G. W. ZASTROW.

CRANE.

APPLICATION FILED AUG. 15, 1917.

1,379,378.

Patented May 24, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

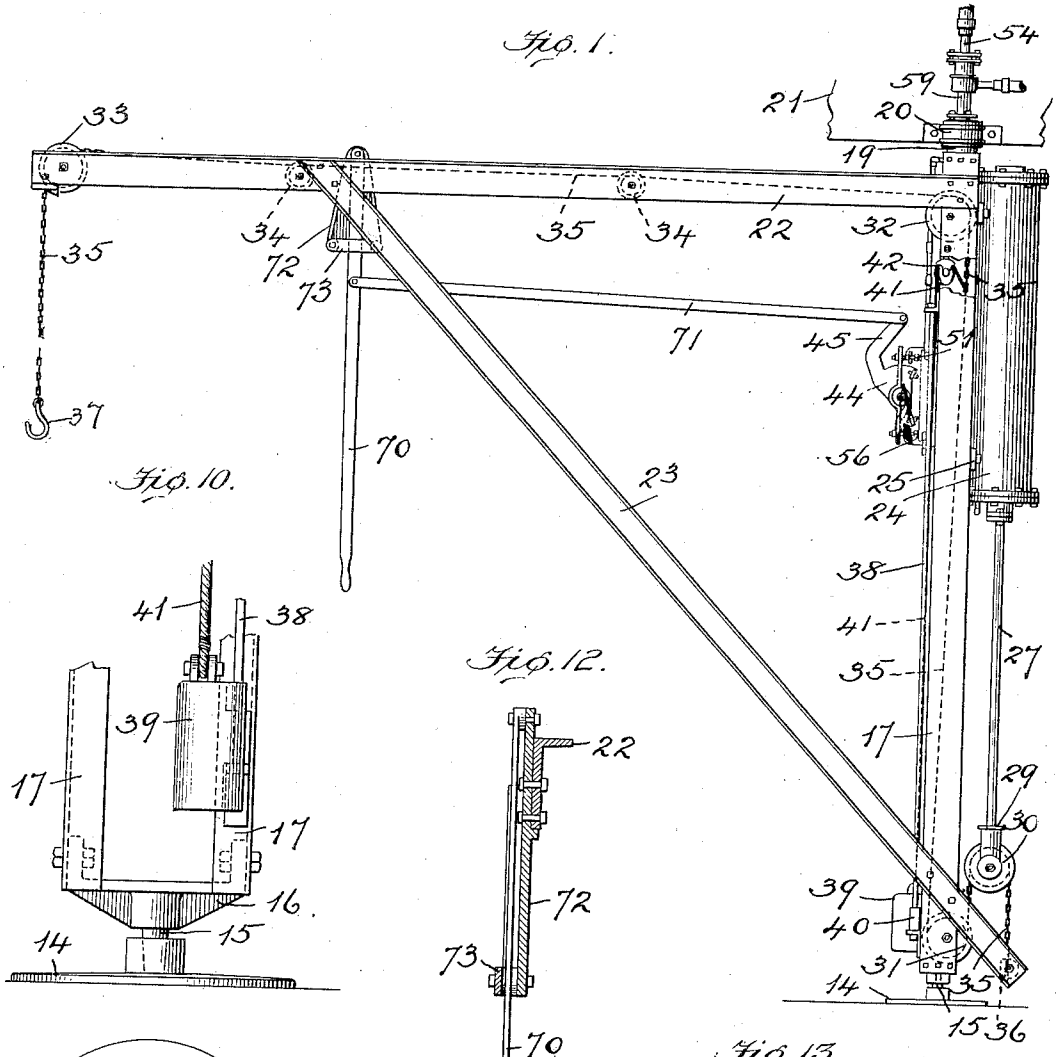


Fig. 10.

Fig. 12.

Fig. 11.

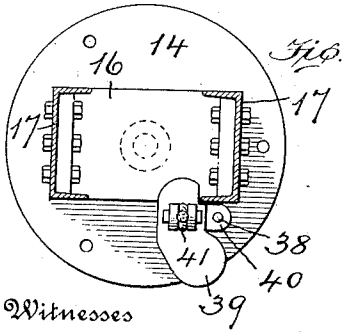
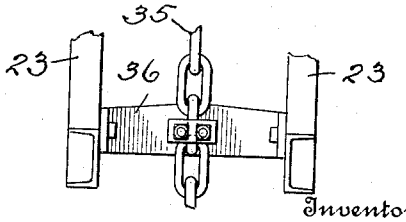


Fig. 13.



Witnesses

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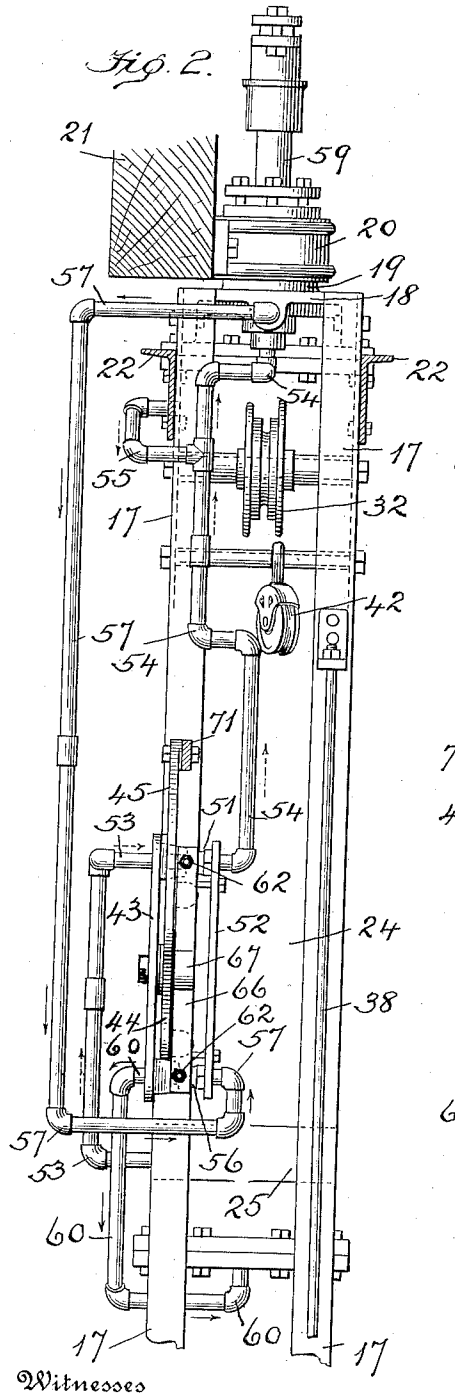
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3 SHEETS—SHEET 2.

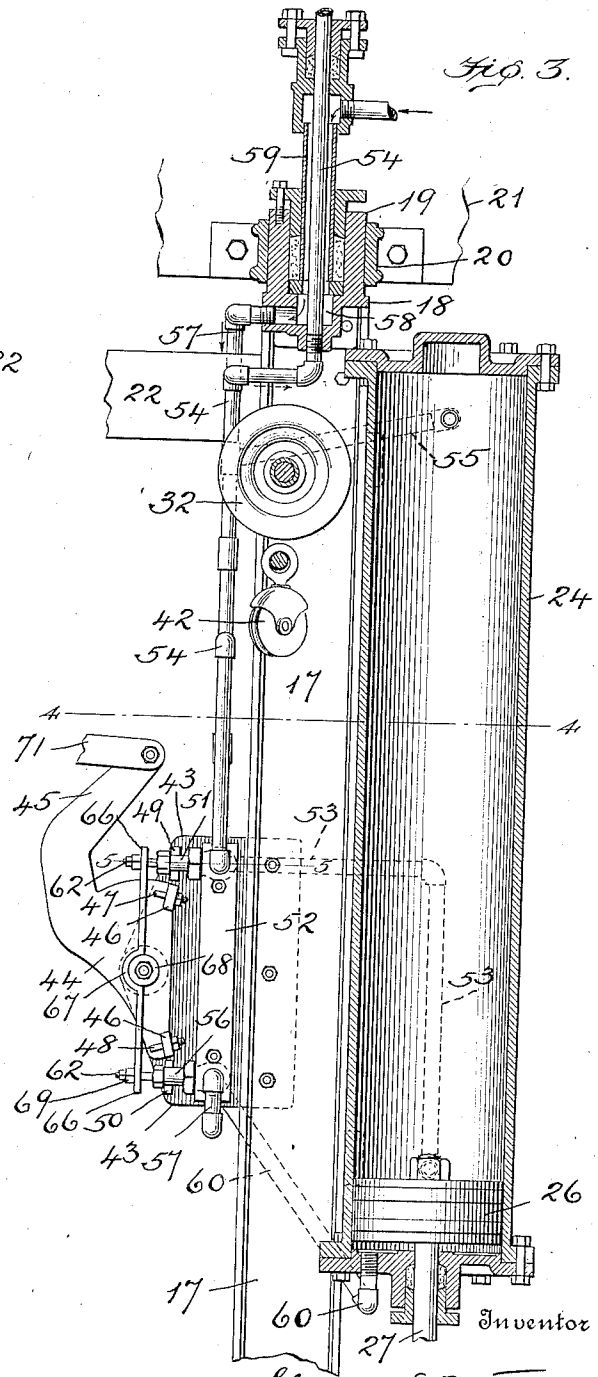
Fig. 2.



Witnesses

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Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

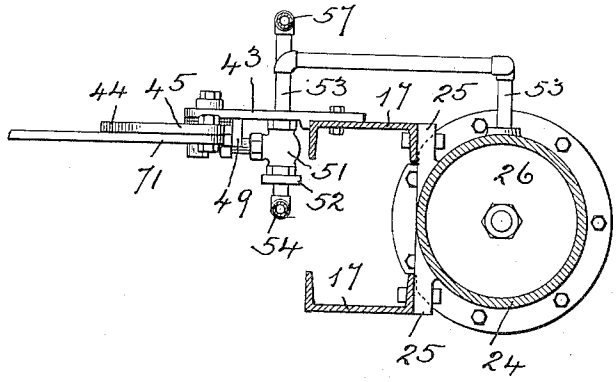


Fig. 5.

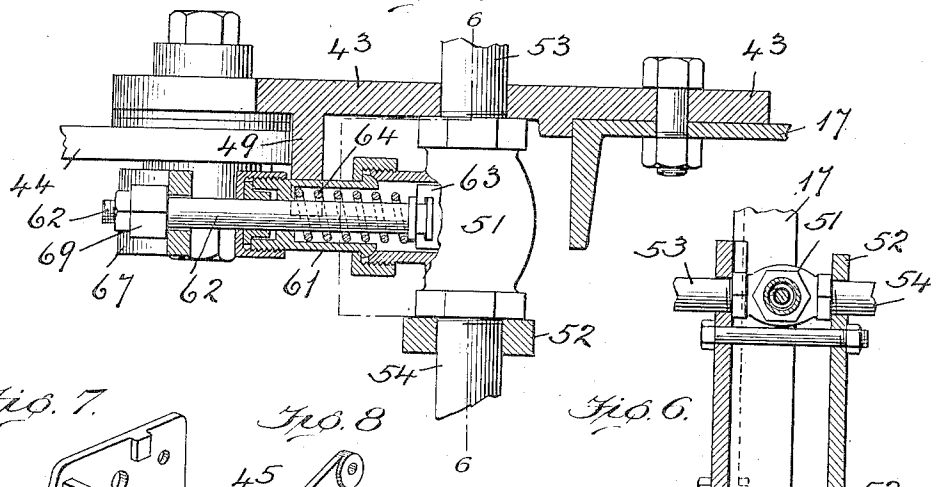


Fig. 7.

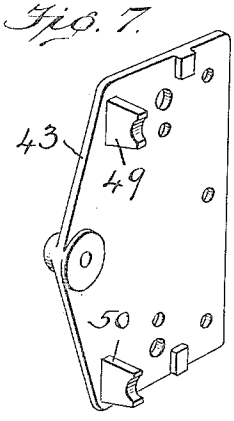


Fig. 8

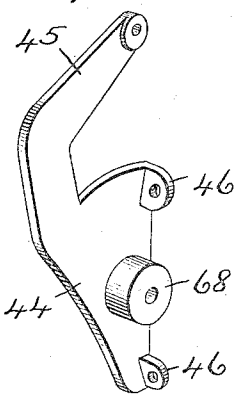


Fig. 9

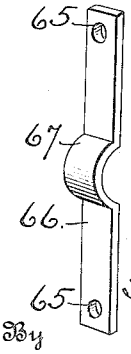


Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE W. ZASTROW, OF WINDSOR HILLS, MARYLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ZASTROW MACHINE COMPANY, INC., OF BALTIMORE, MARYLAND, A CORPORATION OF MARYLAND.

CRANE.

1,379,378. Specification of Letters Patent. **Patented May 24, 1921.**

Application filed August 15, 1917. Serial No. 186,397.

To all whom it may concern:

Be it known that I, GEORGE W. ZASTROW, a citizen of the United States, residing at 3 Talbot road, Windsor Hills, in the State of Maryland, have invented certain new and useful Improvements in Cranes, of which the following is a specification.

This invention relates to improvements in steam cranes and has for its object to provide improved actuating, and valve control mechanisms whereby to enable the operator to keep the load that is being raised or lowered under perfect control, and to provide improved means whereby the chain or cable carrying the load may be given a maximum movement with a minimum movement of the actuating mechanism.

The invention is illustrated in the accompanying drawings wherein,—

Figure 1, shows the improved crane in side elevation.

Fig. 2, illustrates the upper portion of the crane, including the cylinder, valve-operating mechanism and pipe connections in front elevation.

Fig. 3, shows the same parts partly in section and part in side elevation.

Fig. 4, illustrates a horizontal or sectional plan through the same parts,—the section being taken on the line 4—4 of Fig. 3.

Fig. 5, shows an enlarged horizontal cross-sectional detail through one of the valves and its actuating devices,—the section being taken on the line 5—5 of Fig. 3.

Fig. 6, illustrates a vertical sectional detail through the valve devices and their sustaining means,—the section being taken on the line 6—6 of Fig. 5.

Figs. 7, 8 and 9, illustrate perspective views of the valve operating and sustaining devices.

Fig. 10, shows the lower end of the crane in front elevation.

Fig. 11, illustrates the same devices in top plan.

Fig. 12, shows an enlarged vertical section through the bracket that sustains the operating lever and illustrates the latter in front elevation, and

Fig. 13, illustrates on an enlarged scale a detail of the lower end of the inclined channel bars and the devices for securing one end of the hoisting chain.

Referring to the drawings, and particularly Figs. 1, 10 and 11 thereof, the numeral 14 designates a step bearing in which a vertical trunnion 15, that depends from a horizontal supporting plate 16, seats and has bearing.

Two channel beams 17, extend vertically from the plate 16, and have a spaced relation with respect to each other, and at the upper end these vertical beams are connected by an upper horizontal plate 18. This upper plate, as shown in Figs. 2 and 3, of the drawing, is provided with a central vertically-extending hollow hub 19, which is rotatably embraced by a bearing bracket 20, that is bolted to a beam or support 21, provided for that purpose, so that the beams 17, and plates 16 and 18, may be readily rotated.

Horizontal beams or bars 22, extend laterally from the upper ends of the beams 17, and these bars are braced by inclined bars 23, which extend therefrom down to and are bolted at the lower ends of the vertical beams 17.

It will thus be seen that the beams 17, and bars 22, and 23, form the frame or supporting structure of the crane.

A cylinder 24, has a vertical position at the rear of the beams 17, and said cylinder is provided with lugs 25, by means of which it is bolted to and carried by the said beams.

A piston 26, is provided in the cylinder and has a rod 27, that projects through the lower head 28, and depends at the rear of the beams 17. The lower end of this piston rod carries a head 29, in which a grooved pulley or wheel 30, is freely mounted, for a purpose presently to be explained.

A pulley 31, is rotatably sustained between the lower ends of beams 17; another pulley 32, is similarly sustained at the upper ends of said beams, and a pulley 33, is sustained at the outer end of horizontal bars 22. Sustaining or guide pulleys 34, may also be provided on bars 22, between pulleys 33 and 32, all as shown in Fig. 1.

A flexible connecting element, such as a chain or cable 35, has one end securely fastened to a cross-bar 36, at the lower ends of inclined bars 23, and this connecting element is passed over 30; then down and under pulley 31; then up and over pulley 32; then laterally between the bars 22, and over guide pulleys or rollers 34, and finally

passes over pulley 33, and depends from the latter as seen in Fig. 1, of the drawing. The free end of the flexible connecting element 35, is provided with the usual hook or equivalent device 37, by which it may be readily made fast to the load it is to sustain and convey.

From the foregoing explanation it will be seen that pulley 30, at the end of the piston rod 27, is a traveling pulley, and that as it moves upwardly with the rod it lengthens the loop it forms in the flexible connecting element,—one end of the loop being held and fixed. By means of the elongation and contraction of this loop a greater travel at the hook-end 37, of the chain is gained than is made by the piston rod 27, so that a given stroke of the piston will produce, in this instance, substantially twice the travel at the hook 37, and a greater range is attained than would be possible if the chain were made fast to the piston rod. The traveling pulley 30, therefore forms a loop, which it elongates or contracts, at a point between the two ends of the chain.

By referring to Figs. 1, 2, 10 and 11 of the drawings it will be noted that a guide rod 38, is secured to one of the vertical beams 17, and extends vertically at the side thereof, and that a weight 39, has a lug 40, at one side which slidably engages the rod to guide the weight during vertical movement. A cable or equivalent flexible connection 41, has one end attached to the weight and extends upwardly therefrom and passes over a pulley 42, near the upper end of the vertical beams. The cable, after passing over pulley 42, is connected to the chain 35. By means of this construction when the piston makes an upward stroke, the loop in the chain 35, is elongated and the hook-end 37, is drawn upward, but as both piston and hook-end move upward, the stretch of chain to which the cable 41, is attached, will travel downwardly thereby lifting weight 39, and adding the load of the weight to the chain at a point between the loop and the hook-end, when the chain is lifting the load. If therefore, the load is lifted and then removed, while the hook-end 37, is elevated, there would be more chain weight on the long stretch of chain between the beams 17, than at the free hook-end consequently, even if the piston rod be moved downward the hook-end 37, would not be heavy enough to take up the slack and would remain in the elevated position. By attaching the weight 39, however, it will take up the slack referred to and feed the unloaded chain upward toward pulley 32, and the depending end of the chain at the hook-end will be sufficiently heavy to lower as the piston rod moves downwardly.

The control of the piston is effected through a novel construction and arrangement of valve mechanism which will now be explained, reference being made particularly to Figs. 2 to 9, inclusive of the drawings.

A bracket plate 43, is securely bolted to the side of one of the vertical beams 17, and extends forwardly therefrom.

This plate pivotally sustains an oscillating valve-plate 44, which is provided with an arm 45, that extends upwardly therefrom, and said valve plate is also provided with laterally-projecting stop-pin lugs 46, in one of which a pin 47, is adjustably secured and the other of which carries a similar pin 48. One of these pins 47, will therefore have position on the plate 44, above the pivot point and the other pin will be located below said pivot point of the valve-plate so that when said plate is rocked, one pin will be thrown forward while the other pin will be moved backwardly.

The bracket plate 43, also has a brace lug 49, near its upper edge and another and similar lug 50, near its lower edge and both of these lugs are provided with concave recesses in their inner faces as clearly seen in Fig. 7.

An exhaust valve 51, has position just below the upper edge of the bracket plate and is held seated against the concave recess of the brace lug 49, by means of a clamp plate 52, that extends vertically at one side thereof, and a pipe 53, extends from one side of this exhaust valve and enters the cylinder 24, at a point just above the piston 26, when the latter is in its lowermost position.

From the other side of this valve 51, a pipe 54, extends upwardly and passes centrally through the hollow hub 19, to a place of exhaust or discharge. This pipe 54, is therefore the exhaust pipe.

A branch pipe 55, connects the exhaust pipe 54, with the upper end of the cylinder 24, so that the interior of the cylinder above the piston will be free of pressure.

A supply valve 56, is carried by the bracket plate 43, and clamp plate 52, and this supply valve is connected at one side to a supply pipe 57, which latter has its upper end communicating with a chamber 58, in the bottom of the hollow hub 19, and a tube 59, extends down through the said hollow hub and around the exhaust pipe 54, so that steam or other fluid-actuating agent, may be fed to the upper end of tube 59, and delivered into the supply pipe 57. From the supply valve 56, a feed pipe 60, extends downwardly and enters the bottom of the cylinder beneath the piston 26.

Both of the valves 51 and 56, are of like construction and a brief explanation of one will be sufficient, reference being made particularly to Fig. 5, of the drawings.

Each valve has a barrel 61, which incloses a stem 62, and the inner end of the stem is

connected to the valve proper 63, which it is deemed unnecessary to illustrate in detail. A spring 64, encircles the stem 62, and serves to press the stem and the valve in the closed position so as to normally keep the valve closed.

The outer end of each valve stem extends through a slot 65, in a rock-bar 66. This rock-bar is provided with a semi-cylindric hub-part 67, which fits about a circular boss 68, so it may rock thereon, and nuts 69, on the outer ends of the valve stems 62, hold the rock bar and stems together. This rock-bar serves to connect the stems of the upper and lower valves and it also extends vertically in front of the stop pins 47 and 48, and is engaged by one or the other of those pins when the oscillating plate 44, is rocked in one direction or the other. When the rock-bar 66, has a vertical position, as seen in Fig. 3, of the drawing, both valves will be closed and the crane will be in what may be termed a neutral position.

The arm 45, of the oscillating valve-plate is connected to an operating lever 70, by means of a connecting bar 71,—the lever 70, being pivotally sustained at its upper end to a pendant bracket 72, that is carried by one of the horizontal crane bars 22, and a strap 73, on said bracket serving to limit the swinging movement of the lever 70.

From the foregoing explanation it is to be understood that when lever 70, shown in Fig. 1, is in the central pendant position, both valves 51 and 56, will be closed and the crane will remain idle.

When said lever is swung to the right the oscillating plate 44, will be rocked so as to swing stop pin 48, outwardly and against the rear side of the rock bar 66, thereby swinging the lower end of the rock-bar out and drawing the valve stem 62, of the lower feed valve 56, from its seat and allow fluid pressure to pass into the bottom of the cylinder through pipe 57, and force the piston 26, up,—this upward movement of the piston causing an upward movement of the hook-end 37, of the chain 35.

To hold the load where wanted and at a desired elevation the lever 70, will simply be returned to the neutral position.

To lower the load or the hook-end 37, the lever 70, will be swung to the left, whereupon plate 44, will be swung so as to move stop pin 47, outward against rock bar 66, and the upper end of this bar will draw stem 62, of valve 51, from its seat and open the exhaust from the bottom of the cylinder through pipe 53, and valve 51, to exhaust pipe 54, and the exhaust passing from the cylinder 24, will permit the piston to move downwardly and allow the hook-end 37, of chain 35, to also travel down.

Having described my invention what I claim is,—

1. In a valve control mechanism for cranes the combination with a crane having a flexible load-carrying element, of a cylinder having a piston and rod which latter is operatively engaged with the said flexible element; a supply pipe to the cylinder; an exhaust pipe from the cylinder; a valve in each pipe and each valve having a stem; a bar pivotally sustained between its ends and having one end attached to the stem of one valve and its other end attached to the stem of the other valve; an oscillating valve-plate having two contact devices,—one to engage the said bar at one side of its pivot and the other to engage said bar at the other side of its pivot; a single operating lever on the crane and a bar connecting said lever with the said oscillating valve-plate.

2. In a valve control mechanism for cranes the combination with a crane having a flexible load-carrying element, of a cylinder having a piston and a rod which latter is operatively engaged with the said flexible element; a supply pipe leading to the cylinder; an exhaust pipe from the cylinder; a puppet valve in the supply pipe; a puppet valve in the exhaust pipe and each valve having a stem; yielding means for each valve to normally hold the same in the closed position; a bracket plate; an oscillating valve-plate pivotally sustained by the bracket plate and having a boss at one side thereof; a bar having a concave hub-part to seat on said boss said bar having one end attached to one valve stem and its other end attached to the other valve stem; means carried by the valve-plate at each side of the boss for engaging the end of the bar according to the direction in which the valve plate is swung; a single operating lever on the crane and a bar connecting said lever with the oscillating valve plate.

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

GEORGE W. ZASTROW.

Witnesses:
IZELLA E. BAGLEY,
CHAS. B. MANN.