates that are to be operated simultaneously, and weights are employed to both close and open the gates. The devices for controlling the operation of the gate-actuating mechanism alone are duplicated for a double-track road, so that a single apparatus inclosed in a single case is sufficient to operate any desired number of gates, to guard crossings from trains moving over either track. By having the actuating mechanism in an independent case from those supporting the gates, it is possible to remove the said apparatus and the especially-prepared rails for operating it from the planking employed between the rails at highway-crossings, so that the said rails may easily be kept in proper condition. The main elements of the gate-actuating mechanism operate similarly to those shown in the former patent; and the present invention consists, mainly, in novel details in the construction of the parts to be hereinafter more fully specified. Some of the trains of mechanism are capable of being employed for other purposes, and will form the subject of other applications for Letters Patent in which they will be specifically claimed.

Figure 1 is a side elevation, partly in section, of a gate-actuating mechanism embodying this invention, the side of the inclosing-case being removed; Fig. 2, a plan view thereof, the upper portions of the case being removed and the mechanism in the lower part thereof being omitted, to avoid confusion; Fig. 3, a vertical section in a plane at right angles to the plane of projections of Fig. 1; Fig. 4, a horizontal section or plan, showing the parts below those shown in Fig. 2; Fig. 5, a longitudinal sectional detail of the regulating-cylinder; Figs. 6 to 12, details of the various parts of the mechanism to be hereinafter referred to, and Fig. 13 a view showing two gates and the actuating apparatus.

The main shaft *a*, mounted in suitable bearings in the inclosing frame-work or casing A, has loose upon it the winding-drum, shown as consisting of two ratchet-wheels, *b*, one provided with a cylindrical flange, *b'*, which is connected with the other wheel by suitable bolts, the said winding-drum being provided with one or more pawls, b^2, co-operating with a ratchet-wheel, b^3, fixed upon the shaft *a*, between the said ratchet-wheels *b*. The cylindrical portion *b'* of the said winding-drum has fastened to and wound upon it the suspending-chain b^4 of the main actuating-weight W, the force of gravity upon which is transmitted through the pawls b^2 and ratchet b^3 to the main shaft *a*, from which it is transmitted to the gates, and acts to close them at the proper times by the clutch mechanism, now to be described. The shaft *a* has fixed upon it a yoke, *c*, provided at its ends with anti-friction rollers *c'*, entering openings 2 in the spokes or arms of a clutch-wheel, *d*, movable longitudinally on the shaft *a*, but caused to rotate therewith by means of the said yoke, the longitudinal movement of the clutch-wheel *d* being insufficient to disengage it from the friction-wheels *c'*. It will be seen that the force derived from the weight W is thus always applied to the

clutch-wheel *d*, and the said force is transmitted from the said clutch-wheel at the proper time to the co-operating portion of the clutch, shown as a chain-pulley, *e*, loose upon the shaft *a*, and having suspended from one side of it a secondary or restoring weight, *w*, of considerably less amount than the main weight W, and acting to rotate the said wheel *e* in the opposite direction to which it is rotated by the weight W when applied thereto by the clutch, the weight *w* operating to restore the gate to its normal open position. The said movable clutch-wheel has engaging projections, shown as ratchet-shaped teeth d' d^2, on its opposite faces, and it is acted upon by a spring, d^3, or equivalent, which tends to move it toward the co-operating portion *e* of the clutch when permitted by the clutch-shipper *f*, pivoted upon a transverse plate, A′, in the case A, and forked at its free end to engage a groove in the hub of the movable clutch-wheel *d*. The chain-pulley *e* is provided with a pivoted spring-pressed pawl or dog, e^2, which engages one of the teeth or projections, d^2, of the clutch *d* when the latter is moved toward the said pulley *e*, or in the position shown in Figs. 2 and 3 of the drawings, the said pawl being pivoted so as to yield in case the projection of the wheel *d* is opposite its end when the said wheel moves toward it, in which case, immediately after the wheel *d* begins to turn under the action of the weight W, the pawl e^2 will fall into the recess and engage the next projection of the said wheel *d*, thus causing the wheel or pulley *e* to turn with it in its further movement. When the clutch-wheel *d* is disengaged from the pulley *e* by the shipper *f*, as hereinafter described, it has to be prevented from rotating under the stress of the weight W, and thus permitting the said weight to run down without performing its work. The said clutch-wheel *d* is prevented from thus turning by means of a pawl or dog, d^4, pivoted in an arm or bracket, d^5, upon the inside of the case A, the said pawl operating to engage one of the projections d' of the wheel *d* in the same manner that the pawl e^2 engages the projection d^2. The distance that the ends of the pawls d^4 and e^2 project toward the wheel *d* is made adjustable by set-screws d^6, and they are so adjusted that when the wheel *d* is shipped or moved to engage or disengage the clutch the teeth upon one side of it will be brought in range of the corresponding pawl before those on the other side are disengaged.

It will be seen that the yoke *c*, with its friction-rollers, merely constitutes a device for permitting the longitudinal movement of the clutch-wheel *d* on the shaft *a*, but preventing independent rotary movement thereon, and that this device permits the longitudinal movement to be effected by a comparatively small power in spite of the large power developed by the weight W acting upon the shaft *a*, and resisted by the said clutch, when held either by the pawl d^4 or the pawl e^2. The parts *c*, *c*′, *d*, *d*′, d^2, *e*, and e^2, taken collectively, constitute the clutch. The force derived from the weight W, thus transmitted to the chain-pulley *e* when the clutch is engaged, as just described, is transmitted by a chain, *h*, supporting the restoring-weight *w*, and passing over suitable pulleys to the actuating-shaft of one of the group of gates G, (see Fig. 13,) that are connected by chain-gearing, to be operated simultaneously in the usual manner, the said chain *h* being carried around a suitable sprocket-wheel or chain-pulley at the said gate, and returning, as shown at *h*′, into the case A, where it is connected with the rod of a piston, h^2, working in a cylinder or dash-pot, h^3, (see Fig. 5,) provided with a small orifice controlled by a stop-cock, h^4, for permitting the air to escape and enter below the piston h^2 as the latter descends and ascends under the action of the weights W and *w*, the said cylinder and piston constituting a regulating device for controlling the movement of the gates. The weight W in operation overbalances and raises the weight *w*, and at the same time moves all the gates from their open to their closed position, and it is made much heavier than is usually needed to perform this work, so as to make the operation certain, even if the gates are clogged with snow and ice, or otherwise fail to operate easily. In order to prevent the gates from moving too suddenly or rapidly when not thus clogged or impeded, their movement caused by the weight is resisted by the air entrapped in the cylinder h^3, below the piston h^2, which thus regulates the movement of the gates. When the force of the weight W is removed from the pulley *e* by the disengagement of the clutch, the said pulley *e*, being loose on the main shaft *a*, is acted upon by the weight *w*, which operates to open the gates or restore them to their normal position, and is also made greater than usually needed for this work, its movement being resisted by the pressure of the atmosphere upon the piston h^2, which pressure is gradually balanced by the air entering the cylinder h^3 through the orifice h^4. The regulating device also operates to relieve the chains from sudden strains when the gates are acted upon by violent gusts of wind—often a cause of breakage in gates not provided with such a regulating device.

The apparatus is shown as intended to operate with a double-track road, and means are provided for operating the gates by trains passing over either track, so constructed that it is impossible for a train on either track to restore the gates to their normal open position while a train is approaching the crossing upon the other track, so that if two trains approach at or near the same time the gates will be closed by the one first arriving at the proper distance from the crossing, and will not be opened until both trains have arrived at or passed the crossing, it making no difference which passes first. To accomplish this, the shipper *f* of the clutch *d* has duplicate con-

trolling mechanisms, as follows: The said shipper f has pivoted upon it a lever, f', the ends of which are connected by chains f^2 f^3 with shafts f^4 f^5, provided with detent-arms f^6 f^7 upon them, and these, through the lever f', draw the shipper f, and with it the clutch-wheel d, against the action of the spring d^3. The said detent-arms are provided with ratchet-teeth, which are engaged by yielding fingers i, projecting from the hubs of the detent-levers i' i^2, the ends of which are provided with a yielding projection, i^3, normally supported upon the armature-levers i^4 i^5 of electro-magnets i^6 i^7, while the said magnets are magnetized. (See Figs. 3, 4, 7, 8, and 9.) The circuits of the said magnets are provided with circuit-controlling devices, one adapted to be operated by trains approaching the crossing in one direction and the other by trains approaching in the other direction. The chains f^2 f^3 are of such length that both have to be wound upon their shafts f^4 f^5 in order to move the shipper f sufficiently to disengage the clutch, and if either of the said chains is permitted to slacken by the release of the detent-arm f^6 f^7, caused by breaking the circuit of the corresponding magnet, i^6 or i^7, and the consequent release of its armature i^4 or i^5 and dropping of the detent-levers i' or i^2, the spring d^3 immediately acts to throw the clutch-wheel d into engagement with the pulley e, the lever f' then turning on the other chain, which is not slackened, as a fulcrum. Assuming, for example, that the arm f^6 is released and the chain f^2 slackened, if the said chain f^2 should be rewound, as hereinafter described, before the chain f^3 has been slackened, it will cause the withdrawal of the clutch-wheel d from engagement with the pulley e. If, on the other hand, after the chain f^2 has been thus slackened, a train should approach on the other track, breaking the circuit of the electro-magnet i^7, and thus releasing the chain f^3, the subsequent tightening of the chain f^2 will not move the shipper f, but will merely turn the lever f', taking up the slack of the chain f^3, and preparing the chain f^2 to act as a fulcrum for the said lever f', when the chain f^3 is subsequently wound by the train passing over the corresponding track; and it will be seen that the shipper cannot be disengaged until both chains are rewound, which is accomplished, as hereinafter described, only after all trains approaching on either track have arrived at the crossing. The detent-levers i' i^2 fall by their own weight, whether the teeth f^8 of the detent-arms are pressing against the fingers i or not, thus leaving the detent-arms free when their respective chains are pulled upon either by the spring d^3 or by the winding of the other chain, if the latter was slack when the said detent-arm was released.

As shown in Figs. 3 and 4, the various parts being at half-stroke, both chains are in the operation of being tightened and are just beginning to act upon the shipper f to disengage the clutch. The said chains f^2 f^3 are thus wound around the shafts f^4 f^5 to disengage the clutch by mechanism actuated by the passing trains, as follows: Each track is provided with a rail or opposite pair of rails mounted to yield relative to the road-bed as the weight of the different trucks or sets of trucks come upon them, the said rail or rails being mounted upon elastic cushions, which restore them to their normal position in relation to the road-bed when the weight passes off. A vibrating movement is thus imparted to the rail as a train passes over it, and the rails of the two tracks are respectively connected with suitable cranks or arms upon rock-shafts k k', having bearings in a projecting portion, A^2, of the case A. Either of the said rock-shafts k or k' may thus be oscillated independently of the other, and either one is adapted to operate independently to perform its part of the operation of shipping the clutch d by winding the corresponding chain, f^3 f^2, controlled by the magnet i^7 or i^6, corresponding to the same track as the shaft k or k' in question. The said shafts k or k' are provided with arms k^2 k^3, passing into the main portion A of the casing, and connected with rods k^4 k^5, which thus receive a reciprocating movement when the train passes. The said rods are provided with projections or tappets, k^6 k^7, engaging arms f^9 upon the rock-shafts f^5 f^4, thus rotating the said shafts to wind the chains f^3 f^2 thereon, and thus disengage the clutch. The detent-arms f^6 f^7, in their return movement, restore the detent-levers i' i^2 to the proper position to cause their projections i to engage the teeth f^8, the restoring mechanism being shown in Fig. 9 as consisting of a pin, f^{10}, upon the end of the arm f^6 or f^7 that first passes the finger i in the return movement of the said arm, and a laterally-yielding finger or spring, i^8, connected with each lever i' i^2, near its pivot. The said spring i^8 yields to permit the pin f^{10} to pass over it when the detent-lever is released and has dropped to the position shown in dotted lines, Fig. 9; but the said pin, in its return movement, engages the said spring and restores the lever to its normal position, and the pin i^3, resting on the shoulder of the armature-lever i^4 or i^5, which has a projecting finger, i^9, (see Fig. 7,) which serves as a stop for the return movement of the detent-lever. The projection i^3 yields as it passes the shoulder of the armature-lever, so that the armature is not withdrawn from the magnet, and the fingers i yield as the teeth f^8 pass over them in the return movement of the detent-arms.

By providing the detent-arms f^6 f^7 with a number of teeth, they will be engaged and held by the fingers i of the detent-levers at the end of the greatest movement produced by the projections k^6 k^7, and the arms f^9 will not be reached or affected by the subsequent lesser movements of the said projections, so that, although the rock-shafts k k' continue to oscillate while

the train is passing, the detent-arms will usually be affected but once when the heaviest portion of the train—usually the locomotive at the head of the train—operates the said rock-shaft. The movement of the yielding rails also operates to wind the weight W by the movement of either one of the rods k^4 or k^5, which are connected at their upper ends with pawl-carrying yokes m m', which are free to oscillate on the shaft a as the said rods are reciprocated by the movement of the rock-shafts k k'. The said yokes or rocking levers m m' are provided at their ends with pawls m^2, which engage the teeth of the ratchet-wheels b of the winding-drum for the weight W, rotating the said wheels in the downward stroke of the said rods k^4 k^5, caused by the trains passing over the yielding rails of the tracks. The pawls connected with either rocking lever are so arranged that when one is engaged with a tooth the other rests upon the middle of the inclined or rear side of the teeth, so that a movement of the said pawl no greater than half the length of the tooth will always cause the ratchet-wheel to be engaged.

When the apparatus is at rest in its normal position, the pawls m^2 have to be disengaged from the ratchet-tooth, so as to leave the winding-drum free to be turned by the weight W in order to move the gate. The pawls are thus disengaged at the end of their return-stroke by means of the pawl-disengaging device, consisting of two cams or inclines, n n', supported upon the ends of a lever or yoke, n^2, pivoted loosely on the shaft a, and made heavier at one end than the other, or provided with a weight, n^{12}, so as to normally remain in an inclined position, the heavier end being supported on a stop, n^3, connected with the main frame-work or casing A, and thus retaining the said cams in proper position to engage pins m^3 upon the pawls m^2, and lifting the ends of the said pawls beyond the range of the teeth of the ratchet-wheel b at the end of their backward movement over the said teeth. The position occupied by the pawls at the end of their return movement may be determined by adjusting the length of the rods k^4 k^5 by means of right and left threaded nuts or turn-buckles k^{16}, so that the said pawls will thus be engaged and lifted at the extreme end of their return movement, and will consequently be ready to engage the wheels at the very beginning of their downward movement before they have acquired their maximum velocity of movement.

It will be seen in Fig. 2 that the pawl-disengaging inclines n n' extend across the drum b', and are thus in proper position to act upon both sets of pawls carried by the levers m m'. In order to insure that the rods k^4 k^5 shall be raised sufficiently to cause the pawls to be thus disengaged from the ratchet after the train has passed, and also to assist the springs of the yielding rail in recovering as the weight passes off from them, the arms k^2 k^3 are also acted upon by springs tending to raise them, the said springs being shown in Fig. 2 as consisting of rubber blocks k^7, engaging pins k^8 projecting from the sides of the said arms.

The shafts k k' are provided with suitable packing or stuffing boxes where they enter the portion A^2 of the case, which is perfectly tight, and the inclosed mechanism thus thoroughly protected from moisture, dust, &c.

In order to prevent overwinding of the weight W, the winding-pawls must cease to operate upon the ratchets b as soon as the said weight is raised a sufficient distance, and this is accomplished automatically by means of pawl-raising surfaces or shields n^4, concentric with the shaft a, and extending from the inclines n n' for a distance about the ratchet-wheels greater than the maximum length of stroke of the pawls m^2. These shields n^4 are brought into position to engage the pins m^3, and thus retain the pawls m^2 raised during their entire movement, as shown in Fig. 6, by the action of the weight W when wound to the proper height upon a lifting-rod, o, connected with and hanging downward from the lever n^2, and provided with a foot-piece, o', arranged to slide longitudinally on the said rod o, its movement being limited by pin o^2 on the said rod entering a slot in the said foot-piece o', which is engaged by the weight W as it rises. A spring, o^3, is interposed between the foot-piece o' and a suitable shoulder or projection on the rod o, so that when the said foot-piece o' is raised by the weight moving upward under the action of the ratchet-wheel, moved by one of the pawls m^2, the lever n^2 is not positively moved; but the spring o^3, acting upon the said lever, causes it to move in the same direction as the pawl-carrying lever which is winding the weight until the incline n or n' engages the pin m^3 of the pawl that is turning the wheel b, but not being pressed against it with sufficient power to forcibly detach the said pawl from the ratchet-wheel. The moment, however, the said pawl begins its return movement and the pressure of the ratchet-tooth is removed from it, the pin m^3 rides upon the incline and around the cylindrical surface or shield n^4, which is immediately moved with the lever n^2 by the spring o' into the proper position to keep the pawls raised from the teeth during their entire movement, (see Fig. 6,) this movement of the lever n^2 being limited by a suitable stop, n^6. The lifting-rod is connected with the lever n^2 between shaft a and the shields n^4, so that a greater movement is imparted to the said shields than is received by the said rod from weight W, thus insuring that the shield shall be thrown the proper distance to retain the pawls disengaged after the stroke by which the weight W was raised into engagement with the lifting device o o'. The point of attachment of the rod o with the lever n^2 is preferably made adjustable, the said lever being slotted, as shown in Fig. 1, for this purpose, The shields n^4 act upon both

sets of pawls m^2, and thus constitute a disengaging device common to both sets of winding mechanism, and one of the said shields is slotted or forked, as shown, to permit the chain b^4 to pass through it. The pawls do their work upon the ratchets, winding the weight W in the movement produced by the direct application of the weight of the different parts of the passing train, and in their return movement, caused by the reaction of the springs or rubber cushions, the said pawls do no work. The disengagement of the said pawls always takes place during their backward movement over the teeth, so that only a slight power is required to raise them.

It may sometimes be desirable to operate the gates by hand, and for this purpose the chain-pulley e is provided with a segmental worm-gear, p, which may be operated, when desired, by a worm, p', fixed upon a shaft, p^2, having at one end a bearing, p^3, fixed in the case A, (see Fig. 12,) and at the other end a bearing in a movable plate, p^4, (see Fig. 11,) shown as pivoted upon the outside of the case A, so that by the movement of the said bearing-plate p^4 the end of the shaft p^2 is raised or lowered sufficiently to bring the worm p' into engagement with the worm-gear p, as shown in Fig. 12, or to disengage it therefrom, as shown in the other figures. The shaft p^2 passes through a slot in the case A, (shown in dotted lines, Fig. 11,) the plate p^4 being of sufficient extent to always cover the said slot, and thus keep the case tight. When the gate is to be worked by hand, the shaft p^2 will be raised until the worm is brought into engagement with the gear, when the shaft may be retained in this position by a suitable fastening device for the movable bearing-plate p^4, shown in this instance as a hinged socket-piece, p^5, adapted to engage a projection, p^6, in the case A. The shaft p^2 is provided with a crank, p^7, outside the case, by which it may be rotated to close the gates which may also be opened by turning the shaft p^2 in the opposite direction; but I prefer to provide the shaft p^2 with a ratchet, p^8, engaged by a pawl, p^9, upon the framework, which prevents the shaft being turned except in the direction to close the gate, and, when desired to open the gates, the worm p' is disengaged from the gear p by dropping the movable end of the shaft p^2, when the gates will be opened by the weight w, in the usual manner.

It will be seen that by engaging the clutch d e and moving the shaft p^2 and pulley e in the direction to open the gate the weight W will be raised or wound up; but to do this the pawl p^9, if used, must be disengaged from the ratchet p^8, access being had to the interior of the case by a suitable door or removable bonnet for this purpose.

Means are provided for sounding an alarm when the gates are closing, the said alarm consisting of a bell, r, on the outside of the case, having co-operating bell-hammer r', mounted on an arm depending from a rock-shaft, r^2, passing through to the interior of the case A, and provided with a tripping device, r^3, engaged by the teeth d^2 of the clutch-wheel d when the clutch is engaged and the said wheel is being moved by the weight W. (See Fig. 10.) The said trip r^3 is pivoted so as to permit the clutch-wheel d to be moved in the reverse direction, as before described, for winding the weight W by means of the shaft p^2.

The chain hh', passing from the chain-pulley e to the shaft of the nearest gate G, (see Fig. 13,) preferably acts upon the said shaft through an eccentric or cam-shaped sprocket-wheel, the throw or greatest radius of which is opposite to the gate, so that the weight w acts with greater leverage when it begins to move the gate from its horizontal position than during the subsequent movement, thus enabling it to overcome an abnormal weight that may have been applied to the gate—such, for instance, as an accumulation of snow or ice—which weight would also act with the greatest leverage when the gate is in its horizontal position.

I claim—

1. The combination of the main actuating-weight with the clutch for applying the said weight, and the duplicate clutch-controlling devices, substantially as and for the purpose described.

2. In an automatic gate-actuating apparatus, the main actuating-weight and clutch for applying the same, combined with duplicate winding mechanism for the said weight, whereby the said weight may be wound by trains passing on different tracks, substantially as described.

3. The main actuating-weight and its duplicate sets of winding mechanism for winding the said weight by the action of trains passing over different tracks, combined with a disengaging device common to both sets of winding mechanism, whereby the winding operation ceases when the weight is sufficiently raised, substantially as described.

4. The main shaft and main actuating-weight applied thereto, combined with the pulley loose on the said shaft, and clutch for connecting it therewith, and the restoring-weight and regulating device, substantially as described.

5. The clutch-wheel and its shipper, combined with a lever connected with the said shipper, and means, substantially as described, to move either end of the said lever independently, as and for the purpose set forth.

6. The clutch and its shipper, combined with a detent-arm, f^6, provided with a series of engaging projections or teeth, a detent-lever, i', having a projection, i, for engaging the said teeth, and an electro-magnet and its armature, controlling the said detent-lever, substantially as described.

7. The clutch and its shipper, and detent-arm therefor, provided with a series of teeth combined with the detent-lever having a yielding projection to engage the said teeth, an

electro-magnet controlling the said lever, and restoring mechanism actuated by the said detent-arm, whereby the detent-lever is placed in proper position to engage the teeth of the detent-arm, substantially as described.

8. The clutch, its shipper, and lever connected therewith, combined with the independent clutch-disengaging devices connected with the said lever, and independent mechanism actuated by the trains passing over the different tracks, for actuating the said disengaging devices, respectively, substantially as described.

9. The main shaft and main actuating-weight applied thereto, combined with the pulley loose on the said shaft, having a secondary or restoring weight applied to it, and the clutch for connecting the said shaft and pulley, and duplicate winding and clutch-shipping mechanism corresponding to the different tracks, whereby the said main weight is wound when a train passes over either track and the clutch is shipped, substantially as and for the purpose described.

10. The weight W, its winding-drum having ratchet-wheels at either side, and the independent pawl-carriers and pawls, combined with the pawl-raising devices and actuating device therefor, operated by the weight when wound, whereby the winding-pawls are disengaged from the ratchets when at rest in their normal position, and are also retained disengaged during their entire movement after the weight is raised sufficiently high, substantially as described.

11. The main shaft and pulley loose thereon, connected with the gates, combined with the hand-operated shaft p^2 and means to throw it into engagement with the said pulley to operate the gates, substantially as described.

12. The main shaft and pulley loose thereon, connected with the gates and with a restoring-weight, as described, and provided with a worm-gear, combined with the hand-operated shaft provided with a worm, and the movable bearing-piece for the said shaft, substantially as set forth.

13. The loose chain-pulley, connected with the gates and with a restoring-weight, combined with the hand-operated shaft adapted to be thrown into engagement with or disengaged from the said pulley, and its ratchet and pawl, whereby the said shaft is permitted to turn the pulley in one direction only to raise the said weight, substantially as and for the purpose described.

14. The combination, with the main shaft and weight applied thereto, of the chain-pulley loose on the said shaft and connected with the gate, and provided with a laterally-projecting pawl, and the clutch-wheel longitudinally movable on the said shaft, provided with ratchet-teeth on both faces, and the fixed pawl for engaging the said clutch-wheel when disengaged from the chain-pulley, substantially as described.

15. The main shaft and clutch-wheel longitudinally movable thereon, provided with ratchet-teeth, combined with the alarm-bell and its hammer, adapted to be operated by the teeth of the said clutch-wheel, substantially as described.

16. The shaft, winding-drum thereon, and pawl-carrier and pawls for winding it, combined with the yoke pivoted on the said shaft, provided with pawl-raising surfaces, its lifting-rod, and movable foot-piece actuated by the weight in rising, and the spring interposed between the said rod and foot-piece, substantially as described.

17. The rock-shaft adapted to be operated by a passing train, and the crank connected therewith, combined with the spring k^7, acting on the said arm, as described, and the weight-winding and clutch-shipping mechanism actuated by the said arm, substantially as set forth.

18. The main shaft, winding-drum thereon, actuated by passing trains, and the yoke fixed on the said shaft, and provided with friction-rollers, combined with the clutch-wheel longitudinally movable on the said shaft, in engagement with the said rollers, and the chain-pulley loose on the said shaft, connected with the gate, and adapted to be engaged and disengaged by the said clutch-wheel, substantially as described.

19. The gate-shaft and eccentric or cam-shaped sprocket-wheel, combined with the gate-actuating mechanism comprising a chain-pulley and actuating-weights, and the chain connecting the said pulley and sprocket-wheel, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEO. F. FORBES.

Witnesses:
JOS. P. LIVERMORE,
W. H. SIGSTON.