

No. 649,578.

Patented May 15, 1900.

H. H. HOKE.
CRANE.

(Application filed Nov. 29, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

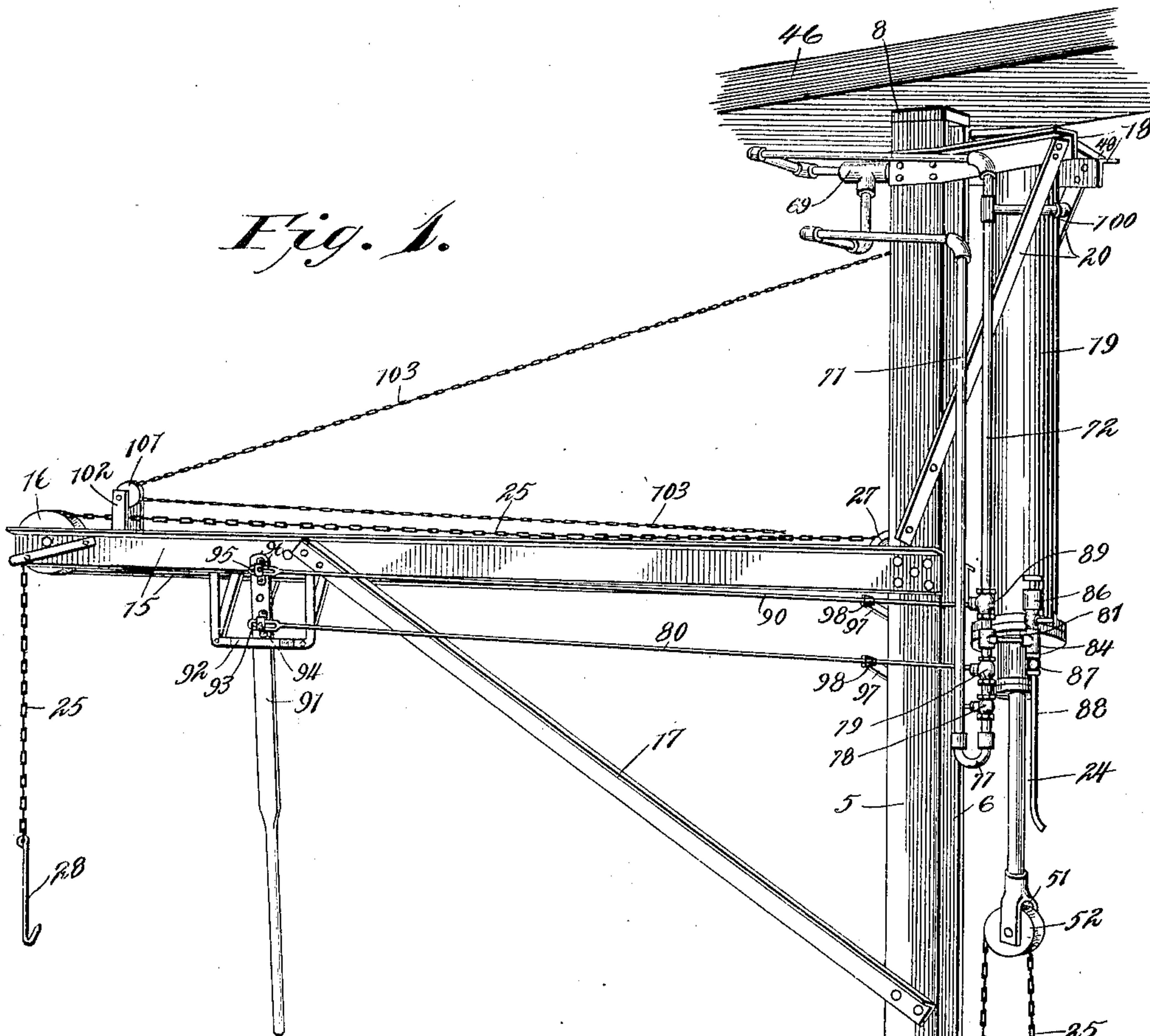
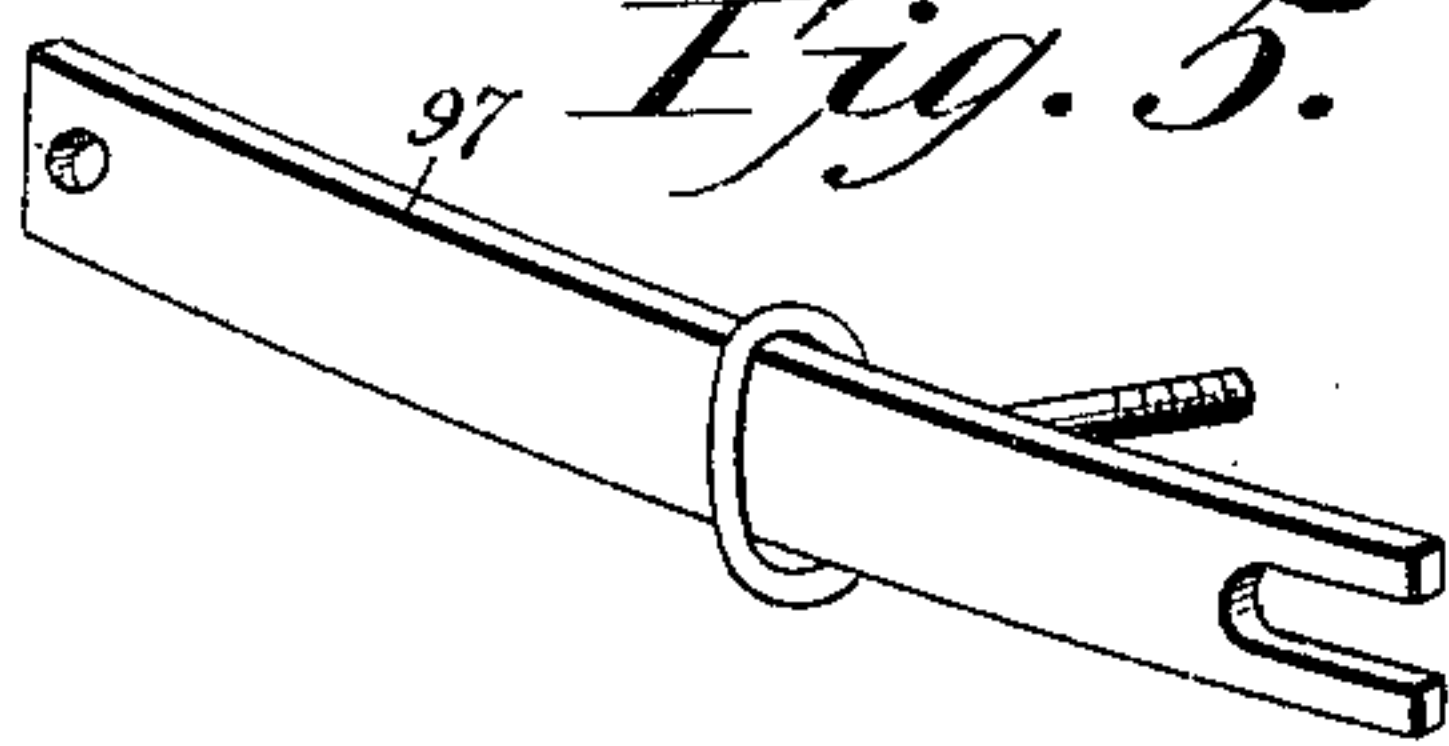


Fig. 5.



Witnesses

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2 Sheets—Sheet 2.

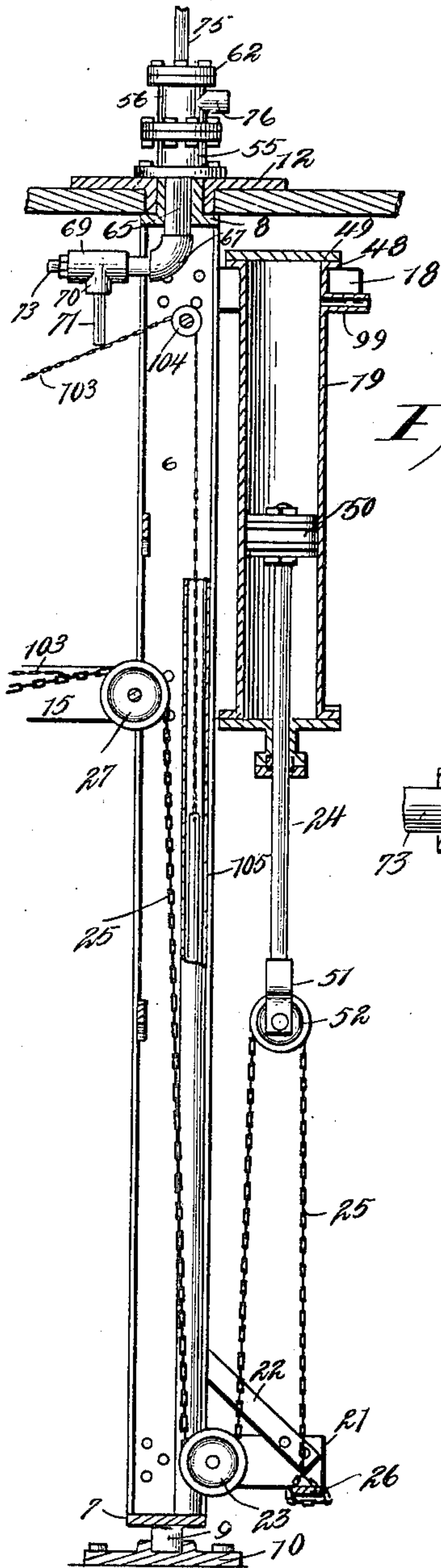


Fig. 2.

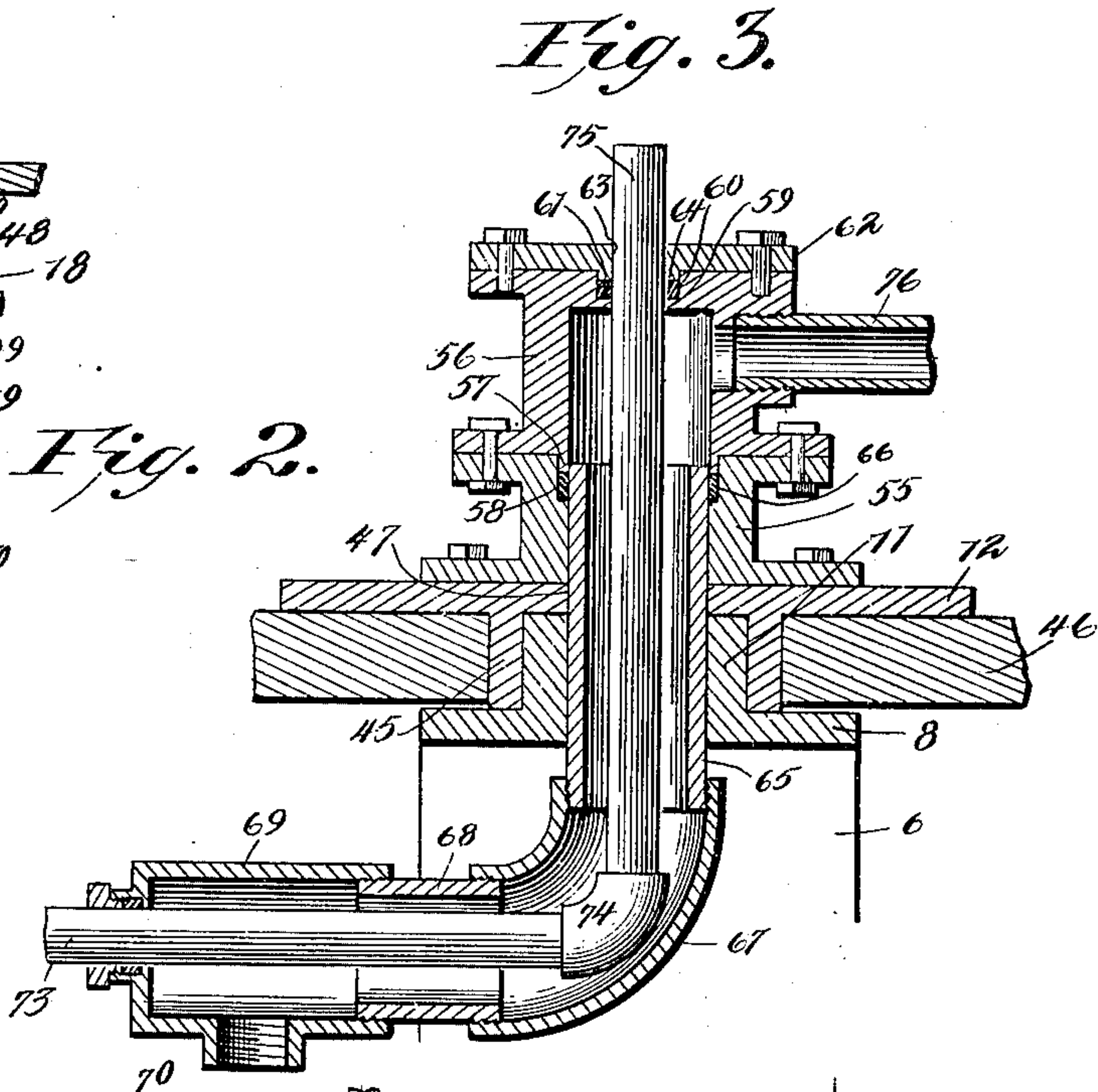


Fig. 3.

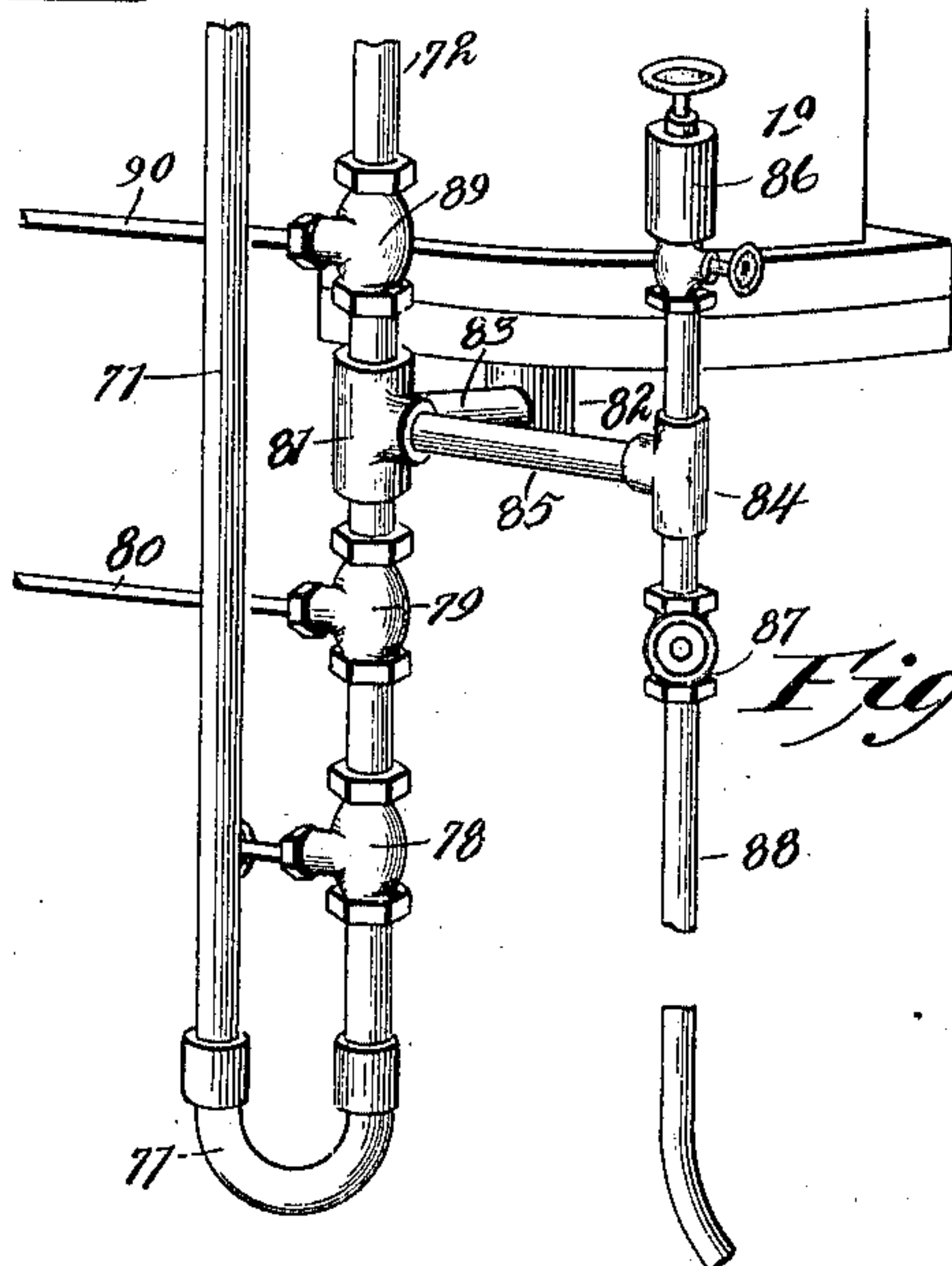


Fig. 4.

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UNITED STATES PATENT OFFICE.

HENRY H. HOKE, OF FREDERICK, MARYLAND.

CRANE.

SPECIFICATION forming part of Letters Patent No. 649,578, dated May 15, 1900.

Application filed November 29, 1899. Serial No. 738,704. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. HOKE, a citizen of the United States, residing at Frederick, in the county of Frederick and State of Maryland, have invented a new and useful Crane, of which the following is a specification.

This invention relates to cranes in general, and more particularly to that class known as "swinging" cranes, and has specific reference to steam-operated cranes, the object of the invention being to provide a construction in which the steam-cylinder is mounted directly upon the mast and in which the supply and exhaust are regulated by a hand-lever mounted upon the arm of the crane, this lever being so arranged and equipped as to permit an efficient operation of the parts in the starting and stopping of the piston and in the manipulation of the lifting-chain which is operated thereby.

In the drawings forming a portion of this specification, and in which similar numerals of reference designate like and corresponding parts in the several views, Figure 1 is a rear perspective view showing the complete crane. Fig. 2 is a vertical central section taken through the mast of the frame and the cylinder, portions of the supply and exhaust pipes and other parts being shown in elevation. Fig. 3 is an enlarged detail section showing the upper end of the mast, with its trunnion, and the arrangement of the steam and exhaust pipes which are passed through the trunnion. Fig. 4 is a detail perspective view showing the lower end of the steam-cylinder and the supply and exhaust pipes connected therewith, together with their regulating-valves and the lubricator and drain-pipe. Fig. 5 is a detail perspective view showing one of the springs which hold the supply and exhaust valves normally closed.

Referring now to the drawings, the crane of the present invention comprises a mast formed of two plates 5 and 6, disposed vertically and which are mutually connected side by side through the medium of end pieces 7 and 8, of which the piece 7 has a bearing piece or projection 9, forming a trunnion which engages a recess in a plate 10, which supports the weight of the crane. The upper end piece 8 of the mast has a tubular projection 11,

forming a hollow trunnion having a bearing within the inclosure of a flange 45 of a plate 12, secured to the roof-beams 46 of the building in which the crane is housed. The plate 12 has a central perforation 47, which registers with the bore of the trunnion 11 for a purpose which will be presently explained.

Riveted or otherwise fixed to the plates 5 and 6 are parallel metallic beams 15, which extend outwardly from and at right angles to the mast, these beams being mutually connected at intervals to hold them in their proper correlative positions. These beams 15 form the arms of the crane, and between their outer ends is journaled a sheave or pulley 16. Braces 17 are riveted to the sides of the beams 15 at one end, while their opposite ends are similarly attached to the plates 5 and 6 below the beams 15 and act to support and brace the outer end of the arm of the crane.

The beams 15 are what is commonly known as "girder-iron," and similar and shorter beams 18 are fixed to the outer faces of the plates 5 and 6 adjacent the upper ends thereof and project at the opposite sides of the mast from the arm of the crane. These beams 18 are disposed mutually parallel and are separated by an interspace, in which is disposed a steam-cylinder 19, the flange at one end of which rests upon the beams 18, which act to support it. This flange, which is shown at 48, has the upper cylinder-head 49 fixed thereto. Braces 20 are fixed to the outer ends of the beams 18 at their upper ends, while the lower ends rest upon the rear ends of the beams 15 and are riveted to the plates 5 and 6. Additional and similar beams 21 are fixed to the outer faces of the plates 5 and 6 of the mast adjacent the lower ends thereof and are provided with hangers 22, attached at their lower ends to the outer ends of the beam 21 and at their upper ends to the plates 5 and 6, and between these beams 21 is journaled a pulley 23 for a purpose to be presently explained.

Within the cylinder 19 is disposed a piston 50, having a rod 24, which extends outwardly through a stuffing-box at the lower end of the cylinder and is adapted for movement in a direction parallel with the mast. The lower end of the piston-rod is bifurcated, as shown

at 51, and within the inclosure of the bifurcations is journaled a pulley 52.

A lifting-chain 25 has one end fixed to a cross-piece 26, attached to the under edges of the beams 21, and is then passed upwardly and over the pulley 52, then downwardly and under the pulley 23, and then upwardly between the plates 5 and 6 and over a pulley 27, journaled between the beams 15 and the plates 5 and 6 at the inner end of the arm of the crane. The chain is then taken outwardly along the crane-arm and is passed over the pulley 16, from which it depends, the depending end of the chain having a hook 28 attached thereto. Thus as the piston moves upwardly within the cylinder 19 the outer end of the chain 25 is raised to correspondingly move the hook, and as the piston moves downwardly the outer end of the chain is lowered to drop the hook.

In order to supply steam to the cylinder 19 and to convey the exhaust therefrom, both the supply and exhaust pipes are passed through the hollow trunnion 11 of the mast. The arrangement of the supply and exhaust pipes through the hollow trunnion is shown in Fig. 3 of the drawings, in which is shown a flanged nipple 55, fixed upon the upper face of the plate 12 and with its bore registering with the opening thereof. Upon the upper end of the flange 55 is disposed a T 56, the vertical bore of which is equal to that of the nipple 55 and the wall of the bore of which is extended downwardly a short distance to form a flange 57, adapted to enter a recess 58 in the inner periphery of the nipple 55 and at the upper end of the latter. The opening 59 at the upper end of the T 56 is smaller than the bore of the T, and in the wall of this opening is a recess 60, in which is disposed a packing-ring 61. A cap 62 is disposed upon the upper end of the T 56 and has a central perforation 63, adapted to aline with the perforation 59, this cap having a lug 64 upon its lower side, which enters the recess 60 to compress the packing-ring.

The steam-supply pipe comprises a nipple 65, which is passed through the trunnion 11, the plate 12, and the nipple 55 and engages a packing-ring 66, disposed in the recess or groove 58, the T 56 being clamped down upon the nipple 55 to compress this packing-ring and form a steam-tight joint, while permitting rotation of the nipple 65 with respect to the plate 12 and nipple 55. The nipple 65 projects downwardly between the plates 5 and 6 and at its lower end has an elbow 67, connected, by means of a nipple 68, with a T 69, from the stem 70 of which leads a steam-supply pipe 71, which is connected to the cylinder 19 in a manner which will be presently explained. The exhaust-pipe 72 comprises a nipple 73, which is passed inwardly through the outer end of the T 69 and into the elbow 67, where it is provided with an elbow 74, having a nipple 75, passed upwardly through nipple 65 and T 56 and outwardly through the openings 59

and 63, the nipple 75 being firmly packed by the packing-ring 61 at the upper end of the T 56, while the nipple 73 is suitably packed at the outer end of the T 69. With this construction it will be seen that steam may be supplied to the T 56 through a nipple 76, engaged with the stem thereof, from which the steam will pass through the several connections to the supply-pipe 71, while the exhaust-steam may pass through the pipe 72 and outwardly through the nipple 75, the crane at the same time being capable of free and unrestricted oscillation and rotation.

Referring now more particularly to Figs. 1 and 4 of the drawings, the supply-pipe 71 extends to a point below the lower end of the cylinder 19, where it is connected with a return 77, to which in turn is connected a globe-valve 78. Above this globe-valve is connected a gate-valve 79, having a reciprocatory stem 80, by means of which the valve may be opened and closed, and above the valve 79 is a four-way connection 81, one stem of which is connected with a tubular projection 82 at the lower end of the cylinder 19 through the medium of a nipple 83, while the second stem is connected with the stem of a T 84 by means of a nipple 85. The T 84 is disposed with its head vertically, and to the upper end of this head is connected a lubricator 86, while at the lower end is attached a globe 87, below which is a waste-pipe 88. The lower end of the head of the four-way connection 81 is connected with the gate-valve 79, as above mentioned, and the upper end of the head of this four-way connection has a second gate-valve 89 connected therewith, which in turn is connected with the exhaust-pipe 72, the gate-valve 89 having a reciprocatory operating-rod 90.

From the above description it will be seen that by manipulation of the valves 79 and 89 steam may be admitted to the cylinder 19 to raise the piston therein and that the supply of steam may be subsequently cut off and the exhaust opened to permit the escape of steam and the downward movement of the piston.

It is of course highly necessary that one valve be cut off before the other is opened to prevent the passage of steam from the supply-pipe directly outwardly through the exhaust-pipe. The valve-operating mechanism which insures this operation comprises a hand-lever 91, pivoted upon the arm of the crane near the outer end thereof and adapted to oscillate between guides 92 upon the crane-arm. The rod 80 of the valve 79 extends to this lever 91 and has an enlarged and longitudinally-slotted end 93, through which slot and into the lever 91 is passed a pivot-bolt 94, this slot permitting a certain degree of lost motion of the lever with respect to the rod 80.

The rod 90 of the valve 79 has its outer end enlarged and provided with a longitudinal slot 95, through which slot is passed a pivot-bolt 96, engaging the lever 91 at the opposite

side thereof from the fulcrum of the lever. The slot of the rod 90 permits lost motion of the lever 91 with respect to the rod, as will be readily understood.

5 In order to hold the rods 80 and 90 inwardly to normally close their respective valves 79 and 89, spring-plates 97 are fixed to the edges of the plate 6 and have their free ends bifurcated and extended beyond the plate 5, these
10 bifurcated ends having the rods 80 and 90 passed therethrough. Upon the rods 80 and 90 are disposed stops 98, which are engaged by the bifurcated ends of the springs, which are thus permitted to exert pressure upon
15 the rods in the direction of their valves to hold the latter closed. Thus if the exhaust-valve 89 be opened and the piston be at the lower limit of its motion the lever 91 may be swung to the left, when it will first permit the
20 rod 90 to move rearwardly under the influence of the spring 97 and close the valve 89, the bolt 94 at the same time passing along the slot at the end of the rod 80. When the valve 89 is closed, the bolt 94 will have reached the
25 end of the slot of the rod 80, and continued movement of the lever will draw the rod 80 to open the valve 79 and permit a flow of steam into the cylinder, when the piston will be forced upwardly and will raise the hook
30 28. If the lever 91 be then moved to the right, the releasing of the rod 80 will permit the spring 97 connected therewith to close the valve 79, after which continued movement of the lever will draw the rod 90 and
35 open the valve 89. Steam will then exhaust from the cylinder through the pipe 72, and the piston will move downwardly, permitting the hook 28 to drop. As the piston moves upwardly under the influence of steam-pressure, it is of course necessary to provide for
40 the escape of whatever gas may be in the cylinder above the piston, and for this purpose a vent 99 is formed in the side of the cylinder, just below its upper end, and with this vent
45 is connected a vent-pipe 100, which leads to the exhaust-pipe 72. The vent 99 being located below the upper end of the cylinder 19, there is a cushion formed above the vent-opening which prevents the piston striking
50 against the upper cylinder-head.

In the employment of a crane of this nature it is of course necessary to provide means for drawing out the slack of the chain 25 as the piston moves downwardly, as, unless a pull
55 be applied to the hook 28, the slack will not run over the roller 27. For this purpose a pulley 101 is mounted in uprights 102 upon the outer end of the crane-arm directly in the rear of the pulley 16, and over this pulley 101
60 is passed a chain 103, one end of which is attached to the chain 25 at a suitable point between the rollers 16 and 27, while the other end of the chain is passed upwardly and over a pulley 104, journaled between the plates 5
65 and 6, a weight 105 being fixed to the free end of the chain. This weight is sufficiently

heavy to draw upwardly the slack between the pulleys or rollers 27 and 23.

When it is desired to lubricate the cylinder, the lubricator 86 is operated in the usual
70 manner, while water of condensation may be drained from the cylinder, the exhaust, and the supply through the drain-pipe 88 when the valve 87 is opened, it being of course understood that in draining the supply-pipe a
75 sufficient head of steam is admitted to blow the water therefrom first into the cylinder.

It will of course be understood that in practice the specific arrangement shown may be varied and that any desired materials and pro-
80 portions may be used without departing from the spirit of the invention.

What is claimed is—

1. In a crane, the combination with a rotatable mast having an arm, of a cylinder
85 mounted upon the mast, a piston in the cylinder provided with a rod, pulleys carried by the mast and the arm, a chain passed over the pulleys and operatively engaged with the piston-rod, a steam-inlet connected with the
90 cylinder, outlets for the cylinder, valves adapted to control the inlets and outlets, a lever, and shifting rods connected with the valve and with the lever, said lever being adapted for partial lost motion with respect
95 to the rod.

2. In a crane, the combination with a mast having an arm, of a cylinder carried by the mast, a piston in the cylinder provided with a rod, a pulley upon the arm, a chain passed
100 over the pulley and operatively engaged with the piston-rod, a steam-inlet connected with the cylinder, outlets for the cylinder, valves adapted to control the inlets and the outlets, a lever, and shifting rods connected with the
105 valve and with the lever, said lever being adapted for partial lost motion with respect to the rod.

3. A crane comprising a mast having an arm, pulleys upon the mast and arm, parallel
110 beams fixed to the mast adjacent its upper end, a cylinder disposed between the beams and having a flange resting thereon to support the cylinder, a piston in the cylinder provided with a rod, a chain passed over the pul-
115 leys and connected with the rod, and means for supplying pressure to the cylinder to reciprocate the piston and its rod.

4. In a crane, the combination with a cylinder having a piston having lifting mechan-
120 ism connected therewith, of a steam-inlet and a steam-outlet connected with the cylinder, valves adapted to control the inlet and outlet, and a lever operatively connected with the valves and having partial lost motion
125 with respect thereto.

5. A crane, comprising a mast having an arm, pulleys carried by the mast and arm, a cylinder carried by the mast and having a piston provided with a rod, a chain operatively
130 connected with the rod, and engaged with the pulleys, a pipe connected with the cylinder,

- a steam-supply connected with the pipe, a steam-exhaust connected with the pipe, a valve for the steam-supply, a valve for the steam-exhaust, means for holding the valves normally closed, and a lever operatively connected with the valves and having lost motion with respect thereto, whereby the valves may be successively opened and closed as the lever is operated.
6. A crane comprising a mast having an arm, a cylinder mounted upon the mast and having a piston provided with a rod, a lifting-chain carried by the mast and arm and having operative connection with the rod, a steam-supply and a steam-exhaust connected with the cylinder at one side of the piston, a valve for the steam-supply, a valve for the steam-exhaust, a rod connected with each valve, yieldable means for holding the valves seated, and a lever connected with the rods at opposite sides of the fulcrum of the lever and having lost motion with respect to the rods, whereby the valve may be alternately and successively seated and unseated as the lever is operated.
7. In a crane, the combination with a cylinder provided with a piston having lifting mechanism connected therewith, of a steam-inlet and a steam-outlet connected with the cylinder, a valve for the inlet, and a valve for the outlet, means for holding the valves normally in one position, and means for moving the valves to their opposite positions, said moving means having partial lost motion with respect to the valves.

8. The combination with a crane comprising a mast and an arm, of a chain slidably mounted upon the arm, means for moving the chain longitudinally to raise and lower its free end, a pulley mounted upon the arm, a second pulley upon the mast, a second chain engaged with the first chain and passed around the pulleys, and means connected with the second chain for moving the first chain in a direction opposite to that of the first-named moving means.

9. A crane comprising a mast including parallel uprights, parallel beams connected with the uprights and extending outwardly thereof to form an arm, braces connected with the arm and the uprights, parallel beams connected with the upper end of the mast, a cylinder having a flange disposed upon the last-named beams to support the cylinder, braces connected with the last-named beams and with the uprights, parallel beams at the lower end of the mast having braces connected with the mast, pulleys journaled upon the beams at the lower end of the mast, pulleys upon the arm, a piston in the cylinder, and a chain passed over the pulleys and having operative connection with the piston.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HENRY H. HOKE.

Witnesses:

D. E. SQUIRES,
C. E. DOYLE.