(No Model.)

2 Sheets—Sheet 1.

# W. HAINSWORTH.

## LADLE.

No. 555,317. Patented Feb. 25, 1896.

Fig. 2.

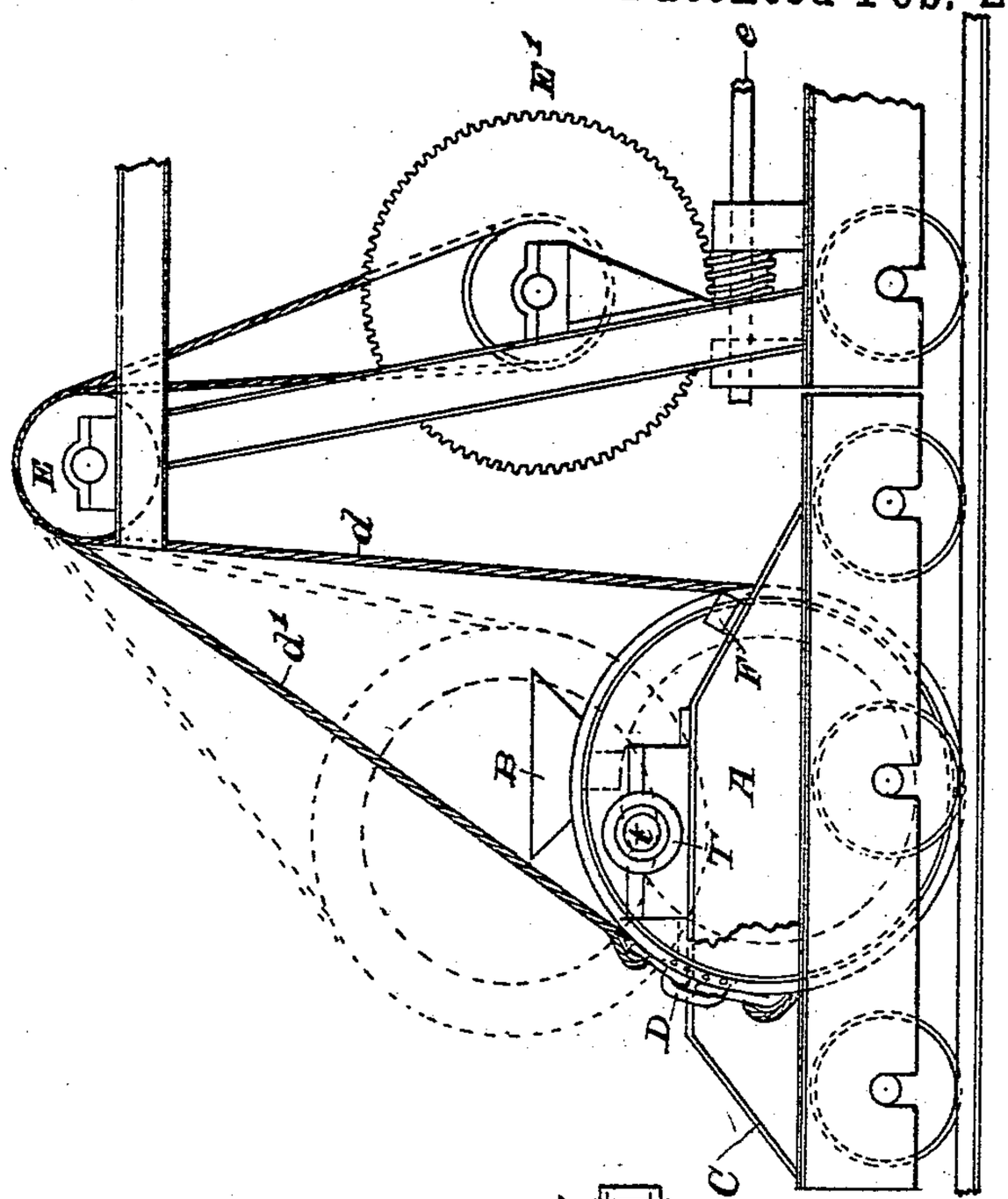
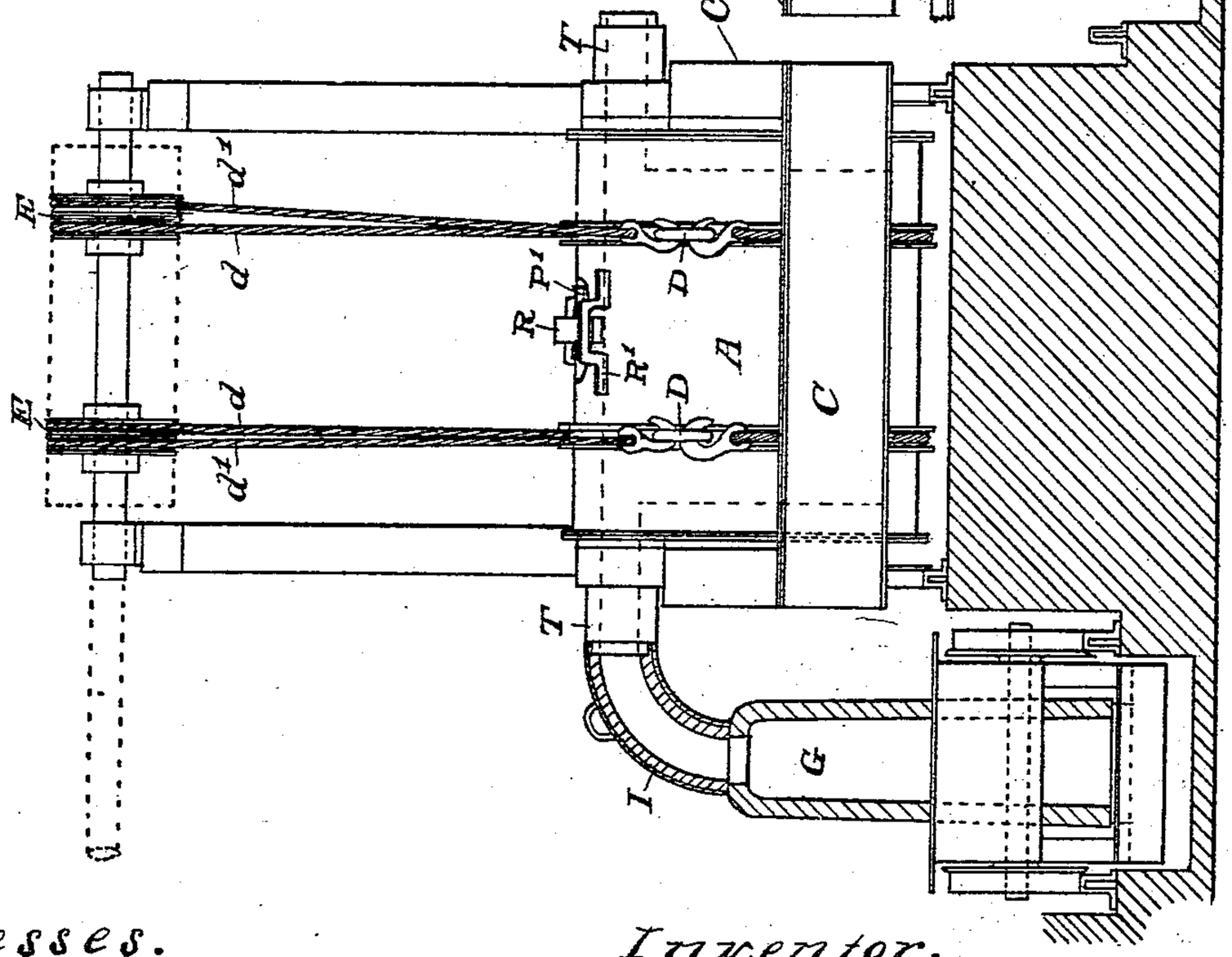



Fig. 1.




Witnesses.
Geo E Morris
L G Kelsey Jr.

Inventor.
Wm Hainsworth,
by H. L. Reynolds,
his atty.

(No Model.) 2 Sheets—Sheet 2.

# W. HAINSWORTH.

## LADLE.

No. 555,317. Patented Feb. 25, 1896.

Fig. 3.

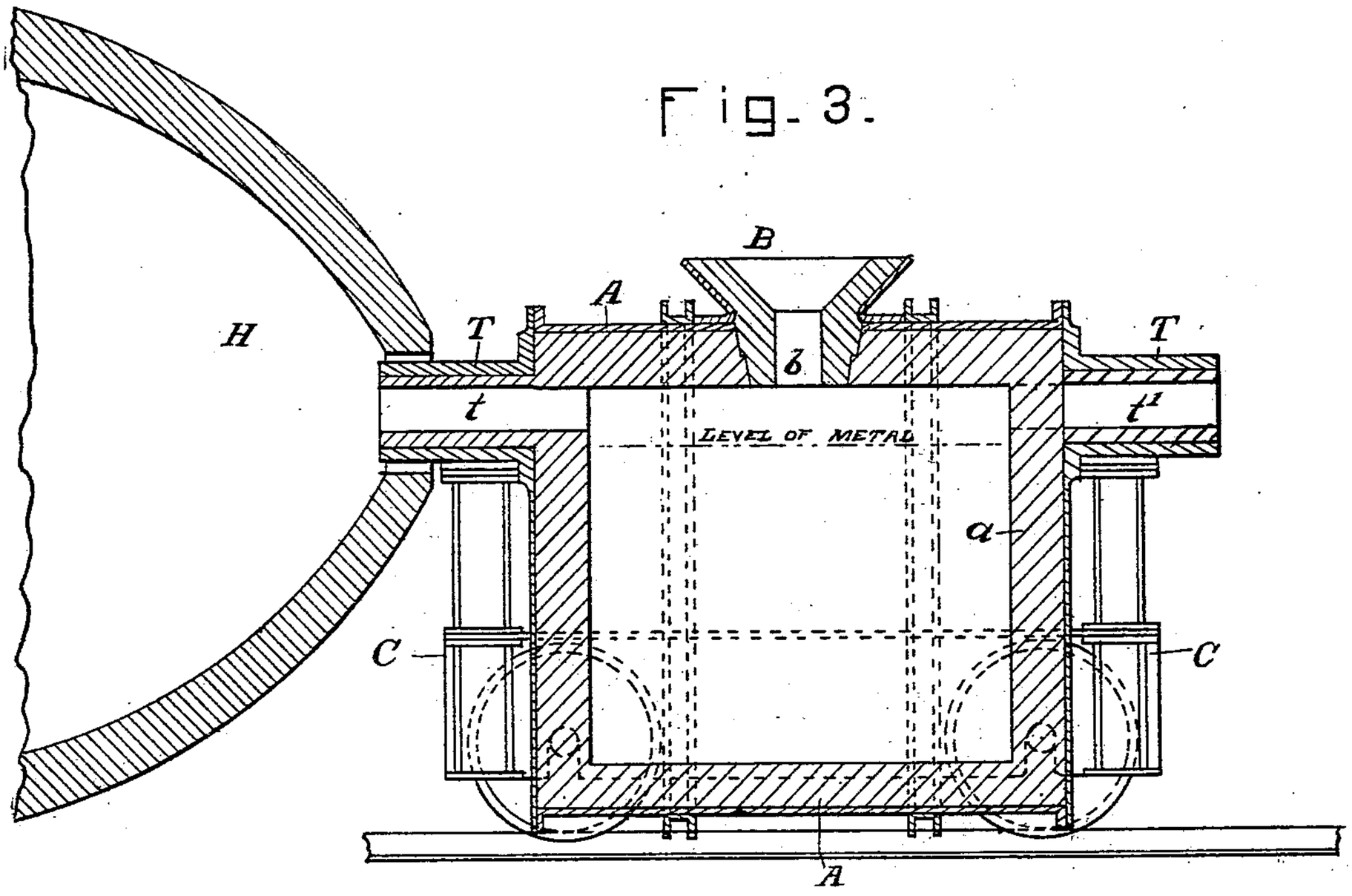



Fig. 5.

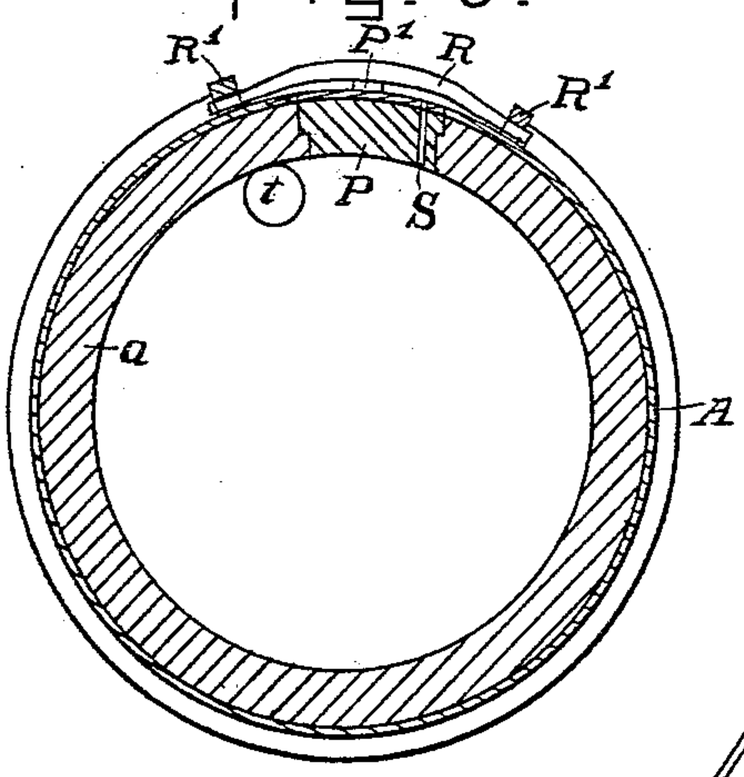
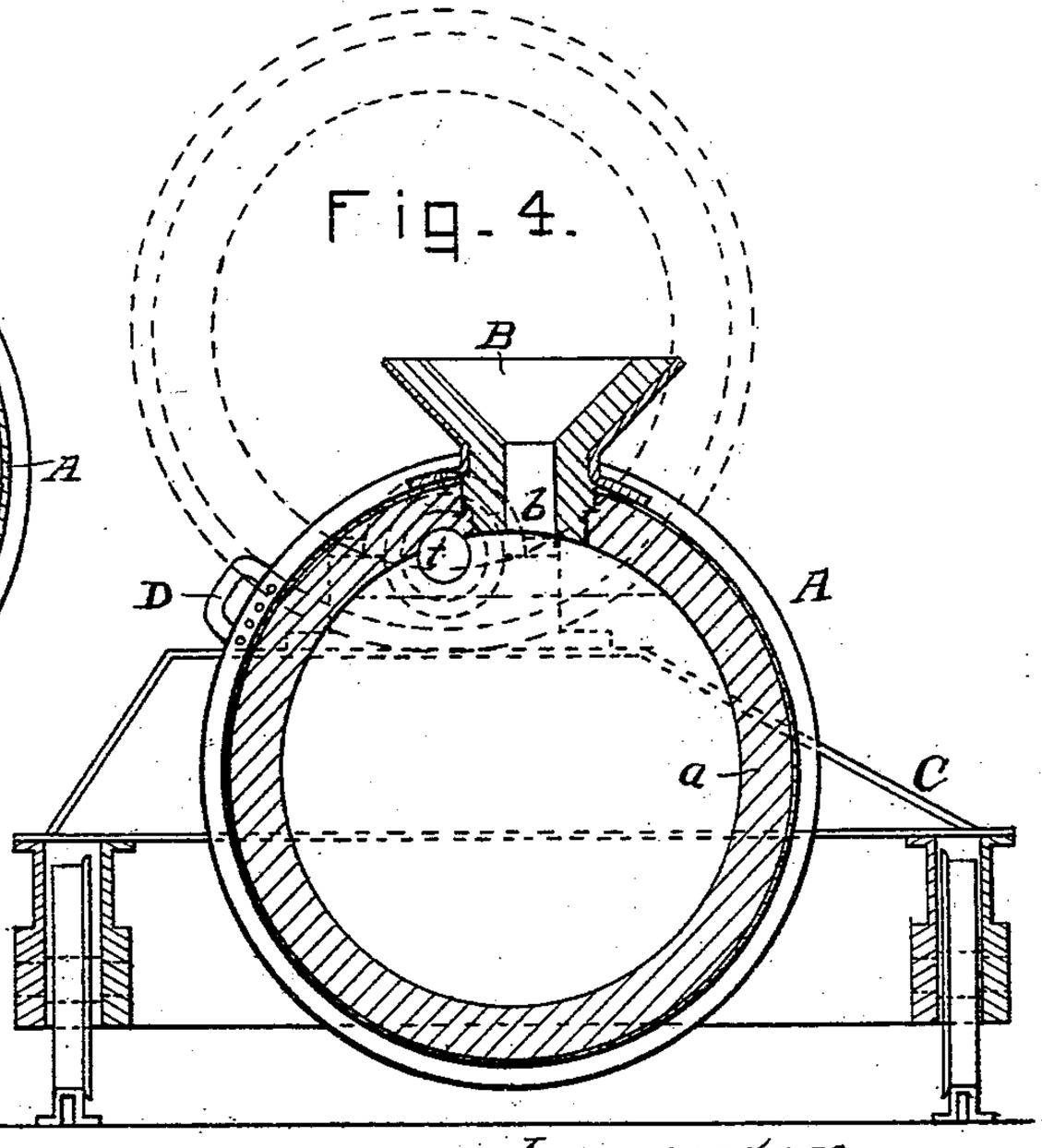



Fig. 4.




Witnesses.
Geo. E. Morris
L. T. Kilroy Jr.

Inventor.
Wm. Hainsworth,
by H. L. Reynolds,
his atty.

# UNITED STATES PATENT OFFICE.

WILLIAM HAINSWORTH, OF WEST SEATTLE, WASHINGTON.

## LADLE.

SPECIFICATION forming part of Letters Patent No. 555,317, dated February 25, 1896.

Application filed August 13, 1895. Serial No. 559,178. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HAINSWORTH, a citizen of the United States, residing at West Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Ladles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to ladles for receiving and transporting molten metal, and is especially designed for use in connection with a Bessemer-steel plant, although capable of being advantageously used in connection with any other kind of plant.

It consists essentially of a cylinder having hollow trunnions on each end placed to one side, so that the hollow of the trunnion may drain the ladle when turned so that the trunnions are down. The whole is mounted upon a truck for convenience of transportation.

In the drawings, Figure 1 is a side view of the ladle in position to pour a steel ingot. Fig. 2 is an end view of the same, showing also mechanism for rotating the ladle. Fig. 3 is a longitudinal sectional view of the ladle ready to charge a Bessemer converter. Fig. 4 is a lateral section of the ladle. Fig. 5 is a similar section showing the stopper or plug in place.

My ladle consists of a cylinder A, having a lining *a* of some material which is well adapted to resist the action of hot metal. It is mounted upon a truck C as a convenient means for transporting it from place to place. It is supported in this truck by trunnions T upon each end. These trunnions are hollow and are also lined with a fire-resisting material. These trunnions are so placed at one side of the head that the entire contents of the ladle may be run out through them by rotating the cylinder upon these trunnions until they are upon the lower side. The ladle is charged by pouring through the funnel B, attached to one side of the cylinder. This funnel is so placed that its neck or communicating passage *b* lies in the middle of the length of the cylinder and a little to one side of the line connecting the trunnions.

Fastened to the outside of the cylinder are the eyes or staples D, to which may be attached the hooks upon the cables *d* and *d'*. These are attached from opposite sides, one of the cables passing about the cylinder. They are carried up in the manner shown in Figs. 1 and 2 and are attached to any kind of hoisting apparatus desired. I have herein shown them as operated by a device consisting of the overhead idler-pulleys E and the winding apparatus E', which consists of a drum operated by a worm and gear, *e* being the shaft carrying the worm and which may be turned by being connected in any convenient manner to any suitable motor. I have shown this device as mounted upon a truck, which enables it to be used at any point reached by its track. Only the front end of this truck is shown. It may, if desired, carry self-propelling means and act as a locomotive to propel itself and the ladle wherever desired.

Where it is desired to do the pouring always at the same place, a fixed hoisting device may be built having a drum over the track and a shaft connected to some power-supply at one side. This has been indicated by dotted lines in Fig. 1. The hoisting cables or chains, if their use is preferred, should be attached to the hoisting-drum in such a way that one part will unwind as the other part winds up.

The ladle having been placed in the position where it is desired to pour its contents, it is rotated upon its trunnions by hoisting upon the cable *d*, which has been passed under the ladle and attached to the eye D. This gradually raises the level of the metal in the ladle without raising the outlets through the trunnions through which the metal will run, until, when the ladle has reached the position shown in dotted lines in Figs. 2 and 4, the metal has all run out, or a suitable gage or gages may be placed on end of cylinder to show the amount of metal therein at any time.

When the cable *d* is attached to the eye D, the cable *d'* is also attached at the same point,

and as the cylinder is rotated it is wound about it. It steadies the cylinder and prevents its being rotated too far, and also secures its positive return. The charging-opening *b* being to one side of the trunnions, the metal will not run out thereat unless the rotation of the cylinder has been so fast that the trunnions cannot carry off the metal with sufficient rapidity.

In Fig. 1 the device is shown as it would be used in pouring steel ingots, the ingot-mold being shown at G mounted upon a truck running on a track alongside. A similar track is shown at the other end of the ladle, and two ingots may be poured at the same time from opposite trunnions. When it is desired to pour from one end only, one of the trunnions must be stopped, as shown in Fig. 3. This figure and Fig. 4 show the ladle as it would be used in charging a Bessemer converter. In this case it is more convenient to have it mounted upon the trucks in the opposite way from that shown in Figs. 1 and 2, which figures show the ladle as mounted for pouring ingots or castings of any kind.

In Fig. 3 the end of the converter, which has been turned horizontally, is shown at H, and one trunnion of the ladle has been inserted in the mouth of the converter. As the ladle is rotated the metal will flow into the converter, and as the end of the trunnion is entirely within the mouth of the converter there can be no spilling of the metal.

In using this ladle for pouring ingots or general castings there will be much less danger of spilling metal than with an ordinary open-top ladle of the pot style, as the lip from which the metal flows has no motion and the pour is all the time from a fixed point.

In Fig. 1 I have shown a curved spout I, connecting the trunnion and the top of the ingot-mold.

A lug F (shown in Fig. 2) is attached to each end of the cylinder and rests upon the frame of the truck and prevents its swinging farther than it should on the return.

The funnel B, for use in charging the ladle, is removable therefrom, and when charged and before pouring it should be removed and the plug P of Fig. 5 substituted therefor. This plug has its outer surface conforming to the outer surface of the cylinder, and is held securely in place by a bar R, whose ends are placed under staples R′ on each side of the opening. A wedge P′ driven between this bar and the outer surface of the plug holds the plug securely to its seat. A vent-hole S through the plug permits the air and gas to pass, as may be necessary. This vent-hole should be placed in the edge of the hole farthest removed from the trunnions.

This ladle being entirely inclosed, will retain the metal in a fluid state longer than an open-top ladle will, and will thus give more opportunity to make such additions as may be needed to produce the exact quality of metal desired. Being mounted upon a truck, it may be easily taken wherever desired and does not require heavy and expensive cranes to lift and transport it.

The power necessary to be applied to the cable in order to rotate the ladle is much less than the weight of the metal, the trunnions at all times supporting not less than half of the weight of the ladle and contents. The center of gravity of the ladle varies from a point nearly under the trunnions when pouring commences to a point equal to the distance of the center of the cylinder from the center of the trunnions when the trunnion-diameter is horizontal. The leverage of the cable to rotate the cylinder at the same time varies from the radius of the outside surface of the cylinder to nearly its diameter, being greatest when the center of gravity of the cylinder is farthest removed horizontally from the trunnions. Moreover, the weight to be lifted is constantly being lessened as the pouring progresses. The lifting power also acts through a distance equal to the semicircumference of the cylinder (and with a constantly-decreasing load to be lifted) instead of the diameter, as would be necessary in a dead-lift, and as a consequence the force at any time is smaller than it would otherwise be. In pouring, also, two ingots or whatever article is being cast can be poured at once, thus doubling the capacity of the ladle. The stream of molten metal is always a steady even stream and is at all times under perfect control. There is no leakage due to a stopper not fitting a hole closely. The metal is all put into the mold where wanted and the ingots all made of uniform size.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A ladle consisting of a hollow cylinder having a refractory lining, a charging-opening upon one side, and trunnions upon its opposite heads and to one side thereof and substantially in line with the inner horizontal wall of the cylinder, one of said trunnions being hollow and forming a pouring-opening, substantially as described.

2. A ladle consisting of a hollow cylinder having hollow trunnions placed at one side of the heads and through which the pouring is done, and a charging-opening in the side of the cylinder placed a little to one side of the line of the trunnions, substantially as shown and described.

3. The combination with a ladle consisting of a hollow cylinder having hollow trunnions placed to one side of the heads, and through which the pouring is done, and a truck having bearings for said trunnions, of an eye or staple fixed to the cylinder, a cable adapted to be passed around the cylinder and attached to said eye, and means for hauling in on said

cable and thus rotating the cylinder upon its trunnions, substantially as shown and described.

4. A ladle consisting of a hollow cylinder having hollow trunnions placed to one side of the heads, and a charging-opening in one side of the cylinder and a little to one side of the line of the trunnions, a plug for closing said charging-opening, and means for rotating said cylinder upon its trunnions, substantially as shown and described.

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

WILLIAM HAINSWORTH.

Witnesses:
FRANK B. WIESTLING,
JOHN H. L. TODD.