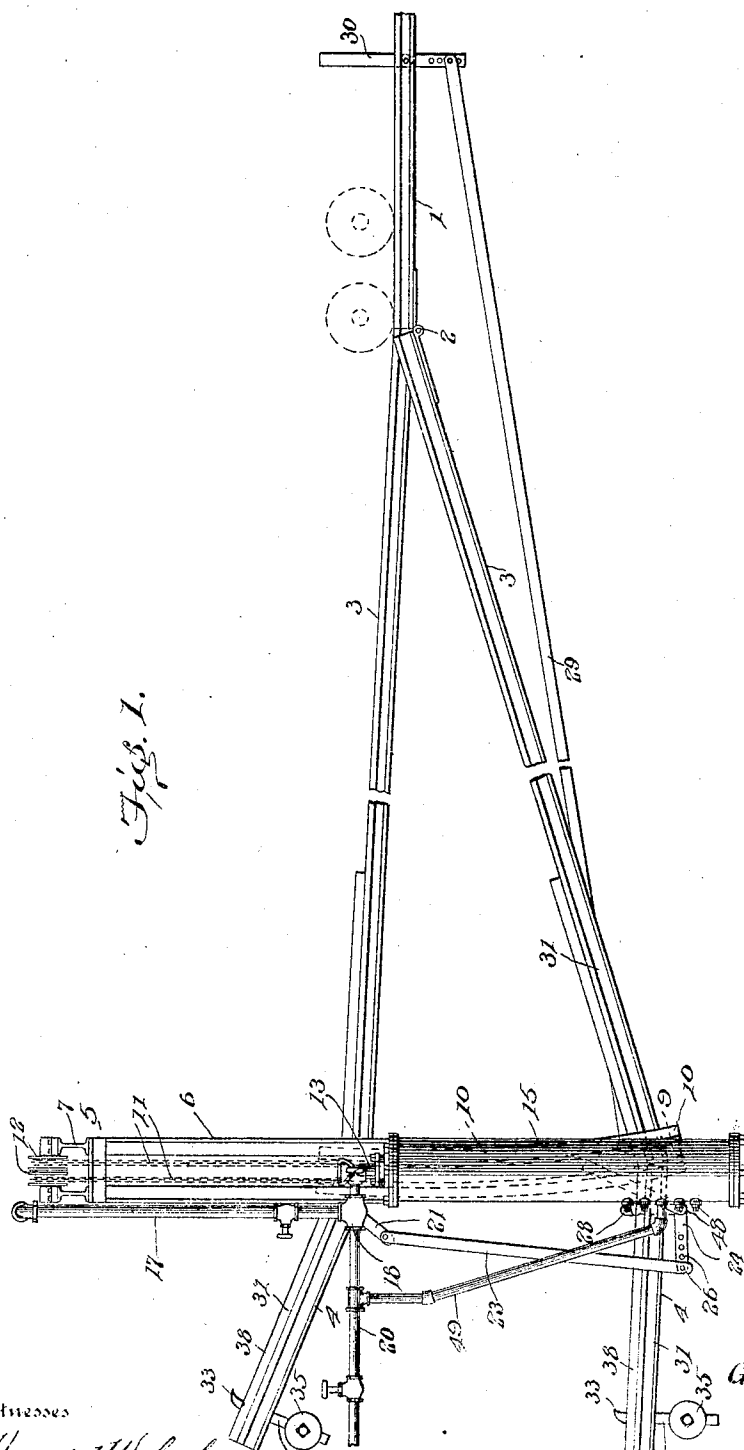


No. 804,950.

PATENTED NOV. 21, 1905.

G. HOLMES.
AUTOMATIC CAR LIFT.
APPLICATION FILED AUG. 18, 1905.

4 SHEETS—SHEET 1.



Witnesses

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Irvine Miller.

Inventor
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4 SHEETS—SHEET 2.

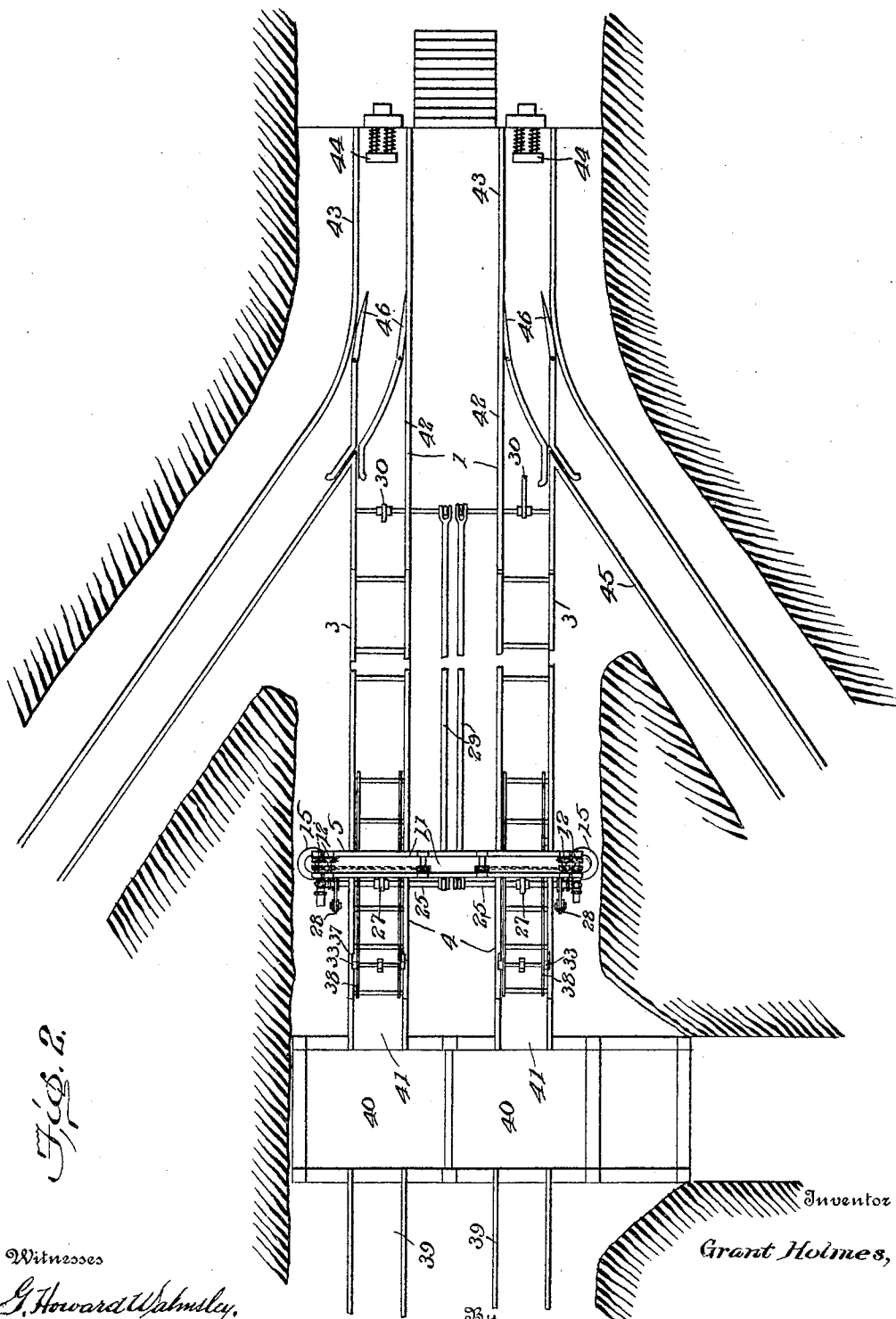


Fig. 2.

Witnesses

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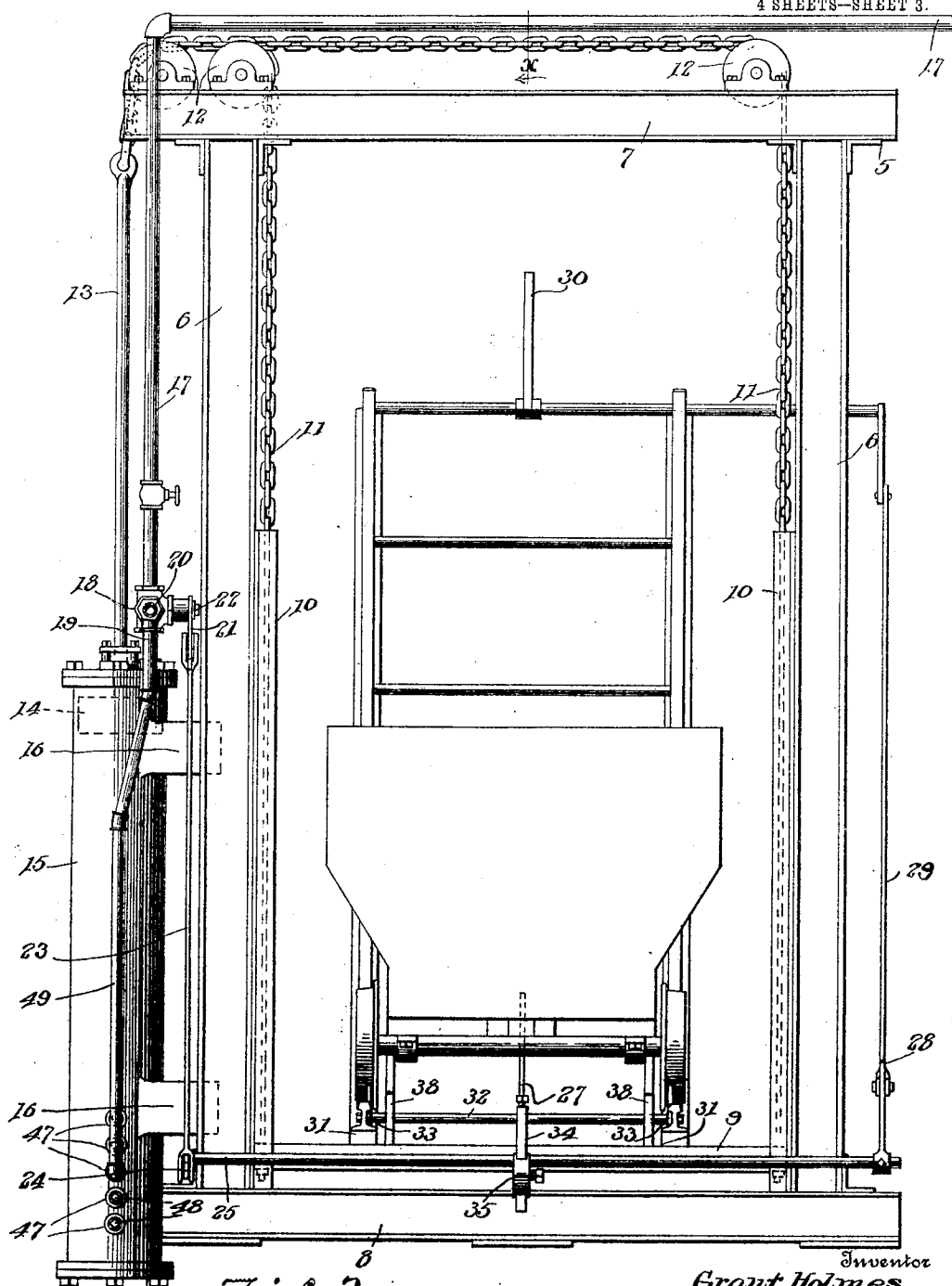
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4 SHEETS—SHEET 3.



Witnesses

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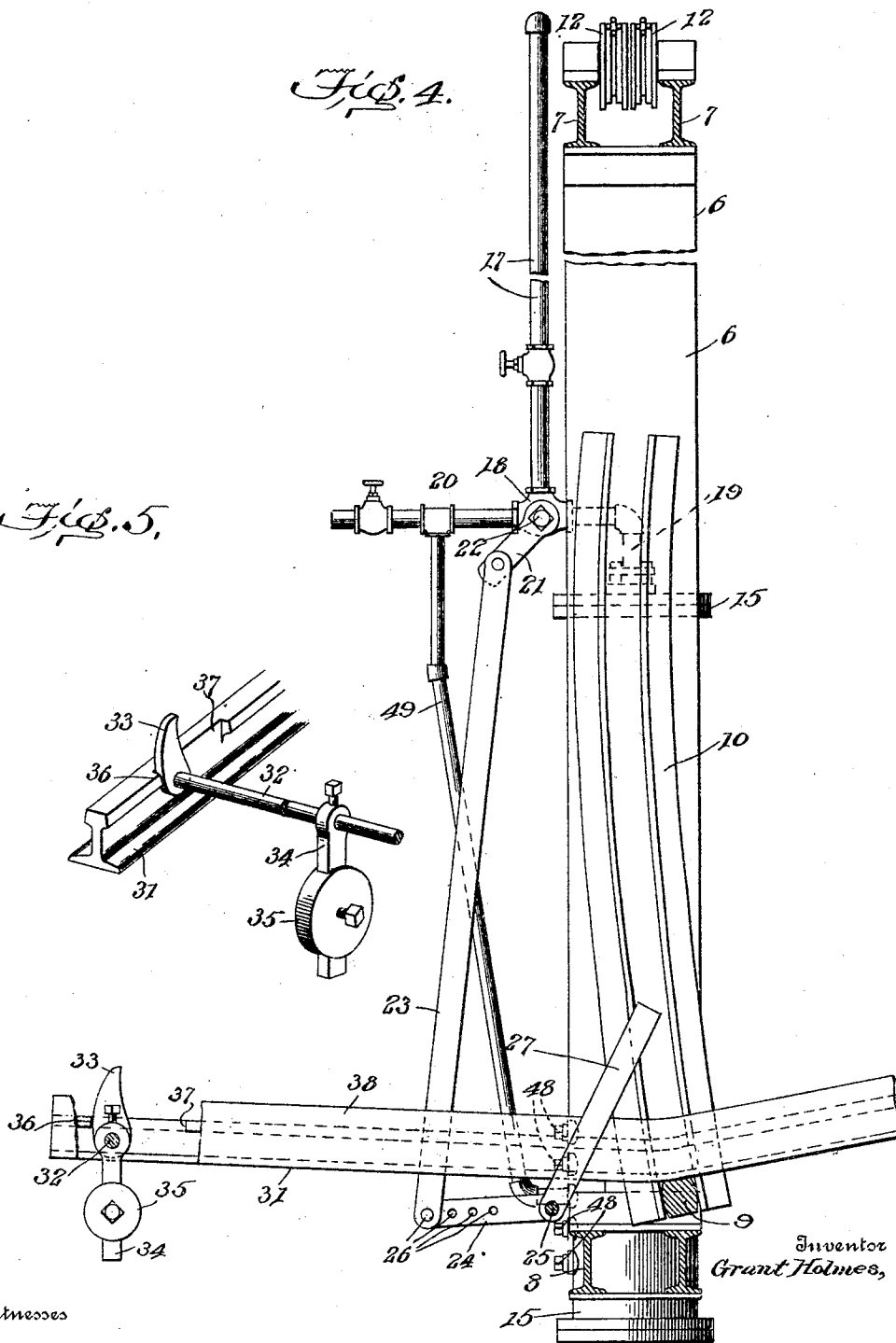
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4 SHEETS—SHEET 4.

Fig. 4.

Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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AUTOMATIC CAR-LIFT.

No. 804,950.

Specification of Letters Patent.

Patented Nov. 21, 1905.

Application filed August 18, 1905. Serial No. 274,714.

To all whom it may concern:

Be it known that I, GRANT HOLMES, a citizen of the United States, residing at Danville, in the county of Vermilion and State of Illinois, have invented certain new and useful Improvements in Automatic Car-Lifts, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to automatic car-lifts, being a mechanism particularly devised for the purpose of automatically handling empty cars at the bottom of a mine-shaft, although capable of use in other connections.

15 The invention has for its object to provide a simple and efficient mechanism which will automatically handle the empty cars as they are delivered at the bottom of the mine-shaft, dispensing with the services of man and animals in the handling of these cars at this point, the mechanism being economical and durable by reason of its low cost of operation and relatively slight wear of the parts, due to the fact that the mechanism is normally stationary and operates only during the period of time when a car is actually being handled by it.

20 To these and other ends my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

25 In the accompanying drawings, Figure 1 is a side elevation of a structure embodying my invention in one form, the lift being shown as a double lift embodying the mechanism in duplicate as it is organized for use in a mine having a hoisting apparatus employing two hoisting-cages moving in opposite directions. Fig. 2 is a plan view showing a horizontal section of the mine at the bottom thereof, the hoisting-shaft and gravity switch-back, and my improved car-lift cooperating therewith. Fig. 3 is a rear elevation of one of the lifts. Fig. 4 is a sectional view taken on the line 30 *x x* of Fig. 3 and looking in the direction of the arrows, and Fig. 5 is a detail perspective view illustrating an automatic stop for holding the car on the lift.

35 My improved lift may be constructed single where a single hoisting-cage is employed or double where two hoisting-cages are employed, as shown in Figs. 1 and 2 of the accompanying drawings. Since the double lift is, however, practically a duplication of the single

lift, I shall first describe the construction of the single lift. This comprises a fixed track-section 1, to which is hinged at 2 a movable track-section 3, having its free end portion 4 arranged at an angle to its body or main portion.

5 indicates an upright frame composed of upright members 6, which are preferably connected at the top and bottom by cross-pieces 7 and 8, respectively. The hinged track-section 3 extends through this upright frame between the side members or uprights 6 thereof and is free to move vertically therein, being guided by a cross bar or tie 9, forming a part of said track-section and having its ends guided in curved ways 10, supported on the inner sides of the uprights 6. To each end of the bar 9 there is connected a chain or other flexible connection 11, and these chains pass over guide-pulleys 12, supported on the top cross-piece 7, and have their ends connected to the piston-rod 13 of a piston 14, which travels in a vertical cylinder 15, located at one side of the frame 5. I have shown said cylinder as supported from said frame by means of brackets 16. Any suitable motor fluid under pressure may be used to actuate the piston 14 in the cylinder 15; but I prefer to employ steam for this purpose. The pressure fluid is supplied from any suitable source through a supply-pipe 17, which is provided with a three-way valve 18, from which a connection 19 leads to the upper end of the cylinder 15, an exhaust-pipe 20 being also connected to said three-way valve. The three-way valve is of a well-known type, its structure being such that in one of its positions the supply-pipe 17 will be connected with the cylinder-pipe 19 to supply pressure to the cylinder, the exhaust 20 being closed, while in its other position the supply-pipe 17 is closed, and the cylinder-pipe 19 is connected with the exhaust 20 to permit the pressure to escape from the cylinder. The valve 18 is provided with an operating-lever 21, secured to the valve-stem 22 to operate the valve, and to the free end of said operating lever or arm there is pivotally connected the upper end of a link 23, the lower end of which is pivoted to the free end of an arm 24, secured on a rock-shaft 25, supported in suitable bearings on the frame 5. The arm 24 is preferably provided with a plurality of apertures 26 for the pivotal connection of the link 23, so that the parts

may be so adjusted as to give the desired throw or range of movement to the arm or lever 21 and valve 18 by reason of the adjustment thus provided. The rock-shaft 25 carries a tappet or contact arm 27, arranged in the path of the car so as to be struck thereby, the arrangement being such that as the advancing car strikes the said contact-arm it will so turn the rock-shaft 25 that through the connecting parts 24, 23, and 21 the valve 18 will be so turned as to admit pressure to the top of the cylinder 15 above the piston 14 therein. The rock-shaft 25 is also provided with an arm 28, secured thereon at one end and connected by a link or connecting-rod 29 with the lower end of a contact arm or tappet 30, mounted in bearings in the fixed track-section 1, its upper end being in the path of the car. The arrangement of these parts is such that when the arm 30 is struck by the advancing car it will move the rock-shaft 25 back to its original position and will so move the valve 18 as to cut off the pressure-supply and place the interior of the cylinder in connection with the exhaust. It will be noticed that the arms 30 and 28 are provided with a plurality of pivot-apertures, by means of which the throw of the parts may be so adjusted as to give the desired range of movement to the three-way valve.

The track-section 3 is provided near its free or receiving end with a stop to prevent any backward movement of the car after it has fully entered the track-section. To this end the rails 31 of the track-section have mounted in them a rock-shaft 32, provided with a stop-arm 33, which extends upward in the path of the car-wheels and which is held normally in said upright position by means of an arm 34, secured on the rock-shaft 32 and carrying a weight 35. A stop-shoulder 36 is provided to prevent rearward motion of the stop-arm 33, and to this end I prefer to employ the construction shown, in which the inner part of the head of the rail is cut away, as indicated at 37, to accommodate the stop-arm 33. The stop-arm is located near one end of said cut-away portion, so that it will bear against the abutment-shoulder 36 when upright, and thus be prevented from yielding rearwardly, while free to yield in a forward direction when struck by the car-wheels to permit the passage of these latter. Guard-plates 38 may be employed inside of the rails 31 to aid in preventing derailment along this portion of the track.

The apparatus above described is shown in Fig. 2 as applied in a mine, the application being in duplicate. The track for the loaded cars is indicated at 39 and a hoisting-shaft for the two cages at 40. The apparatus which I have described is arranged in duplicate adjacent to the shafts 40, the part 4 of each track-section 3 being located below the level of the loaded-car track 39 when said track-section 3 is in its lowered position, and con-

sequently below the level of the track on the cage with which it cooperates when said cage is lowered in its shaft to a position with its track on a level with the loaded-car track 39, so as to receive a loaded car. A short downwardly-inclined section of track 41 extends from the position of the lowered cage to the end of the movable track-section 3, and it will be observed that the part 4 of the track-section 3 has a slight downward inclination in the direction of travel of the car when in its lowered position. The fixed track-section 1, which is also slightly inclined downwardly in the direction of the forward travel of the car, is located a considerable distance above the loaded-car track 39, so that the main portion of the movable track-section 3 extends upwardly in a considerably-inclined position when said movable section is in its lowered position, as shown by the position of the nearest lift in Fig. 1. From the fixed track-section 1 there extends a downwardly-inclined track portion 42, which connects with an upwardly-inclined portion 43, terminating in a spring-buffer 44.

45 indicates a switch-track having an automatic spring-switch 46 located at the lower end of the incline 43, said switch-track 45 constituting a continuation of said incline 43, and the spring-switch being so arranged as to permit the passage of the car along the track 42 and 43 toward the buffer 44, said switch serving to automatically divert the car onto the switch-track 45 with its return by gravity down the incline 43. It will be understood that the switch-track 45 passes around the shaft and returns to a connection with the track 39 at a point beyond the loaded cars stored thereon. The arrangement is, as already stated, in duplicate, since one cage is descending while the other is ascending. Assuming that a cage with an empty car thereon has descended and stopped at the level of the loaded-car track 39, with which it cooperates, the loaded car on said track nearest the cage is pushed onto the cage, and by this operation the empty car on said cage is pushed off of the cage onto the downwardly-inclined track 41. The empty car passes downward along this track by gravity and passes onto the part 4 of the movable track-section 3, which is depressed to receive it, the slight downward inclination of said part 4 aiding in the forward movement of the car by gravity. Upon entering the lift the car-wheels pass over the stop-arm 33, which yields to permit their passage, but which rises behind them in such a way as to prevent the car from moving backward from the lift, thus insuring its being retained in position thereon. As the empty car moves along the track-section 3 it will come into contact with the arm 27, and through the mechanism connected therewith will move the valve 18 in the manner hereinbefore described, so as to admit steam to the

upper end of the cylinder 15 above the piston 14 therein. Said piston will then move downward in the cylinder, and by reason of the connection of the chains 11 to its piston-rod 13 the free end of the track-section 3 will be lifted to a position such as is illustrated by the position of the further lift in Fig. 1. The inclination of the movable track-section is now a downward-and-forward one throughout, the car having been lifted along with the free end of the track-section to a position such that it will run down the same by gravity and onto the fixed track-section 1, the inclination of which will aid the advance of the car. Here the car comes into contact with the arm 30 and, swinging the same over as it passes it, will, through the connecting mechanism described, shift the valve 18 to a position such as to cut off the pressure-supply from the cylinder and connect its interior with the exhaust. The weight of the movable track-section will thereupon cause it to assume its original position as the pressure fluid escapes from the cylinder and the piston rises therein, the rate being controlled in an obvious manner by the extent of opening of the valve 18. During this operation the empty car passes onward down the grade 42 and past the switch 46, being carried up the incline 43 by its inertia until its advance is arrested either by the spring-buffer or by the exhaustion of its impulse. The empty car then returns down the incline 43 and is diverted by the switch 46 to the side track 45, down which it passes by gravity, returning around the shaft to a position back of the loaded cars on the corresponding track 39, from which position it can be hauled back into the mine in the usual way to be again loaded.

It will be noted that the entire handling of the empty cars is purely automatic, the mere operation of placing the loaded car on the cage starting the empty car on its journey, throughout which it is handled without the intervention of the operator. I am thus enabled to dispense with the services of the men and draft-animals usually employed to handle these empty cars as they come from the cages and return them to the track leading into the mine. It will be noted that the empty car as it advances not only puts into operation the power mechanism whereby the lift is raised to bring the car to the necessary higher level, but also serves to so operate said mechanism as to return the lift to its normal lowered position, ready to receive the next empty car. The mechanism is in operation only during the time necessary to handle each car and remains stationary without consuming any power and without causing any wear of the parts until called upon to handle the next car upon its arrival.

In order to regulate the height to which the movable track-section is lifted and at the same time prevent compression and vacuum in front

of the piston and shock at the end of its effective stroke, I have devised the construction which I will now describe. The cylinder is closed at both ends, and in the side wall of the cylinder near its lower end there are formed a plurality of apertures 47, arranged at different heights therein, so as to be at different distances from the end of the cylinder. All of these apertures, with the exception of one, are closed by removable screw-plugs 48 or other suitable closures. The one aperture which is not thus closed serves to permit the escape of the air in the cylinder in front of the piston when this latter descends, also serving to permit the entrance of air and prevent the formation of a vacuum when the piston rises. Furthermore, this aperture serves to provide a cushion to prevent shock at the end of the working stroke of the piston, since as soon as the forward end of the piston has passed beyond said aperture the air in the front of the piston becomes compressed between it and the cylinder-head, thereby acting as a cushion or dash-pot to prevent shock. Furthermore, this open aperture serves to define the length of the stroke of the piston, and consequently the height to which the car is lifted. The body of the piston is of such a length that its rear or upper face passes beyond the upper edge of the aperture, so as to put the same into communication with the steam-space above the piston, and the steam is thus permitted to escape through said aperture, in consequence of which the advance of the piston ceases when said aperture is thus uncovered. Preferably the open aperture is connected with the exhaust-pipe 20 by means of a pipe 49, so that the steam thus escaping is conducted to the exhaust-pipe and discharged at a suitable point. It will be understood that the piston will be thus held balanced as soon as the open aperture is uncovered, since further downward movement of the piston cannot occur for lack of pressure, the steam escaping through the aperture, while upward movement of the piston is resisted by the steam as soon as the aperture is closed. The piston is thus held at the end of its stroke until the three-way valve is shifted and the steam permitted to escape from the upper end of the cylinder through the pipe 19. It will be readily seen that any one of the apertures 47 may be left open, the others being closed, and in this way the stroke of the piston and the height of the lift may be regulated without varying the length of the cylinder. Of course the pipe 49 when it is used will be connected to the particular aperture which is thus left open. The same result may be obtained by forming a single aperture in the cylinder located at the point which will give the piston the desired stroke to suit the conditions of the particular apparatus in which the cylinder is used.

I do not wish to be understood as limiting

myself to the precise details of construction hereinbefore described, and shown in the accompanying drawings, as it is obvious that these details may be varied without departing from the principles of my invention.

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

1. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, means for raising and lowering the other end of said track-section, and controlling means actuated by the car for causing said raising and lowering mechanism to raise the free end of said track-section when the car enters the same and to lower said end when the car leaves said section, substantially as described.

2. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, means for raising and lowering the other end of said track-section, and controlling means actuated by the car for causing said raising and lowering mechanism to raise the free end of said track-section when the car enters the same and to lower said end when the car leaves said section, said track-section having its receiving end inclined downward in the direction of travel of the car when said section is in its lowered position, substantially as described.

3. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, a fluid-pressure cylinder provided with a piston connected with said track-section, a valve controlling the supply of pressure fluid to said cylinder, and contact devices actuated by the car for shifting said valve to raise the track-section when the car enters the same and lower said section when the car leaves the same, substantially as described.

4. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, a pressure-cylinder provided with a piston, guide-pulleys located above the track-section, flexible connections between said piston and the track-section passing over said guide-pulleys, a valve controlling the supply of pressure fluid to said cylinder, and contact devices actuated by the car for shifting said valve to lift the track-section when the car enters the same and to lower said section when the car leaves the same, substantially as described.

5. A car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, an upright frame through which the other end of said track-section passes, said frame being provided with guide-ways and elevated pulleys, said track-section having a cross-piece traveling in said guide-ways, chains connected to said cross-piece and passing over said pulleys, a pressure-cyl-

inder provided with a piston and piston-rod to which said chains are connected, and a valve controlling the supply of pressure fluid to said cylinder, substantially as described.

6. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, a pressure-cylinder having a piston connected to said track-section, a three-way valve having connections with a pressure-supply, the cylinder, and an exhaust, and means actuated by the car for shifting said valve to connect the pressure supply and cylinder when the car enters the track-section, and for shifting said valve to close the pressure-supply and connect the cylinder and exhaust when the car leaves the track-section, substantially as described.

7. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, a pressure-cylinder having a piston connected with said track-section to raise and lower the same, a valve controlling the pressure-supply to said cylinder, a rock-shaft connected with said valve to shift the same to either its raising or lowering position, and two contact-arms operatively connected with said rock-shaft and arranged in the path of the car at the entrance and exit of the track-section respectively, the former arm moving the rock-shaft to shift the controlling-valve to its raising position and the latter arm returning the rock-shaft and valve to their normal lowering position, substantially as described.

8. In an automatic car-lift for lifting a car from a lower to a higher level, a track-section pivoted at one end and provided with means for raising and lowering its other end, said section being provided at said other end with a stop-arm which permits the passage of the car in a forward direction and prevents its return in the opposite direction, substantially as described.

9. The combination, with a loaded-car track located on one side of a shaft, an empty-car track inclined downward from the shaft on the opposite side thereof, and a reverse incline beginning at a higher level and comprising a switch-track passing around the shaft and having an automatic or spring switch, of an automatic car-lift for raising the empty car from the bottom of the first-mentioned incline to a height sufficient to cause it to ascend the reverse incline, said lift comprising a track-section pivoted at one end and having its other end normally level with the lower end of the first-mentioned incline, and automatic mechanism controlled by the car for lifting the free end of said track-section to reverse its inclination when the car enters the same and to restore said track-section to its normal position when the car leaves the same, substantially as described.

10. An automatic car-lift for lifting a car

from a lower to a higher level, comprising a track-section pivoted at one end, a fluid-pressure cylinder closed at both ends and provided with a piston connected with said track-section, a valve controlling the admission and exhaust of the pressure fluid to and from one end of said cylinder, and an opening located in the side of the cylinder at a distance from the other end greater than the length of the piston, substantially as described.

11. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, a fluid-pressure cylinder closed at both ends and provided with a piston connected with said track-section, a valve controlling the admission and exhaust of the pressure fluid to and from one end of said cylinder, a plurality of apertures formed through the side wall of the cylinder at different distances from its other end greater than the length of the piston, and means for

closing all of said apertures except one, substantially as described.

12. An automatic car-lift for lifting a car from a lower to a higher level, comprising a track-section pivoted at one end, a fluid-pressure cylinder closed at both ends and provided with a piston connected to said track-section, a three-way valve, a supply-pipe and exhaust-pipe connected to said valve, a cylinder-pipe connecting said valve and one end of the cylinder, an opening formed through the side of the cylinder at a distance from its other end greater than the length of the piston, and a pipe connecting said opening with the exhaust-pipe, substantially as described.

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

GRANT HOLMES.

Witnesses:

FRANK W. PENWELL,
GERTRUDE C. KOCH.