

H. L. HURD.
 COAL TOWER TROLLEY BOOM SWINGER.
 APPLICATION FILED MAR. 19, 1910.

981,268.

Patented Jan. 10, 1911.

5 SHEETS—SHEET 1.

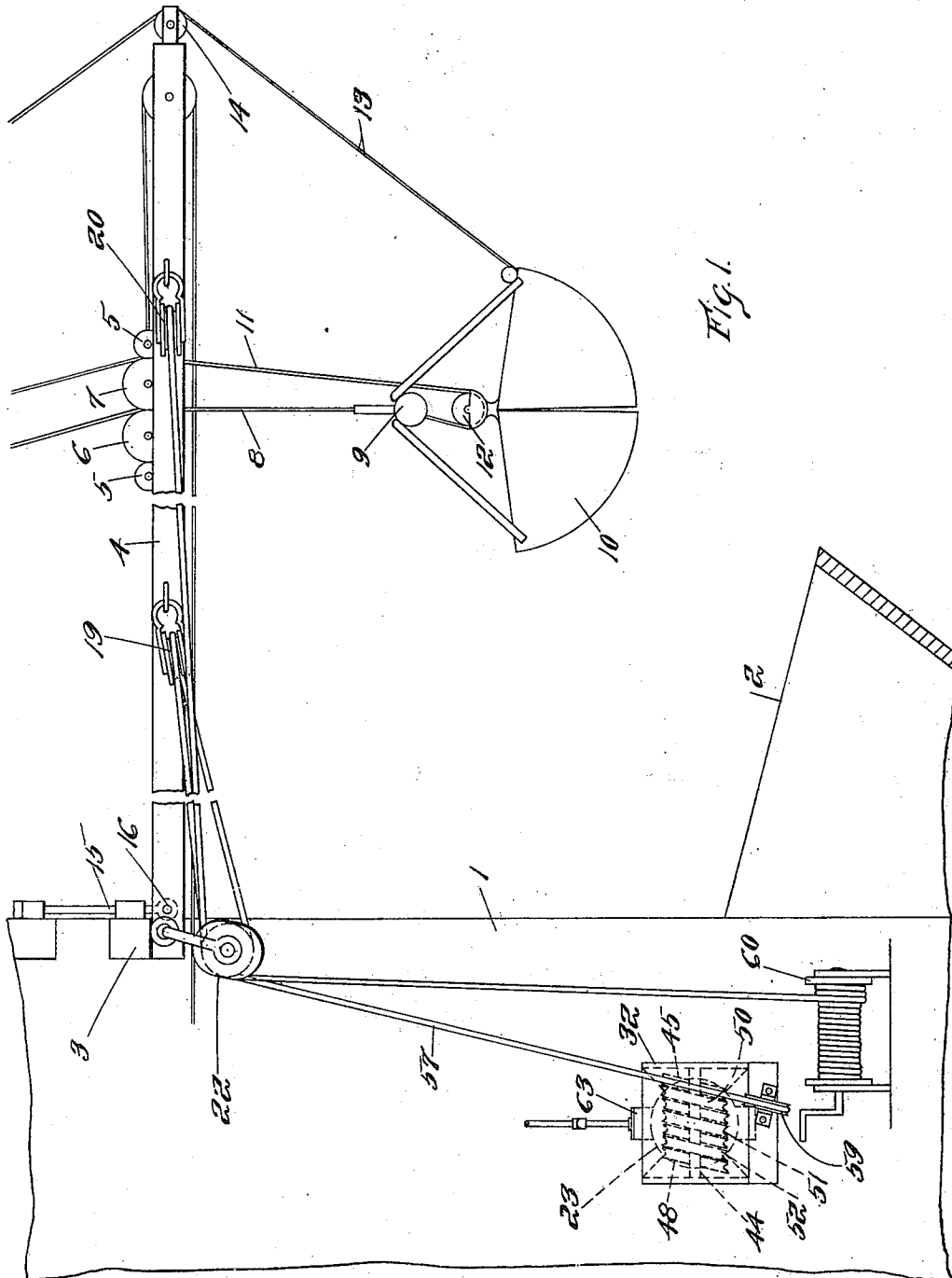


Fig. 1.

Witnesses:
 John H. Parker
 Alvin Tarr

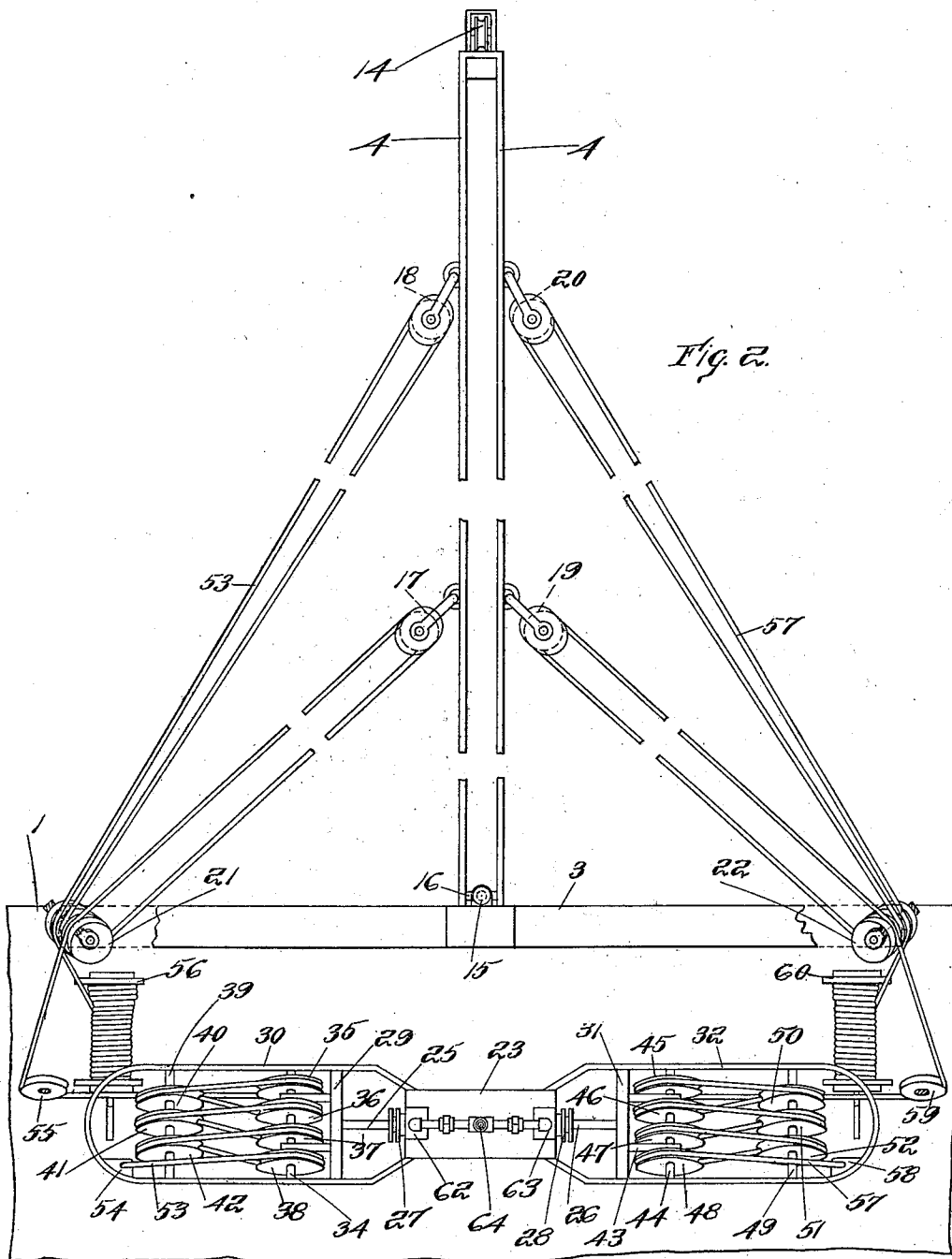
Inventor:
 Henry L. Hurd
 by Macdonald, Colver, Copeland & Lipe
 Attorneys.

H. L. HURD.
COAL TOWER TROLLEY BOOM SWINGER.
APPLICATION FILED MAR. 19, 1910.

981,268.

Patented Jan. 10, 1911.

5 SHEETS—SHEET 2.



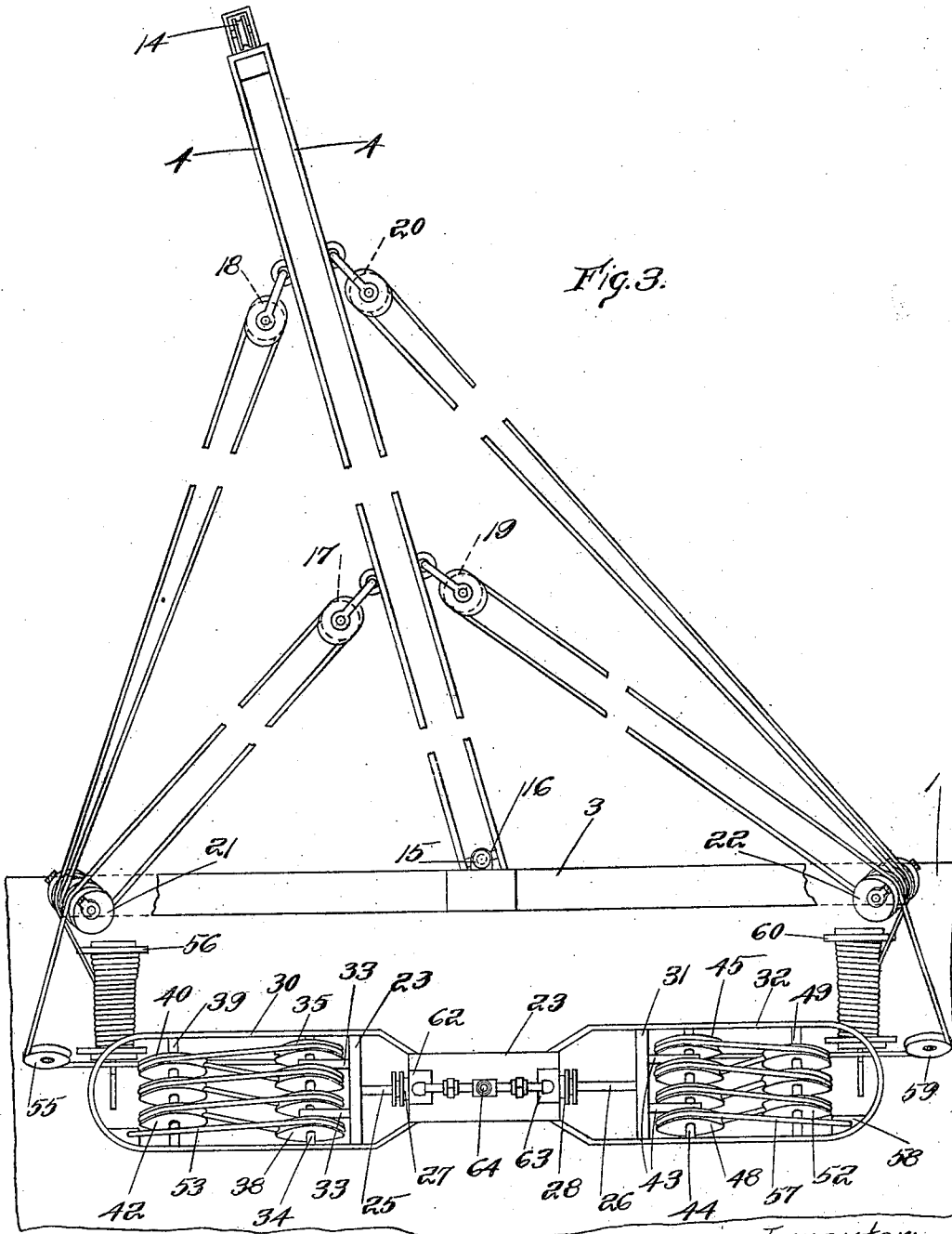
Witnesses:
John H. Parker
Alvin Tarr

Inventor:
Henry L. Hurd
by Macdonald, Calver, Caspell & Sike
Attorneys.

H. L. HURD.
COAL TOWER TROLLEY BOOM SWINGER.
APPLICATION FILED MAR. 19, 1910.

Patented Jan. 10, 1911.
5 SHEETS—SHEET 3.

981,268.



Witnesses:

John H. Parker
Alvin Tarr

Inventor:

Henry L. Hurd

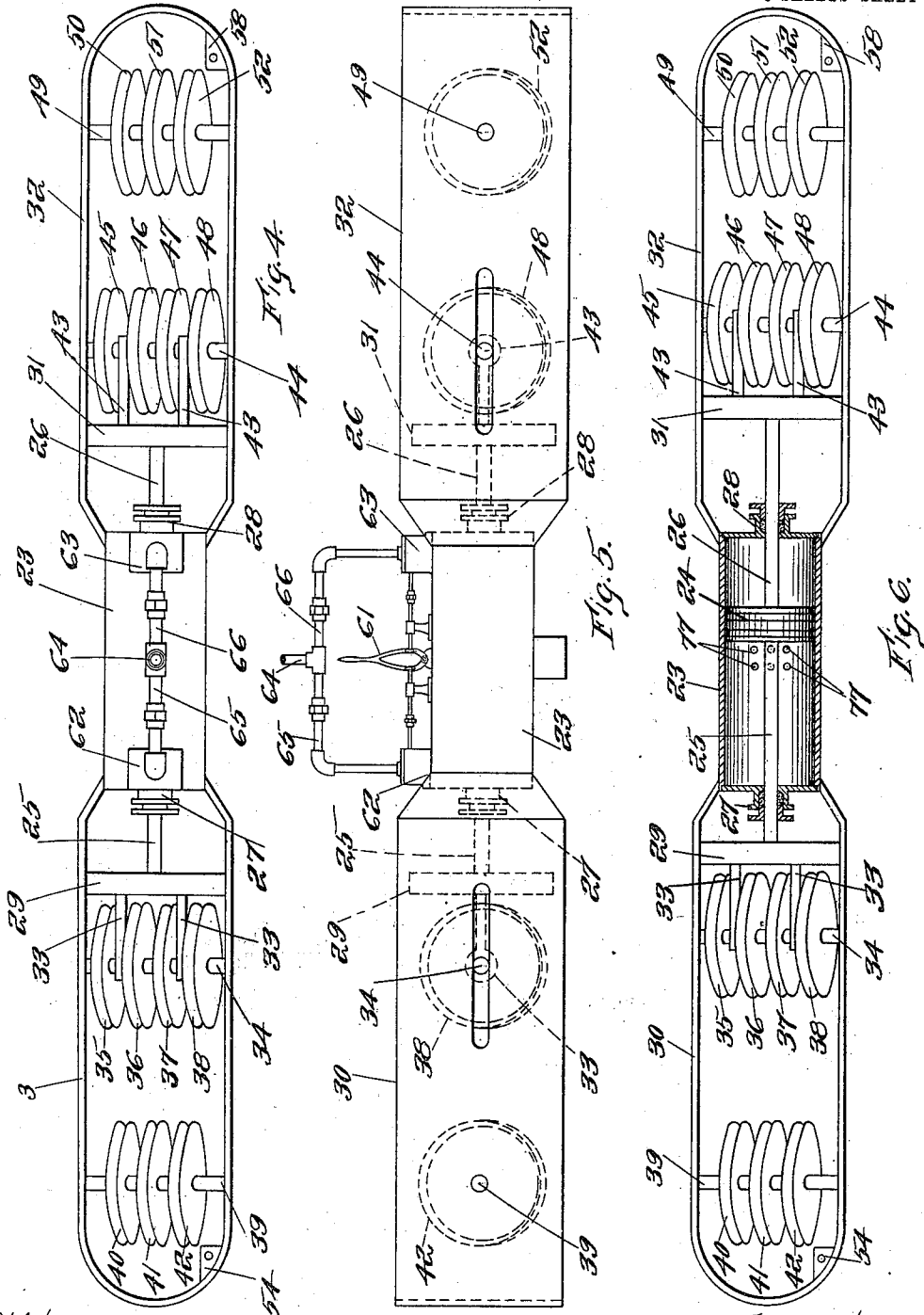
by Macdon, Calver, Leopold & Dike
Attorneys.

H. L. HURD.
 COAL TOWER TROLLEY BOOM SWINGER.
 APPLICATION FILED MAR. 19, 1910.

981,268.

Patented Jan. 10, 1911.

5 SHEETS—SHEET 4.



Witnesses:
 John H. Parker
 Alvin Tan

Inventor:
 Henry L. Hurd
 by Macleod, Balmer, Copeland & Sike
 Attorneys.

H. L. HURD.
 COAL TOWER TROLLEY BOOM SWINGER.
 APPLICATION FILED MAR. 19, 1910.

981,268.

Patented Jan. 10, 1911.

5 SHEETS—SHEET 5.

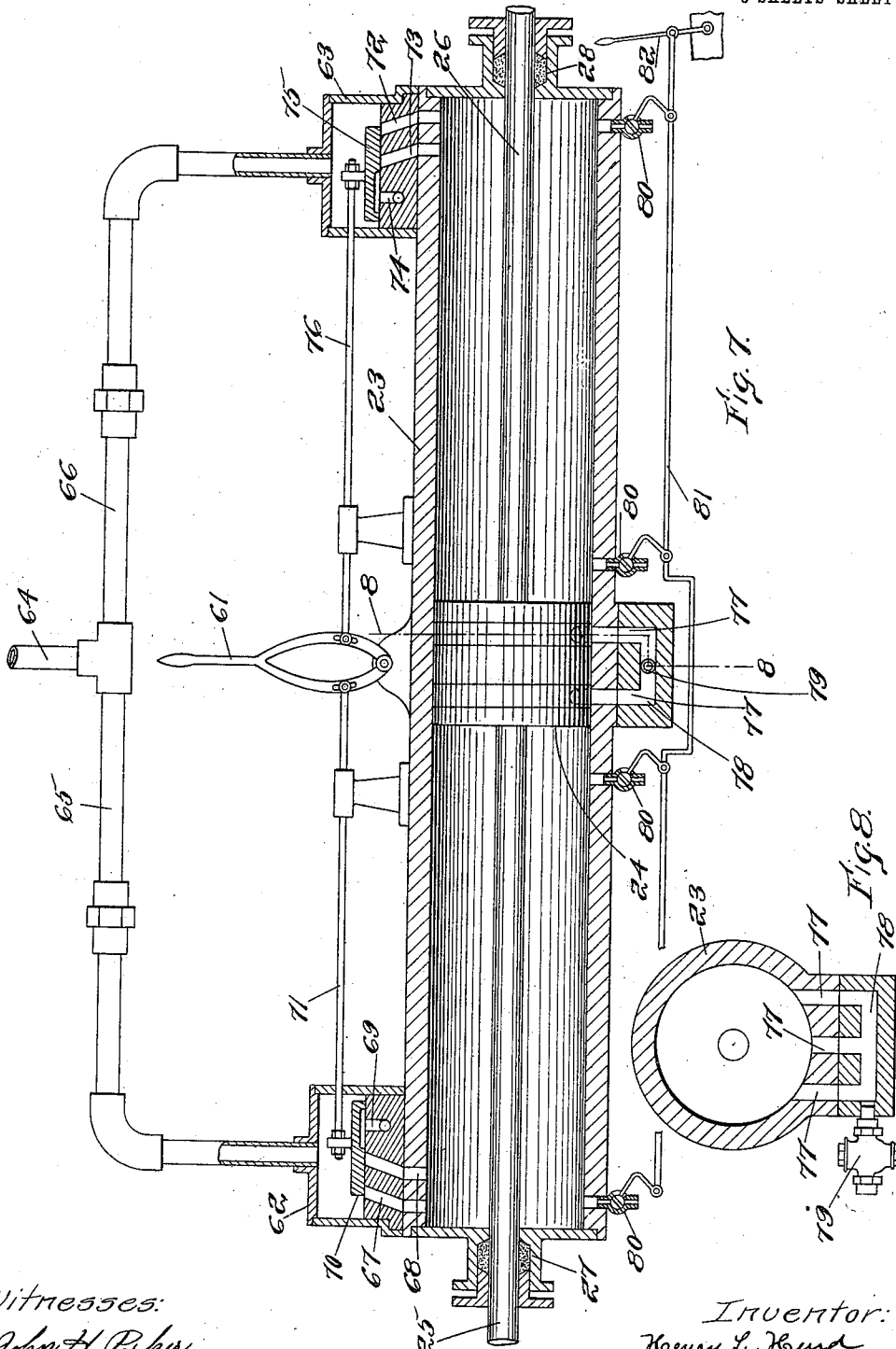


Fig. 7.

Fig. 8.

Witnesses:
 John H. Parker
 Alvin Tarr

Inventor:
 Henry L. Hurd
 by Macleod, Calver, Copeland & Lake
 Attorneys.

UNITED STATES PATENT OFFICE.

HENRY L. HURD, OF BOSTON, MASSACHUSETTS.

COAL-TOWER-TROLLEY-BOOM SWINGER.

981,268.

Specification of Letters Patent.

Patented Jan. 10, 1911.

Application filed March 19, 1910. Serial No. 550,369.

To all whom it may concern:

Be it known that I, HENRY L. HURD, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Coal-Tower-Trolley-Boom Swingers, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to an improvement for use in coal towers for unloading the cargo. The vessel to be unloaded usually hauls up alongside of the wharf. The grab shovel by which the coal is scooped up and lifted from the vessel is suspended and manipulated by cables which are run over a trolley carriage which travels on a boom which projects out over the vessel from the tower. This boom is pivoted on a needle and hung on outside stays to give it support.

Heretofore the boom has been swung out by two rope tackles which are stationary over the center of the hatch for discharging. The coal is taken out from the hatchway and after getting all of the coal that can be grabbed, the shovel is pushed by two or more men to reach the coal each side of the bare floor thwart-ships.

Heretofore so far as is known to me no mechanism has been employed to swing the shovel fore and aft.

The object of my invention is to provide mechanism whereby the shovel can be given a fore and aft movement as well as a movement thwart-ships. I accomplish this by means of mechanism whereby the boom may be swung on its pivot so that the outer end will swing laterally in a horizontal plane.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, and the novel features will be pointed out and clearly defined in the claims at the close of the specification.

In the drawings,—Figure 1 is a side elevation showing a portion of the coal tower and hopper and a boom and operating mechanism constructed in accordance with my invention. Fig. 2 is a plan showing the boom and operating mechanism in central position. Fig. 3 is a plan of the parts shown in Fig. 2 showing the boom swung to the left. Fig. 4 is an enlarged plan of the boom cylinder and the inverted tackle in central position. Fig. 5 is a side elevation of the

parts shown in Fig. 4 also in center position. Fig. 6 is a plan of the tackle, the cylinder being shown in section and showing the piston moved to the right in the position that it would be when it swings the boom to the left as in Fig. 3. Fig. 7 is an enlarged elevation sectioned through the cylinder and the steam chests showing the piston in central position and the valves in central position. Fig. 8 is a cross section through the cylinder and piston on line 8—8 of Fig. 7.

Referring now to the drawings,—1 represents a portion of the coal tower and 2 the hopper into which the coal is dumped by the shovel after being lifted from the vessel.

3 is the cross-tree to which the boom is pivotally connected. This boom consists of two parallel beams 4—4 fastened together at their ends and forming tracks on which the trolley carriage travels. The trolley carriage is mounted on two pairs of trolley wheels 5—5. The trolley carriage is for the purpose of giving a thwart-ship motion to the shovel in the usual way. The two sheaves 6, 7 are carried by the trolley carriage. The holding-on-rope 8 passes between the sheaves 6, 7 and is fastened to the head 9 of the shovel 10. The opening and closing cable 11 passes over the outside of the sheave 7 and around the lower head 12 of the shovel and is fastened to the upper head 9. The opening and closing cable is for the purpose of opening and closing the shovel. Connected with the shovel is a guy wire 13 which runs over a sheave 14 on the end of the boom and runs up to the upper part of the tower from which a weight is hung to keep the shovel straight. The parts thus far described are of well known construction.

The boom 4 is pivoted on the needle 15 whereby the boom is enabled to swing laterally, the needle having a knuckle-joint 16 whereby the boom may be swung in a vertical plane.

Two sheaves 17, 18 are shackled to one side of the boom, for instance the left hand side as viewed in Fig. 2, at some distance apart from each other and two corresponding sheaves 19, 20 are shackled to the other side of the boom. On the opposite ends of the cross-tree 3 are the three-sheaved blocks 21, 22. In the engine room is a power cylinder 23. Within the cylinder there is pro-

vided a piston 24 which is reciprocable within the cylinder and from each end of the piston extends the piston rods 25, 26 respectively which pass through the stuffing boxes 27, 28 respectively in the heads of the cylinder. The piston rod 25 has connected with its outer end a cross-head 29 which is reciprocable in guide ways in the frame 30. The piston rod 26 is connected with a cross-head 31 which is reciprocable in guide ways in the frame 32.

Projecting from the cross-head 29 are the two arms 33, 33, in which is journaled a shaft 34 whose ends move in the same guide ways as the cross-head 29. Loose on the shaft 34 are a series of sheaves preferably four in number 35, 36, 37 and 38, each of said sheaves being rotatable on the shaft independently of the other sheaves on the shaft and all of the sheaves reciprocate together with the cross-head 29. Mounted fast in the frame 30 is shaft 39 on which are loosely mounted a series of sheaves one less in number than the sheaves on the shaft 34, said sheaves being numbered respectively 40, 41 and 42.

Projecting from the cross-head 31 are two arms 43, 43 in which is journaled a shaft 44 on which is loosely mounted a series of sheaves 45, 46, 47, 48 which travel with the cross-head 31 and mounted stationary in the frame 32 also is a shaft 49 on which are loosely mounted the sheaves 50, 51 and 52 corresponding with the sheaves of the shaft 39 already described.

A cable 53 whose end is fast to a holder 54 in the frame 30 runs back first over the sheave 38, thence on the under side of sheave 38, and runs over the top of sheave 42, back over the top and around sheave 37, thence underneath and over the top of sheave 41, thence over the top and underneath sheave 36, thence underneath and over the top of sheave 40, thence over the top and underneath sheave 35, thence around a sheave 55, thence over the top of block 21, thence around sheave 17, thence back around the middle sheave of block 21, thence around sheave 18 which is shackled to the forward end of boom 4, thence back and around the third sheave of block 21, and thence to the windlass 56 to which it is attached and acts as a tightener.

The cable 57 is fastened to one end in the frame 32 and thence runs around over the top and under the sheave 48, thence underneath and over the top of sheave 52, thence over and under the sheave 47, thence over and under the sheave 51, thence over and under the sheave 46, thence over and under the sheave 50, thence over and under the sheave 45, thence around the sheave 59, thence over the top sheave of the block 22, thence around sheave 19 which is shackled to the boom 4, thence around the middle

sheave of block 22, thence around the forward sheave 20 which is shackled to the boom, thence around the lower sheave of the block 22 and thence to the windlass 60 which acts as a tightener, similar to the windlass 56.

By reciprocating the piston in either direction, the slidable members of the inverted tackles connected therewith will be moved and the cable on one side will be paid out and the cable on the other side will be taken up, thereby swinging the boom. For instance, if the piston moves to the right from the position shown in Fig. 2 into the position shown in Fig. 6, the cross-heads 29 and 31 will be moved to the right, and the reciprocable shaft 34 together with the sheaves carried thereon will move to the right away from the stationary shaft 39 and the sheaves mounted thereon, and the shaft 44 together with its sheaves will be moved toward the shaft 49 and its sheaves.

By turning the windlass 60 in a direction to pay out the cable 57 and at the same time taking up the cable 53 by means of the windlass 56 the boom 4 may be swung to the left and by reversing the operation the boom 4 may be swung to the right at any angle.

By means of a valve lever 61 and connecting mechanism which will be described the piston 24 may be reciprocated so as to swing the boom by steam or air power.

Connected with the cylinder 23 and near opposite ends are the two steam chests 62, 63 respectively. A steam pipe 64 connects with the pipe 65 leading to the steam chest 62 and with a pipe 66 leading to the steam chest 63. The passage from the steam pipe 64 through the pipes 65 and 66 into the steam chests 62 and 63 is always open. Leading from the steam chest 62 into the cylinder is a steam port 67 to admit steam from the steam chest into the cylinder. Leading from the cylinder to the steam chest is an exhaust port 68 which cushions the piston 24 when the piston 24 moves to the left hand of the cylinder, as viewed in Fig. 7.

Leading from the steam chest 62 to the outside air is an exhaust cavity 69 connecting with a pipe to the atmosphere. On the face of the steam chest is a D-slide valve 70 which opens and closes the steam and exhaust ports 67 and 68. This slide valve 70 is connected by a valve rod 71 to the lever 61. Leading from the steam chest 63 into the cylinder is a steam port 72 and leading out of the cylinder is an exhaust port 73 and leading from the steam chest also is an exhaust cavity 74 connecting with a pipe to the atmosphere. The steam and exhaust ports 72 and 73 are opened and closed by a D-slide valve 75 which is connected by a rod 76 with the lever 61. Leading through the side of the cylinder in the middle thereof are a series of steam ports 77 which lead into a

relief chamber 78 attached to the side of the cylinder with which is connected a relief valve 79.

The reason for providing the cylinder with separate exhaust and separate steam ports at each end of the cylinder is so that when the piston closes one of the ports, the steam which is thereby held acts as a cushion to the piston on that end of the cylinder, as already stated in describing the steam port 67 and the exhaust port 68.

When the lever 61 is in the central position as shown in Fig. 7, the admission ports 67 and 72 are both open and the exhaust ports 68 and 73 are both closed, and the boom is in central position, as in Fig. 2. If it is desired to swing the boom to the left as in Fig. 3, the lever 61 will be turned to the right as viewed in Fig. 7, thereby opening wider the admission port 67 and leaving exhaust port 68 still closed and closing admission port 72 and opening exhaust port 73 so that the steam which is now admitted through port 67 will drive the piston 24 to the right as viewed in Figs. 6 and 7. This will let out the cable 57 and at the same time the cable 53 will be drawn up corresponding with the letting out of the cable 57 so that the boom 4 will swing to the left without any slack in either cable.

In order to bring the boom back into the center again the lever 61 is placed central as shown in Fig. 7 and relief valve 79 is opened and with the pressure coming into the cylinder through ports 72 and 67 with the relief valve 79 open, the pressure through port 67 against the left hand face of the piston is thereby released and the piston will move to the center of the cylinder, as the openings 77 at the center are of greater area than the port 67 and will allow the pressure of steam to escape from the left hand face of the piston, thereby bringing the piston to the center of the cylinder very gently as the two series of ports 77 are closed one after the other by the piston rings.

The relief valve 79 may be operated by the foot or by hand in well known manner.

In the bottom of the cylinder are four drip valves 80, one near each end and one on each side of the piston when the piston is in center position. These drip valves are connected together by a single rod 81 operated by a lever 82 so that the valves may all be opened or closed simultaneously.

When it is desired to swing the boom to the right the lever 61 will be moved to the left.

While I have shown the sheaves on the movable shafts 34 and 44 as being four in number and the sheaves on the fixed shafts 39 and 49 as being three in number the exact number is immaterial so long as the number of sheaves on the movable shaft is

one more than on the stationary shaft. By increasing the number of sheaves a wider sweep of the boom is secured and the piston area must be increased accordingly. Also while for convenience in description I have referred to the power for driving the piston as being steam power, compressed air or any other suitable fluid pressure may be employed. Also while I have described the apparatus as especially intended for use in unloading coal from vessels it is not intended herein to limit the scope of the claims to the use of the apparatus for unloading any particular kind of cargo.

The cable used is preferably a wire cable on account of the great wear to which it is subjected.

I have described the invention thus far as employed in an apparatus in which the boom is supported by stay-cables and for that reason the inverted tackles are employed and I have so described and illustrated the invention because in connection with trolley booms the stays usually employed are cables. It is obvious however that the trolley boom may be stayed by other means than cables in such a manner as to allow a lateral swing of the boom.

I regard as coming within the scope of my invention the employment of any stay mechanism intermediate the piston and the trolley boom which is actuated by the piston in the manner described herein.

By the employment of my apparatus above described, the shovel can always be lowered through the central hatchway and then swung either to the right or left as desired to swing it under the combings of the hatch to get the coal on the side, and then swung back to the center and hoisted out through the central hatchway again.

The operation will be in the following order, assuming that the boom is in the central position and the piston at center: Suppose, for instance, it is desired to remove the coal from under the combings on the left hand side of the hatch. First, the shovel is lowered through the central hatch without swinging the boom; then the lever 61 is moved to the right, as viewed in Fig. 7, and the piston 24 is driven to the right, as already described, thus swinging the boom to the left. The swinging of the boom to the left in this way gives a pendulum movement to the shovel down in the hatch, carrying it under the combings where it will be manipulated to grab the coal in the usual manner. The lever should be immediately moved back to the center while the shovel is being filled; then as soon as the shovel is filled, the relief-valve should be operated by foot or otherwise as already described which will thereby swing the boom to the center, bringing also the shovel out from under the combings to the center of the hatch;

then the shovel will be hoisted and dumped while the boom still remains at the center; then the shovel will again be lowered and after it is lowered it will again be swung to the left or swung to the right by the proper movement of the lever 61 in the manner previously described.

What I claim is:

1. A trolley boom pivotally connected at one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles each connected with a movable cross-head, two tightening windlasses, a cable connected with each set of tackles and connected windlasses, one end of each of said cables being made fast to the windlass and thence running over one set of side tackles and over the inverted tackle of its set and made fast to a support, a connection between the movable cross-heads of the two sets of inverted tackles and means for reciprocating said connection and cross-heads whereby the cable connected with one side of the boom may be taken up and the cable connected with the other side will be correspondingly let out, thereby swinging the boom in a lateral plane.
2. A trolley boom pivotally connected at one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles, two tightening windlasses, a cable connected with each set of tackles and connected windlasses, one end of each of said cables being made fast to the windlass and thence running over one set of side tackles and over the inverted tackle of its set and made fast to a support, a cylinder, a piston movable within said cylinder, piston rods connected with the opposite ends of said piston and connected respectively with the movable cross-heads of the two sets of inverted tackles, means for admitting fluid pressure to and exhausting it from said cylinder at opposite ends thereof, and means whereby when the fluid pressure is admitted at one end it may be exhausted at the other end whereby said piston is reciprocated in either direction and one of said cables is taken up and the other is correspondingly let out whereby the said boom is caused to swing in either lateral direction desired.
3. A trolley boom pivotally connected at one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles, two tightening windlasses, a cable connected with each set of tackles and connected windlasses, one end of each of said cables being made fast to the windlass and thence running over one set of side tackles and over the inverted tackle of its set and made fast to a support, a cylin-

der, a piston movable within said cylinder and piston rods connected with the opposite ends of said piston and connected respectively with the movable cross heads of the two sets of inverted tackles, means for admitting fluid pressure to and exhausting it from said cylinder at opposite ends thereof, means whereby when the fluid pressure is admitted at one end it may be exhausted at the other end whereby said piston is reciprocated in either direction and one of said cables is taken up and the other is correspondingly let out whereby the said boom is caused to swing in either lateral direction desired, valves for controlling the admission and exhaust of fluid pressure to and from the opposite ends of the cylinder disposed in such manner that the fluid pressure may either be admitted to one end and closed to the other end or may be admitted to both ends at the same time at the will of the operator.

4. A trolley boom pivotally connected at one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles, two tightening windlasses, a cable connected with each set of tackles and connected windlasses, one end of each of said cables being made fast to the windlass and thence running over one set of side tackles and over the inverted tackle of its set and made fast to a support, a cylinder, a piston movable within said cylinder, piston rods connected with the opposite ends of said piston and connected respectively with the movable cross heads of the two sets of inverted tackles, means for admitting fluid pressure to and exhausting it from said cylinder at opposite ends thereof, means whereby when the fluid pressure is admitted at one end it may be exhausted at the other end whereby said piston is reciprocated in either direction and one of said cables is taken up and the other is correspondingly let out whereby the said boom is caused to swing in either lateral direction desired, valves for controlling the admission and exhaust of fluid pressure to and from the opposite ends of the cylinder disposed in such manner that the fluid pressure may either be admitted to one end and closed to the other end or may be admitted to both ends at the same time at the will of the operator, an operating lever and valve rods connecting both of said valves with said lever whereby said valves may be operated simultaneously to admit fluid pressure to one end of the cylinder to close the exhaust and to close the admission to the other end of the cylinder and open the exhaust, or may be moved to open the admission ports to both ends of the cylinder and close both the exhausts.

5. A trolley boom pivotally connected at

one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles, two tightening windlasses, a cable connected with each set of tackles and connected windlasses, one end of each of said cables being made fast to the windlass and thence running over one set of side tackles and over the inverted tackle of its set and made fast to a support, a cylinder, a piston movable within said cylinder, piston rods connected with the opposite ends of said piston and connected respectively with the movable cross-heads of the two sets of inverted tackles, means for admitting fluid pressure to and exhausting it from said cylinder at opposite ends thereof, means whereby when the fluid pressure is admitted at one end it may be exhausted at the other end whereby said piston is reciprocated in either direction and one of said cables is taken up and the other is correspondingly let out whereby the said boom is caused to swing in either lateral direction desired, valves for controlling the admission and exhaust of fluid pressure to and from the opposite ends of the cylinder disposed in such manner that the fluid pressure may either be admitted to one end and closed to the other end or may be admitted to both ends at the same time at the will of the operator, and a relief valve connected with the cylinder at the middle thereof whereby when the piston is at one end of the cylinder, the pressure may be exhausted from the other end of the cylinder and by the admission of pressure to the other end of the cylinder the piston will be brought to the center and close the ports leading to the relief valve on the middle of the cylinder and thereby if the admission ports at each end of the cylinder are open the pressure upon each end of the piston will be equalized and the boom will stand central.

6. A trolley boom pivotally connected at one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles, each inverted tackle comprising a stationary shaft on

which are mounted a plurality of sheaves, a movable shaft parallel with said stationary shaft and reciprocable laterally toward and from said stationary shaft and having mounted thereon a plurality of sheaves, a movable cross-head to which each of said reciprocable shafts is connected, a connection between the movable cross-heads of the two inverted tackles whereby both of said movable cross-heads will move together in the same direction, two cables respectively running over the two sets of side tackles and inverted tackles, two windlasses, each of said cables being fast at one end to a support and fast at the other end to one of said windlasses, and means for reciprocating said connected cross-heads whereby one cable may be taken up and the other cable will be correspondingly let out, thereby swinging the boom in a lateral plane.

7. A trolley boom pivotally connected at one end to a support whereby the boom is adapted to be swung laterally, side tackles connected with the two opposite sides of the boom, two inverted tackles, each inverted tackle comprising a stationary shaft on which are mounted a plurality of sheaves, a movable shaft parallel with said stationary shaft and reciprocable laterally toward and from said stationary shaft and having mounted thereon a plurality of sheaves, a movable cross-head to which each of said reciprocable shafts is connected, a connection between the movable cross-heads of the two inverted tackles whereby both of said movable cross-heads will move together in the same direction, two cables respectively running over the two sets of side tackles and inverted tackles, each of said cables being made fast at both ends to supports, and means for reciprocating said connected cross-heads thereby swinging the boom in a lateral plane.

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

HENRY L. HURD.

Witnesses:

WILLIAM A. COPELAND,
ALICE H. MORRISON.