

No. 617,699.

Patented Jan. 10, 1899.

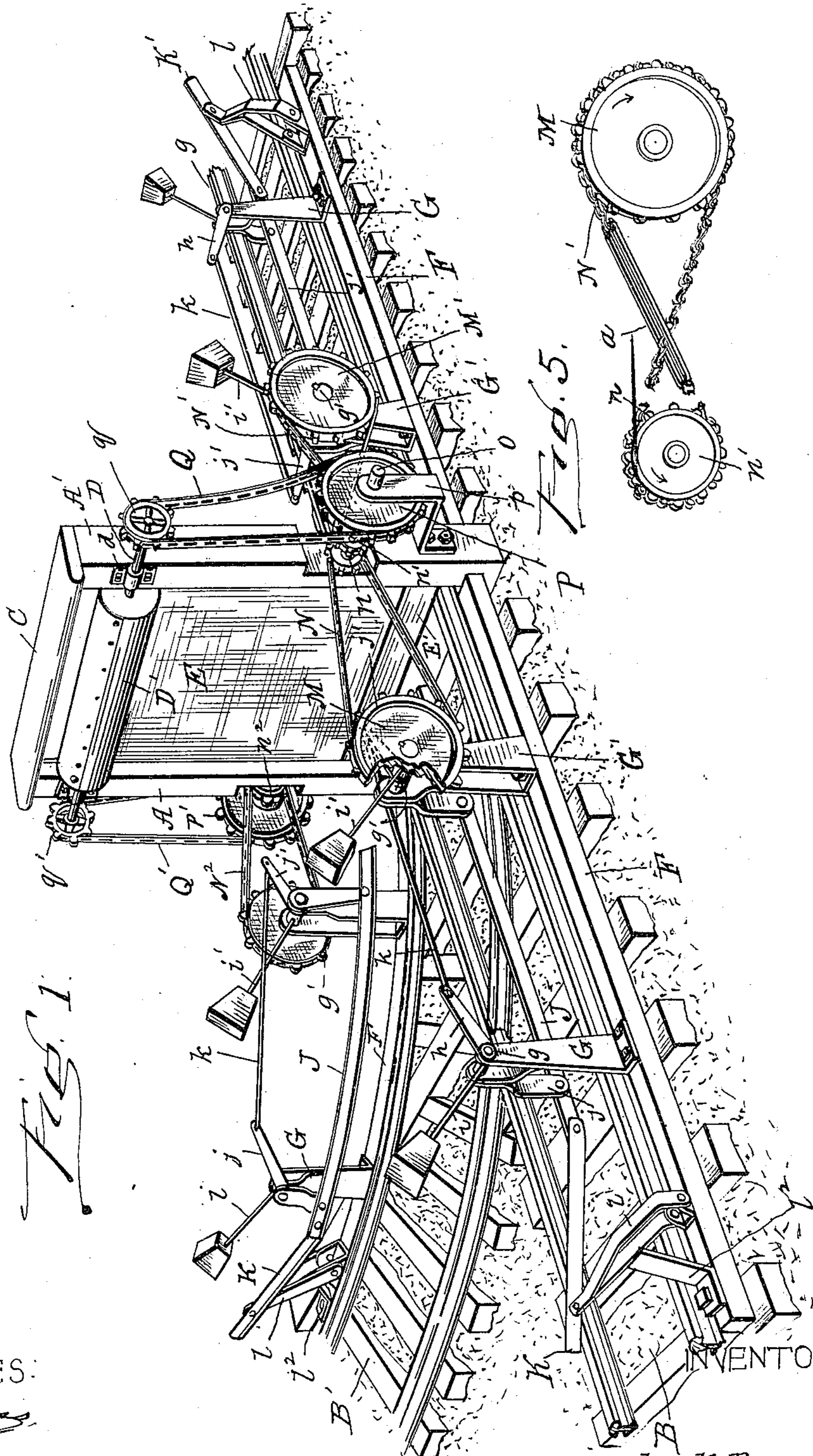
N. K. BOWMAN.

MINE GATE.

(Application filed Apr. 30, 1898.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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By *R. M. H. Kacey*

ATT'Y.

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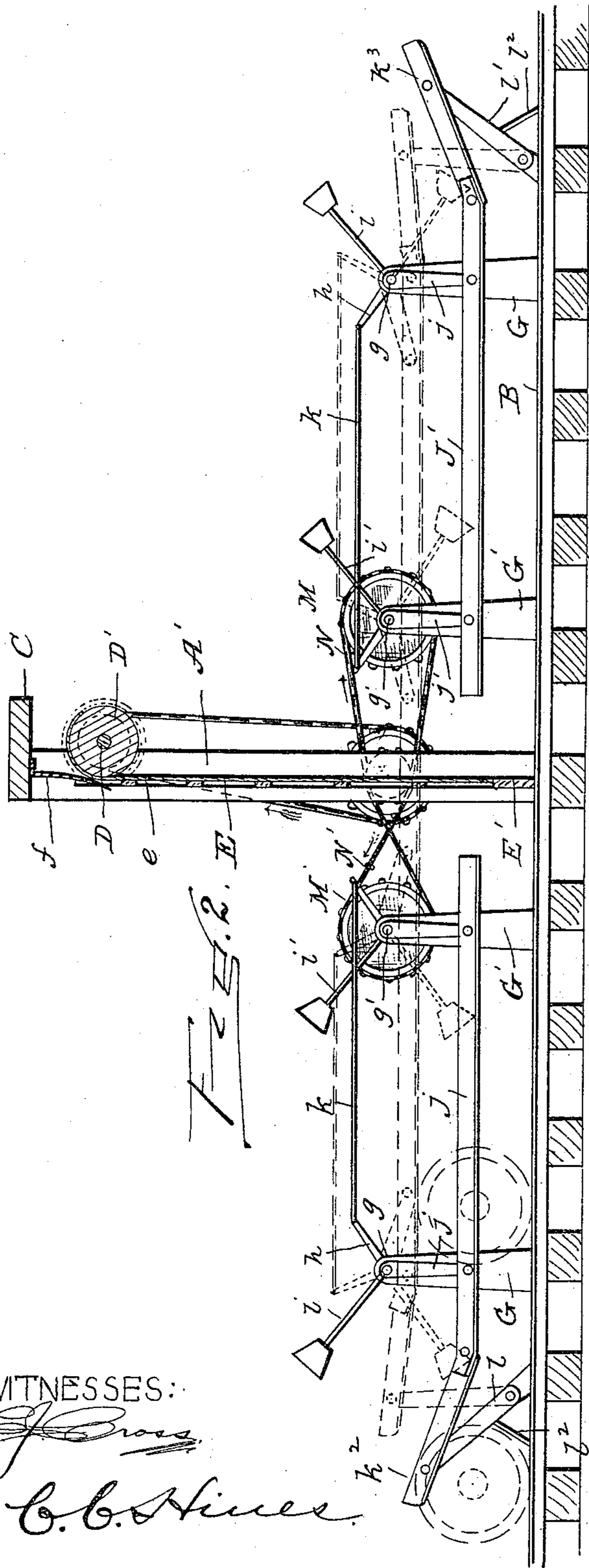
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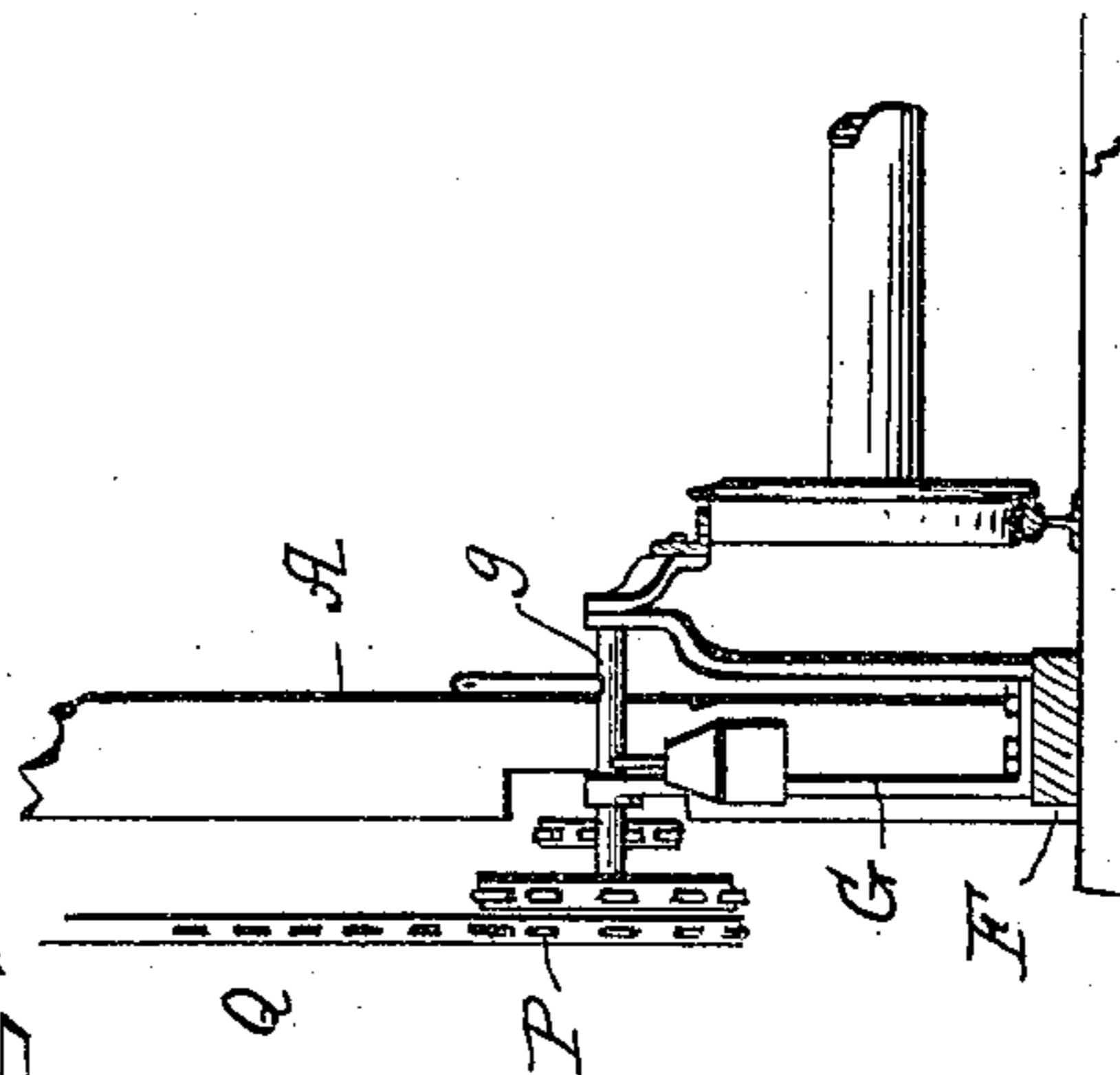
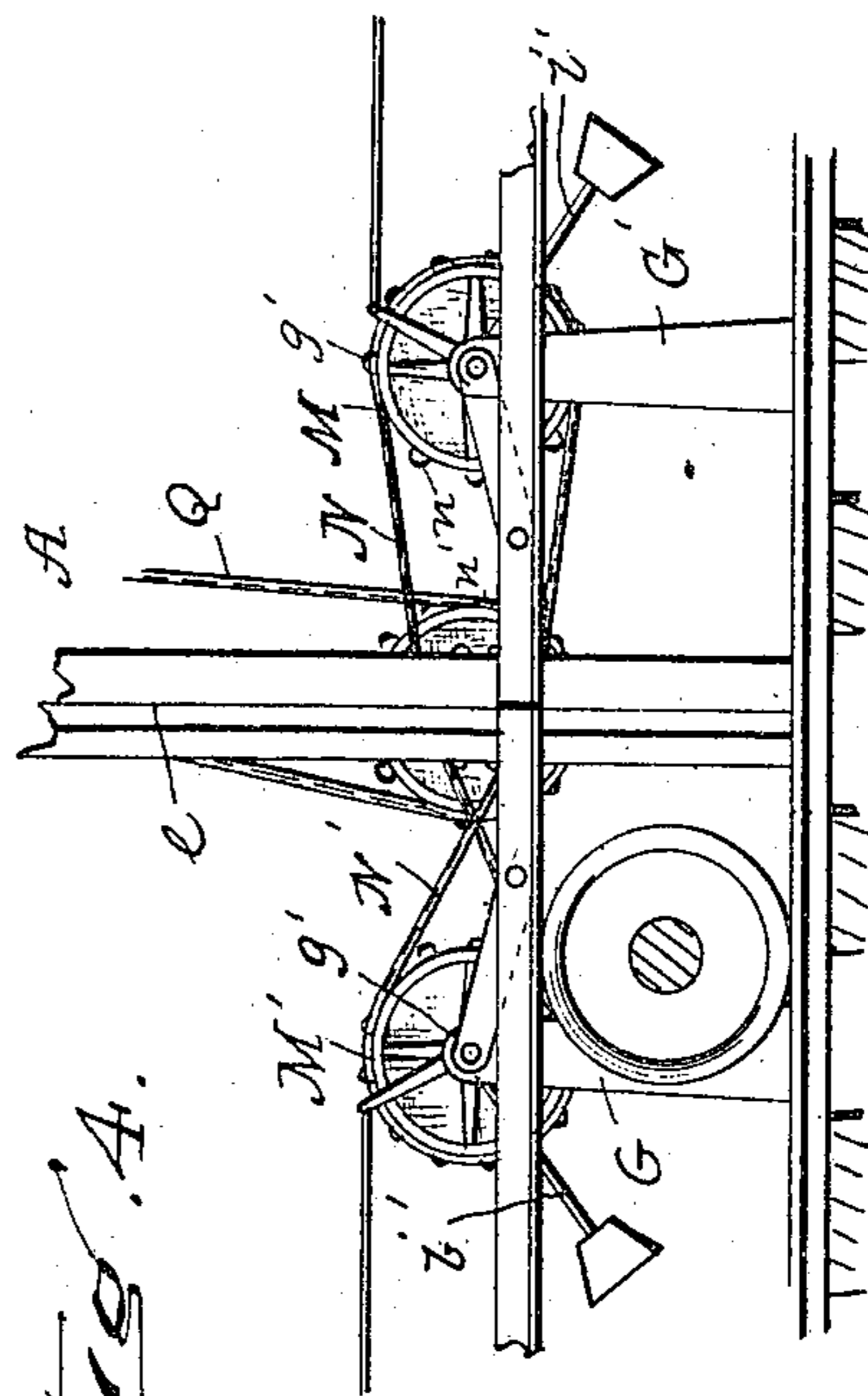
3 Sheets—Sheet 2.



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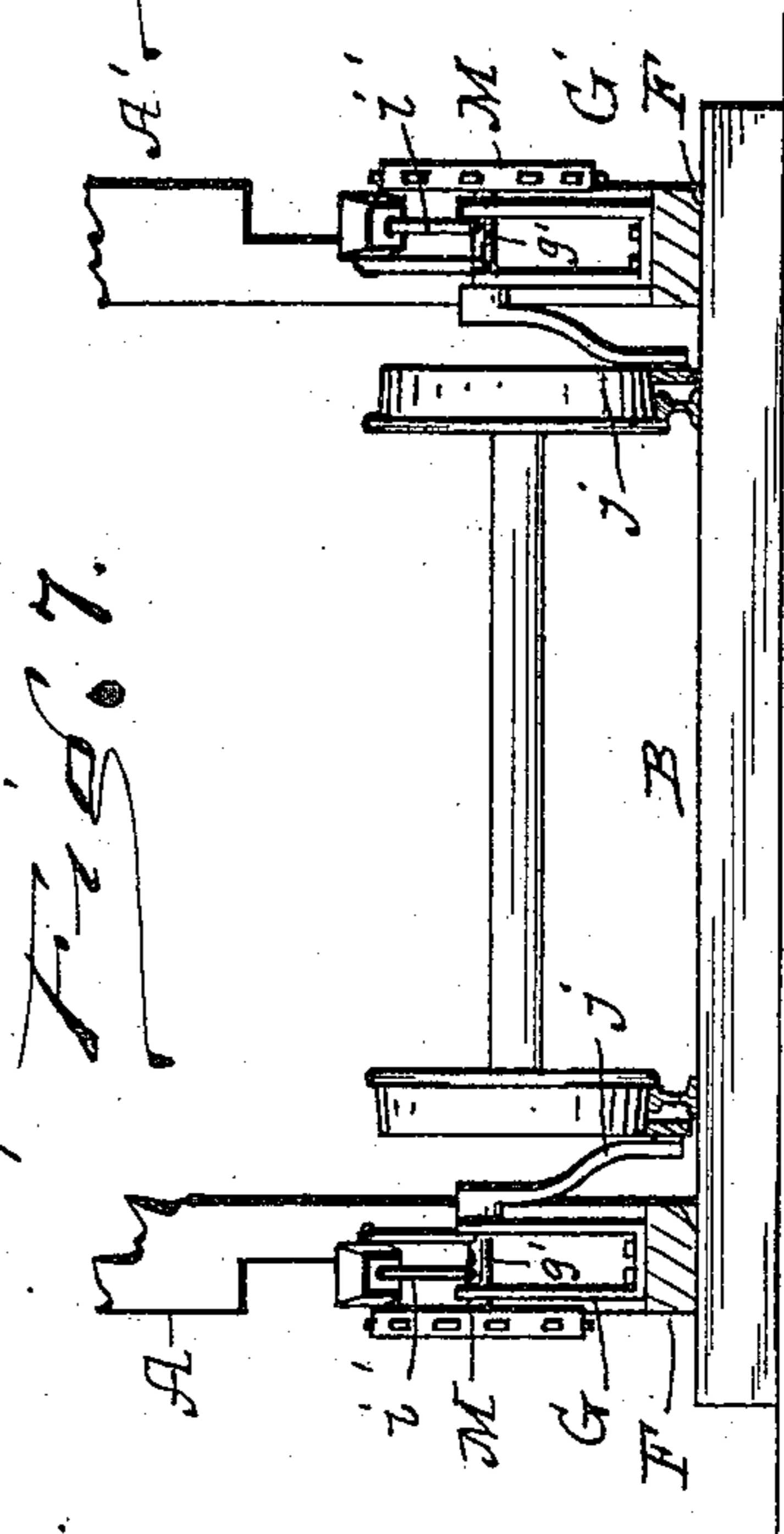
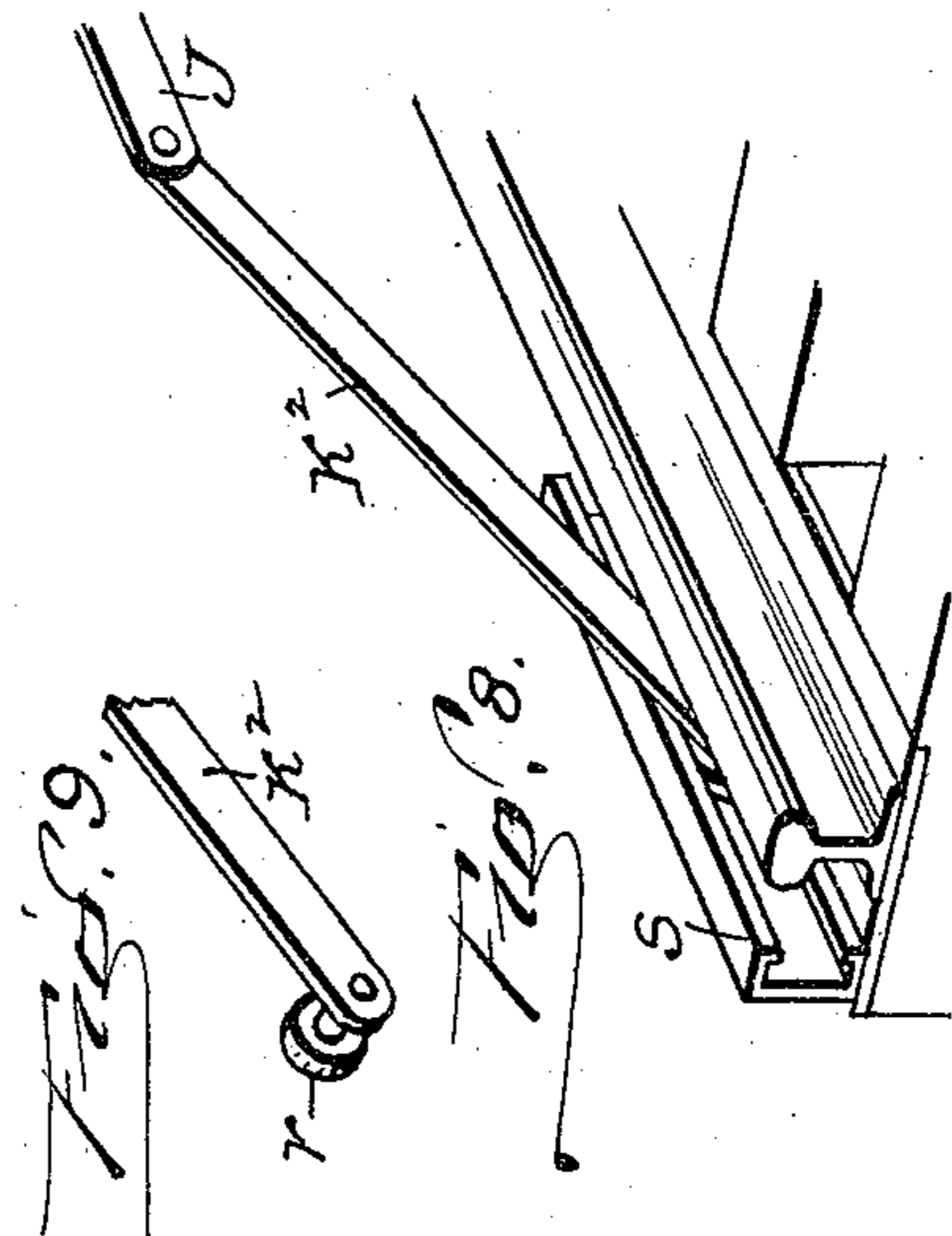
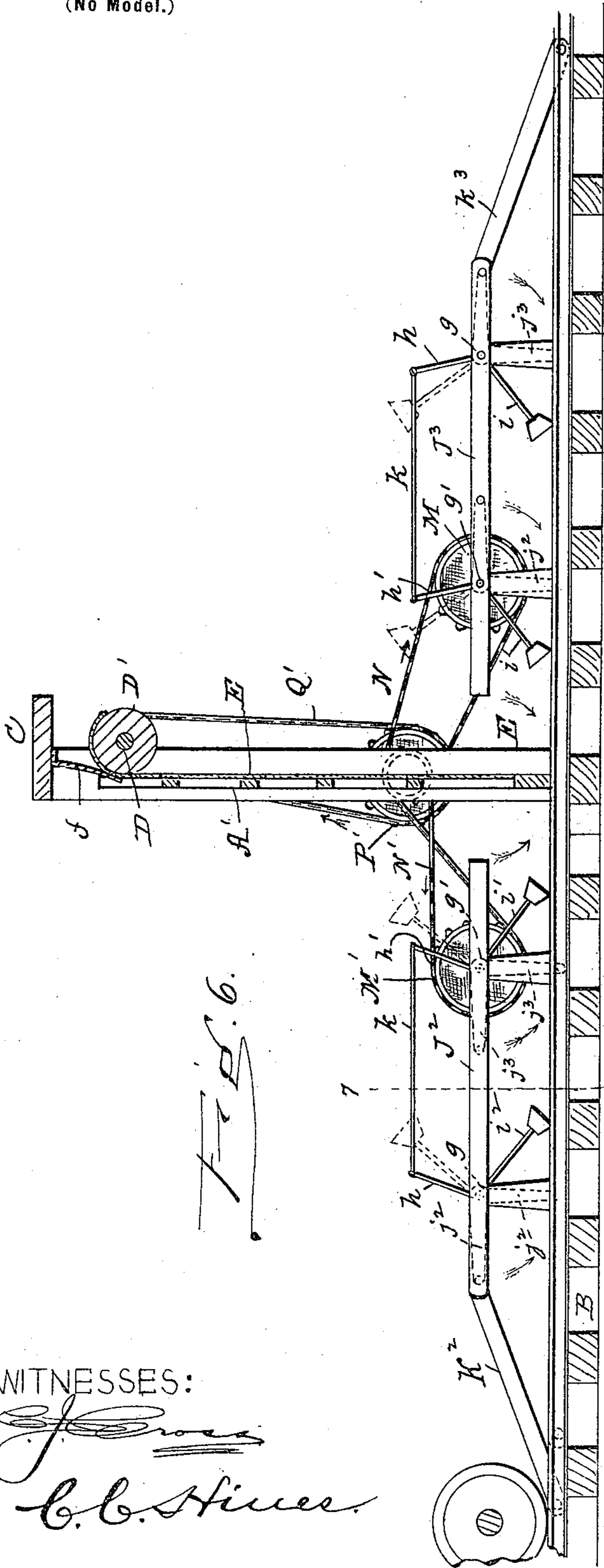
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

NEWTON K. BOWMAN, OF LAWRENCE, OHIO.

MINE-GATE.

SPECIFICATION forming part of Letters Patent No. 617,699, dated January 10, 1899.

Application filed April 30, 1898. Serial No. 679,382. (No model.)

To all whom it may concern:

Be it known that I, NEWTON K. BOWMAN, a citizen of the United States, residing at North Lawrence, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Mine-Gates; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in mechanism for automatically opening and closing mine-gates; and it consists in certain novel features of construction, combination, and arrangement of parts, which will be hereinafter more fully described and claimed.

The objects of the invention are, first, to provide simple and effective mechanism of this character which will be positively operated by the wheels of a car to open the gate and retracted by gravity to close the gate after the passage of the car therethrough; second, to provide a system of gearing by means of which the gate may be located at the junction of two tracks and operated as effectually by a car running from one track onto the other as by a car running through on the main track; third, to provide an improved construction and arrangement of trip-levers and counterbalancing means for the swinging operating-bars whereby the latter are rendered extremely sensitive and adapted to be quickly thrown into or out of operation without unduly jarring or straining the gearing, and, finally, to simplify and improve the construction and render more efficient the operation of this class of mechanism generally. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of a mine-gate embodying my invention, showing the same arranged at the junction of two tracks and combined with the improved mechanism adapted to be operated by a car running on either track. Fig. 2 is a longitudinal sectional view of same, looking toward the main-line mechanism. Fig. 3 is a cross-sectional view showing the swinging operating-bar elevated by a car-wheel. Fig. 4 is an inner side elevational view showing the positions of the bars when the gate-curtain is open. Fig. 5 is a detail view of one of the oscillatory mas-

ter-sprockets, its coacting counter-shaft pinion, and the crossed chain connecting the same. Fig. 6 is a view similar to Fig. 2, but illustrates a slight modification in the construction and arrangement of the operating mechanism. Fig. 7 is a cross-sectional view of same on line 7 7. Fig. 8 is a detail perspective view of one of the rails, the inclined sliding trip-lever, and the guide therefor. Fig. 9 is a similar view of a portion of said trip-lever.

Referring now more particularly to the drawings, wherein like letters of reference designate corresponding parts throughout the several views, A A' represent the gate-posts, arranged on opposite sides of the track B and connected at their upper ends by a cross-bar C; D, a shaft mounted to revolve in bearings d, fixed to the posts and carrying a roller D', and E a gate-curtain secured at its upper end to said roller and having secured thereto at its lower end a counterbalancing-bar E'. The side edges of said curtain and the projecting ends of the counterbalancing-bar are fitted to slide in grooves e, formed in the inner sides of the posts, as shown in Fig. 2, and a flap f, depending from the cross-bar, is provided to close the opening between said bar and the roller and exclude air from the exterior.

To the projecting ends of the ties on either side of the gate-frame are secured sills F, which are arranged in line with one of the gate-posts—the post A' in the present instance—and mounted on said sills are bearing brackets or standards G G', two being disposed on each side of said post, as shown. The outermost standard G of each pair of standards thus arranged has mounted therein a rock-shaft g, to which is rigidly connected a crank-arm h, a weighted counterbalancing-arm i, and a normally-pendent link j. The innermost standard G' of each pair has likewise mounted therein a rock-shaft g', to which is connected a crank-arm h', a weighted counterbalancing-arm i', and a link j', the said two crank-arms h h' being connected to move in unison by a rod k. The normal positions of these parts are clearly shown in Fig. 1, from which it will be seen that the crank-arms project inwardly substantially at right angles to the standards, while the counterbalancing-

arms project outwardly and upwardly at an angle of about forty degrees thereto, and the links hang perpendicularly. Connected to the lower ends of the links of each pair of standards are swinging operating-bars $J J'$, formed of angle-iron, said bars being arranged horizontally, with their horizontal webs projecting immediately above the adjoining track-rail and jointed at their outer ends to inclined trip-levers $K K'$. These levers are in turn pivoted to oscillating brackets $l l'$, whereby they are adapted to swing with the operating-bars toward and from the gate-frame, the inward swinging movement of said brackets being limited by the extent of throw of the bars and the outward movement thereof by stop-plates l^2 . In operation the front wheel of a car running on the track toward the gate will first strike one of the trip-levers—the lever K , for example—and swing said lever and the bar J , attached thereto, inwardly and as it nears the standard G will at the same time gradually raise the bar until the latter rests thereon, as shown in broken lines in Fig. 2 and in full lines in Fig. 3. The bar is thereby swung easily and quickly without straining or racking the gearing, and a quarter-turn is given to the rock-shafts $g g'$, the crank-arms, and the counterbalancing-arms, which assume the broken-line positions shown in Fig. 2. The arms $i i'$ are weighted, so that they nearly counterbalance the swinging bars and attached parts, the latter, however, being made somewhat heavier to swing easily back to their normal positions by gravity when released by the car-wheels.

To the rock-shafts g' of the standards G' are keyed oscillatory master sprocket-wheels $M M'$, which are respectively connected by chains $N N'$ with sprocket-pinions $n n'$, mounted on a counter-shaft o , having bearing at its inner end in the post A' and at its outer end in a bracket p , fixed to said post. Said counter-shaft also carries a sprocket-wheel P , which is connected by a chain Q with a sprocket-pinion q , mounted on the adjacent end of the roller-shaft D . When the bar J is swung inwardly and a quarter-revolution is imparted to the coacting rock-shaft g' , as above described, motion is communicated, through the medium of sprocket-wheel M , chain N , and pinion n , to the counter-shaft, which makes one complete revolution, and from said shaft through the medium of sprocket P , chain Q , and pinion q to the roller-shaft D , which makes four complete revolutions, whereby the gate-curtain E is wound upon the roller D' .

It will be understood that the parts of the mechanism on opposite sides of the gate move in reverse directions, but simultaneously toward or from the gate, and that when the mechanism at one side is positively operated by the wheels of a car the mechanism at the opposite side is moved in unison therewith through the medium of the counter-shaft and coacting gearing. In order to provide for

this reverse movement, the chain N' is crossed and provided in one stretch with a long open link a , through which its opposite stretch may freely move without friction and without throwing said stretches out of alignment. By this construction it will be seen that the bars when swung inwardly to wind up the gate-curtain meet or come in contact with each other, as shown in Fig. 4, and practically form a continuous operating-bar and that the curtain is held open until the car has passed completely through the gateway and the bars are no longer supported by the wheels thereof. The counterbalancing-bar E' will then cause the curtain to close by gravity and reverse the chain-and-sprocket gearing, and at the same time the operating-bars will automatically swing back to their normal positions, the combined weight of said bars and the curtain being sufficient to overcome the friction of the gearing and weight of the counterbalancing-arms.

When the gate is arranged at or adjacent to the point of junction of two tracks, suitable operating mechanism is provided in addition to that hereinbefore described, by means of which the gate may be opened automatically by a car running from the branch track onto the main track and also held open by a car switched from the main track onto the branch track. To this end the mechanism arranged on one side of the gate and alongside the main track is duplicated alongside the branch track B' , as shown in Fig. 1. In addition a counter-shaft o' is mounted on the post A and carries a pinion n^2 and a sprocket-wheel P' . This pinion is connected with the master sprocket-wheel, through the medium of a chain N^2 and the sprocket-wheel P' , with a pinion q' on the adjoining end of the roller-shaft D through the medium of a chain Q' , which arrangement of gearing is substantially the same as that connecting the master-sprocket M with the counter-shaft o and the sprocket P on said shaft with the pinion q on the opposite end of the roller-shaft. The operation with this construction will be readily understood. When a car running on the branch track approaches the gate, the mechanism alongside said branch track will be operated by the wheels of the car to wind up the gate-curtain on the roller. At the same time the swinging bars of the operating mechanism arranged alongside the main track B will be swung inward, and the wheels on the adjacent side of the car will engage the same and hold the curtain open until the car has passed through the gateway, whereupon the gate-curtain will be closed and the parts of the operating mechanism arranged alongside both tracks restored to their normal positions, as hereinbefore described.

In the embodiment of my invention disclosed in Figs. 6 to 9, inclusive, substantially the same elements are employed as in the other figures; but said elements are modified in construction and arranged to operate in a

slightly-different manner. The swinging operating-bars $J^2 J^3$ are mounted upon links $j^2 j^3$ in the same manner, except that said links are normally arranged in horizontal position and said bars when swung are depressed by the car-wheels, as shown in Fig. 7, instead of being elevated. The weighted counterbalancing-arms $i^2 i^3$ also normally hang downward at an angle and are tilted upwardly when the bars are moved and serve to return said bars when released to their normal positions. The only material change in construction occurs in the case of the trip-levers $K^2 K^3$, which are inclined outwardly and downwardly from the bars and are provided at their free ends with friction-rollers r , which travel in channel-iron guides s , arranged alongside the track-rail. From the above explanation of the construction and arrangement of parts the operation of this modified form of mechanism will be apparent. This construction of gate mechanism is deemed preferable in mines where the wheels differ in size on different cars, while that shown in Figs. 1 to 5, inclusive, is intended to be employed in mines where the cars are equipped with wheels of uniform size.

It will of course be understood that changes in the form, proportion, and details of construction may be made within the scope of the invention without departing from the spirit or sacrificing any of the advantages thereof.

Having thus fully described my invention, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a gravity-closing gate, a pair of swinging operating-bars mounted above one of the track-rails—one on each side of the gate, an inclined trip-lever connected to the outer end of said bar, and mechanism connecting between the gate and bars, whereby when one of said trip-levers and its coacting bar are positively swung inward by the wheel of a car approaching the gate, the other bar will also be swung inward and the gate opened, substantially as described.

2. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a gravity-closing gate, a pair of swinging operating-bars mounted above one of the track-rails—one on each side of the gate, an inclined trip-lever connected to the outer end of each bar, an oscillating bracket supporting the outer end of each trip-lever and normally holding the same inclined, and mechanism connecting between the gate and bars, whereby when one of said trip-levers and its coacting bar are positively swung inward by the wheel of a car approaching the gate, the other bar will also be swung inward and the gate opened, substantially as described.

3. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a gravity-closing gate, a pair of

swinging operating-bars mounted above one of the track-rails—one on each side of the gate, an inclined trip-lever connected to the outer end of each bar and chain-and-sprocket gearing connecting the bars and gate and adapted to simultaneously open the gate and swing one of the bars inwardly when the other bar is positively operated by contact with the wheel of a car approaching the gate, substantially as described.

4. In a mine-gate, the combination with a main track and a branch track, of a gate-frame arranged at or adjacent to the point of junction of said tracks, a gravity-closing gate mounted thereon, coacting operating mechanism arranged alongside the main track on either side of the gate adapted to be operated in unison by contact with a passing car to open the gate, and duplicate operating mechanism arranged at one side of the gate and alongside the branch track, the construction and arrangement being such that a car approaching the gate from either side and on either track will operate said mechanism to open the gate and maintain the gate in open position until it has passed through the gateway, substantially as described.

5. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a pair of swinging operating-bars mounted above one of the track-rails—one on each side of the gate, an inclined trip-lever connected to the outer end of each bar, counterbalancing-weights acting on the bars, and mechanism for opening the gate and swinging one bar inwardly when the other bar is positively operated by an approaching car, the parts being so constructed and arranged that the combined weight of the gate and bars will cause the former to close and the latter to return to their normal positions against the tension of said counterbalancing-weights and opening mechanism, substantially as described.

6. In a mine-gate, the combination with a main track and branch track, of a gate-frame arranged at or adjacent to the point of junction of said tracks, a gravity-closing gate mounted thereon, a pair of swinging operating-bars mounted above one of the rails of the main track—one on each side of the gate, means for operating said bars in unison and opening the gate, a swinging bar mounted above one of the rails of the branch track at one side only of the gate, and means for simultaneously operating the main-line and branch-line mechanism and opening the gate when the said branch-track swinging bar is operated, whereby inward movement of either one of said bars will result in all the bars being swung simultaneously and the gate opened or closed, substantially as described.

7. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, standards arranged alongside one of said rails on opposite sides of the gate, a pair of swinging operating-bars mounted upon

said standards—one on each side of the gate, trip-levers connected to the outer ends of said bars, and mechanism connecting between the gate and bars, whereby when one of the said trip-levers is positively swung inward by the wheel of a car approaching the gate, the other levers will also be swung inward and the gate opened, substantially as described.

8. In a mine-gate, the combination with a track, of a gate-frame, a gravity-closing gate, a pair of standards mounted alongside one of the track-rails and at either side of the gate, said standards having rock-shafts journaled therein, a crank-arm and a counterbalancing-weight connected to each shaft, a rod connecting the crank-arms of each pair of shafts to move in unison, a pair of swinging operating-bars pivoted to links pendent from said shafts and arranged above one of the track-rails—one on each side of the gate, and mechanism connecting between the gate and bars for positively swinging said bars and opening the gate simultaneously, the construction and arrangement being such that the combined weight of the bars and gate will cause the former to return to their normal positions and the latter to close by gravity against the tension of said mechanism and weighted arms, substantially as described.

9. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a gate-curtain mounted on a shaft having bearings therein, said shaft being provided at one end with a sprocket-pinion, a pair of swinging operating-bars mounted above one of the track-rails—one on each side of the gate, rock-shafts operatively connected with said bars and carrying oscillatory master sprocket-wheels, a counter-shaft arranged at one end of the gate-frame and carrying a pair of sprocket-pinions and a sprocket-wheel, a chain connecting said sprocket-wheel with the sprocket-pinion on the gate-curtain shaft, and chains connecting the said master sprocket-wheels with the pinions on the counter-shaft, one of said chains being crossed, whereby the bars are adapted to be simultaneously moved in reverse directions, but toward or from the gate-frame, substantially as described.

10. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a gate-curtain mounted on a shaft having bearings therein, said shaft being provided at one end with a sprocket-wheel, standards arranged alongside one of the track-rails and on opposite sides of the gate and having rock-shafts journaled therein, the crank-shafts of the standards at opposite sides of the gate being connected to move in unison, a counterweight connected with each rock-shaft, a master sprocket-wheel mounted on the rock-shaft of each innermost standard, a swinging operating-bar connected with the rock-shafts at each side of the gate, a counter-shaft mounted at one end of the gate and carrying a sprocket-wheel and sprocket-pin-

ions, a chain connecting said sprocket-wheel and the sprocket-pinion on the curtain-shaft, and chains connecting the said master sprocket-wheels with the counter-shaft pinions, one of said chains being crossed to cause the swinging bars to move simultaneously in reverse directions, but toward or from the gate-frame, substantially as described.

11. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a gate-curtain mounted on a shaft having bearings in said frame and provided at one end with a sprocket-pinion, standards arranged alongside one of the track-rails at opposite sides of the gate and having rock-shafts journaled therein, each of said shafts carrying a crank-arm and a counterweight, a rod connecting the crank-arms of the rock-shaft at each side of the gate to cause the same to move in unison, a master sprocket-wheel mounted on the rock-shaft of the innermost standard at each side of the gate, a swinging operating-bar at each side of the gate and connected to said rock-shaft, an inclined trip-lever connected to the outer end of each swinging bar, a counter-shaft arranged at one end of the gate and carrying a pair of sprocket-pinions and a sprocket-wheel, a chain connecting said sprocket-wheel with the sprocket-pinion on the curtain-shaft, and chains connecting the said master sprocket-wheels with the counter-shaft pinions, one of said chains being crossed to cause the swinging bars to move simultaneously in reverse directions, but toward or from the gate-frame, substantially as described.

12. In a mine-gate, the combination with a main track and a branch track, of a gate-frame arranged at or adjacent to the point of junction of said tracks, a roller-shaft mounted in bearings on said frame and carrying at each end a sprocket-pinion, a gate-curtain secured to said roller-shaft, standards arranged alongside one of the main-line rails on opposite sides of the gate and having rock-shafts mounted therein, similar standards alongside the branch track at one side only of the gate, a master sprocket-wheel connected with the innermost rock-shaft of each of said standards on both the main and branch line mechanism, a pair of swinging operating-bars connected to the rock-shafts of the main line, a similar swinging operating-bar connected to the rock-shafts of the branch-line standards, a main counter-shaft mounted at one end of the frame in line with the main-track mechanism and carrying a pair of sprocket-pinions and a sprocket-wheel, a chain connecting said sprocket-wheel with the sprocket-pinion on the adjacent end of the roller-shaft, chains connecting the said master sprocket-wheels of the main-track mechanism to the pinions on the counter-shaft, one of said chains being crossed to cause the main-track operating-bars to move simultaneously in reverse directions but toward or from the gate-frame, an auxiliary counter-shaft at the oppo-

site end of the gate-frame carrying a sprocket-pinion and sprocket-wheel, a chain connecting said sprocket-wheel with the sprocket-pinion on the adjacent end of the roller-shaft, and a chain connecting the master sprocket-wheel of said branch-track mechanism with the pinion on said auxiliary counter-shaft, substantially as described.

13. In a mine-gate, the combination with a track, of a gate-frame arranged transversely thereof, a roller-shaft having bearing in said frame and carrying at one end a sprocket-pinion, a rock-shaft mounted on each side of the gate and carrying a master sprocket-wheel, a swinging operating-bar connected with each

rock-shaft, a counter-shaft carrying a pair of sprocket-pinions and a sprocket-wheel, a chain connecting said sprocket-wheel with the sprocket-pinion on the roller-shaft, and chains connecting said master sprocket-wheels with the said counter-shaft pinions, said chains being adapted to move the master sprocket-wheels simultaneously in reverse directions, substantially as described.

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

NEWTON K. BOWMAN.

Witnesses:

C. C. HINES,
A. B. LACEY.