No. 652,313. Patented June 26, 1900.

G. H. HULETT.

APPARATUS FOR HANDLING ORE.

(Application filed Nov. 28, 1899.)

(No Model.)

6 Sheets—Sheet 1.

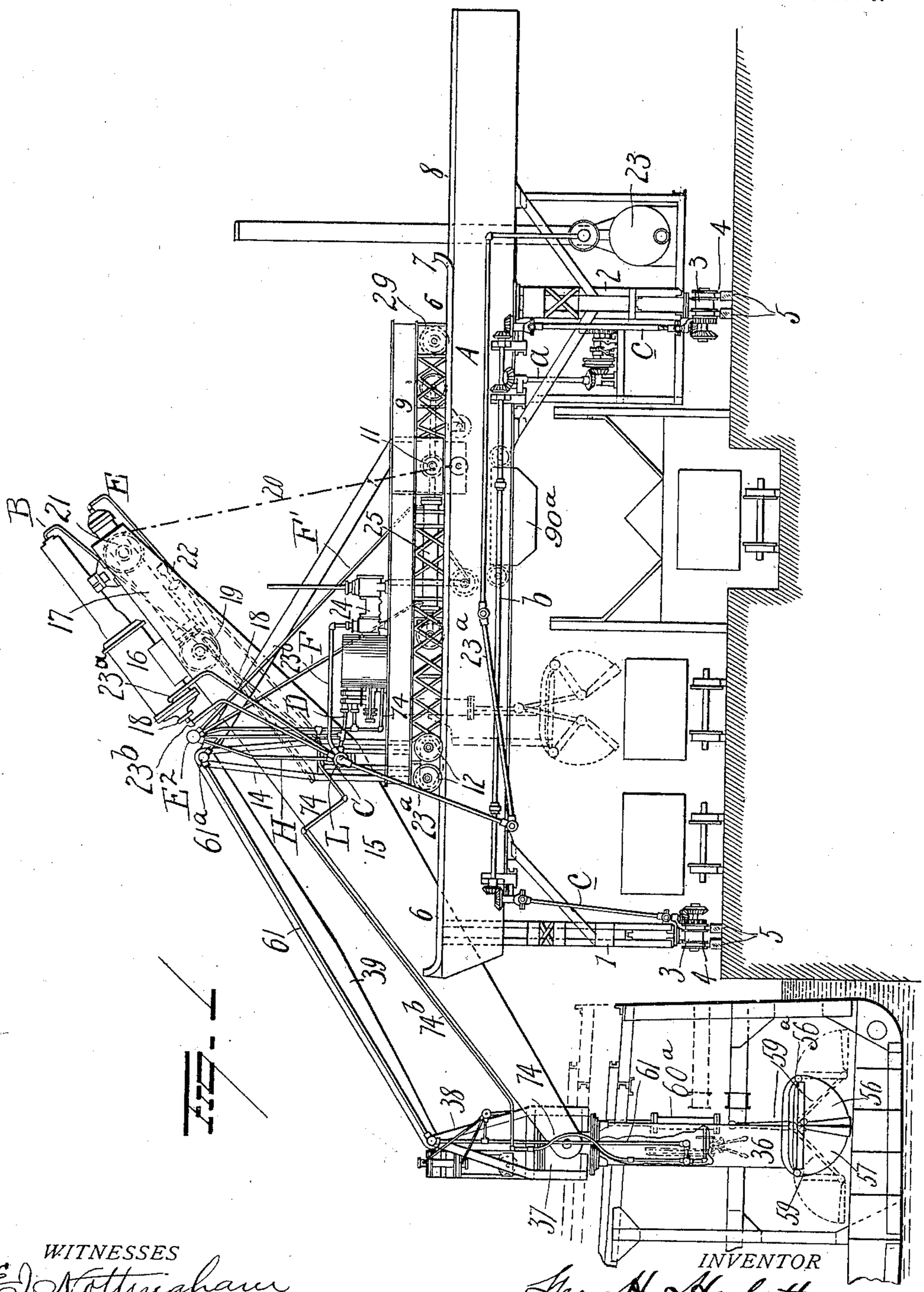


FIG. 1.

WITNESSES

E. D. Nottingham

G. F. Downing.

INVENTOR

Geo. H. Hulett

By H. A. Seymour

Attorney

No. 652,313. Patented June 26, 1900.

G. H. HULETT.

APPARATUS FOR HANDLING ORE.

(Application filed Nov. 28, 1899.)

(No Model.) 6 Sheets—Sheet 2.

FIG. 2.

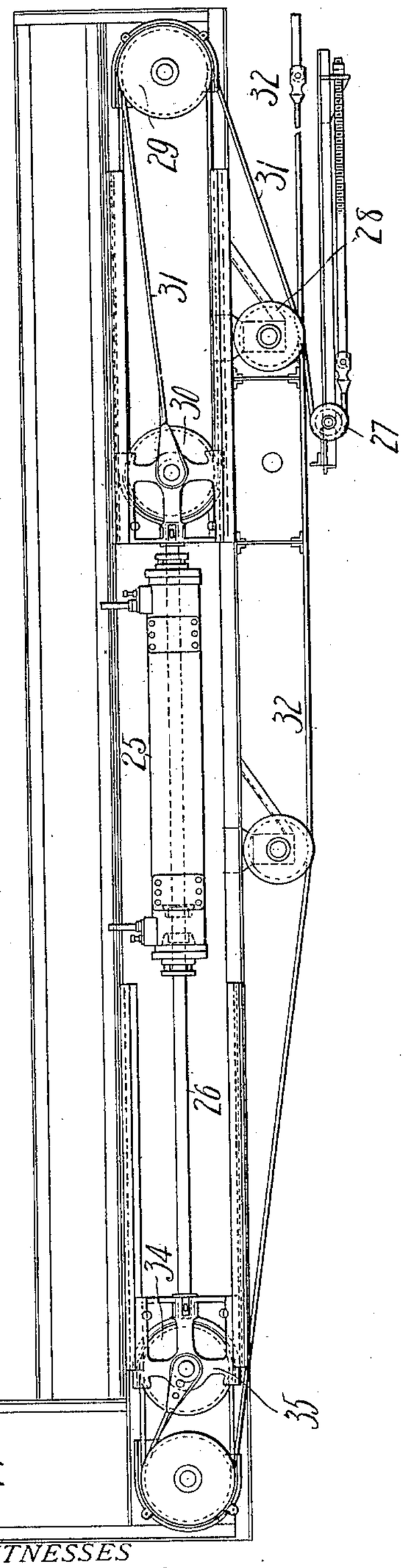
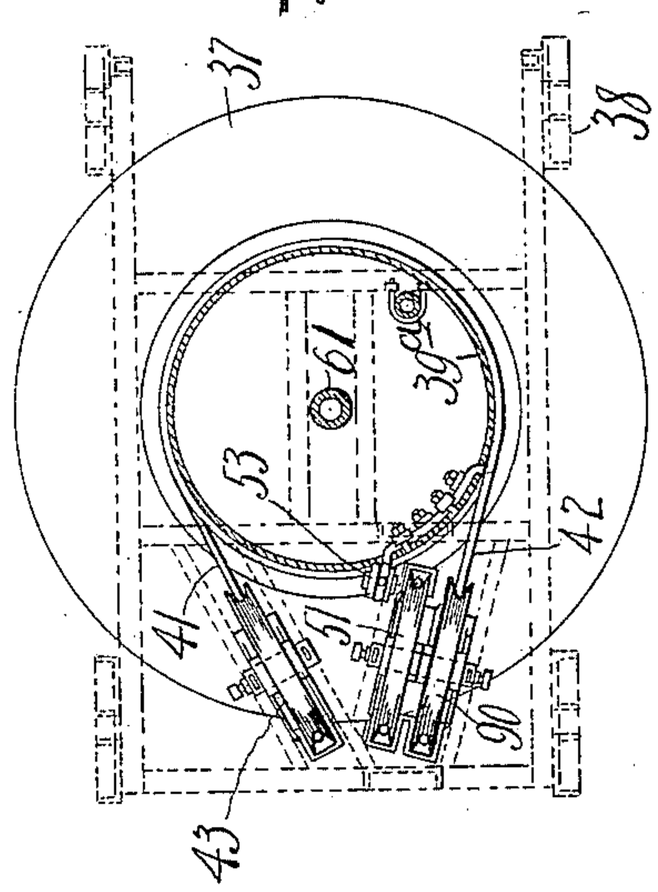


FIG. 5.



WITNESSES

E. S. Nottingham

G. F. Downing

INVENTOR

Geo. H. Hulett

By H. A. Seymour

Attorney

No. 652,313. Patented June 26, 1900.

G. H. HULETT.

APPARATUS FOR HANDLING ORE.

(Application filed Nov. 28, 1899.)

(No Model.) 6 Sheets—Sheet 3.

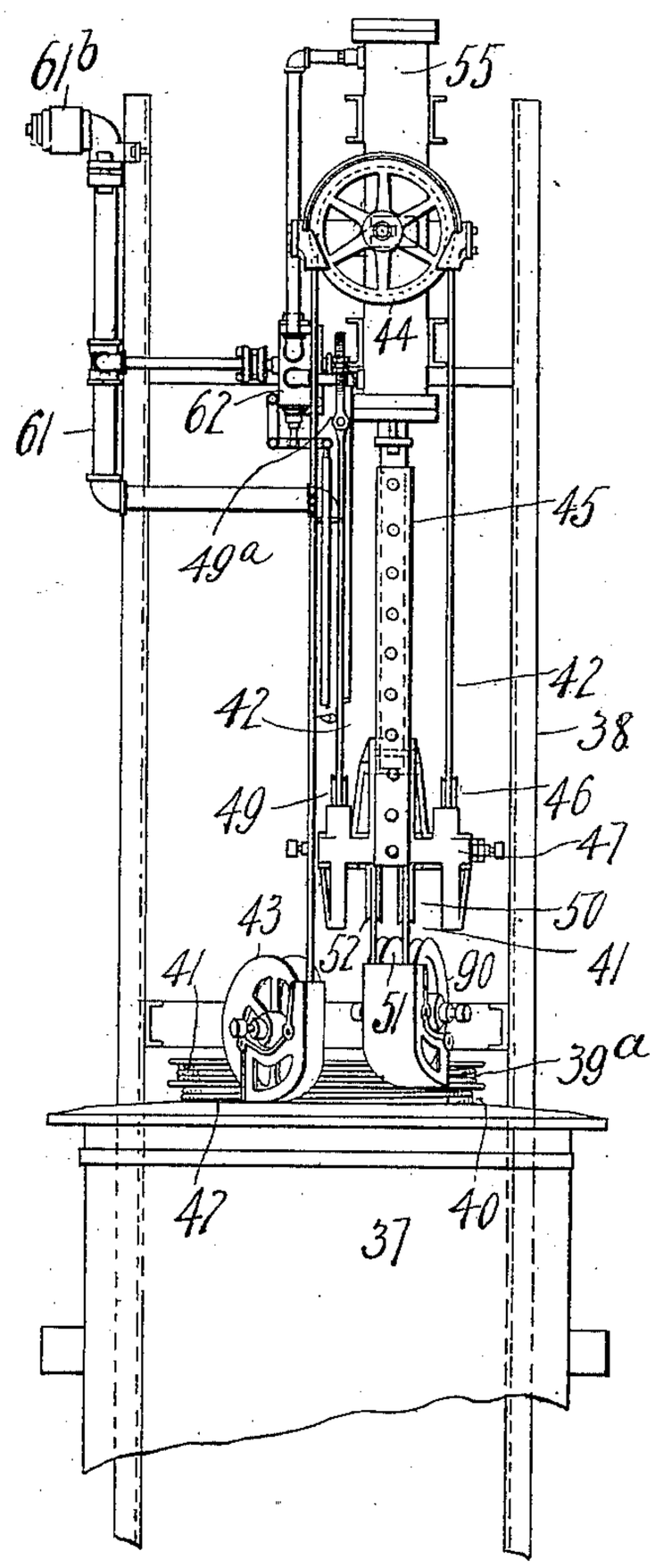


Fig. 4.

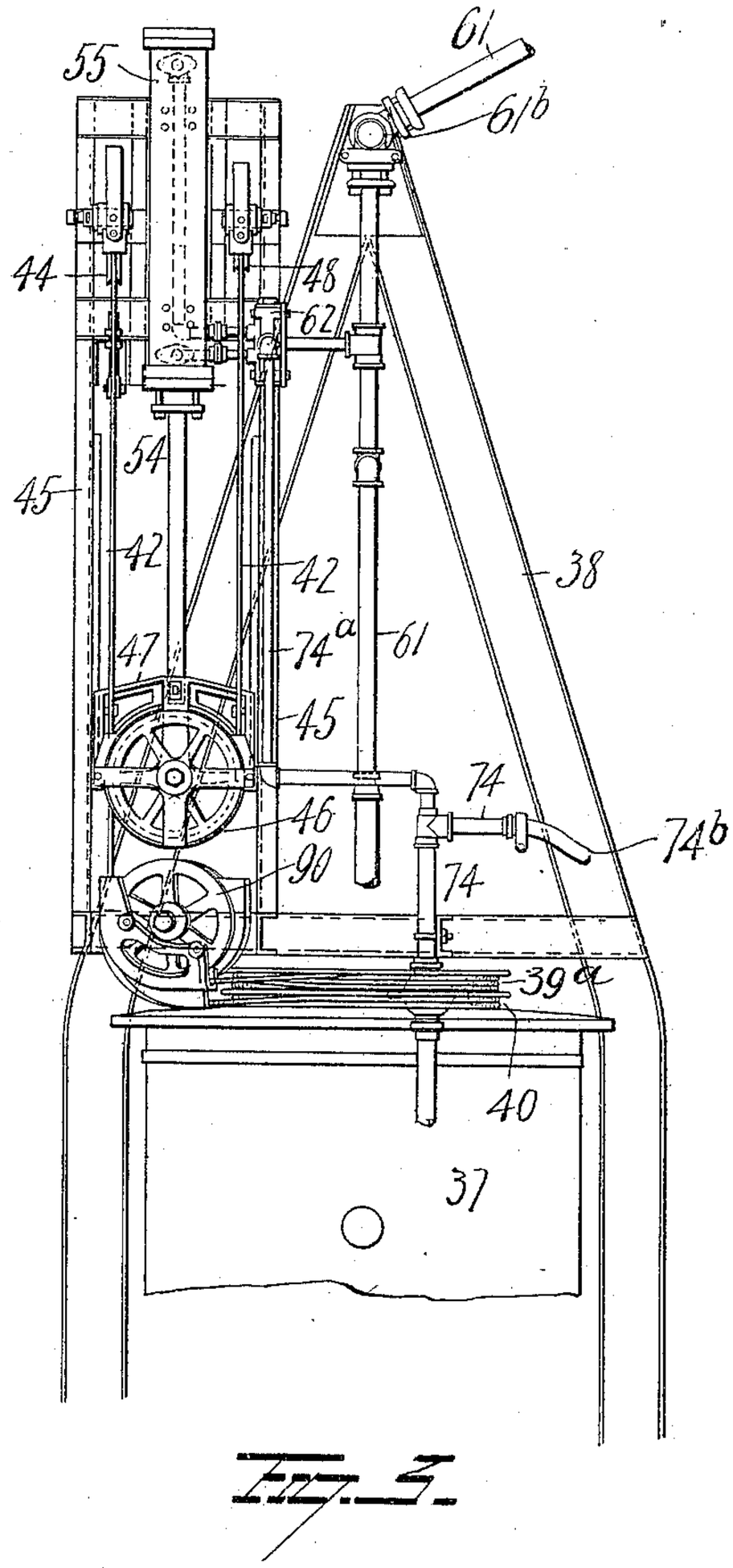


Fig. 5.

WITNESSES
E. J. Nottingham
G. F. Downing.

INVENTOR
Geo. H. Hulett
By H. A. Seymour
Attorney

No. 652,313. Patented June 26, 1900.

G. H. HULETT.

APPARATUS FOR HANDLING ORE.

(Application filed Nov. 28, 1899.)

(No Model.) 6 Sheets—Sheet 4.

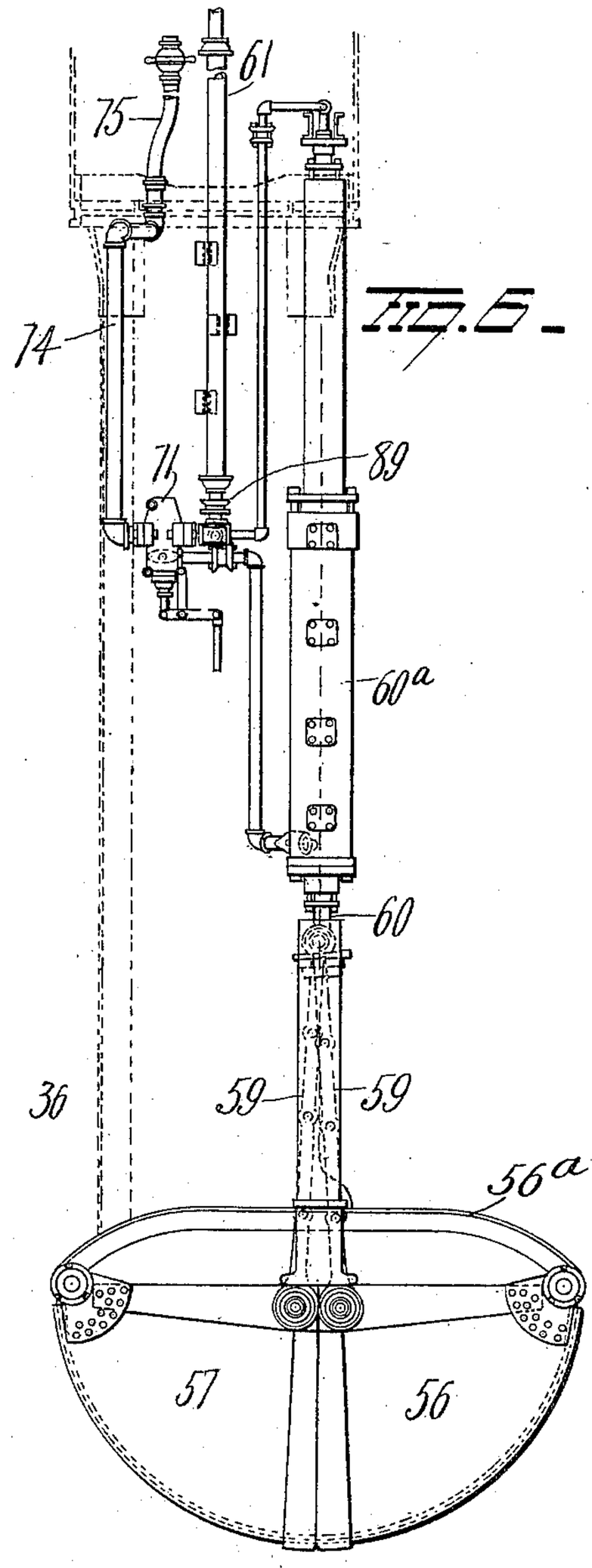


FIG. 6.

WITNESSES
E. J. Nottingham
G. F. Downing.

INVENTOR
Geo. H. Hulett
By H. A. Seymour
Attorney

No. 652,313. Patented June 26, 1900.

G. H. HULETT.

APPARATUS FOR HANDLING ORE.

(Application filed Nov. 28, 1899.)

(No Model.) 6 Sheets—Sheet 5.

FIG. 9.

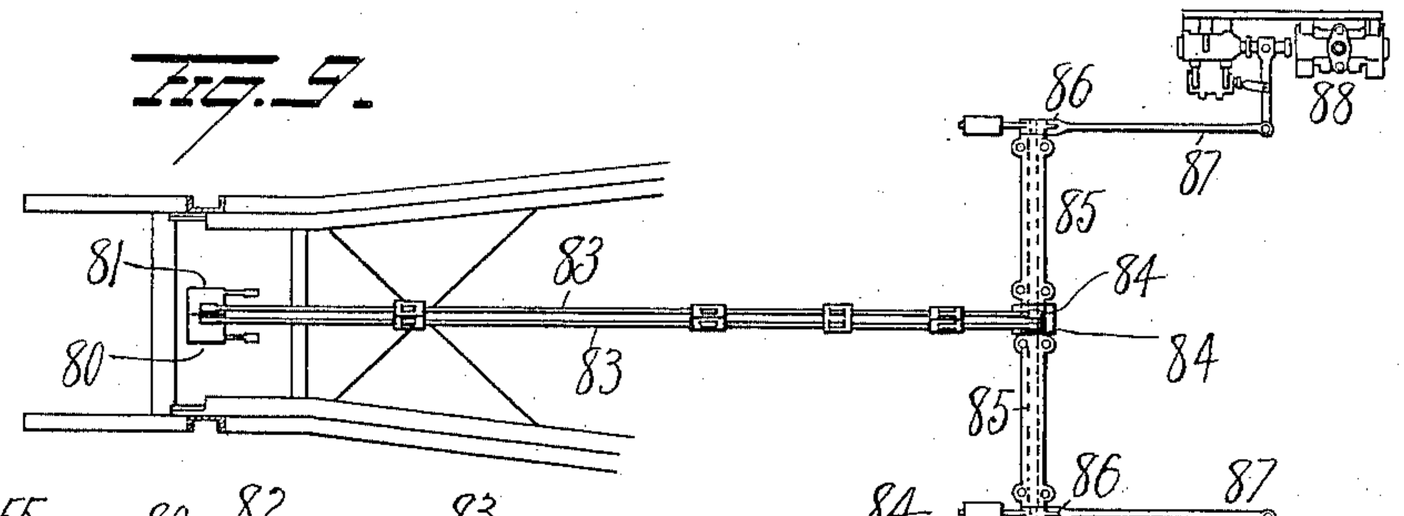


FIG. 7.

FIG. 8.

FLOOR LINE.

WITNESSES

E. J. Nottingham

G. F. Downing.

INVENTOR

Geo. H. Hulett

By H. A. Seymour

Attorney

No. 652,313. Patented June 26, 1900.

G. H. HULETT.

APPARATUS FOR HANDLING ORE.

(Application filed Nov. 28, 1899.)

(No Model.) 6 Sheets—Sheet 6.

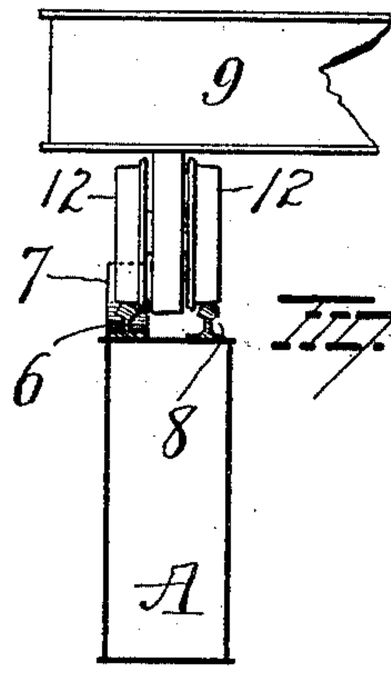


Fig. 12.

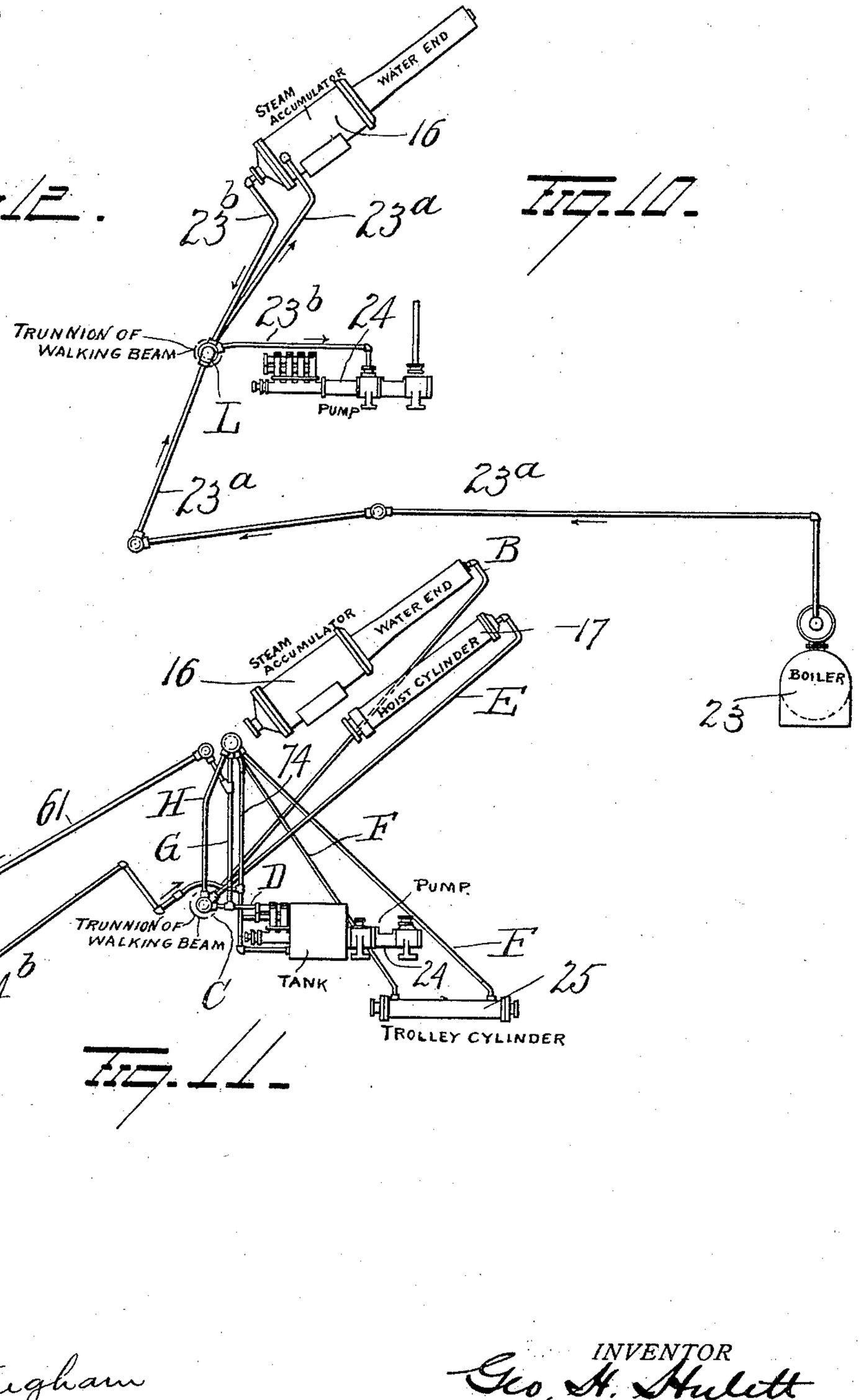


Fig. 10.

Fig. 11.

WITNESSES
E. D. Nottingham
G. F. Downing.

INVENTOR
Geo. H. Hulett
By H. A. Seymour
Attorney

UNITED STATES PATENT OFFICE.

GEORGE H. HULETT, OF AKRON, OHIO, ASSIGNOR OF ONE-HALF TO THE WEBSTER, CAMP & LANE MACHINE COMPANY, OF SAME PLACE.

APPARATUS FOR HANDLING ORE.

SPECIFICATION forming part of Letters Patent No. 652,313, dated June 26, 1900.

Application filed November 28, 1899. Serial No. 738,562. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HULETT, of Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Apparatus for Handling Ore; 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 an improvement in apparatus for handling ore and coal, and is designed, primarily, for unloading ore and coal from boats; and it consists in the parts and combinations of parts and in the details of construction, as will be more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in side elevation of my improved apparatus. Fig. 2 is a view in elevation of the mechanism for moving the trolley back and forth on the bridge. Fig. 3 is a view in side elevation of the tower carrying the leg-rotating mechanism and showing also the supply and exhaust pipes. Fig. 4 is a view in end elevation of same. Fig. 5 is a plan view showing the sheaves on the upper end of the leg. Fig. 6 is a view of the bucket opening and closing mechanism. Figs. 7, 8, and 9 are views of the mechanisms for actuating the several valves. Fig. 10 is a diagrammatic view showing the steam-supply pipes between the boiler-pump and accumulator. Fig. 11 is a similar view showing the water-supply pipes between the several motors and the accumulator and pump; and Fig. 12 is a view in cross-section of one of the bridge-girders, showing thereon one of the double-wheeled trucks at the front end of the trolley.

A represents a bridge consisting of parallel girders secured to front and rear legs 1 and 2. These legs 1 and 2 rest on carriages 3, which latter are mounted on the track-wheels 4. The tracks 5 are located parallel with the water-front, so that the front ends of the bridge-girders rest approximately in line with the water-front, and the bridge is propelled back and forth parallel with the water-front by any suitable mechanism. I have shown in Fig. 1 an engine coupled up, by means of a drive-shaft *a*, with counter-shaft *b*, which in turn drives the shafts *c*, coupled up to gear-wheels carried by the track-wheels 3; but I do not confine myself, however, to such mechanism. Each bridge-girder is provided with two lines of rails, (see Figs. 1 and 12,) one of which, 6, on each girder terminates in upturned ends 7, forming stops or abutments which limit the travel of the trolley thereon, while the other and inner lines of rails 8 extend rearwardly throughout the length of the girders. The trolley 9 comprises an elongated truck mounted on wheels 11, which travel on the inner track 8, while the forward end of the truck is carried by two pairs of wheels 12 on each side, the outer wheels of each pair resting on the rails 6, while the inner wheels of each pair rest on the inner track-rails 8. Thus it will be seen that the trolley can travel rearwardly until the outer wheels 12 at the front of the truck come in contact with the abutment 7 and forwardly until the front wheels 12 engage the front ends of the rails 6, which are also turned upwardly, as shown in Fig. 1.

The trolley 9 is provided at its front end with two upwardly-projecting towers 14—one at each side—between which the walking-beam 15 is pivoted. This walking-beam is pivoted at one side of its center and carries at its rear end a Worthington steam-accumulator 16, which operates to properly compress the water employed in the several hydraulic motors that will be hereinafter referred to. Located below the accumulator 16 and carried by the walking-beam 15 is the hoisting-cylinder 17, which latter is provided with a plunger having a cross-head carrying a series of sheaves 19, the cross-head being guided and sustained by the guides 18, secured between the walking-beam girders. Hoisting-cables 20, preferably about four, are secured at their lower ends to the trolley and pass upwardly each over a sheave 21 at the rear end of the walking-beam and from thence forwardly around its respective sheave 19 on the cross-head of the plunger and from thence back to the equalizing-bar 22, to which the several cables are attached, the said equalizing-bar being attached to and carried by the walking-beam 15. This equalizing-bar is constructed like and operates on the principle of a four-horse

whiffletree, so that the hoisting strain is equally borne by the several cables. The accumulator 16 is supplied through a walking-pipe 23^a with steam from the boiler 23 and operates the hydraulic plunger therein, which holds the water under compression and supplies steam through pipe 23^b to the pump 24, which latter forces the water into the accumulator. This accumulator 16, as is fully explained in the Worthington patent, No. 524,013, granted August 1, 1894, automatically regulates the supply of steam to the pump, so that when the accumulator is full or approximately full of water the steam-supply to the pump 24 will be cut off and remain so until the volume of water in the accumulator shall have been reduced, after which the pump will be automatically started and the accumulator refilled. The steam generated in the boiler 23 passes through walking-pipe 23^a to a swivel-joint L, concentric with the axis of the walking-beam 15. It passes from thence through pipe 23^a to the accumulator. Within the accumulator is a perforated pipe the outer end of which communicates with pipe 23^b, and embracing the perforated pipe is the plunger, against which the water is forced by the pump. From this it will be seen that as water is withdrawn from the accumulator the plunger therein, moving on the perforated steam-pipe, uncovers the perforations and permits a greater volume of steam to pass into pipe 23^b and from thence down to the pump and accelerates the speed and work of the latter, and as the accumulator fills with water the perforations are gradually covered up, thus reducing the supply of steam. I make no claim to the accumulator and have simply described parts of its construction and its operation, so as to show its application to my improved apparatus.

The accumulator 16 is connected by a pipe B with the water or pressure pipe C, concentric with the axis of the walking-beam, and this pressure-pipe, which is also in direct communication with the pump 24 by pipe D, supplies water under pressure to the several motors. The cylinder or motor 17 is controlled by valve 88^a, (see Fig. 8,) while the motor 25 is actuated or controlled by the valve 88, the two valves being alike. Pipe B leads from the accumulator and is coupled up by a swivel-joint to the pipe C, which latter is concentric with the axis of the walking-beam 15. A pipe H leads from pipe C up to valve 88^a on the near side of the machine, and a pipe leads from said valve down to a point concentric with the trunnion of the walking-beam and is there coupled up by a swivel-joint to the pipe E for supplying water to the hoist-cylinder 17. A pipe G connects supply-pipe D, leading from the pump, with the valve 88, located on the far side of the machine, and this latter valve is connected by pipes F and F′ with the trolley-cylinder 25. The two valves 88 and 88^a, above referred to, are located on opposite sides of the tower 14 and are respectively connected, as above explained, through the medium of the pipe D, leading from the pump, and the pipe C, concentric with the trunnion of the walking-beam, with the accumulator, the pipe D having accumulator-pressure therein through the connection with pipe C.

The trolley 9 is propelled back and forth on the bridge by hydraulic mechanism carried by the trolley. This mechanism, which is shown in Fig. 2, comprises a cylinder 25, above referred to, secured to the under side of the trolley. The piston-rod 26 of this cylinder projects from both ends of the cylinder and carries sheaves at each end. A cable 31 is secured to the bridge-girders near its forward end and after passing guide-pulleys 27 and 28 passes around sheaves 29, carried by the trolley, and sheaves 30, carried by the cross-head, on the adjacent end of piston-rod 26. This cable 31 passes around one sheave 29 and thence forward to a sheave 30 on the cross-head, thence back to second sheave 29, and forwardly again to second sheave 30, and so on around preferably about four sheaves 29 and three sheaves on the cross-head, the free end of the cable being then secured to the cross-head. Cable 32 passes from near the rear end of the bridge-girders forwardly and around sheaves 33, carried by the trolley, and sheaves 34, carried by the cross-head 35, its free end being secured to the latter, as explained in connection with cable 31. With this construction it will be seen that by moving the piston longitudinally the trolley travels on the bridge, and by the differential mechanism shown the distance traveled by the trolley exceeds (with the construction shown) the distance traveled by the piston about seven times.

The walking-beam 15 above referred to is rocked by the cable 20 and the hydraulic cylinder and its piston and sheaves, and it carries at its outer end the depending hollow leg 36. This hollow leg is preferably angular in cross-section and is revolubly mounted at its upper end in the cylindrical head 37. This head, as clearly shown in Figs. 1, 3, and 4, is provided with side trunnions journaled in bearings in the outer end of the walking-beam 15 and is provided with an upwardly-projecting rigid tower 38, the upper end of which is connected to the upper end of tower 14 by the equalizing-bar 39. The pivots of this bar 39 are parallel with the pivoted axis of the walking-beam and pivoted axis of the head 37. Hence it will be seen that as the outer end of the walking-beam is elevated and lowered the leg 36 is positively maintained in a perpendicular position and is absolutely prevented from swaying or swinging and is also held against movement when the ore buckets or scoops are being opened or closed. The leg 36 passes through the head 37 and is provided at its upper end with two drums 39^a and 40, which latter are located

immediately above the head. To the drums are secured the cables 41 and 42, the cable 41 being secured to the drum 39ª and the cable 42 to the drum 40. These cables are wound in opposite directions around the drums, so that when one cable is unwound from its drum the other is wound around its drum. Cable 42 on drum 40 passes around sheave 43 and from thence upwardly and around sheave 44, carried on the guides 45, which latter are supported by the tower 38. The cable then passes downwardly around sheave 46 on the cross-head 47 and up and around sheave 48, thence down and around sheave 49 on the cross-head 47, and up to the screw-bolt 49ª, to which it is secured. Cable 41 passes around sheave 90, journaled to guides 45, and thence up and around sheave 50 on the cross-head 47. From sheave 50 it passes down and around sheave 51 on the tower, thence up and around sheave 52 on the cross-head, and down to the eyebolt 53, to which it is secured. The cross-head 47 is mounted to slide in the guides 45 and is connected to the piston-rod 54 of the hydraulic cylinder 55. This cylinder is mounted on the guides 45, and it will be seen that when the piston carrying the cross-head is moved up or down the leg 36 will, by the movements of the cables 41 and 42, be turned either to the right or left, the direction of rotation being always under the control of the operator stationed in the hollow leg. This hollow leg 36 carries at its lower end the buckets or scoops 56 and 57, the latter of which is hinged to the lower end of the leg approximately in line with the wall of the latter, while the bucket 56 is pivoted to the outer end of the horizontally-projecting bracket 56ª, so that the bucket 56 may be projected well under the decks, so as to readily grasp and pick up the ore or coal adjacent to the side of the boat or between the hatches. Both buckets or scoops are pivotally connected by links 59 with the lower end of the piston-rod 60. (See Fig. 6.) Hence it will be seen that by elevating the piston-rod or plunger the buckets will be moved to a closed position and by dropping the piston the buckets will be opened to the position shown in dotted lines in Fig. 1. With this construction approximately all the ore or coal in the vessel can be reached by the buckets, and as the leg carrying the buckets can be elevated and lowered and turned and as the movements of the buckets are under the control of the operator stationed in the leg it will be seen that the operator can not only fill the buckets from the mass of ore, but after he has removed the greater bulk can, by opening and partially closing the buckets, scrape the outlying ore or coal into a mass sufficient to form a bucketful. The leg 36, as before stated, constitutes the operator's cage, and the lower end thereof is therefore provided with an opening for the entrance of the operator and with openings sufficiently numerous for him to view all the surroundings, and within the cage or leg are the several levers or other devices for controlling the movements of the several hydraulic motors.

Secured centrally within the upper end of the leg 36 and projecting above the drums 39ª and 40 is a pressure-pipe 61. This pipe is located in a line with the vertical center of the leg and forms a support (see Figs. 7 and 8) for the actuating-rods of the several valves, which control the movements of the hydraulic motor. This pipe 61 is coupled up, by means of a valve 62 and suitable pipes, with the opposite ends of cylinder 55, (see Fig. 3,) and hence by manipulating this valve water under pressure is admitted to one end of the cylinder and exhausted from the other and the leg 36 rotated in its bearing through the operation of its cables, sheaves, and drums before described. The valve-stem of valve 62 is connected, by pitman 63, with valve-actuating rod 64. Rod 64, together with rods 65 and 66, rests against and in contact with the water-supply pipe 61 and are held thereagainst by means of suitable clips or other fastening devices, the clips or fastening devices permitting of free longitudinal movement, but preventing lateral or outward displacement. The lower end of rod 64 is secured to a grooved ring 67, which latter is not connected to the other rods, and the ring 67 is connected to pitman 68 by lever 69, one end of which is pivoted to the inner surface of the leg, while the lower end of pitman 68 is connected to the operating-lever 70, also pivoted to a bracket secured to the inner face of the leg. When this lever 70 is in one position, the water is shut off completely, and by elevating it water is admitted to one end of the cylinder 55 and exhausted from the other, and by depressing the lever the direction of supply and exhaust is reversed. Hence it will be seen that by the movements of the lever the leg can, by means of the cables, drums, and sheaves before referred to, be rotated in either direction or locked against rotation. Supply-pipe 61 is also connected, (see Fig. 6,) by means of valve 71 and suitable pipes, with the cylinder 60ª, which, as before explained, operates to open and close the buckets. This valve 71 is coupled up to an exhaust-pipe 74, which returns the water to the tank of the force-pump on the trolley. The position of this exhaust-pipe within the leg is, owing to the position of the supply-pipe, to one side of the vertical center of the leg, and hence to permit the leg to turn without straining the exhaust-pipe the latter is provided with the rubber-hose section 75, which is of sufficient length to permit the leg to make more than a complete revolution. The valve-controlling cylinder 55 is also provided with an exhaust-pipe 74ª, leading to pipe 74, (see Fig. 3,) and the pipe 74 after passing the top of leg 36 turns horizontally toward the walking-beam and is connected to a flexible hose 74ᵇ, which passes along the walking-beam and dis-

charges into pipe 74, which latter leads to the pump-tank on the trolley.

Rods 65 and 66, which, together with rod 64, surround the water-pipe 61 within the leg, are each coupled up, by means of rings 76, levers 77, and pitmen 78, with the levers 79, which latter are located within convenient reach of the operator within the leg. Rods 65 and 66 are connected, respectively, to rocking sleeves 80 and 81, mounted at upper end of tower 38, (see Fig. 9,) and each sleeve has oppositely-projecting arms 82, to which are connected the tension-rods 83. These rods are connected at their opposite ends to arms 84 on shafts 85, which latter are mounted in bearings on the upper end of tower 14. Shafts 85 are also provided with arms 86, to which are secured, respectively, pitmen 87, one of which is connected to the valve-stem of valve 88, while the other is connected to the valve 88[a], which regulates the supply and exhaust of fluid to cylinder 17, both valves being supported on the tower and coupled up to the supply and exhaust pipes, as previously explained. The valves 88 and 88[a] each consist, preferably, of two valves, the smaller of which is a pilot-valve and is operated by the lever mechanism before explained and operates to accelerate the larger valve in the ordinary and well-known manner.

The water-pipe B leads from the rear end of the accumulator along the walking-beam to the towers and is there connected by swivel-joints with pipes leading up to the valves 88 and 88[a], as previously explained. From one of the pipes leading to one of the valves 88 88[a] is connected the pressure-pipe 61. This pipe is provided with a swivel-joint 61[a], concentric with the pivotal point of connection of the equalizing-bar 39 with the tower 14, and passes along the equalizing-bar to the top of tower 38, where it is again provided with a swivel-joint 61[b], concentric with the pivotal point of the equalizing-bar and tower 38, the latter swivel-joint forming a connection with that portion of the pressure-pipe 61 which extends down into the leg 37. Pipe 61 is also provided near its lower end with a swivel-joint 89, so that the leg 37 may turn around on the pipe 61 and carry with it the valve and supply and exhaust pipes for the bucket-actuating cylinder.

While I have attempted to illustrate in the drawings the several pipes leading to and from the pump and accumulator to the several motors, still I do not wish to be confined to the system shown. With the accumulator on the walking-beam, the pump on the trolley, and the motors on parts which are frequently changing their position relative to the accumulator it is evident that in order to avoid the use of several series of walking-pipes the water under pressure for the several motors, which change their positions relative to the accumulator, must be supplied from a pipe concentric with the axis of the walking-beam carrying the accumulator. Hence by coupling up the accumulator with such a pipe concentric with the axis of the walking-beam and then taking the water from this concentric pipe to the several motors all walking-pipes are dispensed with and water at accumulator-pressure is delivered to all the motors.

With this construction it will be seen that the operator located within the leg has absolute control over the movements of the trolley, walking-beam, and leg. Consequently he can lower the buckets onto a bed of ore in the hold of a boat, turn the buckets, if necessary, close them, and tilt the walking-beam in a direction to elevate the bucket clear of the gunwale of the boat. He can then cause the trolley to travel inwardly until the bucket is in a position to discharge its contents directly into a car, or he can discharge it into a traveling car 90[a], mounted on a track carried by the lower flanges of the bridge-girders, and be carried rearwardly to be discharged onto an ore-bank or into cars located out of the reach of the buckets.

It is evident that changes in the construction and relative arrangement of the parts might be made without avoiding my invention, and hence I would have it understood that I do not restrict myself to the particular construction and arrangement of parts shown and described; but,

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

1. In an unloading apparatus, the combination with a leg, a motor for moving same vertically, and a bucket on the lower end of said leg, of devices located within said leg for controlling said motor.

2. In an unloading apparatus, the combination with a beam movable outwardly from its support, a leg depending from said beam, the said leg adapted to move vertically, a scoop connected with and operated from the lower end of the leg and a motor for each movable part, of controlling mechanisms for the several motors located within the leg.

3. In an unloading apparatus, the combination with a beam movable outwardly from its support, a leg carried on the end of said beam and adapted to move vertically and a scoop on the end of said leg, of motors adjacent to the several movable parts and controlling devices for the several motors within the leg.

4. In an unloading apparatus the combination with a bridge, a trolley on the bridge and a walking-beam carried by the trolley, of a leg pivoted to the walking-beam at one end, means connected to the other end for rocking the beam and a scoop on the lower end of the leg.

5. In an unloading apparatus, the combination with a bridge, a trolley thereon, a walking-beam on the trolley and means connected to one end of the beam for rocking same, of a leg depending from the other end

of the beam and a scoop at the lower end of the leg and adapted to reach out laterally from the leg.

6. In an unloading apparatus, the combination with a support and a movable trolley thereon, of a beam on the trolley, a leg depending from the outer end of the beam, a scoop at the lower end of the leg adapted to reach out laterally from the leg, means for rotating the leg, motors for actuating the several parts and controlling devices located within the leg for the several motors.

7. In an unloading apparatus, the combination with a support and a movable trolley on said support, of beam on the trolley, a leg depending from said beam, a scoop on the lower end of the leg, a motor and connection for tilting the beam, a motor and connections for actuating the scoop and devices located within the leg for controlling the several motors.

8. In an unloading apparatus, the combination with a beam movable outwardly from its support, of a leg depending from said beam the said leg being hollow and constituting the operator's cage, a scoop on the lower end of the leg, motors for actuating the several parts and devices located within the leg for controlling the several motors.

9. In an unloading-machine, the combination with a tilting beam adapted to move outwardly, of a leg carried by the outer end of said tilting beam, a scoop on the lower end of said leg, a motor for tilting the beam, a motor for rotating the leg, a motor for actuating the scoop and devices located within the leg for controlling the several motors.

10. In an unloading-machine, the combination with a support, a trolley thereon, a walking-beam on the trolley and a leg depending from one end of the walking-beam and carrying a scoop, of a motor for actuating the trolley, a motor for tilting the walking-beam, a motor for actuating the scoop and devices located within the leg for controlling the several motors.

11. In an unloading apparatus, the combination with a traveling bridge, a trolley thereon, a walking-beam on the trolley, a leg depending from the walking-beam and a scoop at the lower end of the leg, of motors for actuating the several parts, a source of power common to all the motors, means for conveying the energy from the source of power to the several motors and an operator's cage and devices located within the operator's cage for controlling the several motors.

12. In an unloading apparatus, the combination with a traveling trolley, a walking-beam thereon, a depending leg carried by the walking-beam and a scoop on the lower end of the leg, of a pump, an accumulator, a pipe connecting the pump and accumulator, hydraulic motors for actuating the trolley, tilting the beam and opening and closing the scoop, pipes connecting the several motors with the accumulator and exhaust-pipes leading from the several motors to the pump-tank.

13. In an unloading apparatus, the combination with a traveling trolley, a walking-beam thereon, a depending leg at one end of said walking-beam, an accumulator on the other end thereof for counterbalancing the leg, and a scoop at the lower end of the leg, of motors for imparting movements to the several parts and pipes leading from the accumulator to the several motors.

14. In an unloading apparatus, the combination with a bridge, a trolley thereon, and a car mounted on the bridge below the trolley and adapted to travel independently of the trolley, of a walking-beam on the trolley, a leg carried by the walking-beam and a scoop on the end of the leg, the said scoop adapted to be elevated so as to discharge its contents into a car.

15. In an unloading apparatus, the combination with a bridge, a trolley thereon, a walking-beam carried by the trolley and a scoop-carrying leg depending from the walking-beam, of a pump on the trolley, an accumulator on the inner end of the walking-beam, motors adjacent to the several parts to be operated, and pipes connecting the several motors and the accumulator, and the several motors and the pump-tank, and motor-controlling devices.

16. In an unloading apparatus, the combination with a walking-beam, a support therefor and a leg loosely mounted at one end of the walking-beam, of a motor and devices for rotating the leg in the beam.

17. In an unloading apparatus, the combination with a walking-beam, and a support therefor, of a device connecting the support and the inner end of the walking-beam and support for rocking the beam, a leg revolubly mounted in a seat at the outer end of the beam, a scoop on the lower end of said leg and means carried by and adjacent to the outer end of the beam for turning the leg.

18. In an unloading apparatus, the combination with a bridge open at one end, of a trolley on the bridge, a walking-beam pivoted to the trolley, means engaging the inner end of said beam for rocking same, and a scoop-carrying leg depending from the outer end of the beam adjacent to the open end of the bridge.

19. In an unloading apparatus, the combination with a trolley, a walking-beam thereon and a scoop-carrying leg depending from the outer end of the beam, of a beam-tilting cable secured at one end to the trolley, and a motor on the inner end of the beam for actuating the cable.

20. In an unloading apparatus, the combination with a bridge and a trolley thereon, of a hydraulic ram carried by the trolley, the piston-rod of said ram projecting from both ends of the cylinder, and cables extending

from each end of the piston-rod to the opposite ends of the bridge for propelling the trolley on the bridge.

21. In an unloading apparatus, the combination with a trolley and a walking-beam pivoted thereto at a point to one side of its center, of a scoop-carrying leg carried by the longer end of the beam and means connected with the shorter end for raising the longer end of said beam.

22. In an apparatus for handling ore or coal, the combination of a hollow leg, a scoop at the lower end thereof, a motor and means for moving the leg vertically, a motor for opening and closing the scoop, and devices located within said leg for controlling the motors.

23. In an apparatus for handling ore, the combination with a trolley, of a beam extending outwardly therefrom, a leg depending from the outer end of the beam, a scoop on the lower end of the leg, a motor for moving the beam, a motor for actuating the scoop, a support located within the leg, a series of actuating-rods movably mounted on said supports, devices connecting said rods with the motor-valves and a lever for each actuating-rod.

24. In an apparatus for handling ore, the combination with a trolley, a walking-beam thereon, a cylindrical seat carried by the outer end of the walking-beam, a tower secured to said seat and an equalizing-bar pivoted to the upper end of the tower and to the beam-supporting frame on the trolley, of a leg mounted to turn in the cylindrical seat, a scoop carried by the lower end of the leg, a motor for opening and closing the scoop, a motor for rotating the leg and a motor for tilting the beam, a series of actuating-rods located within the leg, devices connecting said rods with the valves of the several motors and levers for actuating said rods.

25. The combination with a traveling trolley provided with a tower, a walking-beam pivoted to said tower, a cylindrical seat pivotally supported at the outer end of the beam, a tower secured to said seat, an equalizing-bar pivotally connecting the top of said tower and the top of the beam-supporting tower, and a scoop-carrying leg mounted in said seat, of a motor for rotating the leg, a motor for tilting the beam, a source of power traveling with the trolley, pipes connecting said source of power and the several motors, actuating-rods mounted upon a support within the leg, means connecting the several rods with the valves of the several motors and levers for actuating the rods.

26. In an apparatus for handling ore, the combination with a traveling trolley, a walking-beam thereon and a scoop-carrying leg on the outer end of said walking-beam, of means for tilting the beam, a pump on the trolley, an accumulator on the beam, a walking-pipe connecting the steam generator and accumulator, fluid-pipes connecting the accumulator and the several motors, and a steam-pipe connecting the accumulator and pump.

27. In an unloading apparatus the combination with a traveling trolley, a tilting beam carried by said trolley, a leg depending from and mounted to turn in the outer end of said beam, and a scoop carried by the lower end of the leg, of a motor carried by the leg and adjacent to the scoop for operating the latter, a source of power remote from the scoop-actuating motor and a jointed supply-pipe between said motor and source of power.

28. In an apparatus for handling ore, the combination with a traveling trolley, a walking-beam thereon and a scoop-carrying leg carried by the walking-beam, of a steam-accumulator carried by the beam, a pump carried by the trolley, a steam-pipe leading from the accumulator to the pump, and fluid-pipes leading from the accumulator to the several motors.

29. In an ore-handling apparatus, the combination with a rotating leg and a fluid-pressure pipe passing centrally into said leg, of an exhaust-pipe carried by the leg and extending to a support above, an intermediate section of said exhaust-pipe being flexible to permit it to pass or wind around the central pressure-pipe.

30. In an unloading apparatus the combination with a leg mounted in a vertically-movable support and carrying a bucket and a motor for rotating said leg, of devices located within said leg for controlling the motor.

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

GEORGE H. HULETT.

Witnesses:
A. W. BRIGHT,
S. G. NOTTINGHAM.