No. 623,073. Patented Apr. 11, 1899.

A. D. BURT.

MEANS FOR TRANSFERRING STEEL FROM VESSELS OR FURNACES TO MOLDS.

(Application filed May 8, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

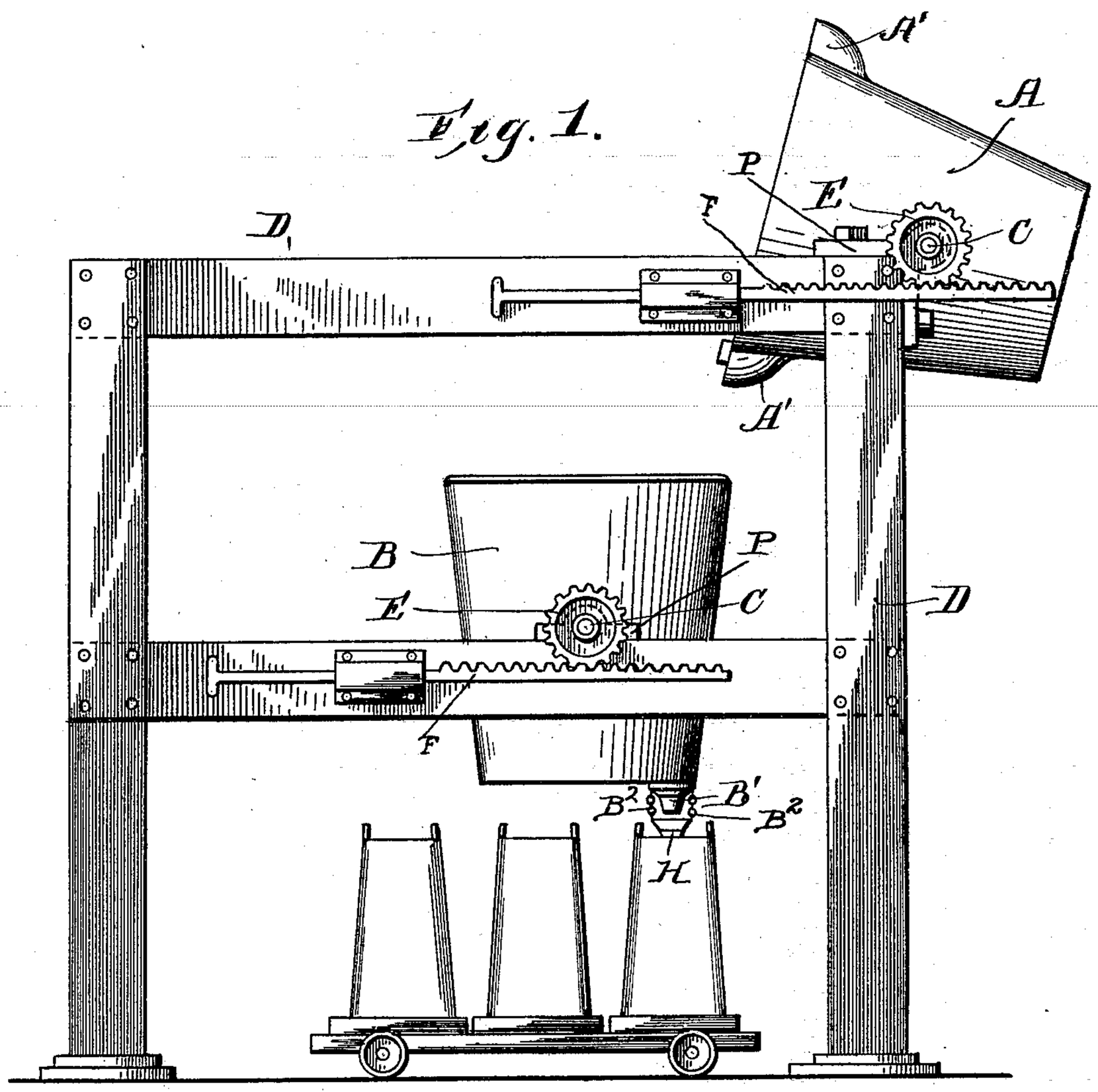
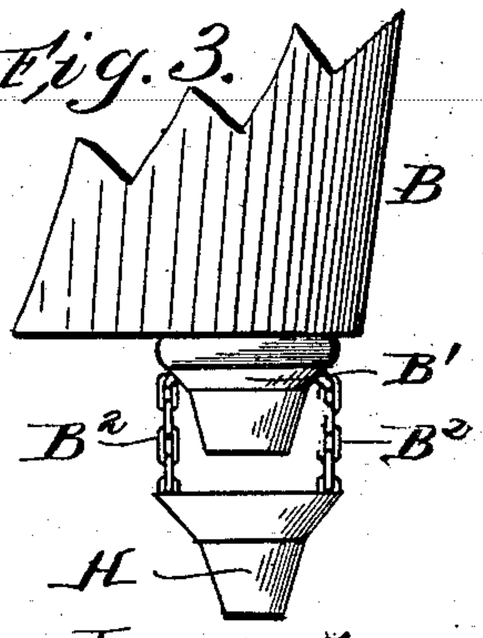


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

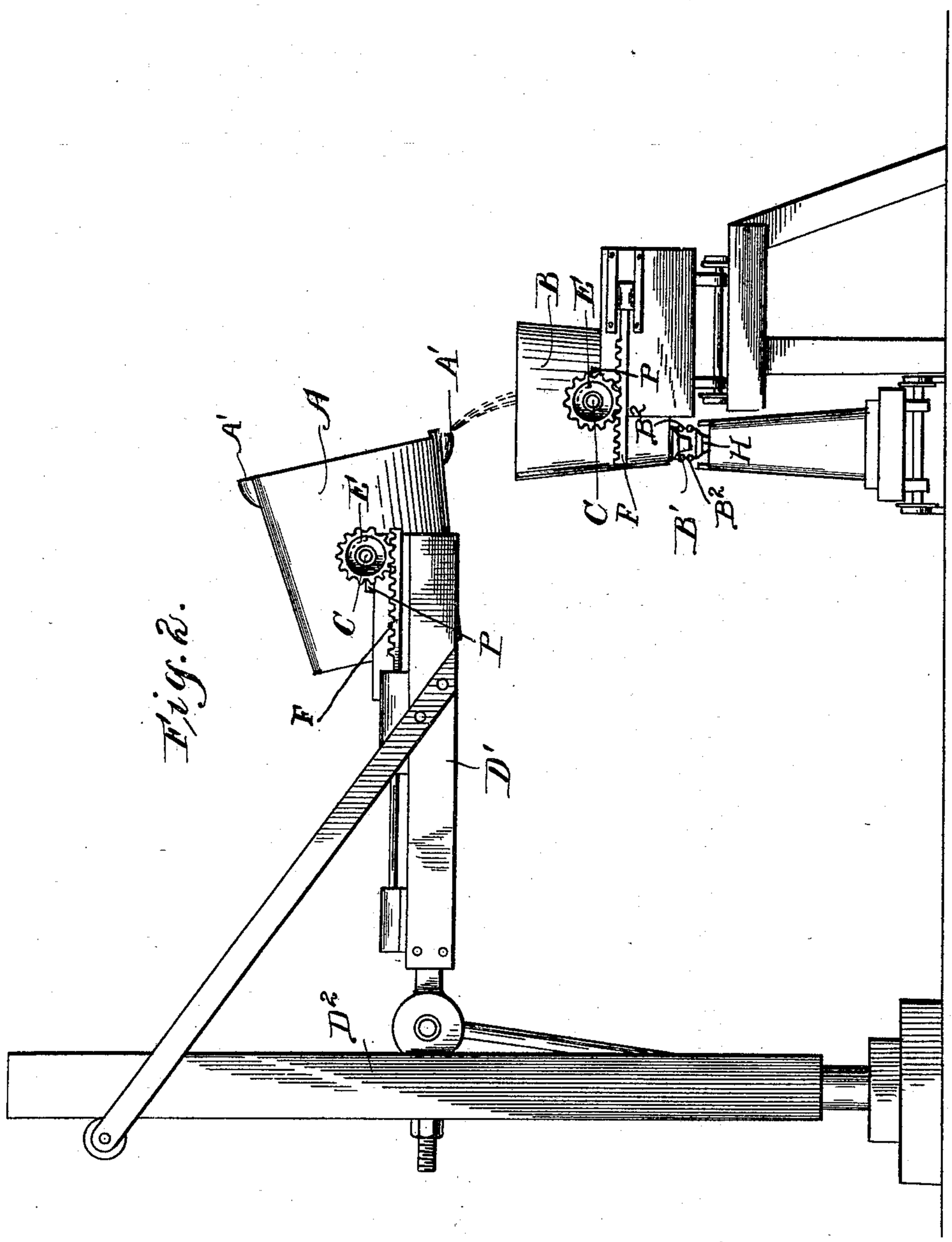

Fig. 2.

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MEANS FOR TRANSFERRING STEEL FROM VESSELS OR FURNACES TO MOLDS.

(Application filed May 8, 1897.)

(No Model.) 3 Sheets—Sheet 3.

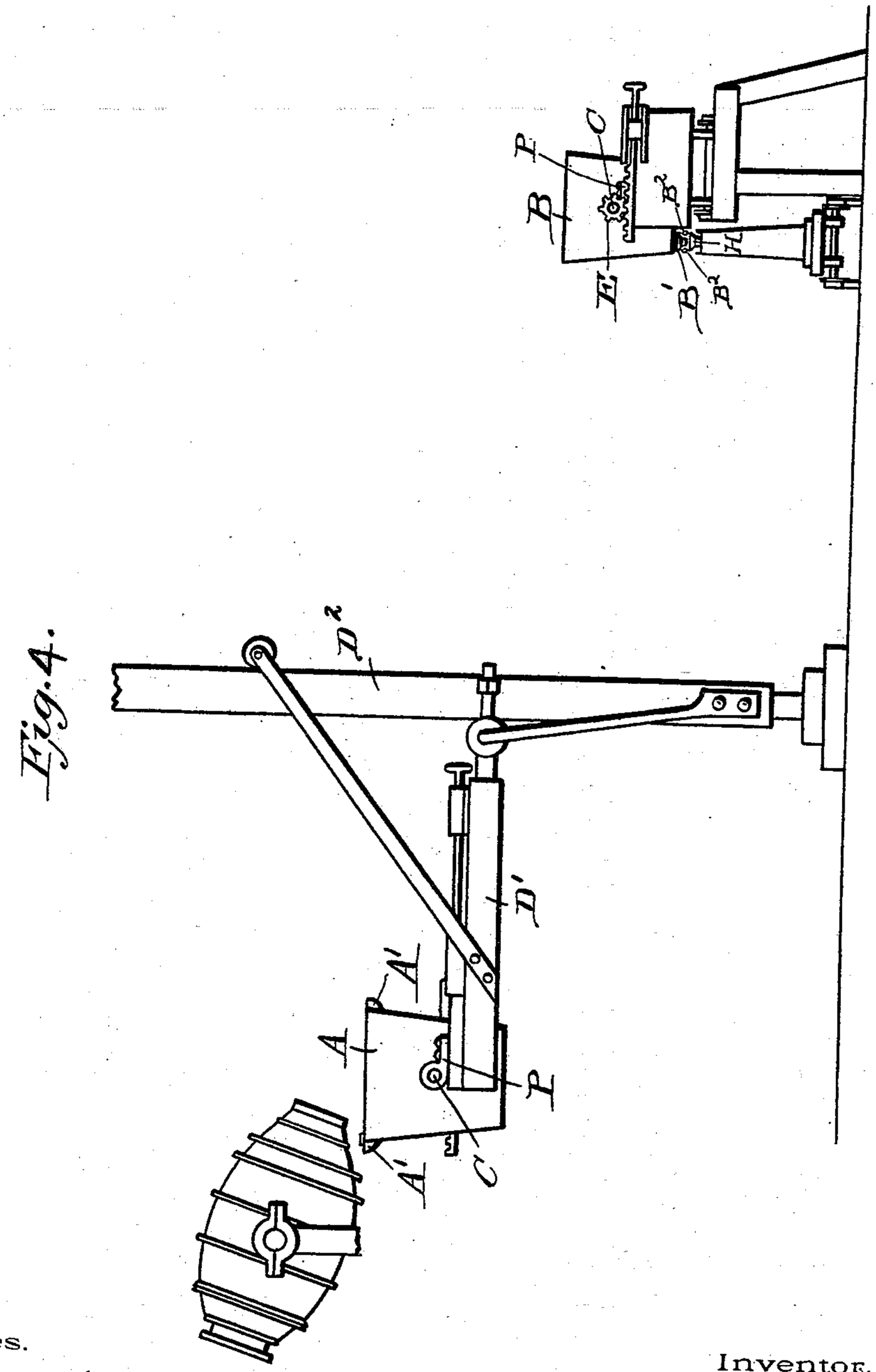

Fig. 4.

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UNITED STATES PATENT OFFICE.

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MEANS FOR TRANSFERRING STEEL FROM VESSELS OR FURNACES TO MOLDS.

SPECIFICATION forming part of Letters Patent No. 623,073, dated April 11, 1899.

Application filed May 8, 1897. Serial No. 635,704. (No model.)

To all whom it may concern:

Be it known that I, ALLEN DAVID BURT, a citizen of the United States, and a resident of Bellaire, in the county of Belmont and State of Ohio, have invented certain new and useful Improvements in Means for Transferring Steel from Vessels or Furnaces to Molds; and I do 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a side view of apparatus which may be employed for carrying out this invention. Fig. 2 is a similar view showing different apparatus for the same purpose. Fig. 3 is a detail view showing the ladle. Fig. 4 is a side view similar to Fig. 2, but with the crane-arm D′ swung around to bring its ladle A in position to receive its charge from a converter.

This invention has relation to a certain new and useful apparatus for pouring open-hearth, Bessemer, or other steels and metals in the formation of ingots, castings, &c.

The invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claim.

The invention is designed to produce a superior quality of steel or other metal by effecting a more thorough mixing of the component parts thereof and by eliminating therefrom the accumulated sulfurous and other gases which in the present methods to a large extent enter the molds and injuriously affect the quality of the product. It is also designed to effect a large saving in time, labor, and cost of material and to largely prevent accident to life and limb by burns resulting from the molten metal or otherwise.

It is also designed to provide simple and effective means for manipulating metal in its molten state.

Other objects and advantages arising from the practice of the invention will be hereinafter pointed out.

In the practice of my invention I provide two ladles, which in the accompanying drawings are designated, respectively, by the letters A and B. The first ladle A is designed to receive the molten metal from the converter, furnace, or other vessel or receptacle, while the second ladle B is designed to receive the metal from the first ladle and deliver it to the mold or molds.

In Fig. 1 I have shown both ladles as being mounted upon trunnions C in bearings P on a suitable pouring stand or frame D, to which the ladle A may be transferred, with its load of metal, from the converter or furnace by a crane or other suitable means.

In Fig. 2 I have shown the ladle B as being mounted on the pouring stand or frame, while the ladle A is on the arm of a crane D′. This crane may be of any suitable or well-known character. As shown in Figs. 2 and 4, it consists of a horizontal arm D′, connected to a rotary post D^2. Such crane, however, forms no part of my invention. The two ladles may, however, be supported on carriers of any suitable character.

In Figs. 2 and 4 the ladle B is shown as mounted upon a movable carriage, upon which it may be carried around in the path of the crane. The molds are also shown as being mounted upon movable trucks.

One of the trunnions C of each ladle is shown as having a gear-wheel or trunnion E, whose teeth engage the teeth of a longitudinally-movable rack-bar F, by the operation of which the ladles can be readily tipped or turned.

The ladle A is provided with a semicircular or trough-shaped spout or pouring-lip A′ at its upper portion, (in the drawings one of these lips or spouts is shown upon each side,) and placed across the same is a bar or brick *a* of refractory material, the purpose of which is to hold back the cinder or slag and at the same time permit the metal to flow underneath it.

The ladle B has in its bottom, to one side of the center, an apertured fire-brick B″, through which the metal is delivered to the mold.

H indicates a funnel which is suspended underneath the orifice of the apertured brick B′ by means of chains B^2 or the like. The purpose of this funnel is to catch any molten metal which might otherwise be thrown from

the orifice of the said apertured brick when the ladle B is tipped to one side to cut off the flow through said brick.

In operation while the ladle A is being filled from the furnace, converter, or the like there is thrown into it (or has been thrown into it) spiegeleisen, ferromanganese, molten pig-iron, or other material or compound used in the particular process being carried out, this operation being known as the "mix" or "recarbonization." The metal is then poured into the ladle B as it is needed, and from thence runs through the apertured brick B′ and the funnel H into the mold. When sufficient metal has been poured into the mold to form the ingot or casting, the first ladle is turned back to stop the flow. The second ladle is also turned backward to prevent loss of metal, (the brick B′ being located to one side of the center, as described.) The ladles are then moved to the next mold, or another mold is moved under the ladle B, and the foregoing operation is repeated to form another ingot or casting. When slag becomes accumulated in the ladles, they can be turned upside down and cleared.

Another method of using the apparatus consists in first pouring the metal into the first ladle or other suitable receptacle, thence back into the furnace, converter, &c., whereby the metal is given the mix, thence tapped, poured, or drawn into the second ladle, and thence through the brick B′ into the mold. By the second pouring of the metal before it enters the mold a more uniform and much superior quality of steel is obtained, a thorough agitation of the manganese and steel taking place in the passage of the molten metal from one ladle or receiver to another before it enters the mold or other casting device and causing a more thorough melting of the manganese and a more uniform cohesion of the molecules of the manganese and steel to produce a solid and dense ingot or casting. The accumulated gases are also afforded an escape, and the tendency of the metal to "pipe"—that is, to boil up in the mold and then settle down, leaving a metal chill around the mold—is overcome. The temperature is also more evenly regulated. In the methods heretofore practiced the pressure of the metal in the ladle (from five to ten tons) is so great that the first ingot or casting is formed in a much less time than the later or last ones, resulting in a lack of uniformity in the product. By the use of the apparatus herein described each ingot is poured at nearly the same pressure and temperature and in the same given time.

In the old process the immense pressure when the stopper is opened causes the stream to strike the mold-stool with such force as to melt and cut or wear it in a short time. My invention is designed to obviate this difficulty and to afford a great saving in the cost of stools alone. This immense pressure also ruins the bottom of the mold in a short time. This I avoid to a large extent. I am also enabled to pour the stream at the center of the mold. By pouring from the first ladle just enough metal to allow it to flow through the brick B′ lightly and of its own weight I also avoid splashing or spraying. When metal spashes or sprays against the sides of the mold, it becomes chilled, and as the metal rises in the mold it becomes chilled and attaches to the ingot, which is thereby ruined or made defective.

The invention also does away with the cost of stoppers, the making and repair of cores for stoppers, the cost of hollow bricks to cover the stopper-cores, and of end bricks to cover the lower ends of stoppers; also, the cost of the key-wedges and cast-iron sleeves to fasten such hollow and end bricks, and with the expense of making and repairing stopper slides and frames, with the brackets and securing devices therefor; also, the expense of iron and wooden pricks, slide-operating devices, chisel-bars to clean out the brick-hole, the cost of ladle-bricks, &c., the labor required to scrape molds to remove waste steel therefrom, &c.

It is also designed to reduce largely the force required in each shift in the manipulation of the metal and in the setting and operation of the stopper as now required.

The invention also greatly reduces the liability of accidents, there being no stopper to burn off or become misplaced or for metal to chill on its base end or to chill the metal in the ladle-brick; also, by having no slide to fail to operate, (when a stopper burns off, becomes misplaced, or metal chills on the end or it chills metal in the brick or when the slide fails to work, the metal escapes on the mold and floor and scatters among the workmen;) also, by reason of there being no stopper to pull out or become unfastened and fly out, no wedges to drive out of the slide, and no necessity for opening the ladle, (this last act sometimes causes the metal to boil over the top of the ladle and fly among the workmen;) also, by doing away with the necessity for pricking a heat while the metal is flowing or when the ladle-brick hole is stopped up, (when a prick is forced through the chilled metal in the ladle-brick, the metal occasionally boils up and slops over and is thrown among the workmen with great force.) With the apparatus herein described to prick a heat when the metal is flowing the first ladle is turned up, which thereby stops the flow of metal to the second. The latter is then reversed, so as to allow the apertured brick to be cleared.

In all of the above-enumerated features of advantage there also is effected a great reduction in loss of metal due to accidents of the character enumerated and also by preventing the formation of defective ingots, which go to the scrap-pile. The metal chilled in the ladles is melted by the next heat, and by regulating the flow I also prevent loss from boiling over in "wild heats." The ladles be-

ing always prepared for a heat, (no stoppers to be set or slides adjusted, &c.,) I also effect a considerable saving in close heats. The metal left over after pouring a heat can be poured back into the converter or furnace or be kept for the next heat. Chilled heats may be saved by raising the temperature in the next heat and taking one-half of the chilled and one-half of the hot heat to constitute one pour.

Other advantages arising from the use of the apparatus herein described might be enumerated. The above, however, will be sufficient to indicate its utility.

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

In apparatus of the character described, the combination with a converter, of an open-top ladle for receiving molten metal from said converter and supported to tilt in a vertical plane, said ladle having one or more pouring-lips at its upper edge, a second open-top ladle supported at a lower level than the first-named ladle, and in position to receive the discharge from a pouring-lip thereof, and having in its bottom, to one side of its center, a stopperless apertured brick through which the metal received from the first ladle is delivered to the molds, said second ladle being also supported so as to tilt in a vertical plane, whereby the flow of metal through said brick may be cut off or the ladle may be reversed together with means underneath the said apertured brick and flexibly connected to the second ladle for directing the discharge from said brick into the mold, substantially as specified.

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

ALLEN DAVID BURT.

Witnesses:

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HUNTER S. ARMSTRONG.