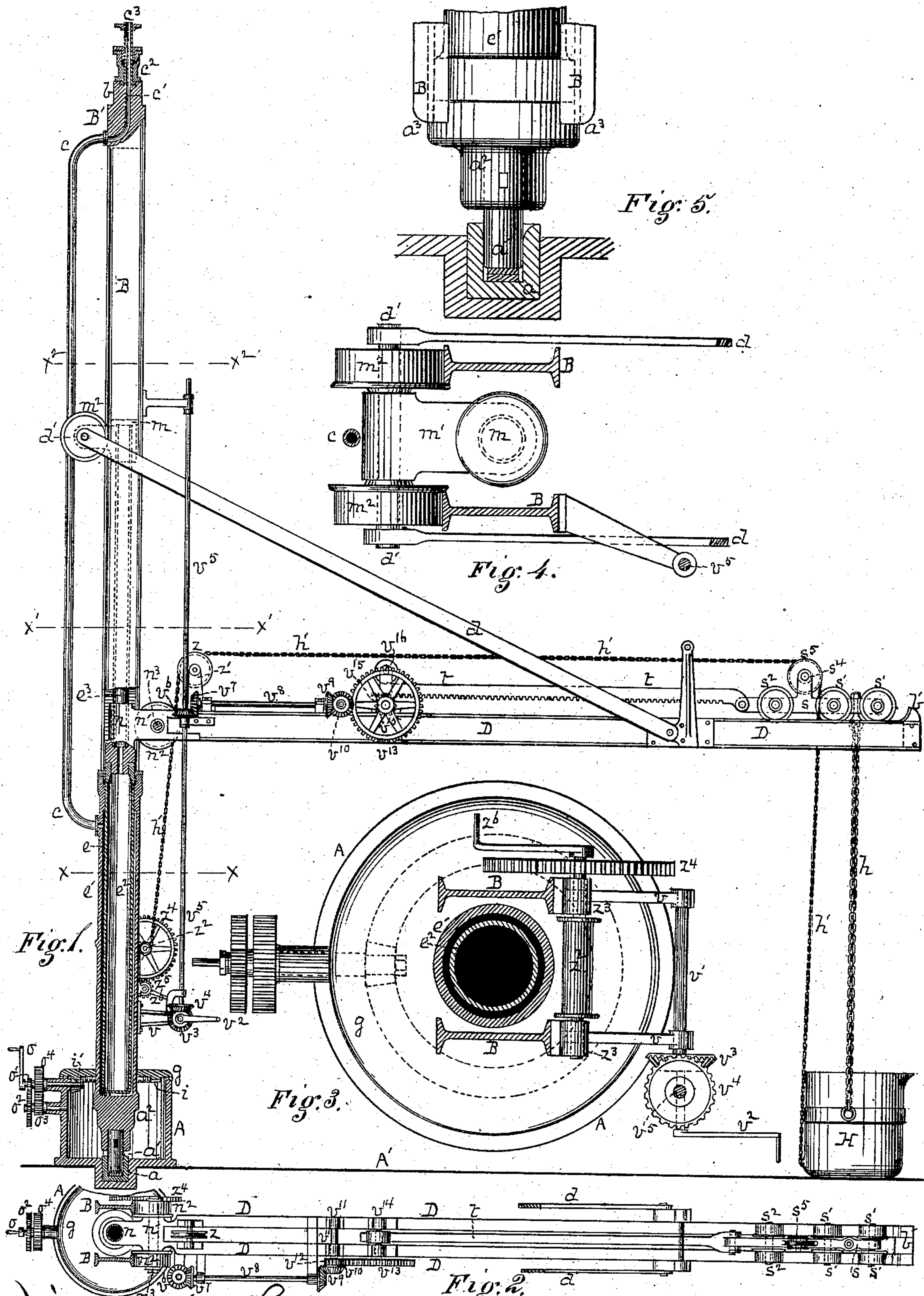


(No Model.)

J. HEMPILL.
Hydraulic Crane.

No. 239,775.

Patented April 5, 1881.



Witnessed
James Thompson
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Fig. 2.
Inventor James Hempill
By Attorney George H. Christy

UNITED STATES PATENT OFFICE.

JAMES HEMPHILL, OF PITTSBURG, PENNSYLVANIA.

HYDRAULIC CRANE.

SPECIFICATION forming part of Letters Patent No. 239,775, dated April 5, 1881.

Application filed February 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, JAMES HEMPHILL, of
Pittsburg, county of Allegheny, State of Penn-
sylvania, have invented or discovered a new
5 and useful Improvement in Hydraulic Cranes;
and I do hereby declare the following to be a
full, clear, concise, and exact description there-
of, reference being had to the accompanying
drawings, making a part of this specification,
10 in which—like letters indicating like parts—

Figure 1 is a side elevation, partly in sec-
tion, of a high-ladle hydraulic crane embody-
ing my present invention. Fig. 2 is a sec-
15 tional view through the post in the plane of
the line xx of Fig. 1, and a top or plan view
of the jib, and of the devices thereon. Fig. 3
is a transverse horizontal section, to an en-
larged scale, in the plane of the line $x'x'$, Fig.
1. Fig. 4 is a transverse horizontal section,
20 but to a less enlarged scale, in the plane of
the line x^2x^2 , Fig. 1; and Fig. 5 is an enlarged
view of the pedestal or foot of the post, as
viewed from the left-hand end of Fig. 2, with
the socket or step in section.

25 My invention relates generally to certain
features of improvement in the construction
of hydraulic cranes, and I have illustrated
and will describe them as embodied in a
crane such as is adapted for use in the hand-
30 ling of large bodies of molten metal, such as
are produced in the Bessemer process or open-
hearth process, or even in large foundries;
and the peculiar features of improvement
which I claim herein relate to the introduction
35 of the operative hydraulic pressure through
the top bearing of the crane-post; also to the
construction of the apparatus whereby the
ladle can be tilted by the same hydraulic power
which is employed in raising and lowering.

40 The line A' may represent a suitable founda-
tion or floor. At the proper point thereon I
arrange a box, A , and therein make a step, a ,
in which rests the pintle a' of the post. The
pedestal a^2 of the post, by a socket made there-
45 in, rests on and is keyed to the upper end of
the pintle, as shown. The pedestal a^2 has a
square shoulder, a^3 , cut on each of its two op-
posite sides, Fig. 5, and two I-beams, B B ,
which, with the pedestal, pintle, and head-
50 piece B' , constitute the post proper, rest at
their lower ends on such shoulders a^3 , and at

their upper ends are secured to the head-piece
 B' by like shoulders, or by being bolted there-
to, or in other suitable way.

Heretofore in hydraulic cranes of this class 5
it has been usual to introduce the hydraulic
pressure through the bottom bearing of the
post and in the axial line thereof. In such
case the post has been supported, so as to ro-
tate with comparatively little friction, on a 60
series of conical rollers, radially arranged out-
side of the water-port, between suitable bear-
ings. It has been found difficult to keep such
roller-bearings so perfectly free from the pres-
ence of dirt or other obstructions as always to 65
work easily and readily, and hence I have in
the construction here represented returned to
the old form of pintle bearing or joint at the
lower end of the post, into which dirt cannot
enter if even ordinary care is exercised, and I 70
introduce the water-pressure through the head-
piece B' by a pipe, c^3 , which passes through
a swiveling stuffing-box, c^2 , and thence a port,
 c' , through the head-piece B' leads to a pipe,
 c , and the latter opens into the hydraulic- 75
pressure chamber e , between the standing cyl-
inder e' and the plunger e^2 . The cylinder e'
rests on or is made in the same piece with the
pedestal a^2 , and the plunger e^2 works up and
down therein under the application or release 80
of water-pressure, as is usual in the working
of cranes of this class.

The head-piece B' has a cylindrical bearing,
 b , by which, through a suitable support, to
connect it with the floor or frame above or 85
with braces or guys secured below. Also, in
order to lessen friction and to secure certainty
of easy and ready rotation, I insert one or
more steel washers beneath the pintle a' , as
shown in Figs. 1 and 5. Then if a little dirt 90
should happen to work in, so as to cause the
pintle to lock with or stick on the upper
washer, such upper washer will turn on the
next, and so on.

It will be observed that the I-beams B are 95
properly spaced for the cylinder e' to be ar-
ranged between them, as illustrated in Fig. 3.
On top of the plunger e^2 rests a jib-block, n ,
and in a socket bored in the upper end of it I
secure a plunger-stem, e^3 , which extends up 100
the required distance, and has on its upper end
a bracket-block, m . Each end of the stem

rests firmly on a shoulder made for the purpose, so that the upward motion of the plunger shall be transmitted to the stem, and through the jib-block n to the inner or post end of the jib, and through the bracket-block m to the jib stays or braces which lead to the outer end of the jib, as presently to be explained.

From the jib-block n a jib-arm, n' , extends out, made of an inverted-U or other suitable form, and to the sides of the U are bolted the jib-bars D , so that such bars and jib-arm constitute the jib proper of any desired length. The jib-bars are connected at their outer end by an interposed spacing-block, the upper end of which projects up, as at b' , to form a stop to the truck which runs on the jib. This truck may be of any suitable construction, but, as shown, it consists of a central frame, s , and outside bearing-wheels, s' s' , four in number; but in order to prevent any of the forces which act on or over the truck from tilting it, I lengthen the frame, so as to provide for the addition of another pair of bearing-wheels, s^2 , and just back of these wheels, on posts s^4 , which extend up from the truck-frame, I mount a sheave, s^5 . From the truck-frame, between the wheels s' , I suspend, by a chain, h , the ladle H , with proper means for attaching and detaching readily and at pleasure.

In the end of the truck-frame I attach a tongue, t , which is made with a toothed rack on its under side, as shown; and hence, as it is used to move or "rack" the truck with the suspended ladle in or out along the jib, I will term it a "rack-bar." It extends to a racking-gear, which I will next describe.

Secured to the post B , in suitable position to be reached by hand from the ground or from a raised platform, is a pair of brackets, v , which, at their outer ends, carry a crank-shaft, v' , operated by a hand-crank, v^2 , Figs. 1 and 3. On the shaft is a miter-wheel, v^3 , which gears into a like wheel, v^4 , on an upright shaft, v^5 . The latter being rotated by the turning of the crank imparts motion to a miter-wheel, v^6 , through which it passes, and with which it is connected by a spline or groove and feather. The wheel v^6 is secured, by a suitable bracket, to the side of the jib, and gears into another miter-wheel, v^7 , also with its shaft, v^8 , supported on jib-brackets. A miter-wheel, v^9 , on the other end of the shaft gears with a like wheel, v^{10} , on a cross-shaft, v^{11} , Fig. 2, and a spur-wheel, v^{12} , on this cross-shaft gears into a toothed wheel, v^{13} , on a shaft, v^{14} , and a pinion, v^{15} , Fig. 1, on this cross-shaft gears into the rack on the rack-bar t , while a bearing-roll, v^{16} , above keeps the rack and pinion in gear. Hence by turning the crank v^2 the truck and suspended ladle can be racked along the jib in either direction until the ladle shall be brought to the proper point for filling or pouring, as the case may be.

It will be understood that the ladle is raised and lowered with the jib by hydraulic pressure applied to or released from the plunger e^2 , in the usual way. For this work, however,

the jib requires additional support, which I secure by the stay-bars d , bolted to the jib-bars on their outer sides and as near their ends as may be desired. These stay-bars d pass on each side of the post, back of the same, and are secured to a shaft or axle, d' , which passes through a bracket-arm, m' , of the block m , Figs. 1 and 4, and this arm m' is long enough to provide for the addition of bearing rollers or wheels m^2 in such manner that their treads, as the jib goes up and down with the plunger, will roll easily and without undue friction on the back heads of the I-beams B , which form the post. Thus the downward strain at or near the outer end of the jib is carried, to a large extent, by the post I-beams B through the interposed stay-bars d and rollers m^2 ; and the more perfectly to carry the residue of the weight of the jib and its load on the post I-beams B , I arrange like bearing-rollers n^2 n^2 , Figs. 1 and 2, at the base end of the jib and on the jib side of the post, so that such rollers running on the adjacent heads of the post I-beams will carry the strain at that point. These rollers n^2 are secured on any suitable axle, n^3 , passing through the sides of the inverted U-shaped jib-arm n' .

As a part of the present invention, I also provide for tilting the ladle, either by hand or automatically by hydraulic power, as may be preferred. To this end I carry a chain, h' , from the ladle H at a point at or near its rear bottom side over the sheave s^5 , and thence over a sheave, z , at or near the inner end of the jib and suitably supported thereon, as by posts z' , and thence down to a winding drum or shaft, z^2 , which revolves in suitable bearings, z^3 , Figs. 1 and 3, affixed to the post I-beams B . This shaft has a gear-wheel, z^4 , thereon, and receives motion from a pinion, z^5 , Fig. 1, the bearings of the axle of which are similarly secured, and motion may be given to the whole by a hand-crank, z^6 . If this gear be left loose, the chain h' will unwind, as the hydraulic plunger e^2 is raised, until the ladle has been elevated to the desired level. The operator then, by turning the crank z^6 , will wind in the chain h' , and thereby tilt the ladle; but I also provide for tilting the ladle automatically by hydraulic power, and to this end, after the ladle is raised or lowered to the desired level for pouring, I turn the crank z^6 till the slack chain is taken up, (if there be any slack,) and then the operator retains his hold of the crank, so as to prevent the chain h' from unwinding; or a pawl or other suitable device may be added for locking the tilting-gear. While the chain h' is thus held taut the operator, by again turning on or applying hydraulic pressure, raises the plunger, jib, and ladle; but as one end of the tilting-chain h' is now made fast to the post by the lock, or is held fast by the hand, such motion will have the effect of hauling in on the free or ladle end, so as to tilt the ladle and discharge its contents. This is by far the easiest way of pouring, and it is only open to the objection that extra care must be taken to

see that the winding end of the chain is not locked or held when it ought to be free, as otherwise the contents of the ladle might be poured out at the wrong time.

5 The box A at the foot of the post has a cover, *g*, which is fixedly secured to the post, and which rotates on top of the box. Dirt is thus excluded.

10 In order to rotate the post, I make a bevel-gear, *i*, on or secure it to the under side of the cover, and drive it by a bevel-pinion, *i'*, which receives its motion from a hand-crank, *o*, pinion *o'*, (both being on a sleeve outside of the shaft,) gear-wheel *o*², pinion *o*³, and wheel
15 *o*⁴, which latter is secured to the same shaft as the pinion *i'*.

I claim herein as my invention—

1. In the construction of a hydraulic crane, a

water-supply and discharge-port through the head-piece B', which forms the top bearing 20 and support of the crane-post, substantially as set forth.

2. A tilting-chain, *h'*, extending from the ladle to a winding-gear fixed on the post, in combination with a hydraulic plunger, where- 25 by the ladle may at pleasure be tilted either by hand or (the slack being taken up) by the further motion of the hydraulic plunger, substantially as set forth.

In testimony whereof I have hereunto set 30 my hand.

JAMES HEMPHILL.

Witnesses:

S. HARVEY THOMPSON,
GEORGE H. CHRISTY.