Nov. 16, 1943. J. L. GILBERT 2,334,323

SCRAPING AND LOADING MACHINE

Filed Dec. 6, 1941 3 Sheets-Sheet 1

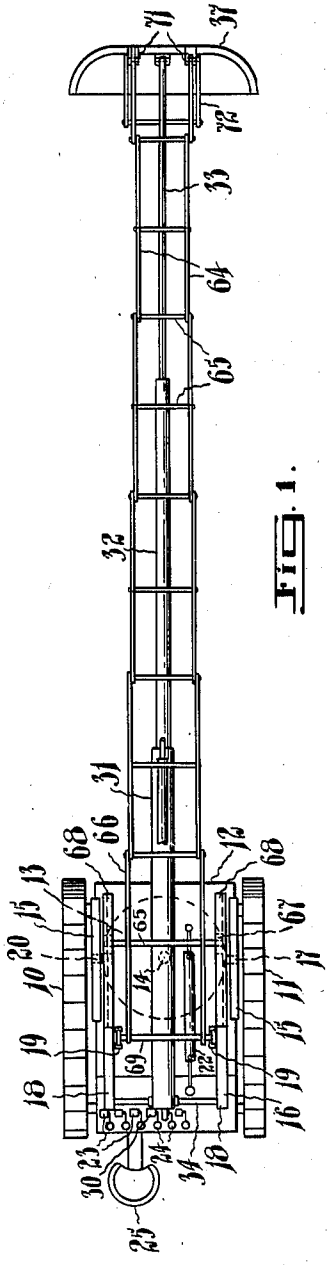


Fig. 1.

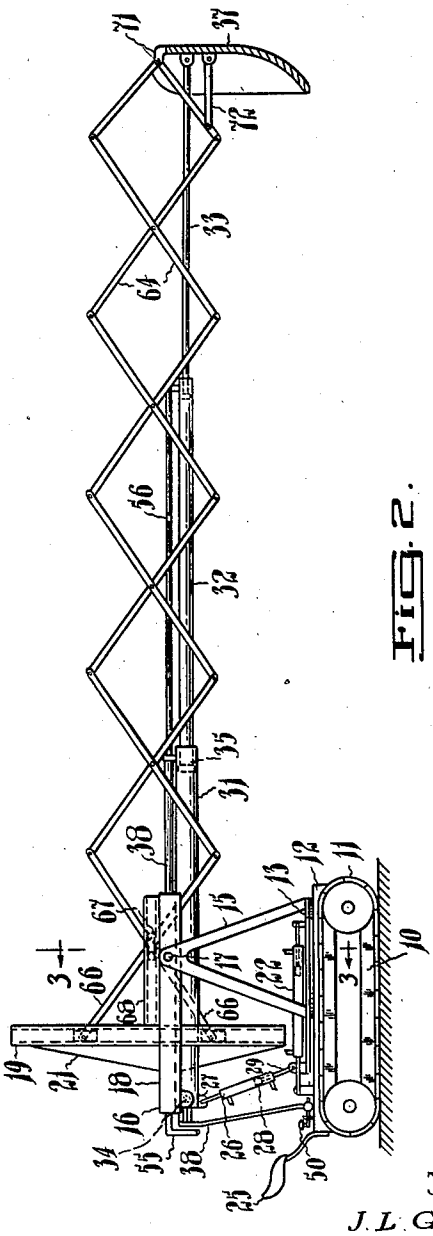


Fig. 2.

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SCRAPING AND LOADING MACHINE

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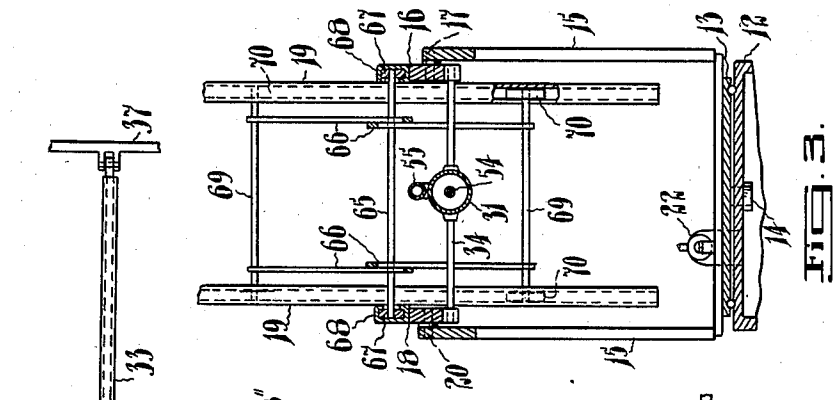


Fig. 3.

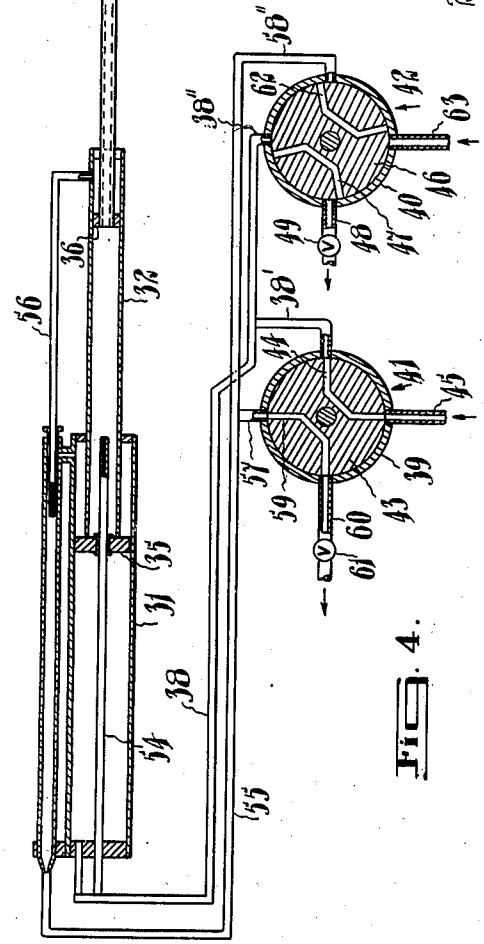


Fig. 4.

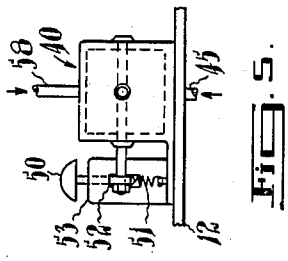


Fig. 5.

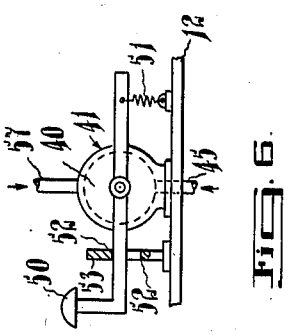


Fig. 6.

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SCRAPING AND LOADING MACHINE

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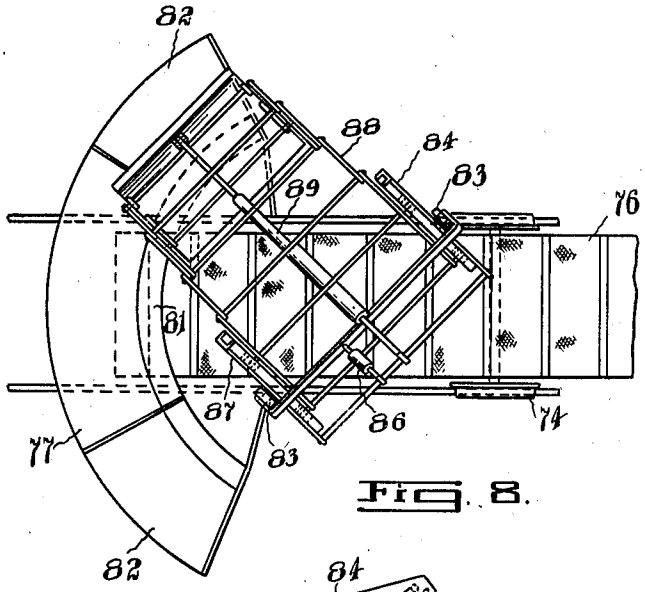


Fig. 8.

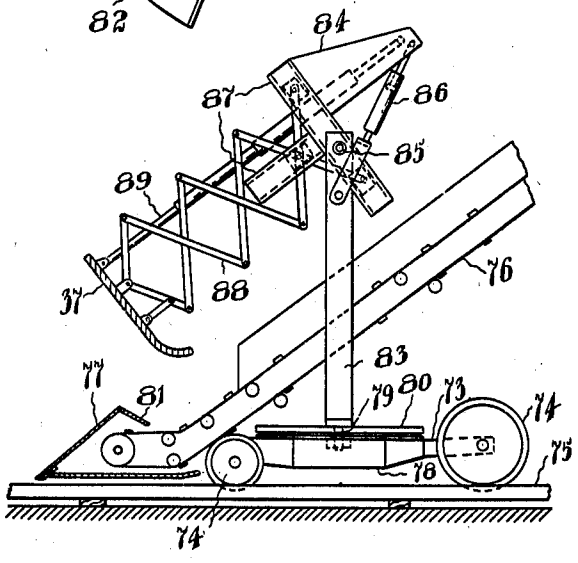


Fig. 7.

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Patented Nov. 16, 1943 2,334,323

UNITED STATES PATENT OFFICE

2,334,323

SCRAPING AND LOADING MACHINE

Jack Leslie Gilbert, Toronto, Ontario, Canada

Application December 6, 1941, Serial No. 421,876

9 Claims. (Cl. 198—224)

My invention relates in particular to mining machinery, and has for its major objects the provision of a scraper mechanism capable of great extension which renders it admirably suited for operation in close quarters, and one which can be compacted so that the machine as a whole in which it is incorporated may be moved from place to place within the limited passage space of a mine.

The invention consists essentially of a machine comprising an arrangement of telescopic members pneumatically reciprocated and supported for such movement by a lazy-tong device for actuating a scraper. The telescopic members comprise cylinders connected to a system for supplying air under pressure and controlled by an arrangement of valves by which an operator can regulate the action of the scraper. The telescopic members and the lazy-tong device are mounted upon a frame having axes on which the scraper may be raised and lowered and also shifted sidewise by manipulation of valves that control air cylinders. The lazy-tongs are connected to the frame by means of slidably guided blocks devised to accommodate expansion and contraction.

A distinctive feature of construction is that the telescopic members are devised so that they function solely to reciprocate the scraper, and the lazy-tongs are devised to carry the telescopic members and the scraper.

A further distinctive feature of construction is that the valves of the pneumatic system provide for regulating the stroke of the scraper and for locking it in any stage of its travel.

My invention is especially useful in at least two capacities; one as a stope scraper and the other as a mine car loader. As herein disclosed as a scraper machine, the device operates to scrape broken ore in "square set" stopes to a grissly" or chute so that the material will drop down the passage thereof. Since this operation is at present chiefly performed by manual labor my invention will facilitate and expedite this work.

As herein disclosed as a loader the device operates to scrape broken ore onto an apron of a conveyor, which conveyor elevates the material and deposits it in a mine car.

The advantages and utility of the invention will be understood better from the ensuing description in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of the machine for use as a stope scraper.

Fig. 2 is a side elevation thereof depicting the scraper hoe in section.

Fig. 3 is a vertical section taken on line 3—3 of Fig. 2.

Fig. 4 is a schematic view, mostly in section, showing the telescopic members, the valves for actuating the same and the pipe-line connections of the pneumatic system in which the valves are incorporated.

Fig. 5 is a side view of one of the valves illustrated in Fig. 4, which valves are of identical construction.

Fig. 6 is an end view thereof showing the pedal as it appears in side elevation.

Fig. 7 is a side view of a loading machine incorporating the invention.

Fig. 8 is a plan view thereof.

Like numerals of reference denote similar parts in each figure of the drawings.

The invention will be recounted first in its application as a machine for use as a mine-stope scraper, as illustrated in Figs. 1 to 6, inclusive. This comprises a wheeled body 10 such as a truck or the like desirably equipped with caterpillar treads 11 and preferably supplied with an air motor as the prime mover by which the machine may be capable of locomotion. The air motor (not shown) will be of standard type and provided with an air line for connection to a source of compressed air, which of course is available in a mine. The wheeled body 10 will be of suitable construction and will provide a platform 12 at the top having a turn table 13 rotatable about a vertical axis 14.

Rigidly mounted on the turn table is a pair of spaced standards 15 having at their upper ends an approved connection for tiltably supporting a frame 16 on a transverse axis 17. This frame is composed of a pair of spaced members 18 each carrying a vertical guide beam 19. The members 18 are disposed oppositely and each is located at the inner side of a standard 15 so as to extend substantially horizontally for movement in a vertical plane about the axis 17. Each member 18 may have a trunnion 20 journalled in the adjacent standard to constitute the axis 17. The members 18 are tied to each other for unitary operation and the guide beams 19, rigidly carried thereby, are braced as at 21.

Frame 16 is thus mounted for compound movement, that is to say, the turn table enables it to be swung from side to side of the wheeled body 10, and the trunnions 20 enable it to be tilted on the standards 15.

It is intended that the turn table 13 shall be

equipped with a device by which it may be turned to any angle within a range of movement desirable. Devices are well known in the art for achieving this purpose, however I have indicated in the drawings a cylinder 22 having one end pivoted to the platform 12 and having the other end furnished with a rod extending from a double acting piston therein and pivoted to the turn table to one side of its dead centre. The cylinder is operated by compressed air and regulated by valves 23, which may be of the type hereinafter recounted. The valves 23 will have pedals, denoted at 24, by which an operator, occupying a seat 25, may manipulate the same. This expedient is given by way of illustration but not of limitation.

For the purpose of tilting the frame 16 about its axis and retaining it in any position of rest, I employ a double-acting cylinder 26 having suitable connections for admitting air into and exhausting it from each end as customary. This cylinder has a yoke connection 27 with the frame at a point removed from the axis 17 and contains a piston 28 whose rod 29 is pivotally united to the turn table 13. Air under pressure from a source of supply is controlled by a pair of valves 30 actuated by pedals in juxtaposition to the pedals 24 aforesaid. Each of the valves 30 is of the four-way type hereinafter described, and serves to introduce air into one end of the cylinder and at the same time to exhaust air from the other end. When both valves are in normally closed position, the piston is locked against motion and consequently the frame is secured at rest. To raise or lower the frame to any angular degree it is only necessary that the operator depress the proper pedal. Such a valve-controlled system needs no further description for it is well known in the art.

The telescopic members project forwardly from the frame 16 and comprise a main cylinder 31, a second cylinder 32 slidable therein and a ram 33. The main cylinder extends coextensively between the members 18 of the frame and is preferably non-rigidly connected thereto at its rear end by means of a cross piece 34 which unites these members. The connection is of a pivotal nature. The second cylinder has a piston portion 35 within the main cylinder and the ram has a piston portion 36 within the second cylinder and is tubular, the outer end being pivoted to a scraper hoe 37. The scraper hoe may be of any desirable shape or construction as best suited to the work for which it is intended.

The telescopic members provide for great extensile movement so as to impart a long stroke to the scraper hoe. They are pneumatically controlled by the pneumatic system detailed in Fig. 4 comprising a pipeline 38 communicating with the rear end of the main cylinder 31 and connected by branch lines 38' and 38'' to the casings 39 and 40 of valves 41 and 42 respectively, which are of the four-way type. The plug-body 43 that is revolubly seated in the valve 41 has a port 44 by which communication is established between the branch line 38' and an air supply line 45 leading to a source of compressed air. The plug-body 46 that is similarly seated in the valve 42 has a port 47 by which communication is established between the branch line 38'' and an exhaust pipe 48 leading from the casing 40 and controlled by a cock 49. Valves 41 and 42 are actuated by pedals 50 connected externally to the plug-bodies 43 and 46 thereof, and are normally held in closed position by means of a spring as at 51 which urges the respective pedal against a shoulder 52 of a stop 53 as shown in Figs. 5 and 6. Valves 41 and 42 are mounted on the platform 12 and grouped with the valves above referred to.

Assuming that the telescopic members are in contracted position, the opening of valve 41 causes air from the source of supply to be conducted by the pipe line 38 to the main cylinder 31 so as to act on the piston 35 of the second cylinder and urge it outwardly. Pipe line 38 has a tube 54 centrally extending through the main cylinder into the second cylinder by which air is simultaneously introduced therein to act concurrently on the piston of the ram 33 and drive it outwardly. In this manner a forward stroke is imparted to the scraper hoe, it being understood that valve 42 is closed at this time.

A second pipe line, indicated at 55, is connected to the front end of the main cylinder and is provided with a slidable extension 56 attached to the front end of the second cylinder so as to communicate therewith and at the same time to accommodate reciprocation of this cylinder. Pipe line 55 has branches 57 and 58'' connected to the casings 39 and 40 of valves 41 and 42 respectively. Branch 57 establishes a communication with a port 59 in the plug-body 43, which port leads to an exhaust line 60 having a cock 61. Branch line 58'' establishes a communication with a port 62 in plug-body 46, and this port leads to an air supply line 63. This second pipe line permits air in advance of the pistons 35, 36, to be exhausted through port 59 when valve 41 is open and valve 42 is closed. On closing valve 41 and opening valve 42, pipe line 55 conducts air to the forward ends of the cylinders to drive the second cylinder and the ram backwardly in order to telescope them and thus return the scraper hoe. The air back of the pistons is exhausted by pipe line 38 through port 47 into pipe 48. Tube 54 enters the hollow ram.

It will be gathered that this system enables the telescopic members to be reciprocated by the operator to cause the scraper hoe to be alternately pushed and pulled. It will also be understood that the system is operative to lock the telescopic members in any position, and that the rate of operation of the scraper hoe can be regulated by using the cocks 49 and 61 as throttles for controlling air flow from the source of supply.

A paramount feature of the invention is that the telescopic members are employed solely to reciprocate the scraper hoe, and the weight thereof is taken by the lazy-tongs structure, which comprises two sets of lazy tongs 64 arranged co-extensively with the telescopic members in straddling relation. Each set of lazy tongs has its component bars pivoted at the points of intersection and at the meeting ends as usual. The companion sets, however, have their bars joined at the points of intersection and at their meeting ends by means of crossbars 65. The rear end pair of bars 66 of each set have their pivotal juncture supplied with a block 67 longitudinally slidable in a guide 68 of a channel-shaped cross section. These guides are rigidly carried by the members 18 of the frame.

The rearmost termini of said bars 66 are pivotally united by means of crossbars 69 to blocks 70 slidably carried in the guide beams 19 which are of a channel-shaped cross section to supply

guideways. By this arrangement the frame 16 supports the lazy tongs in a manner to permit them to extend and contract. The frontal bars of the lazy tongs are pivoted at 71 to the scraper hoe 37 and links 72 removed from this pivot connection operate to retain the scraper hoe in operative position.

It will now be evident that the lazy tongs carry the telescopic members and the scraper hoe, and that any slight flexing of the telescopic members will not affect the operation of the device on account of the manner in which they are mounted.

Having fully recounted my invention as a stope scraper I shall now proceed to describe its application as a mine car loader as illustrated in Figs. 7 and 8. The loader comprises a truck 73 having wheels 74 for running on a track 75. The truck carries an inclined conveyor of the endless belt type, indicated at 76, which delivers broken ore to a car to be loaded. The conveyor is of the ordinary type, but is equipped with a specially designed apron 77 at its receiving end for co-operating with the scraper device. The apron is an upwardly inclined member supported by the truck-body 78 and curved on an arc of a circle whose centre is concentric with the axis 79 of a turn table 80. At the top of the apron is a downwardly directed chute piece 81, and at each side thereof is a wing 82 so constructed as to be extensible for increasing the breadth of the apron. The wings operate to enable material at the sides of the track to be scraped onto the conveyor and when not in use can be retracted in order not to interfere with the movement of the machine in the confined space of a mine tunnel. The wings may be extended by any suitable mechanism—not shown.

The scraper mechanism comprises standards 83 straddling the conveyor and mounted on the turn table 80 diametrically of its axis. The standards carry a frame 84 pivoted on an axis 85 and controlled by a double-acting air cylinder 86 similar to the cylinder 26 already described for raising and lowering the scraper hoe 37. The frame 84 provides guide pieces 87 for the lazy tongs 38 which operate and are connected to the scraper hoe in the manner above related. The telescopic members, generally designated at 89, are identical in construction and operation to those previously recounted, in fact the whole scraper mechanism is the same as that of the stope scraper, except that it is mounted on a car loader of the conveyor type.

In operation, the scraper hoe is raised and extended over a pile of broken ore and then lowered and retracted to draw material from the pile onto the apron of the loader so that it will drop onto the conveyor and be carried upwardly and deposited in a car hitched to the loader.

Having described my invention in a practical form it will be understood that various changes and modifications may be resorted to as coming within the scope of the appended claims.

What I claim is:

1. In a mechanism of the class described, the combination with an arrangement of power operated telescopic members projecting from a support, of a scraper tool at the distal terminus of the telescopic members and reciprocable thereby, and means for sustaining said distal terminus and said scraper tool, said means comprising lazy tongs supported for co-extensive motion with the telescopic members and having end bars pivoted to the scraper tool, and a link pivoted to one of said end bars and similarly connected to the scraper tool at a distance from the pivotal connection of the end bars thereto.

2. In a mechanism of the class described, a frame, an arrangement of power operated telescopic members pivotally supported at an end thereby and projected therefrom, a scraper tool attached to the distal end of the telescopic members, lazy tongs carried by the frame co-extensively with the telescopic members and straddling the same and pivotally attached to the distal end thereof, whereby detrimental bending stress is relieved by the pivotal attachment, and means providing a connection with the frame to enable the lazy tongs to fold and unfold thereon, said means consisting of guide pieces slidable in guide ways arranged longitudinally and transversely of the lazy tongs to firmly support them for operative motion.

3. In a mechanism of the class described, a frame, an arrangement of telescopic members comprising a main cylinder connected to said frame, a second cylinder slidable therein having an apertured piston portion, and a ram extending from the second cylinder for working a tool, the ram being tubular and having a piston portion, lazy tongs carried by said frame for co-acting therewith to support the telescopic members and said tool, and a pneumatic system for introducing air under pressure to said cylinders and exhausting it therefrom, said system comprising a pipe line communicating with the main cylinder and having a tube extending therein and into the aperture of the piston portion of the second cylinder, a second pipe line communicating with the main cylinder and having an extension slidable therein and communicating with the second cylinder, four-way valves connected in said pipe lines such that one valve functions to advance the second cylinder and the ram and to exhaust air back of the piston portions thereof, and another valve functions similarly to return the second cylinder and the ram and to exhaust air from the opposite side of the piston portions thereof, and spring-urged pedals normally retaining the valves in closed position.

4. In a mechanism of the class described, a frame, an arrangement of telescopic members comprising a main cylinder connected to said frame, a second cylinder slidable therein having an apertured piston portion, and a ram extending from the second cylinder for working a scraper tool, the ram being tubular and having a piston portion, an extensile device carried by said frame for co-acting therewith to support the telescopic members and said scraper tool, and a pneumatic system for introducing air under pressure to said cylinders and exhausting it therefrom, said system comprising a pipe line communicating with the main cylinder and having a tube extending therein and into the aperture of the piston portion of the second cylinder, a second pipe line communicating with the main cylinder and having an extension slidable therein and communicating with the second cylinder, four-way valves connected in said pipe lines such that one valve functions to advance the second cylinder and the ram and to exhaust air back of the piston portions thereof, and another valve functions similarly to return the second cylinder and the ram and to exhaust air from the opposite side of the piston portions thereof, and spring-urged pedals normally retaining the valves in closed position.

5. In a mechanism of the class described, a frame, an arrangement of telescopic members comprising a main cylinder connected to said frame, a second cylinder slidable therein having an apertured piston portion, and a ram extending from the second cylinder for working a tool, the ram being tubular and having a piston portion, lazy tongs carried by said frame for co-acting therewith to support the telescopic members and said tool, and a pneumatic system for introducing air under pressure to said cylinders and exhausting it therefrom, said system comprising a pipe line communicating with the main cylinder and having a tube extending therein and into the aperture of the piston portion of the second cylinder, a second pipe line communicating with the main cylinder and having an extension slidable therein and communicating with the second cylinder, four-way valves connected in said pipe lines such that one valve functions to advance the second cylinder and the ram and to exhaust air back of the piston portions thereof, and another valve functions similarly to return the second cylinder and the ram and to exhaust air from the opposite side of the piston portions thereof, and actuating means normally retaining the valves in closed positions.

6. In a mechanism of the class described, a frame, an arrangement of telescopic members comprising a main cylinder connected to said frame, a second cylinder slidable therein having an apertured piston portion, and a ram extending from the second cylinder for working a tool, the ram being tubular and having a piston portion, lazy tongs carried by said frame for co-acting therewith to support the telescopic members and said tool, and a pneumatic system for introducing air under pressure to said cylinders and exhausting it therefrom, said system comprising a pipe line communicating with the main cylinder and having a tube extending therein and into the aperture of the piston portion of the second cylinder, a second pipe line communicating with the main cylinder and having an extension slidable therein and communicating with the second cylinder, and valve means controlling said pipe lines for advancing the second cylinder and the ram and exhausting air back of the piston portions thereof, and also for returning the second cylinder and the ram and exhausting air from the opposite side of the piston portions thereof.

7. In a mechanism of the class described, a frame, an arrangement of telescopic members comprising a main cylinder connected to said frame, a second cylinder slidable therein having an apertured piston portion, and a ram extending from the second cylinder, a scraper tool carried by the distal end of the ram, the ram being tubular and having a piston portion, an extensile device carried by said frame for co-acting therewith to support the telescopic members and the scraper tool, and a pneumatic system for introducing air under pressure to said cylinders and exhausting it therefrom, said system comprising a pipe line communicating with the main cylinder and having a tube extending therein and into the aperture of the piston portion of the second cylinder, a second pipe line communicating with the main cylinder and having a slidable extension communicating with the second cylinder, and valve means controlling said pipe lines for advancing the second cylinder and the ram and exhausting air back of the piston portions thereof, and also for returning the second cylinder and the ram and exhausting air from the opposite side of the piston portions thereof.

8. In a mechanism of the class described, a frame, an arrangement of telescopic members comprising a main cylinder pivoted on said frame and projected therefrom, a second cylinder slidable therein, and a ram extending from the second cylinder; a power system for operating said telescopic members by fluid pressure, a scraper tool carried by the ram, lazy tongs carried by the frame co-extensively with the telescopic members and pivotally attached to the ram thereof whereby detrimental bending stress is relieved by the pivotal attachment, and means providing a connection with the frame to enable the lazy tongs to fold and unfold thereon, said means consisting of guide pieces slidable in guide-ways arranged longitudinally and transversely of the lazy tongs to firmly support them for operative motion.

9. In a mechanism of the class described, a frame, an arrangement of telescopic members pivotally supported at an end thereby and projected therefrom, a valve-controlled pneumatic system for operating the telescopic members, a scraper tool attached to the distal end of the telescopic members, lazy tongs carried by the frame co-extensively with the telescopic members and straddling the same, and pivotally attached to the distal end thereof, whereby detrimental bending stress is relieved by the pivotal attachment, and means providing a connection with the frame to enable the lazy tongs to fold and unfold thereon, said means consisting of guide pieces slidable in guide-ways arranged longitudinally and transversely of the lazy tongs to firmly support them for operative motion.

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