(No Model.) 3 Sheets—Sheet 1.

M. B. MILLS.

GATE.

No. 387,435. Patented Aug. 7, 1888.

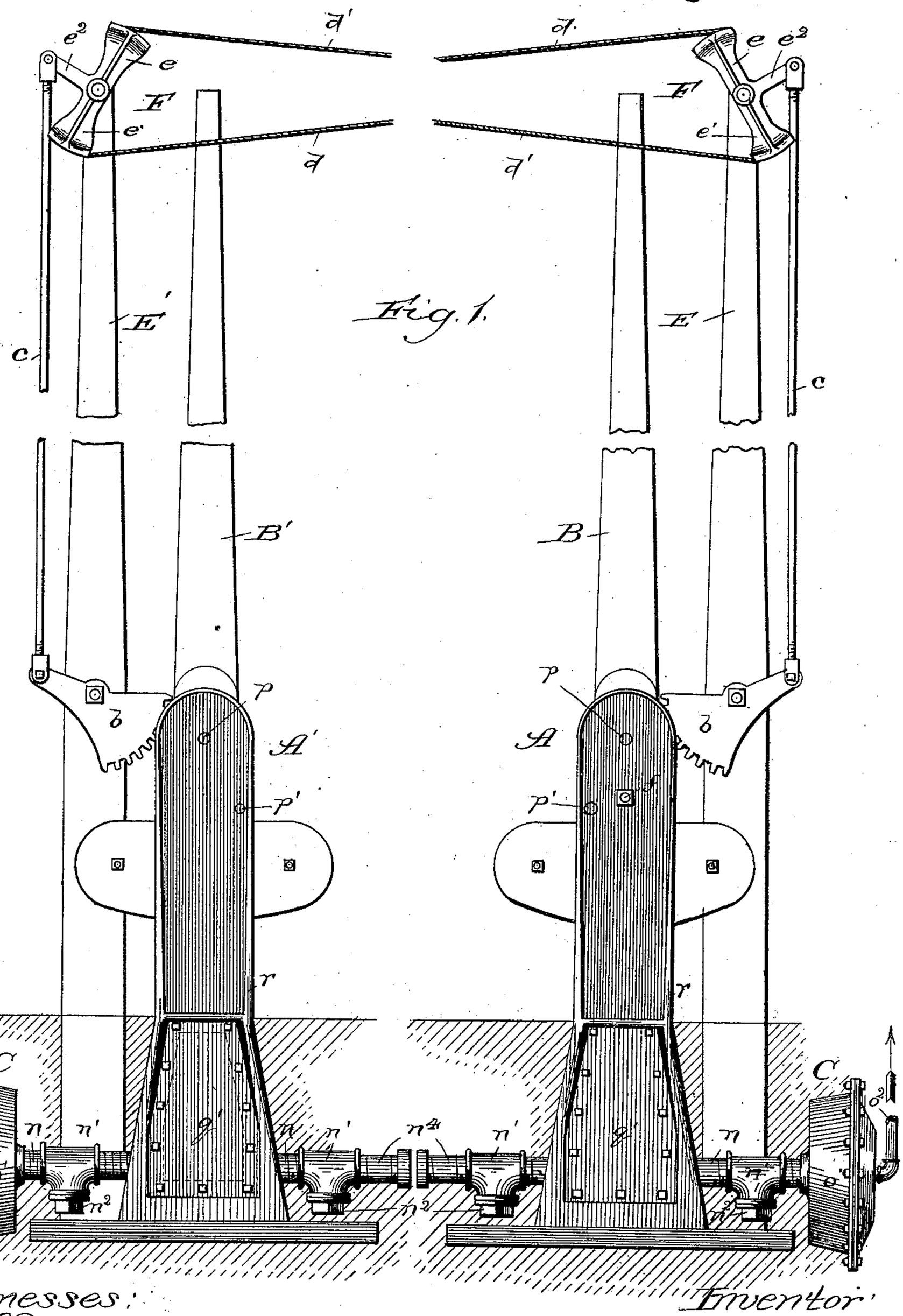

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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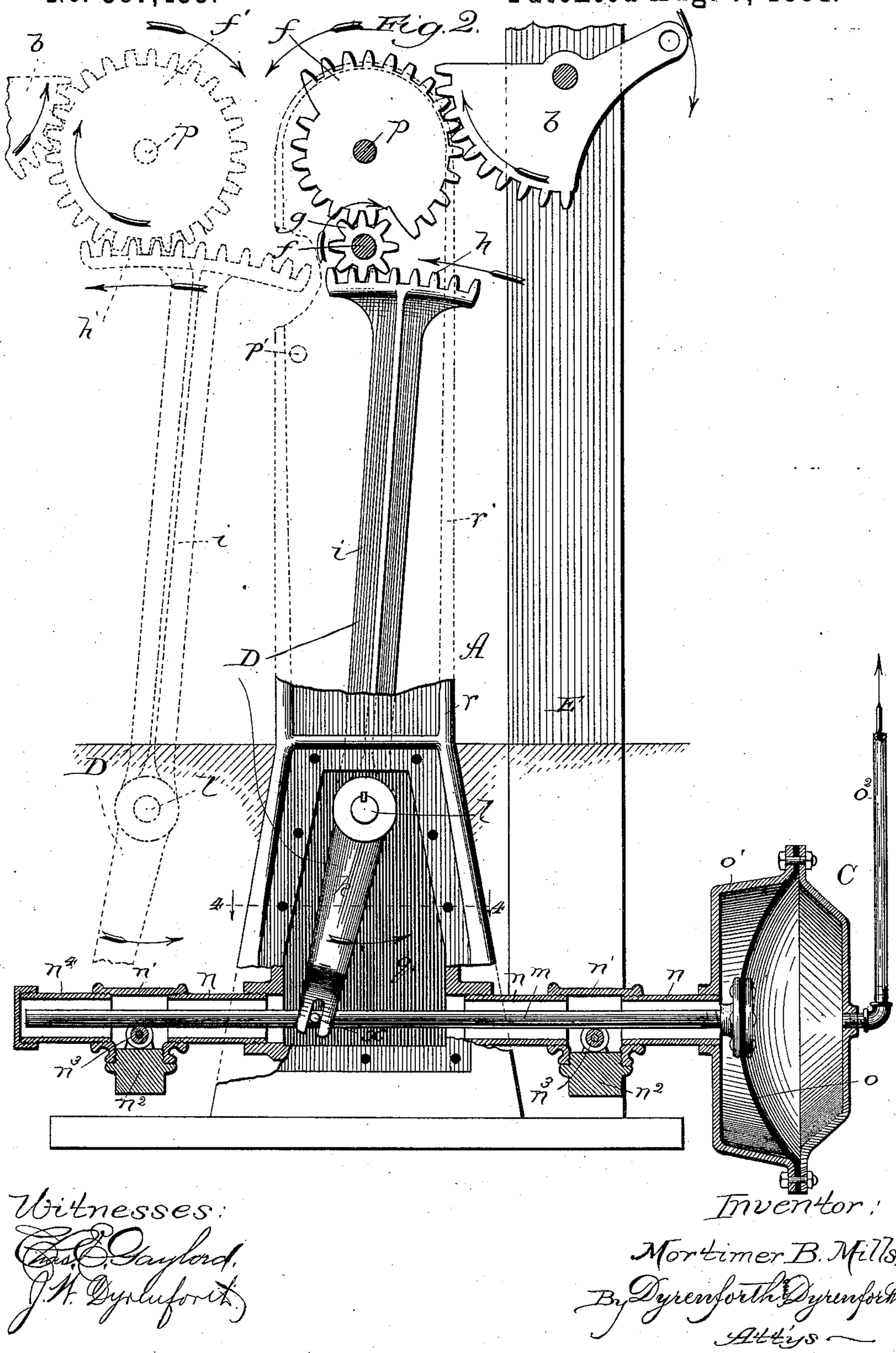

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 3.

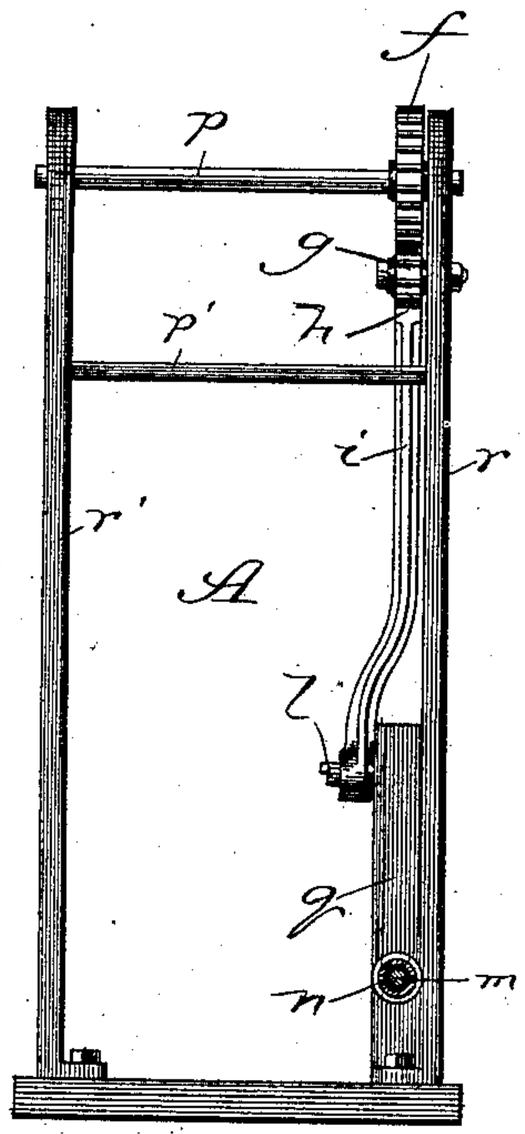
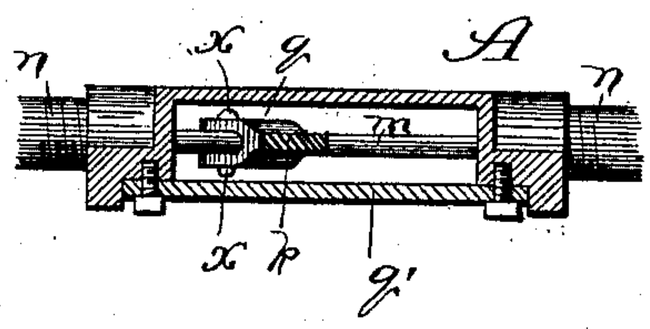


Fig. 4.



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UNITED STATES PATENT OFFICE.

MORTIMER B. MILLS, OF CHICAGO, ILLINOIS.

GATE.

SPECIFICATION forming part of Letters Patent No. 387,435, dated August 7, 1888.

Application filed April 17, 1888. Serial No. 270,914. (No model.)

To all whom it may concern:

Be it known that I, MORTIMER B. MILLS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Gates, of which the following is a specification.

My invention relates to improvements in the class of gates commonly employed at railroad-crossings, and comprising, broadly stated, vertically-swinging arms supported on posts and connected in a manner to cause the movement of one in one direction to produce the movement of the other simultaneously and equally in the opposite direction, whereby the effect of wind, unequal friction of parts, and the like, is counteracted and the arms actuated uniformly to open or close the gates.

The motive power which I prefer to employ for actuating my present improved gate is air-pressure, either pressure for both raising and lowering the arms or air-pressure to actuate them for one of the said purposes and exhaust to produce the opposite movement. The mechanism I employ, however, as will be seen, admits readily of the operation of the gate-arms by other means—as by lever mechanism.

Air-pressure being, as aforesaid, the preferred medium for operating the swinging arms, I show in the accompanying drawings mechanism for utilizing it, and confine the description hereinafter contained, with reference to the construction shown, to air-pressure mechanism.

One of the main objects of my present invention is to improve upon the construction of the gate shown and described in Letters Patent of the United States No. 381,159, granted on the 17th day of April to myself and Frank W. Mills, by making more compact the mechanism below the surface of the ground and connected with the gate-arms to produce their movements. This I accomplish by adapting the posts to receive arm-actuating levers corresponding with the bell-cranks in the aforesaid patent.

Another object is to produce improved means for tying the gate-arms overhead and connecting them with the underground actuating mechanism, and a further object is to afford generally improved mechanism for operating the gate-arms.

In the drawings, Figure 1 is a view in elevation, partly broken, of my improved gate; Fig. 2, a broken sectional view showing by full and dotted lines the construction of the underground actuating mechanism and of one gate-arm post with the adjacent post for one end of the overhead tie, and by dotted lines the construction of the bell-crank engaged by the underground mechanism and engaging with the cog-wheel on the shaft of the other gate-arm, and also the segmental rack for the opposite end of the overhead tie, the whole presenting diagrammatically my improved construction; Fig. 3, an edge elevation of a post, showing its construction with the gate-arm removed; and Fig. 4 a section taken on the line 4 4 of Fig. 2 through the chambered side of a post and viewed in the direction of the arrows.

In all gates employing underground mechanism for actuating the swinging arms it is necessary, to insure reliability in the operation, to provide against access to the movable underground parts of water, thus to avoid impediment to their movements by the formation of ice in contact with them in cold weather.

In the present instance I accomplish the desired result by the following means:

A and A′ are posts supporting swinging arms B and B′, and formed each in two parallel parts, *r* and *r′*, the former comprising a plate or flat bar, preferably of metal and of the form shown—that is to say, having parallel lateral edges throughout the part which extends above the ground, which may be rounded transversely at its upper end and flaring laterally throughout the portion which is embedded in the ground, a strengthening-bead being provided around the edges of the bar and across the face of the non-flaring part, as shown, to increase the strength, and a chamber, *q*, Fig. 3, is let into the face and extends beyond the rear side of the flaring portion, and is covered by a cap, *q′*, which is bolted against the shoulders at the sides of the opening to the chamber. The other bar, *r′*, is the exact counterpart of that already described, except that it has no chamber *q*, and consequently no cap *q′*, but is flat throughout on both sides. The two parts *r* and *r′* are embedded in the ground at their flaring bases closely enough together to admit the rear portion of a gate-arm between them and parallel to each other, and a rod or shaft,

p, which carries and moves with the gate-arm, connects the two bars *r* and *r'* near their upper ends. A rod, *p'*, forming a stop for the gate-arm when up, extends between the two parts of the post in proper position near their inner edges.

C is a collapsible receiver, such as is shown in the aforesaid Letters Patent, embedded in the ground, as shown, and comprising a diaphragm, *o*, in a case, *o'*, which communicates by a pipe, o^2, with a suitable air-pump, (not shown,) and is open on its side facing the gate-post in line with the chamber *q*, to which it is connected by a tube or conduit, *n*, in sections, as shown, coupled by a T-joint, *n'*, provided in the base with a screw-plug, n^2, which affords a seat for a roller or pulley, n^3, within the joint *n'*. A similarly-constructed tube, n^4, extends from the opposite side of the chamber *q*, in line with the tube *n*, and forms, practically, a continuation of the latter, and it is closed at its outer end. A rod, *m*, extends from the diaphragm *o*, to which it is secured at one end, through the tubes or conduits *n* n^4 and intervening chamber *q*, which is connected with the tubes by water-tight joints, Fig. 2, and the rod is supported and guided on the pulleys n^3. Expansion of the diaphragm *o* moves the rod *m* longitudinally in one direction, and with the collapse of the diaphragm the rod moves or is moved in the opposite direction.

Each post A and A' may, as shown in Fig. 1, be provided with all the mechanism thus described, when one collapsible receiver is provided to move the rod *m* of one post in one direction and another to move that of the other post in the opposite direction, the contents of one receiver being exhausted with the expansion of the other, though (as will appear from the further description hereinafter contained, and so obviously that it does not require illustration,) one conduit *n* n^4 and rod *m* may extend through the chambers *q* of both posts from a single collapsible receiver, (thus connecting the gate-arms by an underground tie,) which would then serve by its expansion to actuate the rod *m* in one direction, and by its collapse, with the exhaustion of its pneumatic contents, or a portion thereof, to move the rod in the opposite direction. A suitable lever, however, could be used in the instance last described for actuating the rod.

Whether the construction shown or either of the constructions last suggested be employed, the mechanism I employ with it on the gate-posts, and hereinafter described, remains the same and is as follows: Within the chamber *q* of each post A and A' is a rock-shaft, *l*, having its bearing in the rear wall of the chamber, through and beyond which it extends, Fig. 3, and to the rock-shaft is keyed an arm, *k*, bifurcated at its lower end, and preferably on both sides thereof, as shown in Figs. 2 and 4, where it embraces the rod *m* and engages with pins *x*, projecting from opposite sides of the rod. To the end of the shaft *l*, which projects beyond the rear wall of the chamber *q* in the post A, is keyed an arm, *i*, provided at its upper end with a segmental rack, *h*. The arms *k* and *i*, as will be seen, form, practically, a bell-crank lever, D, one arm of which is within the chamber *q* and the other arm without the same, as in the aforesaid Letters Patent. The arm *i*, which extends upward from the shaft *l* between the parts *r* and *r'* of the post A, is slightly bent toward the rear face of the part *r*, to bring its segmental rack portion in line with a rotary pinion, *g*, supported on the post directly below the cog-wheel *f*, secured on the shaft *p*, to move the latter or with it. And the cog-wheel *f*, for a purpose hereinafter described, may be reduced in diameter around the portion of its periphery with which the pinion *f* engages. The post A' is provided with an arm, *k*, and a rock-shaft, *l*, exactly like the corresponding parts on the post A, and also constituting, substantially, a bell-crank, D; and, also, with an arm, *i*, having a segmental rack, *h'*, at its upper extremity, which engages with a regular cog-wheel, *f'*, on the shaft *p*, supporting the arm of the gate-post A'. The arms *i* and *i'* are pivotally supported at the shafts *l* on the same horizontal plane, and the shafts *p* are likewise on the same horizontal plane, so that the arm *i'*, to engage at its segmental rack *h'* directly with the cog-wheel *f'*, must be longer than the arm *i*, the segmental rack *h* on which reaches only to the pinion *g*, the difference in the lengths being equal to one-half the diameter of the pinion. At the outer sides of the posts A and A' are rigid posts E and E' for the overhead tie, as high as municipal requirement necessitates, provided near their upper ends with double bell-cranks F and F', pivoted in place at the point where the three arms converge, and having opposite arms, *e* and *e'*, connected from post to post by cables, wires, or the like, *d* and *d'*, which cross each other, and the rear arms, e^2, of the bell-cranks have pivotally connected to them rods *c* extending and pivotally attached to the rear ends of segmental racks *b*, pivoted to the posts E and E' and engaging with the cog-wheels *f* and *f'*.

The operation is as follows: As the device is illustrated in Fig. 1, air-pressure introduced into the collasible receiver C at the left-hand side expands the diaphragm, whereby the rod *m*, connected with it, is moved forward and turns the bell-crank D' in a direction to produce, through the segmental rack *h'*, turning of the cog-wheel *f'* in the same direction. This effects the lowering of the gate-arm B'. The cog-wheel *f'* turns the adjacent segmental rack *b* in the opposite direction, and by the connection of the rear end of the latter, through the cross-connected bell-cranks F and F' and rod *c* with the corresponding end of the segmental rack *b* on the post E, the cog-wheel *f* is moved in a direction opposite that in which the cog-wheel *f'* moves, thus also lowering the arm B simultaneously with the arm

B'. The cog-wheel *f*, through the pinion *g* and segmental rack *h*, turns the bell-crank D in a direction which moves the rod *m* which it engages toward the collapsible receiver C at the right, the diaphragm of which is permitted to collapse by exhausting the air from behind it through the pipe o^2. The air-pump may be provided with an ordinary three-way cock, having an exhaust-aperture for leading the air-pressure into one receiver C, while it permits the escape of that previously introduced into the other receiver. To raise the gate-arm, the diaphragm of the receiver C at the right-hand side in Fig. 1 is actuated by the introduction of air-pressure, when the parts whose operation has just been stated move in directions opposite those described. Of course where a single receiver C or lever is employed, as hereinbefore suggested, the operations of raising and lowering the gate-arms are substantially the same as where two receivers C are used, though without requiring the arms to be tied overhead. By interposing the pinion *g* between the cog-wheel *f* and segmental rack *h* the movements of the rods *m*, which are necessarily simultaneous in the same direction, produce movements of the cog-wheels *f* and *f'* in opposite directions, and the interposition of the pinion necessitates shortening of the arm *i* and reduction of the diameter of the cog-wheel *f*, to cause the sweep of the arm *i* to move the said cog-wheel the same distance that the longer arm, *i'*—the rack *h'* on which, owing to its greater sweep, is longer than the rack *h*—moves the cog-wheel *f'*. The same result may obviously be attained by lowering the shaft *l* of the arms *i* and *k;* but as this would entail a change in the pattern of the post A, involving additional expense and tending to produce mistakes by the workmen who erect the gates, it is not desirable.

Where a single gate-arm is used to form the barrier, the construction of cog-wheel *f'* and bell-crank D', (shown in Fig. 2,) may be used with advantage, when the arm *k* would of course engage with the horizontally-reciprocating rod *m*.

I do not confine myself to the employment of collapsible receivers C as the medium for operating my improved gate by air-pressure, for, as is quite obvious, other means—such as ordinary pistons and air-cylinders—may be employed.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a gate, the combination of a post having a chamber in its base embedded in the ground and supporting a swinging arm having a cog-wheel upon its shaft, a horizontally-reciprocating rod extending through the chamber and incased against the access to it of water, and a bell-crank having one arm within the chamber engaging with the rod and its other arm without the chamber, and provided at its extremity with a rack engaging with the cog-wheel, substantially as described.

2. In a gate, the combination of a post formed of two bars, *r* and *r'*, embedded at their bases in the ground, a water-tight chamber, *q*, on the bar *r*, a swinging arm supported between the said bars on a shaft carrying a cog-wheel, a horizontally-reciprocating rod, *m*, extending through the chamber *q* and inclosed beyond the chamber in a water-tight conduit containing rollers n^3, and a bell-crank having one arm within the chamber engaging with the rod and its other arm without the chamber, and provided at its extremity with a rack engaging with the cog-wheel, substantially as described.

3. In a gate, the combination of a post formed of two bars, *r* and *r'*, embedded at their bases in the ground, a water-tight chamber, *q*, on the bar *r*, a swinging arm supported between the said bars on a shaft carrying a cog-wheel, a horizontally-reciprocating rod, *m*, extending through the chamber *q* and inclosed beyond the chamber in a water-tight conduit formed in sections connected by T-joints *n'*, having plugs n^2 in their bases supporting rollers n^3, and a bell-crank having one arm within the chamber engaging with the rod and its other arm without the chamber, and provided at its extremity with a rack engaging with the cog-wheel, substantially as described.

4. In a gate having posts supporting vertically-swinging arms tied together overhead to cause the rise or fall of one arm to raise or lower simultaneously the other, the combination of posts A and A', having chambers *q* in their bases embedded in the ground and supporting swinging arms B and B', cog-wheels *f* and *f'* on the axes of the arms, a pinion, *g*, engaging with the cog-wheel *f*, horizontally-reciprocating rods *m*, extending through the chamber in the posts incased against the access to them of water, bell-cranks D and D', having arms *k* in the chambers, engaging with the rods *m*, and having their other arms without the chambers and provided at their extremities with racks *h* and *h'*, respectively engaging with the pinion *g* and cog-wheel *f'*, and collapsible receivers C, connected with the rods *m* and communicating with a suitable air-pump, substantially as described.

5. In a gate having posts supporting vertically-swinging arms tied together overhead to cause the rise or fall of one arm to raise or lower simultaneously the other, the combination of posts A and A', having chambers *q* in their bases embedded in the ground, and supporting swinging arms B and B', a cog-wheel, *f'*, on the axis of the arm, a cog-wheel, *f*, reduced in diameter throughout a portion of its periphery on the axis of the other gate-arm, a pinion, *g*, engaging with the cog-wheel *f*, horizontally-reciprocating rods *m*, extending through the chambers in the posts and incased against the access to them of water, bell-cranks D and D', having arms *k* in the chambers, engaging with the rods *m*, and having their other arms without the chambers and provided at their extremities with racks *h* and *h'*, respect-

ively engaging with the pinion *g* and cog-wheel *f'*, and collapsible receivers C, connected with the rods *m* and communicating with a suitable air-pump, substantially as described.

6. In a gate having vertically-swinging arms on posts, the combination, with the arms and posts, of cog-wheels on the axes of the arms, posts E and E', respectively adjacent to the gate-posts, and racks *b*, pivotally supported on the posts E and E', and respectively engaging with the said cog-wheels and connected overhead to cause the rise or fall of one gate-arm to raise or lower the other, substantially as described.

7. In a gate having vertically-swinging arms on posts, the combination, with the arms and posts, of cog-wheels on the axes of the arms, posts E and E', respectively adjacent to the gate-posts, racks *b*, pivotally supported on the posts E and E' and respectively engaging with the said cog-wheels, double bell-cranks F and F', pivoted on the posts E and E', near their upper ends, and having their arms e^2 connected with the racks *b*, and cables *d* and *d'*, crossing each other and connecting opposite arms *e* and *e'* of the bell-cranks, substantially as described.

8. A gate comprising, in combination, posts A and A', having chambers *q* in their bases, embedded in the ground and supporting swinging arms B and B', cog-wheels *f* and *f'* on the axes of the arms, a pinion, *g*, engaging with the cog-wheel *f*, horizontally-reciprocating rods *m*, extending through the chambers in the posts and incased against the access to them of water, bell-cranks D and D', having arms *k* in the chambers, engaging with the rods *m*, and having their other arms without the chambers and provided at their extremities with racks *h* and *h'*, respectively engaging with the pinion *g* and cog-wheel *f'*, collapsible receivers C, connected with the rods *m* and communicating with a suitable air-pump, posts E and E', respectively adjacent to the gate-posts, and racks *b*, pivotally supported on the posts E and E' and respectively engaging with the cog-wheels *f* and *f'*, and connected overhead to cause the rise or fall of one gate-arm to raise or lower the other, substantially as described.

MORTIMER B. MILLS.

In presence of—
J. W. DYRENFORTH,
W. H. DYRENFORTH.