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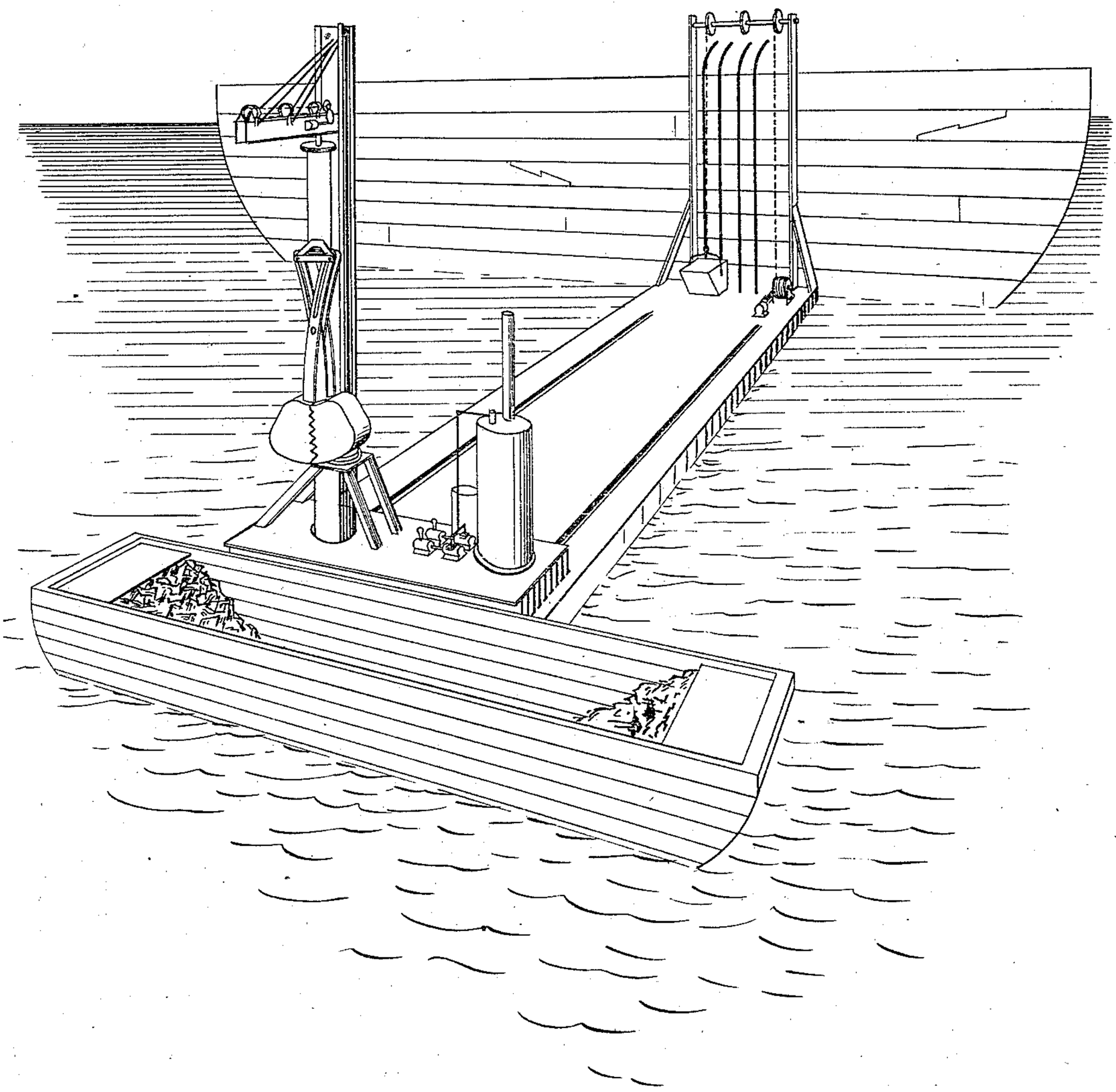
W. H. MADDOCK & A. MICHAELS.

HOISTING APPARATUS.

No. 312,737. Patented Feb. 24, 1885.

Fig. 1.



WITNESSES:
Darwin S. Wolcott
A. R. Clarke.

INVENTORS.
William H. Maddock.
Albert Michaels.
BY George A. Cunsly
ATTORNEY.

(No Model.) 4 Sheets—Sheet 2.

W. H. MADDOCK & A. MICHAELS.

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Fig. 10.

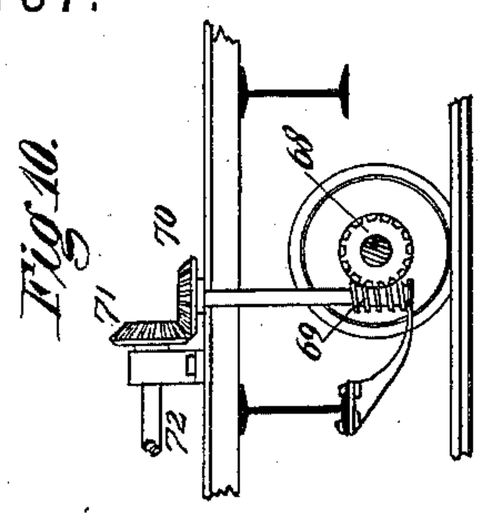

Fig. 2.

Fig. 6.

Fig. 7.

WITNESSES:

Damon S. Wolcott

C. M. Clarke

INVENTORS:

William H. Maddock.

Albert Michaels.

BY George N. Christy

ATTORNEY.

(No Model.) 4 Sheets—Sheet 3.

W. H. MADDOCK & A. MICHAELS.

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Fig. 3.

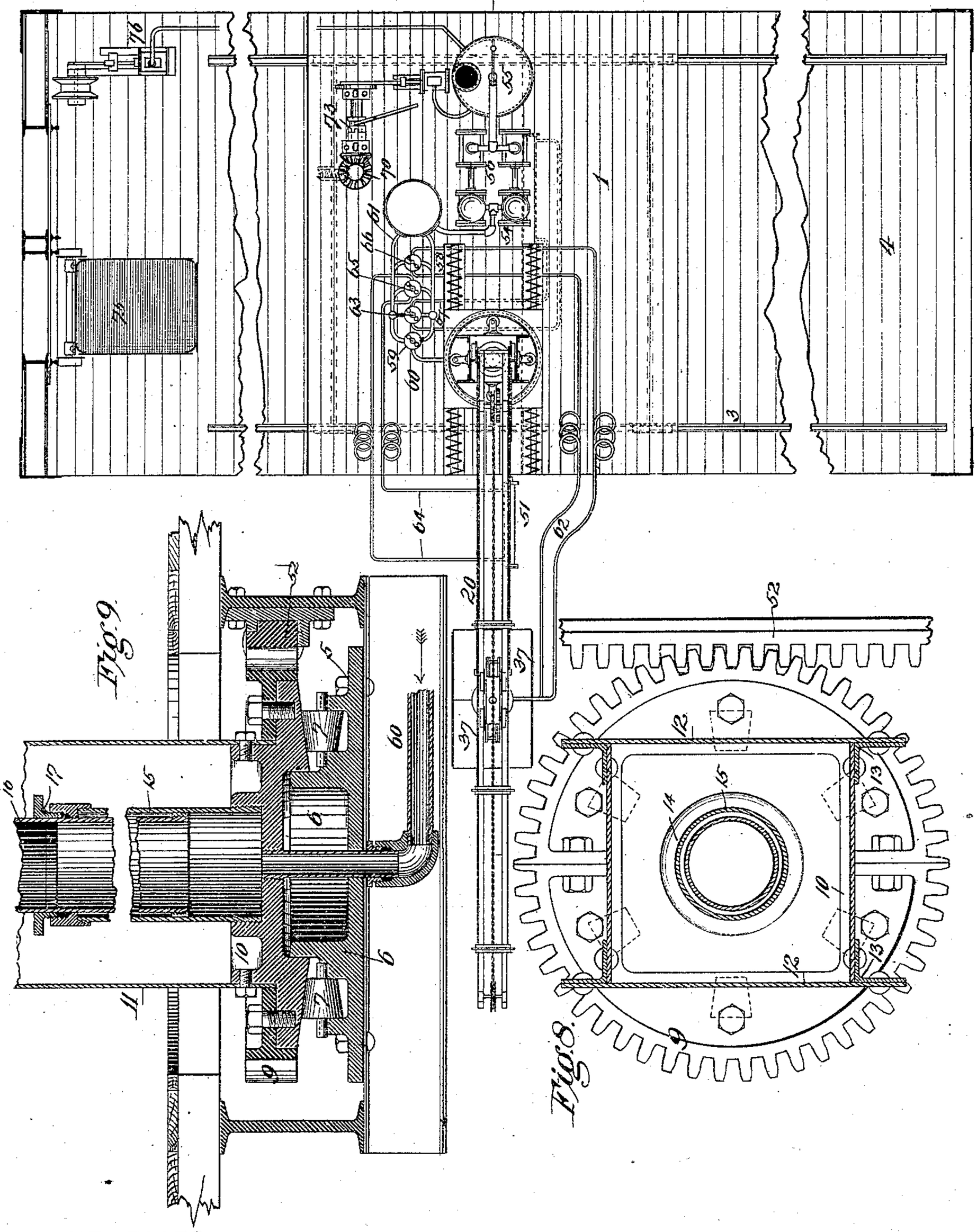

Fig. 9.

Fig. 8.

WITNESSES:
Damon S. Wolcott
C. M. Clarke

INVENTORS.
William H. Maddock.
Albert Michaels.
BY George H. Christy
ATTORNEY

(No Model.) 4 Sheets—Sheet 4.

W. H. MADDOCK & A. MICHAELS.

HOISTING APPARATUS.

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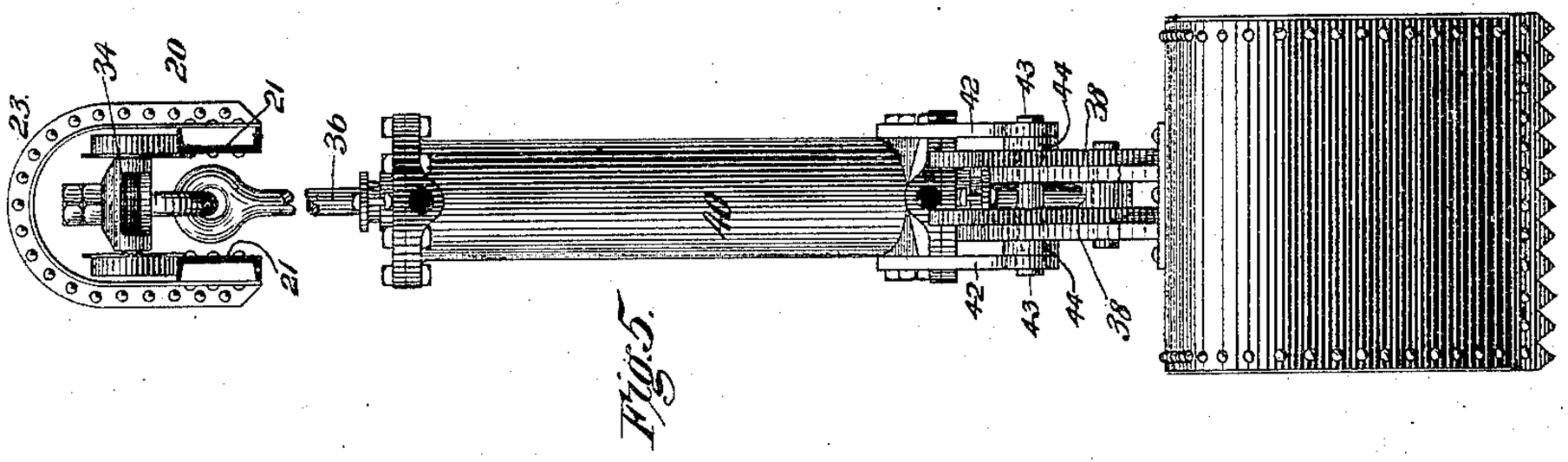

Fig. 5.

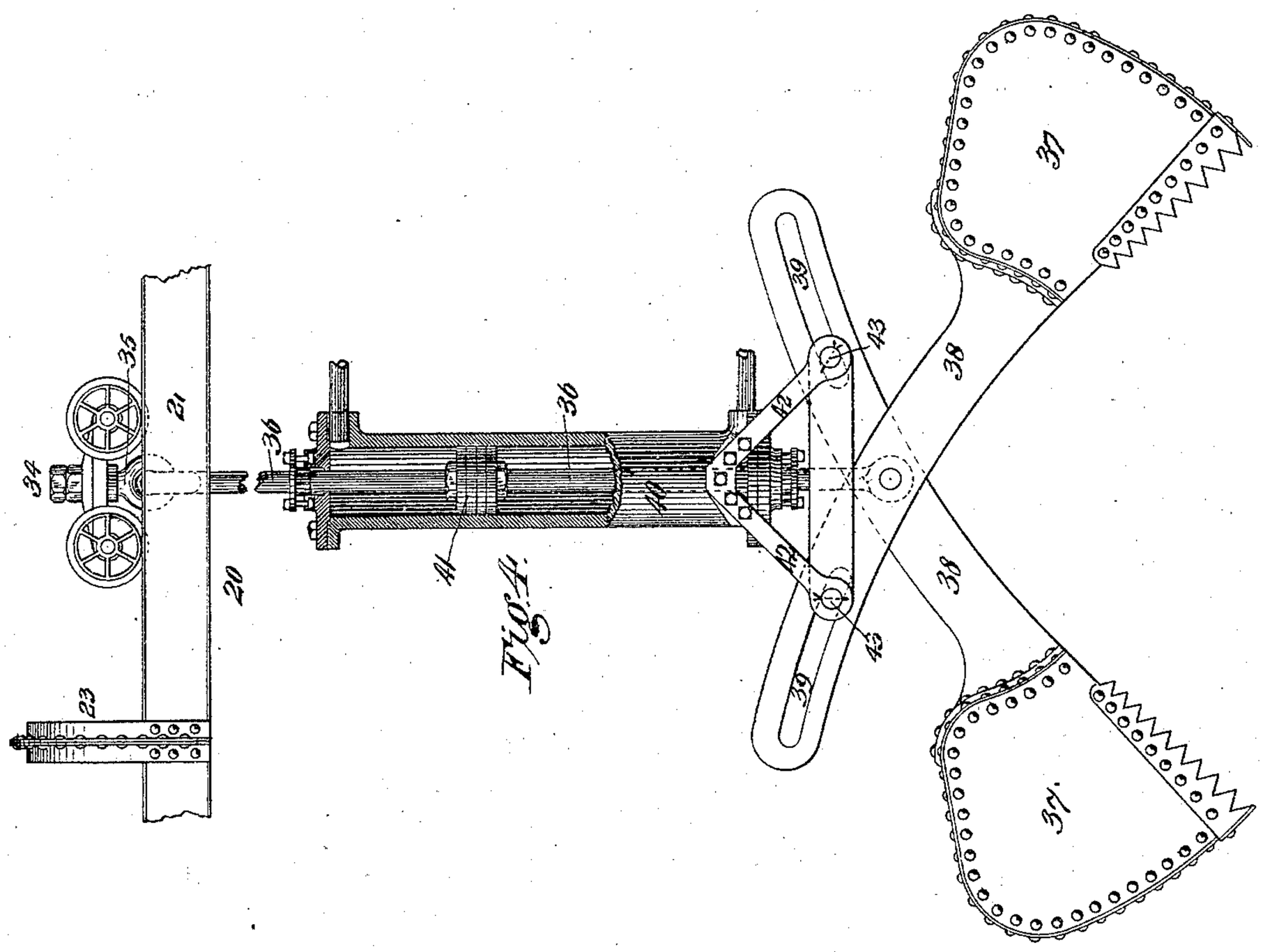

Fig. 4.

WITNESSES:
Dannie S. Wolcott
C. M. Clarke.

INVENTORS.
William H. Maddock.
Albert Michaels.
BY George H. Christy
ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM H. MADDOCK, OF ALLEGHENY, AND ALBERT MICHAELS, OF PITTSBURG, PENNSYLVANIA.

HOISTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 312,737, dated February 24, 1885.

Application filed August 20, 1884. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. MADDOCK, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, and ALBERT MICHAELS, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, citizens of the United States, have invented or discovered certain new and useful Improvements in Hoisting Apparatus, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a perspective view of our improved plant for removing coal, grain, or other merchandise from barges, boats, or cars, and transferring the same to any desired point. Fig. 2 is a view in side elevation of the apparatus for removing the coal from barges, boats, or cars. Fig. 3 is a plan view of the same. Figs. 4 and 5 are enlarged detail views of the clam-shells and their operating mechanism. Fig. 6 is a top plan view of the supporting-mast and the inner end of the boom. Fig. 7 is an enlarged detail view of the supporting-ring and braces. Fig. 8 is a transverse section of the mast and hydraulic rams on the line *x x*, Fig. 2. Fig. 9 is a vertical sectional view of the lower end of the mast and hydraulic cylinders, showing the manner of supporting said parts vertically. Fig. 10 is a detail view showing the manner of propelling the car supporting the hoisting mechanism.

Our invention relates to the construction of cranes or derricks and other auxiliary apparatus for the removal and transfer of coal, grain, or other merchandise carried in bulk on barges, vessels, cars, &c.; and the object of our invention is to so construct such a crane and its connections that the entire operation of seizing, raising, and transferring the load may be quickly and effectively performed, the whole operation being under the control of one operator; and to this end our invention consists in the construction and combination of parts, all as more fully hereinafter described and claimed.

The bed or foundation 1, on which the hoisting apparatus is placed, is mounted on suitable wheels, 2, adapted to move on rails 3, which may either form a track on a float, 4, or may be an ordinary railway-track, according to the location of and purpose for which the hoisting apparatus is to be used. On transverse iron beams of the bed 1 are secured the bed-plate 5, provided with the central boss or projection, 6, and the friction-rollers 7, arranged around the central boss. On the rollers 7 rests the circular foot-plate 8, provided with a central recess in its under side, into which projects the central boss, 6, thereby preventing any lateral movement of the foot-plate. On the periphery of the foot-plate is secured the annular rack 9, the function of which will be hereinafter stated. On the upper side of the foot-plate are formed the ribs 10, to which are secured the lower ends of the sides of the mast 11, rectangular in cross-section, as clearly shown in Figs. 6, 8, and 9. This mast is formed of plates 12, secured at their edges to the angle-irons 13, and, if desired, the mast may be strengthened as against lateral strain by a system of lattice-work, as is frequently employed in iron structures.

Around the center of the foot-plate, within the ribs 10, is formed the annular rim 14, within which is placed the lower end of the main hydraulic cylinder 15, that portion of the foot-plate included within the rim 14 forming the lower head of the cylinder 15, as shown in Fig. 9.

Within the main cylinder 15 is placed a second cylinder, 16, having its lower end open, as shown, and projecting through a stuffing-box, 17, on the top of the main cylinder, and within the secondary cylinder 16 is placed the piston 18, practically filling said cylinder and projecting through a stuffing-box, 19, on the upper end of the secondary cylinder. The upper end of the piston 18 fits within a socket formed in the inner end of the boom 20, said boom being formed of channel-irons 21, secured at the inner ends to a block, 22, in which the socket for the piston 18 is formed, and the channel-irons are braced and held in proper relation to each other by the ∩-shaped braces 23. (See Figs. 4 and 5.) To permit of the up-and-down motion of the boom, the

plate 12 on one of the sides of the mast is slotted for a suitable distance. The outer end of the boom-20 is supported by the tie-rods 24, which extend from different points along the boom to the supporting-truck 25, provided with wheels adapted to bear against the edge of the channel-irons 26, located within the mast 11 and riveted to the side plates thereof. The truck 25 is held in proper vertical position by the tie-rods 27, extending from said truck down the axle of the bearing-rollers 28, the axle of said rollers being mounted in bearing 29, secured to the under side of the channel-irons 21 of the boom in such proximity to the mast that the rollers 28 will bear against the side plate, 12, on that side of the mast from which the boom projects. The rollers 28 will transfer any end-thrust to which the boom may be subjected to the mast, thereby preserving the piston 18 from any lateral strains, as will be readily understood.

To the sides of the mast 11, near its lower end, are secured the angular plates 30. In the apices of these plates are mounted the friction-rollers 31, the plate 30 on that side of the mast from which the boom projects being provided with three of such friction-rollers, while the other plates have only one roller, as shown in Figs. 6 and 7. These friction-rollers 31 are adapted to bear against the inner face of the annulus 32, said annulus being secured on the upper ends of the brace-rods 33, which are attached at their lower ends to bed or foundation 1. By the above construction the mast 11 is supported laterally, and at the same time perfect freedom as to rotary motion is permitted.

On the upper edges of the channel-irons 21, forming the boom 20, is mounted the trolley 34, consisting of a center plate or bed provided with axles at its corners, on which are journaled flanged wheels adapted to ride upon the channel-irons 21, as above stated. To the center plate or bed of the trolley is secured the eyebolt 35, from which depends the suspension and fulcrum rod 36, and to the lower end of this rod 36 are pivoted the clam-shells or scoops 37. These scoops are formed of plate-iron in the usual manner, and are given any desired shape, which will depend upon the kind of work to be performed by the scoops. Each of the scoops is provided with an arm, 38, said arms being pivoted together by the same pin which connects them to the suspension and fulcrum rod 36, the outer ends of these arms 38 being provided with the curved slots 39.

Around the suspension and fulcrum rod 36 is placed the hydraulic cylinder 40, and to the rod 36, within the hydraulic cylinder, is secured the piston 41, fitting closely within the cylinder, which is provided with suitable stuffing-boxes at its ends, surrounding the rod 36. It is obvious that as the piston is secured to the rod 36, when water or air is admitted to the cylinder, said cylinder will move up or down along the rod. On opposite sides of the cylinder, near its lower end, are bolted the arms 42, extending a short distance below the end of the cylinder, and to these arms 42 are connected the arms 38 of the scoops by the pins 43, said pins passing through eyes in the end of the arms 42 and the slots 39 in the scoop-arms 38. The arms 42 are braced and held in proper relation to each other by the bars 44, having eyes in their ends, through which also pass the pins 43. It will be readily understood from the above that as the cylinder 40 is raised and lowered, sliding along the suspension and fulcrum rod, the outer ends of the scoop-arms will be moved out and in, thereby opening and closing the scoops.

At the inner and outer ends of the boom 20 are mounted wheels 45, over which passes the chain or wire rope 46, the lower portion of which is attached to the trolley 34.

On the shaft of the inner wheel 45 is secured a pinion, 47, which meshes with a gear-wheel, 47ª, said gear-wheel being secured to a shaft, 48, carrying also the pinion 49, said pinion 49 meshing with the rack 50, which is attached to the end of the piston-rod of the cylinder 51, connected by suitable pipes to a hydraulic or pneumatic accumulator, as will be hereinafter described.

The annular rack 9, secured, as above described, to the circular foot-plate 8 of the mast, meshes with a rack, 52, secured to the piston-rod 53 of cylinder 54, connected by suitable pipes to the accumulator.

Upon the bed or foundation 1, adjacent to the mast, are located a boiler, 55, and steam-pump 56, for the purpose of maintaining a constant pressure of air or water in the accumulator 57. This accumulator is connected by a pipe, 58, with a three-way cock, 59, which in turn is connected with the cylinder 5 by a pipe, 60, passing up through the bed-plate 5 and the foot-plate 8, as shown in Fig. 9. The cock 59 is connected with an exhaust-reservoir in the lower part of the accumulator by a pipe, 61. The scoop-operating cylinder 40 is connected by flexible pipes 62 with a four-way cock, 63, which is connected to the supply-pipes 58 and exhaust-pipe 61 by short branch pipes, as shown in Fig. 3. The cylinder 51, located in the boom, is connected with the accumulator and exhaust-receiver by a similar system of flexible pipes, 64, cock 65, and short branch pipes. The four-way cock 66 is also connected by branches to the supply and exhaust pipes 58 and 61, and to the mast-revolving cylinder 54 by the pipes 67. The regulating-cocks are located in close proximity to each other, as shown in Fig. 3, so that they can be conveniently reached by the operator.

On one of the axles of the wheels, under the bed or foundation 1, is keyed a gear-wheel, 68, (see Fig. 10,) meshing with a worm-wheel, 69, secured to said bed, the upper end of the

shaft of the worm-wheel being provided with a bevel-gear, 70, which meshes with a corresponding bevel-gear, 71, secured to the shaft 72, said shaft being adapted to be connected by a clutch mechanism, 73, (see Fig. 3,) to a shaft driven by an auxiliary engine, 74, suitably connected by pipes to the steam-boiler.

The operation of the hoisting apparatus, when used for discharging coal, &c., from boats or barges, is as follows: The float on which the hoisting apparatus is mounted is secured alongside of a boat or barge, as shown in Fig. 1. Then by turning the cock 66 air is admitted to the cylinder 54, thereby moving its piston and the rack connected therewith, turning the mast until the boom is brought over the boat. The cock 59 is then turned, so as to open the connection between the cylinder 15 and the exhaust-reservoir, thereby lowering the boom and the scoops depending therefrom, said scoops having previously been moved along the boom to the proper position by turning the cock 65, so as to open communication between the accumulator and the cylinder 51, the piston of said cylinder being forced in or out, as required, and correspondingly moving its rack and turning the pinions and gears, thereby moving the chain 46 and the trolley 34, connected therewith. During the lowering of the boom and the horizontal adjustment of the scoops the latter are opened to the position shown in Fig. 4 by causing the cylinder 40 to move down along the suspension-rod, which movement is effected by turning the cock 63, so as to connect the lower part of the cylinder with the accumulator, as will be clearly understood. The scoops having been adjusted into operative position, the cock 63 is so turned as to allow the fluid in the accumulator to pass into the upper part of the cylinder 40, thereby raising said cylinder and closing the scoops, and at the same time fluid is admitted to the cylinder 15 by turning the cock 59, thereby raising the boom and with it the scoops. It will be observed that as the scoops are being closed the lower edge of said scoops will move down, and consequently will either be forced into the coals in the boat or raise the trolley on the boom. It is therefore necessary that the upward movement of the boom, caused by admitting fluid into the cylinder 15, should equal the downward movement of the scoops in their closing movement. As soon as the scoops have been closed and raised to the proper height, the cocks 59 and 63 are closed and the cock 66 is opened so as to admit fluid into the cylinder 54, thereby moving the rack 52, meshing with the annular rack 9 on the foot-plate 8 of the mast, and turning said mast until the scoops are brought to the point of discharge, when the cock 63 is so turned as to allow of the escape of the fluid in the upper part of the cylinder 40 and its admission to the lower part, thereby driving down said cylinder and opening the scoops. When the coal or other merchandise is to be discharged onto the shore, an inclined railway provided with cars is arranged from the float carrying the hoisting machinery to the desired point on the shore, and the scoops are discharged into the cars on said railway; but in case the coal is to be discharged from the boat or barge into a vessel whose sides are higher than the lift of the hoisting machinery a vertical lift or elevator, 75, (see Fig. 1,) is arranged at one end of the float, the cars of said elevator being operated by an engine, 76, connected by pipes to the steam-boiler, as shown. The contents of the scoops are discharged into the cars of the elevator, and said cars are then raised and emptied on board the vessel.

In lieu of having the cylinder 40 movable, it may be attached to the trolley on the boom, and the scoops may be opened and closed by moving the pivotal point of its arms, the piston in the cylinder being connected to said pivotal point; or the arms or handles of the scoops may be pivoted to the lower end of the cylinder 40, and the scoops opened and closed by toggle-levers, the moving part of said levers being connected to a movable piston.

We claim herein as our invention—

1. In a hoisting apparatus, the shells or scoops 37, having a suspension and fulcrum bar, in combination with a cylinder moving along said suspension-rod and connected with scoop, whereby said shells or scoops are opened and closed by the movement of the cylinder, substantially as set forth.

2. In a hoisting apparatus, the shells or scoops having a suspension and fulcrum bar and provided with handles, in combination with a cylinder moving along said suspension-rod and connected to the handles of the grapple or scoop, whereby the movement of said cylinder will effect the opening and closing of the shells or scoops, substantially as described.

3. In a hoisting apparatus, the combination of the shells or scoops 37, a cylinder, and a piston, these members being combined for joint operation to effect the opening and closing of the scoops by the reciprocation of the cylinder or piston, substantially as set forth.

4. In a hoisting apparatus, the combination of the shells or scoops 37, a suspension or fulcrum bar, a cylinder for operating said scoops, and a trolley supporting the suspension-rod and adjustable along a vertically-movable boom, substantially as set forth.

5. In a hoisting apparatus, the combination of the shells or scoops 37, a suspension and fulcrum bar, a cylinder for operating said scoops, a horizontally-adjustable trolley for supporting the scoops and their operating mechanism, a boom supporting the trolley, and a ram for raising and lowering the boom, substantially as set forth.

6. In a hoisting apparatus, the mast 11, having angular plates 30 secured to its sides, in combination with friction-rollers mounted in

the apices of the angular plates, and the supporting-ring 32, connected by suitable braces to the bed or foundation 1, substantially as set forth.

7. In a hoisting apparatus, the combination of the boom, the vertical mast having inwardly-projecting flanges 26, a supporting-truck, 25, bearing against said flanges, braces or tie-rods 24, extending from the boom to the truck, and the thrust-receiving rollers 28, secured to the boom and bearing against the mast, substantially as set forth.

In testimony whereof we have hereunto set our hands.

WILLIAM H. MADDOCK.
ALBERT MICHAELS.

Witnesses:
S. HARVEY THOMPSON,
DARWIN S. WOLCOTT.