(No Model.) 3 Sheets—Sheet 1.

G. H. REYNOLDS.

HYDRAULIC ELEVATING APPARATUS.

No. 524,046. Patented Aug. 7, 1894.

Fig. 1.

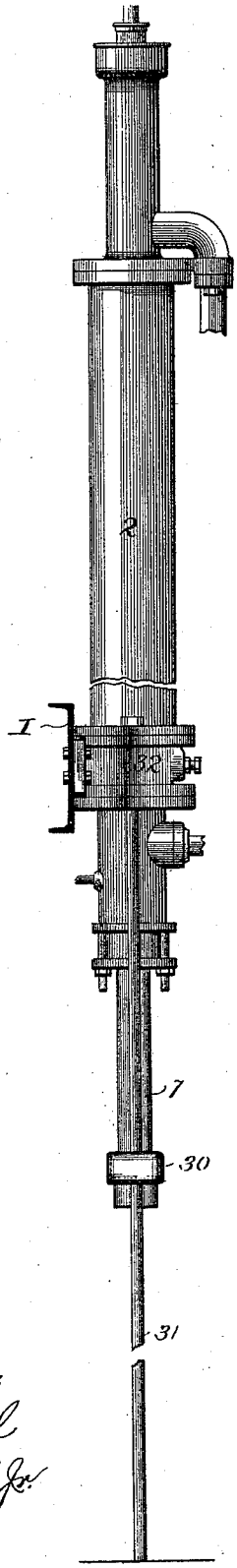
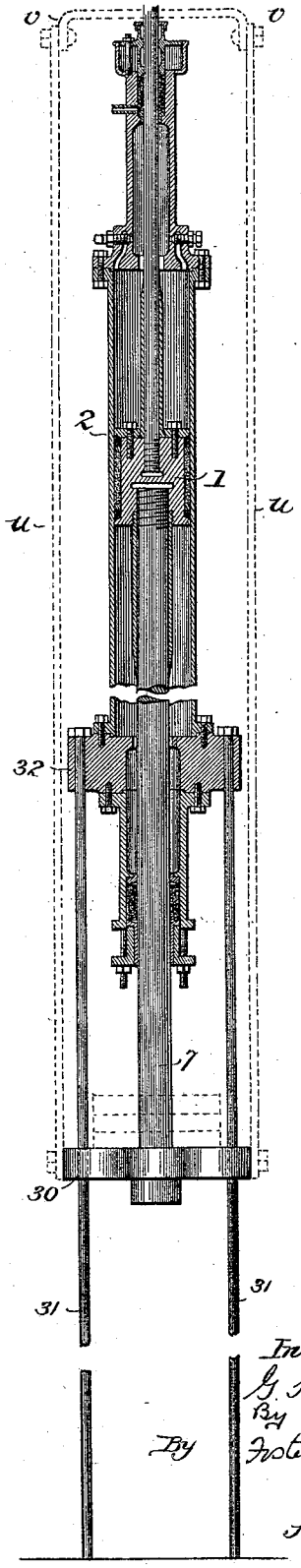


Fig. 2.



Witnesses:
Jno. G. Hinkel
Jno. Enders Jr.

Inventor
G. H. Reynolds
By
By Foster & Freeman
Attorneys

(No Model.) 3 Sheets—Sheet 2.

G. H. REYNOLDS.

HYDRAULIC ELEVATING APPARATUS.

No. 524,046. Patented Aug. 7, 1894.

Fig. 3.

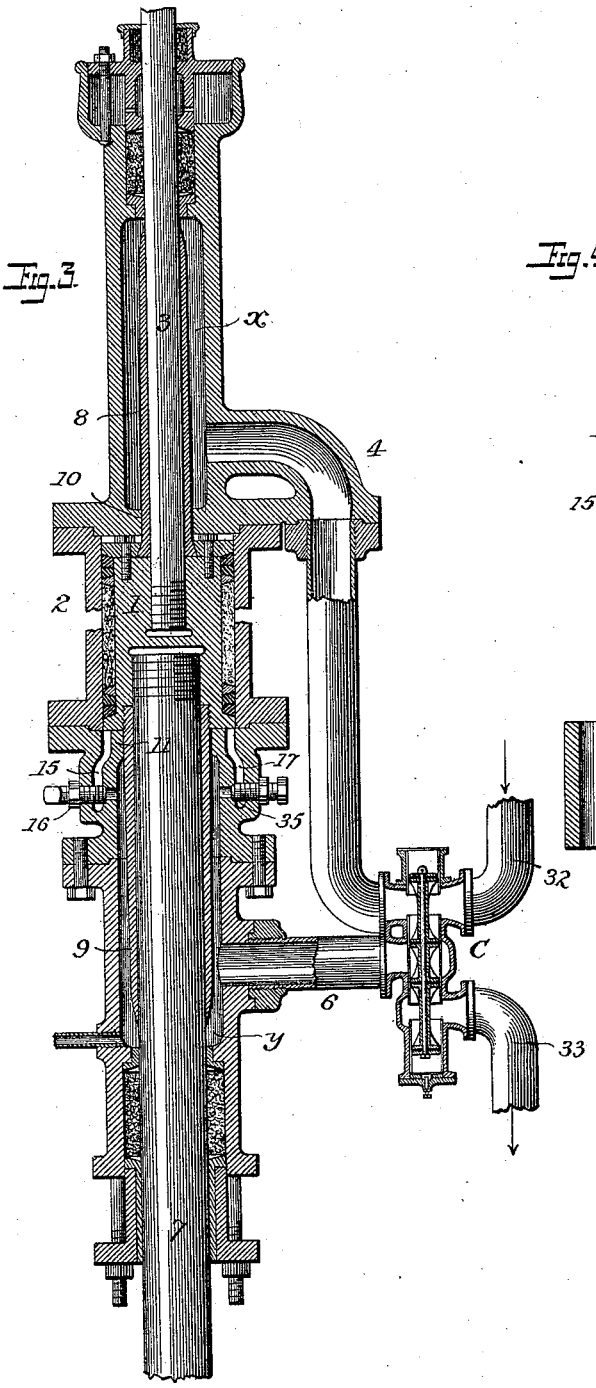


Fig. 4.

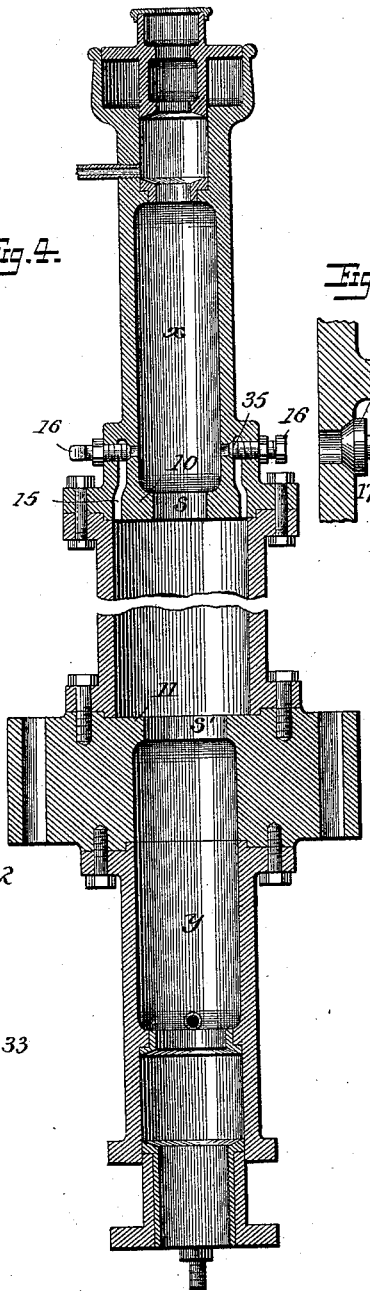
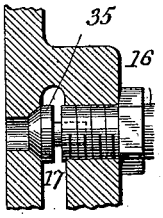


Fig. 5.



Witnesses:
Jno. J. Hinkel
Jno. Enders Jr.

Inventor
G. H. Reynolds
By Foster & Freeman
Attorneys

(No Model.) 3 Sheets—Sheet 3.

G. H. REYNOLDS.

HYDRAULIC ELEVATING APPARATUS.

No. 524,046. Patented Aug. 7, 1894.

Fig. 6.

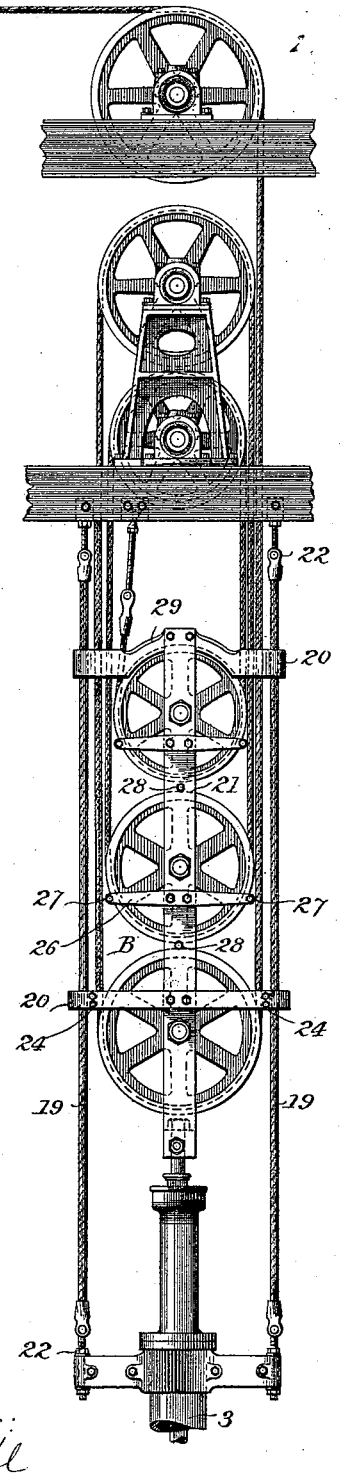
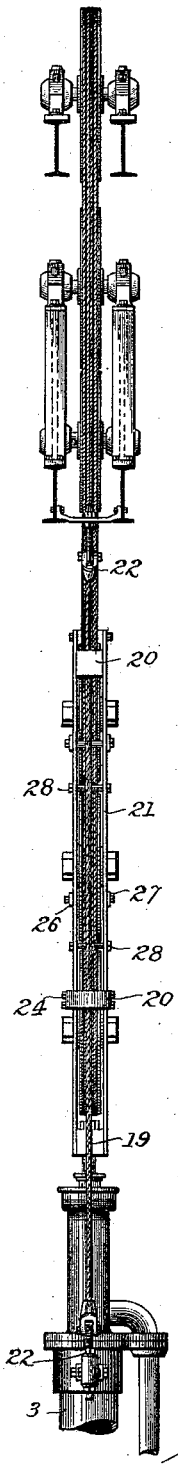


Fig. 7.



Witnesses:
Jno. G. Hunkel
Jno. Enders Jr.

Inventor
G. H. Reynolds
By Foster & Freeman
Attorneys

UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO THE CRANE ELEVATOR COMPANY, OF CHICAGO, ILLINOIS.

HYDRAULIC ELEVATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 524,046, dated August 7, 1894.

Application filed December 22, 1892. Serial No. 456,092. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Hydraulic Elevating Apparatus, of which the following is a specification.

My invention relates to hydraulic elevating apparatus and consists of means for dispensing with the ordinary counterbalance, certain details of improvement in means for arresting the movements of the piston at the termination of its stroke and means otherwise improving the construction and operation as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1. is an external elevation of my improved apparatus; Fig. 2. a vertical longitudinal section; Fig. 3. an enlarged longitudinal section; Fig. 4. an enlarged vertical section of the cylinder and adjuncts; Fig. 5. a detached enlarged view showing the self acting valve with the cylinder in section; Fig. 6. a side elevation of the multiplying sheaves and adjuncts; and Fig. 7. an edge view of Fig. 6.

The piston 1, in the cylinder 2, has a piston rod 3, to the upper end of which are connected the multiplying sheaves B, Fig. 6, as usual, and the water circulates through the pipes 4 and 6, and valve casing C, when the cage descends, and passes into the pipe 4, and is discharged from the pipes 6, when the piston descends to raise the cage, as in the Baldwin elevator. From the lower end of the piston extends a displacing rod 7, which may be tubular, but which is larger in diameter than the rod 3, in proportion as it is desired to have a difference in the available pressure faces of the top and bottom of the piston, for the purpose of securing a continuous counterbalancing of the cage and its attachments, and avoiding the use of a counterbalance weight. Thus when the cage is descending which is done by its weight which is greater than the piston attachments, as usual, and the water circulating from above to below the piston the limited area below will not permit all of the water from above to pass to the bottom, and consequently a certain portion is pumped back into the supply pipe 32 with an energy that reduces the effective descending force of the cage and serves as a constant counterbalance thereto precisely as if a weight equal to the weight on the differential area of the piston was acting to retard the descent of the cage. Thus I pump back with the main operating piston and into the regular supply without additional appliances by the mere addition of means for decreasing the effective lower area of the piston. While I have illustrated this feature of my invention and connection with an apparatus having a piston rod 3, and displacing rod 7, the latter may be used alone and may constitute the piston rod with like effect. Such construction is indicated in dotted lines, Fig. 2, where the upper cross head v is connected by links or rods u, u, with the lower cross head 30, the rod 3, in such case being omitted.

It is advisable to reduce the shock as the piston approaches the termination of each movement, which is accomplished by enlarging the diameters of the rods, 3 and 7, preferably by the addition of sleeves 8, 9, as shown, which are slightly tapering and enter openings s, s', in partitions 10, 11, near the ends of the cylinder, beyond which partitions are chambers x and y. As the enlargement 8 or 9, enters the opening s or s', it gradually closes the latter and the escape of the water back to the main cylinder around the enlargement is gradually throttled.

To permit water to gain admission to the chambers x or y into which the enlargements 8, 9, pass, so as to permit the withdrawal of the latter, I provide for channels 15, between the main cylinder, and such chambers, and I regulate the flow by means of suitable adjusting devices. As shown, the channels 15, are more or less closed by plug or screw valves 16, and the speed at which the piston is arrested is according to the adjustment of the valves.

As it is necessary to start the piston back at greater speed than it stops, I provide additional channels 17, with check or self-acting valves 35, which open when pressure is brought to move the piston. As the multiplying sheaves B and their supports are apt to sag and strain the parts, bending the rod 3, in case the cables become slack from any cause, I provide guide cables or rods 19, 19, for cross bars 20, extending from the loop 21,

of the multiplying sheaves and supporting the said loop whether the cables are taut or not, and I prefer to provide these guide cables with tightening devices 22, of any suitable character to maintain them taut.

Bolts or lugs 24, are arranged upon the lower cross bar 20, in position to prevent the cables from moving outward from the groove in the lower sheave, and a cross bar 26, also supports lugs or bolts 27, for holding the cables onto the middle sheave, and bolts 28, below the sheaves serving to prevent the loops of cable from descending out of the grooves. A cable shield, cover or guard plate 29, which may be part of the upper cross bar 20, serves to cover the upper sheave and prevent those accidents which result from a tool or other object falling and getting caught between the periphery of the upper sheave and its cable. The lower displacing rod 7, has a cross head 30, which is guided by guide rods 31, which are tension rods passing through ears 32, on the lower head of the cylinder and tying the latter to the foundation and holding it against upward strains, while the cylinder is secured against normal displacement by bolts bolting it to a side beam I, or other part of the structure.

Where desired any additional weight necessary to compensate for unestimated differences may in any suitable manner be connected with the lower piston 7, or with its cross head 30, as shown in dotted lines, Fig. 2. A projecting rod on the piston entering an opposite opening *s*, *s'*, would serve the same purpose as the enlargement on the piston rod.

I make no claim broadly to the combination of cylinder having a passage for the inlet and exhaust of the fluid, the piston therein adapted to close said passage when near the limit of its stroke, auxiliary passages not closed by the piston and connecting the interior of the cylinder with the first-named passage, with or without means for regulating the flow through one of said passages, and a check-valve in the other of said passages permitting an in-flow to said cylinder, but not return.

Without limiting myself to the precise construction and arrangement of parts set forth, I claim as my invention—

1. The combination with the cylinder, piston and supply pipe of an elevator and with a cage, the weight of which is greater than the weight of the piston and its connections, of the circulating pipe for circulating the water on the descent of the cage from one side of the piston to the other and in connection with the supply pipe, and a displacing rod extending from one end of the piston through the adjacent head of the cylinder, substantially as set forth.

2. The combination with the cylinder, the piston, and the supply pipe of an elevator and with a cage, the weight of which is greater than the weight of the piston and its connections, of the circulating pipe connected with the cylinder on opposite sides of the piston and with the supply pipe to cause the water to circulate on the descent of the cage in connection with the supply pipe, piston rod extending from one end of the piston, and a displacing rod of greater diameter than the piston rod extending from the end or side of the piston and extending through the head of the cylinder, substantially as set forth.

3. An elevating apparatus provided with a cylinder, a piston having a greater working area at one end than at the other, a cage the weight of which is greater than the weight of the piston and its connections the supply pipe, the discharge pipe, the circulating pipe, and a valve device arranged to bring the circulating pipe in connection with the cylinder upon opposite sides of the piston, and in connection with the supply pipe when the cage is descending, substantially as set forth.

4. The combination of the cylinder having a partition with an opening near each end and having a free contracted opening through each of the said partitions, a piston having a piston rod extending from one end and a displacing rod from the other and an enlargement upon the piston rod, and an enlargement upon the displacing rod, each adapted to the opening in the adjacent partition, substantially as set forth.

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

GEO. H. REYNOLDS.

Witnesses:

HENRY L. BRANT,

CHARLES E. FOSTER.