

(No Model.)

2 Sheets—Sheet 1.

G. W. ZASTROW.
HYDRAULIC CRANE.

No. 514,251.

Patented Feb. 6, 1894.

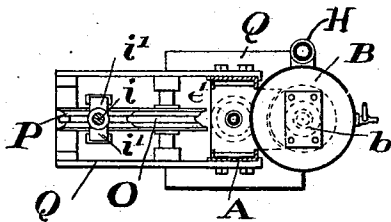
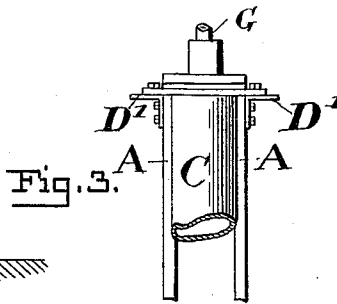
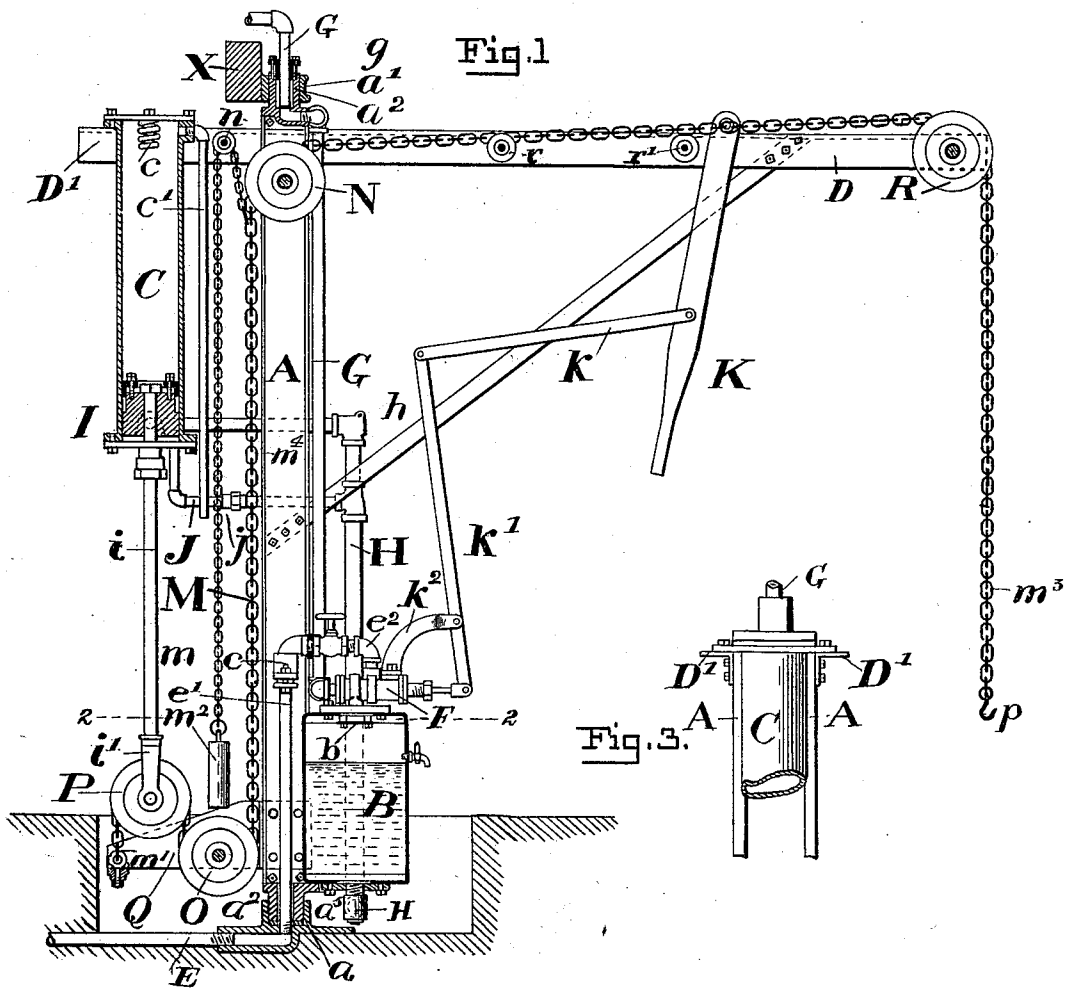


Fig. 2.

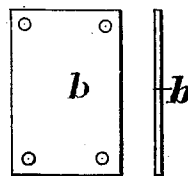


Fig. 4.

Witnesses:—

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att'y

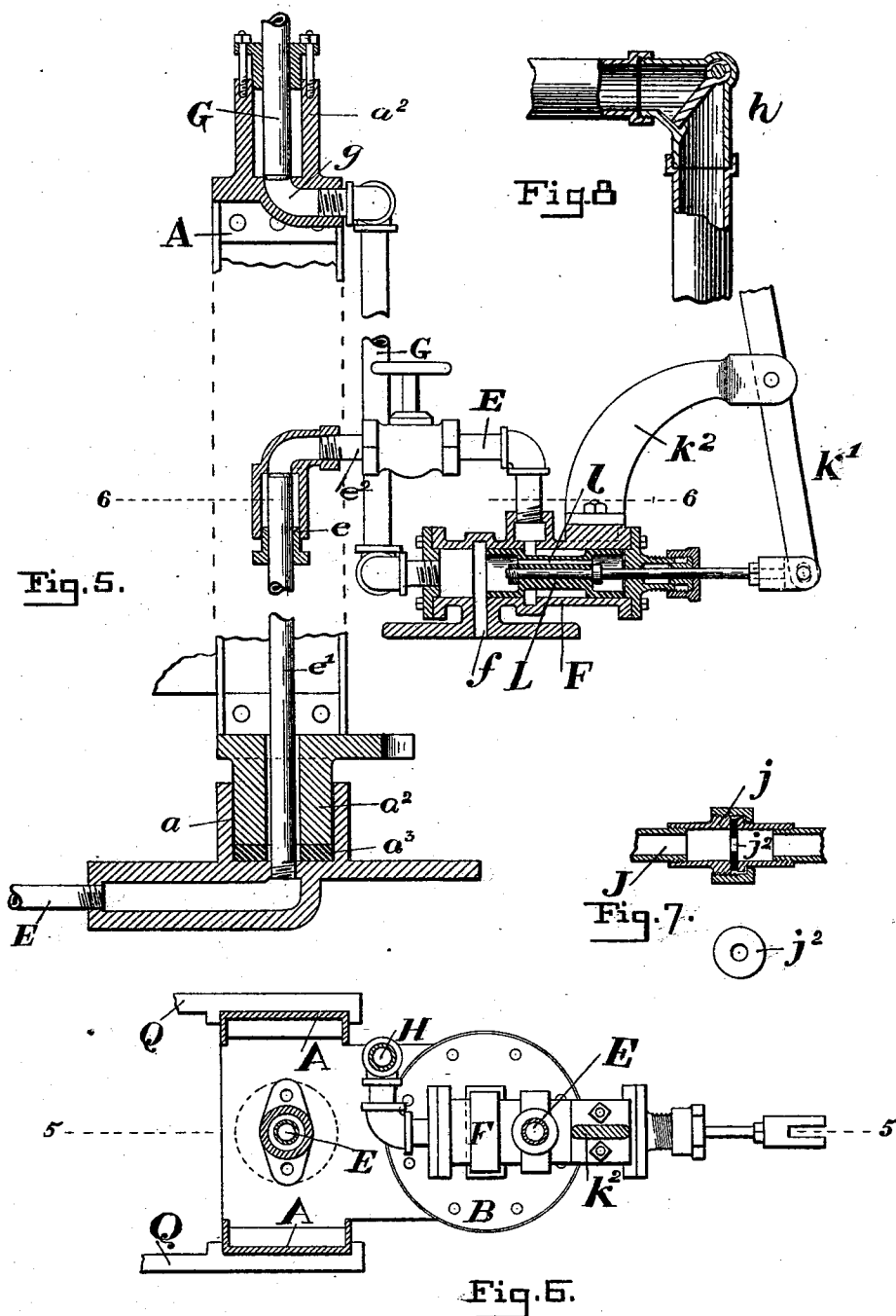
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A. O. Babondrier,
Abram Macauley

Inventor:—

G. W. Zastrow
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UNITED STATES PATENT OFFICE.

GEORGE W. ZASTROW, OF BALTIMORE, MARYLAND.

HYDRAULIC CRANE.

SPECIFICATION forming part of Letters Patent No. 514,251, dated February 6, 1894.

Application filed March 16, 1893. Serial No. 466,295. (No model.)

To all whom it may concern:

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

This invention relates to that class of hydraulic cranes in which the piston is caused to traverse its cylinder by water, which, steam-impelled, acts against the piston.

The invention has special reference to features hereinafter pointed out.

In the accompanying drawings, Figure 1, is a view of the crane partly in section and partly in elevation. Fig. 2, is a section on the line 2—2 of Fig. 1. Fig. 3, is a detail elevation of the cylinder and showing parts of the mast of the crane. Fig. 4, shows two views of the steam deflector-plate shown in Figs. 1 and 2. Fig. 5, is a detail sectional elevation showing the extremities of the mast, and the valve mechanism for controlling the admission of the live steam. Fig. 6, is a section on the line 6—6 of Fig. 5. Fig. 7 is a section of the pipe-union which is located in the exhaust water-pipe leading from the lifting-cylinder to the water-tank. Fig. 8 is a detail section view of the pipe-elbow containing the check-valve.

Referring to the drawings the letter A, designates the mast which rotates on pivot bearings; B, the water-tank secured at one side of and near the lower end of the mast; C, the lifting-cylinder secured to the extension D' of the jib D; E, the live-steam-pipe connecting, through the valve chest F, the steam-boiler with the water-tank B; G, the exhaust steam-pipe leading from the water-tank; H, a water-supply pipe leading from the bottom of the tank B, to the bottom of the lifting-cylinder C, and it supplies the water into the cylinder below the piston I; this supply pipe has at the elbow a check-valve, *h*, shown in detail in Fig. 8, to prevent the return flow of water from the cylinder; J, the exhaust water-pipe leading from the bottom of the lifting cylinder, C, and connecting with the supply pipe, H beyond the check-valve, *h*; this exhaust pipe, J, is of smaller diameter than the supply pipe, H. This pipe, J, serves also as a

water-supply-pipe, supplemental to the larger pipe, H. By this arrangement and construction, the water will be supplied rapidly to the lifting cylinder, but the exhaust therefrom will be slower, since all of the exhaust must pass through the smaller pipe, J. The valve-lever K, through the link *k*, and lever *k'*, pivoted to the extremity of the arm *k*², operates the piston-valve L, within the valve casing F.

The letter M, designates the lifting-chain one end of which is made fast to the eye *m'*, on the frame Q, which is secured to the lower end of the mast A, from this point the chain passes over the pulley P, which is journaled to rotate in pivot bearings in the branched arms *i'*, at the lower extremity of the piston-rod *i*, whence it passes under the pulley O, which is journaled in pivot bearings in the frame Q, and up over the pulley N, journaled in bearings in the mast A, and out over the pulley R, in the extremity of the jib D. Between pulleys, N, and, R, it is supported by the rollers, *r*, *r'*. The small supplemental chain *m*, secured at one end to a convenient point in the lifting chain M, passes over a pulley *n* journaled in jib-extension D', and has a weight *m*², upon its free end. The function of this supplemental chain *m*, is to take-up any slackness of the main chain M, about the pulleys O and P, and keep it always in close engagement with the grooves in the peripheries of said pulleys.

The mast A, is adapted to rotate in its pivot-bearings, *a*, *a'*, secured in any suitable manner and which serve also to maintain it in an upright position. The mast pivots, *a*², are hollow, and the live-steam-pipe, E, connects at one end with the lower pivot bearing, *a*, and at the other end with the valve-chest F, while the exhaust steam-pipe, G, connects at one end with the upper pivot bearing, *a'* and at the other end with the valve-chest. The swivel pipe-union, *e*, on the vertical section, *e'*, of the live steam-pipe, E, permits the lateral arm, *e*², of said pipe, E, to be swung around as the crane is rotated, and will yet preserve a steam-tight joint. A similar swivel-pipe-union, *g*, is located on the exhaust-steam-pipe, G, in the upper pivot *a*², of the mast.

The water-tank, B, rests upon a frame, Q,

secured to the mast and hence swings with the crane when the latter is rotated.

The valve-chest, F, is mounted upon the tank, B, and communicates therewith through the port, *f*. It has been found in practice, that if the steam is allowed to enter the water-tank and strike the water in a solid stream, it will plow into the said water and thereby soon heat it to the boiling point and generate steam and it will consequently raise the pressure in the tank, which seriously interferes with the operation of the piston L, in cylinder, C, which controls the admission and exhaust of the steam from the boiler. To obviate this defect, I employ the deflector-plate, *b*, which is located in the tank directly below the steam opening, so that the live steam entering through the port *f*, will strike against the said deflector-plate and be spread out and distributed when it strikes the water.

The valve piston, L, is cylindrical and slides within a cylindrical casing of the chest F. To balance the valve and maintain an equal pressure in the casing, at each end of the same, the valve-piston has a longitudinal passage, *l*, through it, as shown in Fig. 5, whereby this one valve may be easily and smoothly operated both to admit the steam to the tank and to exhaust it therefrom. Without this longitudinal passage in the valve it would be difficult if not impossible to properly control the action of the water-impelled piston, especially when slowly depositing the load or when, in lowering the load, it is desired to suspend it at any certain point; under these conditions the valve, L, would be moved to slightly open the port, *f*, to exhaust steam from the water-tank; now if the longitudinal passage, *l*, was absent the valve would be forcibly thrown to the full release position and thus prevent a control over the depositing or suspending of the load. This result of forcibly throwing the valve would follow by the full exhaust pressure acting on one end only of the valve. It will be seen, therefore, that the longitudinal passage co-acts with the other parts and enables them to be fully controlled.

Fig. 7, of the drawings illustrates in detail the pipe-union, *j*, which is located in the water-pipe, J, and which has the removable perforated disk, *j*², so that by having disks with different sizes of perforation one may be used which will make the water in the lifting-cylinder exhaust rapidly or slowly as may be preferred. A compression spring, *c*, at the top end of the cylinder keeps the piston, I, from striking too violently against the end of the cylinder on its up-stroke.

An open pipe, *c'*, leading from the top of the cylinder, C, is employed as an escape for any water which may leak past the piston, I. The valve-operating lever, K, is pivoted to the swinging end of the jib, D, and the practical advantage of so locating it may be appreciated when it is seen that thereby one

man may manipulate both it and the hook, *p*, upon the end of the lifting chain M. It requires but one man to entirely operate and control the crane and the chain-hook. By disposing the cylinder, C, upon the extension, D', of the jib, D, its weight serves to balance the weight of the jib, D. A wearing plate *a*³, of steel is in the bearing socket at the bottom end of the mast.

The position of the live, and exhaust-steam pipes at the bottom and top of the mast respectively, may be reversed without interfering with the operation of the crane, that is, the live steam may enter at the top of the mast and the exhaust leave at the bottom of the same.

Having thus described my invention, I claim as new and desire to secure by Letters Patent in the United States—

1. In a hydraulic crane, the combination of the pivoted mast carrying a jib; the water-cylinder and piston therein carried by the mast; the water-tank also carried by the mast; a water-pipe connection between the piston-cylinder and water-tank; a valve-chest on the water-tank and having a piston-valve which controls both the admission of steam upon the water in the tank and the exhaust of steam therefrom; a steam-supply pipe, E, connecting through one of the pivot-bearings of the mast with the valve-chest; a steam exhaust pipe connecting through the other pivot-bearing of the mast with the valve-chest; a lifting chain connected with the piston and pendent from the end of the jib; and a lever pendent from the swinging end of the jib and in proximity to the pendent end of the chain and connected with the said piston valve, whereby one man alone may operate the valve which controls the crane and also manipulate the hook at the end of the pendent chain.

2. In a hydraulic crane the combination of the mast and jib; a water tank carried by the mast; a lifting-cylinder and piston also carried by the said mast; a lifting chain passing over said mast and jib; steam-pipe connections for the water tank; water-pipe connections between the lifting-cylinder and water-tank, comprising a main water-supply-pipe having a check valve therein, and a supplemental supply pipe of reduced diameter with respect to the main water-supply-pipe, and which serves also as the exhaust water-pipe.

3. In a hydraulic crane the combination of the mast and jib; a water-tank carried by the mast; a lifting-cylinder and piston also carried by the mast; a lifting chain connected to the piston; steam-pipe connections for the water tank, and water-pipe connections between the lifting-cylinder and water-tank comprising a main water-supply-pipe having a check valve therein and a supplemental water-supply-pipe, which serves also as an exhaust water pipe and which has a pipe-union therein, and a removable perfo-

rated plate within said union, whereby the rapidity of the exhaust may be regulated, as described.

4. In a hydraulic crane, the combination of
5 the pivoted mast; a jib rigidly secured to the
mast and having a short extension, D', on the
side of the mast opposite its longer portion;
a water-cylinder secured vertically to the said
jib-extension and having a piston; a lifting-
10 chain connected at the lower end of the mast,
engaging the piston and extending to the jib;
a water-tank resting on a seat carried by the
mast and projecting at the side thereof oppo-
15 site the water-cylinder; a water-pipe connec-
tion between the said water-cylinder and wa-
ter tank; a valve-chest on the water-tank; a
steam-supply pipe connected with the valve-
chest; and a piston-valve in said chest which

controls both the admission of steam upon
the water in the tank and the exhaust of 20
steam therefrom, as set forth.

5. In a hydraulic crane, the combination of
a water-tank; a valve-chest on the water-
tank and having a valve which controls both
the admission of steam upon the water in the 25
tank and the exhaust of steam therefrom; a
jib having a lifting-chain pendent from its
end; and a lever having one end pivoted to
the jib and pendent therefrom and connected
30 with the said valve.

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

GEORGE W. ZASTROW.

Witnesses:

ARTHUR O. BABENDREIER,
CHAS. B. MANN, Jr.