

(No Model.)

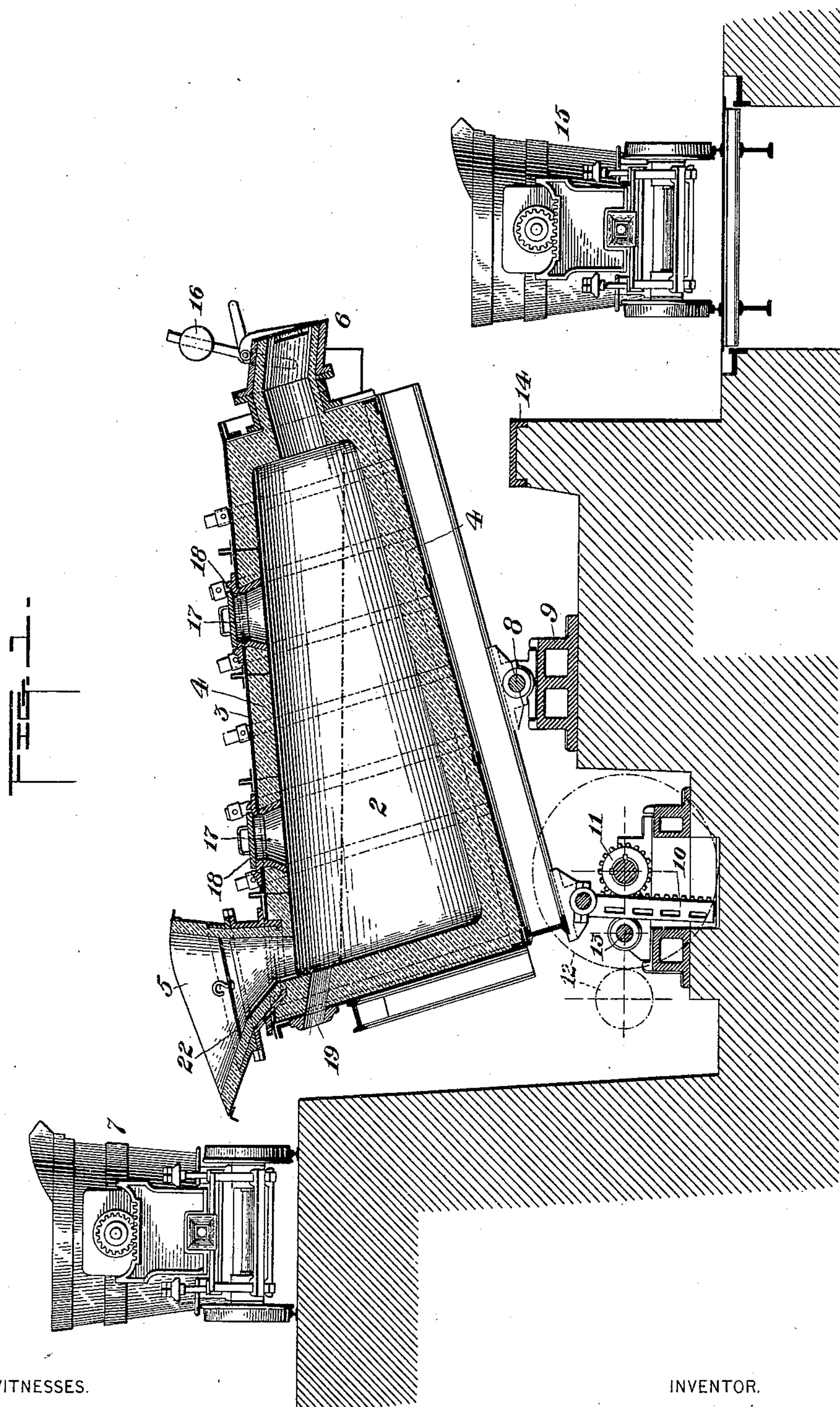
2 Sheets—Sheet 1.

W. R. JONES.

APPARATUS FOR MIXING MOLTEN PIG METAL.

No. 404,415.

Patented June 4, 1889.



WITNESSES.

*N. B. Connor*  
*H. L. Gill*

INVENTOR.

*William R. Jones*  
*by W. B. Baskett & Sons*  
*his attorneys*

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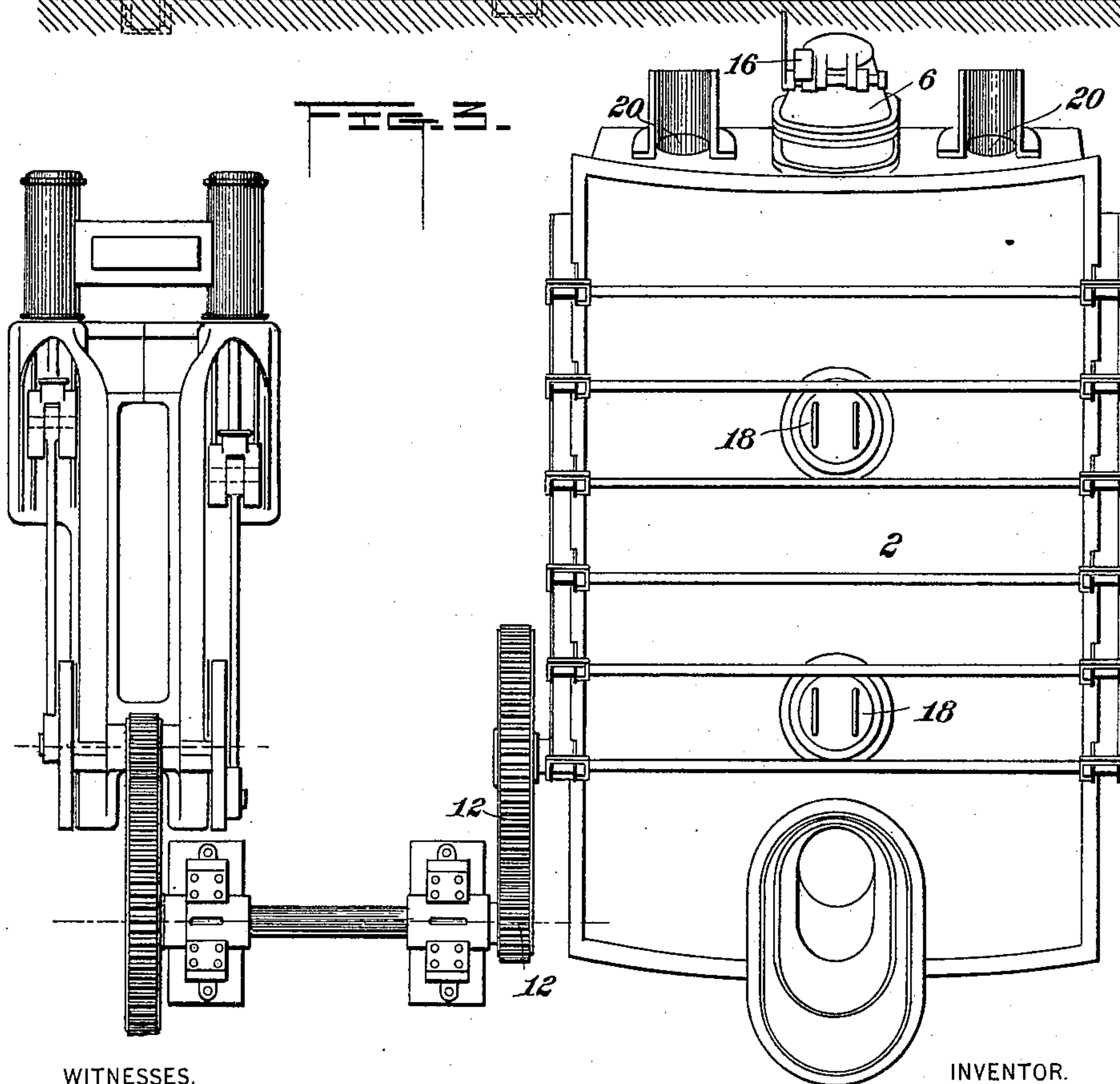
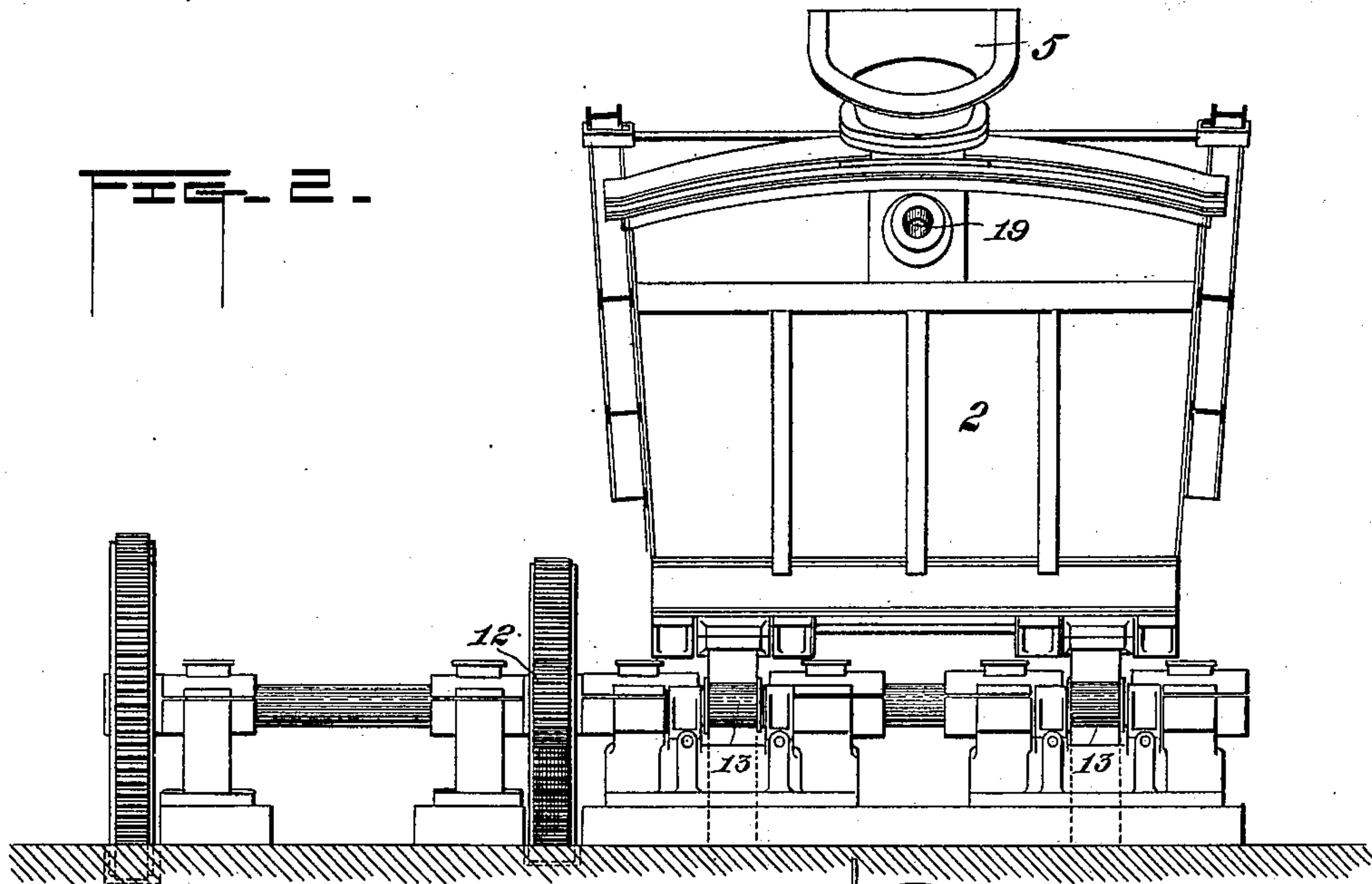
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*his attorneys*



# UNITED STATES PATENT OFFICE.

WILLIAM R. JONES, OF BRADDOCK, PENNSYLVANIA.

## APPARATUS FOR MIXING MOLTEN PIG METAL.

SPECIFICATION forming part of Letters Patent No. 404,415, dated June 4, 1889.

Application filed October 31, 1888. Serial No. 289,673. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM R. JONES, of Braddock, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Mixing Molten Pig Metal; and I do hereby declare the following to be a full, clear, and exact description thereof.

I shall describe my invention with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of my improved apparatus. Fig. 2 is an end elevation of the mixing-vessel and its actuating mechanism, viewed in the direction of the arrow A of Fig. 1. Fig. 3 is a plan view of the parts shown in Fig. 2.

Like symbols of reference indicate like parts in each.

The primary object of the invention is to provide means for insuring uniformity in the product of a Bessemer steel works or similar plant, in which the metal from one or more blast-furnaces is employed to charge the converters. The product of different furnaces or of the same furnace at different times varies in quality, the variation depending on the kind of ore employed and on many other conditions well known to those skilled in the art, so that when the converters are charged at one time with the output from one furnace and at another time with the output from another furnace or furnaces the manufactured steel lacks uniformity in grade. To avoid this, I employ suitably-constructed reservoirs or vessels, into which the molten metal from the blast-furnaces is put, the vessels being of proper capacity to hold a considerable charge of metal from a single furnace or from a number of furnaces, and being adapted to retain the metal in a molten state for a sufficient time to enable the different charges to mix and become homogeneous. The advantage which I thus obtain in securing uniformity and homogeneity in the total product will be readily understood by those familiar with the operations of a steel-works and the frequent loss which is caused by the lack of such uniformity. Such apparatus possesses, also, an additional advantage in that it makes it possible to dispense with cupola furnaces for remelting the pigs preparatory to charging the converters. The metal

may be tapped from the blast-furnaces into ladles or trucks, carried to and discharged into the mixing reservoir or vessel, and there retained in a molten state until sufficient metal has been accumulated to charge the converters. My invention is not, however, limited to its use in connection with converters, since similar advantages may be obtained by casting the metal from the mixing-vessel into pigs for use in converters, puddling-furnaces, or for any other uses to which pig-iron may be put in the art.

Referring now to the drawings, 2 represents the reservoir before mentioned. It consists of a covered hollow vessel having an outer casing 3, of iron or steel, which is suitably braced and strengthened by exterior beams and tie-rods, as shown in the drawings. The whole interior of the vessel is lined with fire-brick or other refractory lining, which should be of sufficient thickness to retain the heat of the molten contents of the vessel and to prevent chilling thereof. The vessel is strongly braced and supported by braces and tie-rods, and may be of any convenient size, holding, say, one hundred tons of metal, (more or less,) and its shape is preferably such as shown in the drawings, being rectangular, or nearly so, in cross-section and an irregular trapezium in longitudinal section, one end being considerably deeper than the other. At the top of the deeper end, which I call the "rear" end, is a hopper 5, into which the molten metal employed in charging the vessel is poured, and at the front end is a discharge-spout 6, which is so located that the bottom of the spout is some distance above the bottom of the vessel—say two feet in a hundred-ton tank, and more or less, according to the capacity of the vessel—the purpose of which is that when the metal is poured out of the spout a considerable quantity may always be left remaining and unpoured, and that whenever the vessel is replenished there may already be contained in it a body of molten metal with which the fresh addition may mix. I thus secure, as much as possible, uniformity in character of the metal which is fed to and discharged from the tank, and cause the fluctuations in quality of the successive tappings to be very gradual.

For convenient use of the apparatus I have



found it best to so arrange it that it is adapted to receive its charges of metals from cars or bogies 7, which run on an elevated track at about the level of the normal position of the hopper 5, and to discharge its contents into similar cars or bogies 15 on a track below the spout 6. In order to facilitate the charging and discharging of the metal, the vessel is set on journals or bearings 8, which have their bearings in suitable pedestals 9, and its rear end is provided with depending rack-bars 10, which are pivotally connected with the bottom of the mixing-vessel 2 and are in gear with pinions 11, the shaft of which is connected by gearings 12 with the driving mechanism of a suitable engine. The pinions are held in gear with the rack-bars by idler wheels or rollers 13. As the journals or bearings 8 are located on a transverse line somewhat in advance of the center of gravity of the vessel, it tends by its own weight to tilt backward into the position shown in Fig. 1, but may be restored to a level position by driving the pinions 11, and thus raising the rack-bars 10 until the front part of the bottom of the vessel comes in contact with a rest or stop 14.

The mode of operation of the apparatus is as follows: When the vessel is in the backwardly-inclined position shown in Fig. 1, it is ready to receive a charge of metal from the car 7. Before introducing the first charge, however, the mixing-vessel should be heated by internal combustion of coke or gas, and when the walls of the vessel are sufficiently hot to hold the molten metal without chilling it it is charged repeatedly from the cars 7 with metal obtained either from a number of furnaces or at different times from a single furnace. The charges of metal introduced at different times into the vessel, though differing in quality, mix together, and when the vessel has received a sufficient charge its contents constitute a homogeneous molten mass, whose quality may not be precisely the same as that of any one of its constituent charges, but represents the average quality of all the charges. The mixing-chamber being deeper at its rear than at the front end, as before described, and its normal position when not discharging metal for the purpose of casting being with the bottom inclined upward toward the front or discharging end, and the bottom of the spout being situate above the bottom of the vessel at its forward end, it is adapted to receive and hold a large quantity of molten metal without its surface rising high enough to enter the discharge-spout.

The discharge-spout 6 is furnished with a movable cover operated by a weighted lever 16, which, when closed, serves to exclude the outside air and prevent a draft of air through the vessel and the rapid cooling of the molten contents. If care is exercised in keeping the cover closed, the metal can be kept in a fluid condition for a long time, the heat being kept

up by repeated fresh charges of molten metal and, if necessary or found desirable, by burning gas introduced by a pipe or pipes into its interior.

After the vessel is properly charged the metal is drawn off into the cars 15 from time to time, as it is needed, by opening the door or cover 16 of the spout 6 and driving the engine 12, so as to elevate the rear end of the vessel and tilt it forward, and thus to discharge any required amount of its contents in the manner before explained into the cars 15, which are transported to the converters, or the metal is cast into pigs or otherwise used. The tilting of the vessel does not, however, drain off all the contents thereof, a portion being prevented from escaping by reason of the elevated position of the spout 6, and as the vessel is replenished from time to time each new charge mixes with parts of previous charges remaining in the vessel, by which means any sudden variations in the quality of the metal supplied to the converter is avoided. Instead of discharging the metal into the cars 12 and carrying it in the cars to the converters or casting-house, the vessel 2 may be so situate relatively to the other parts of a furnace-plant as to deliver its contents immediately to the converters or other place where it is to be utilized.

I shall now describe briefly other parts of the apparatus which are desirable and important in its practical use.

At the top of the vessel 2 are man-holes 17, designed to permit of access to its interior for the purpose of repairing or fixing the lining. These holes are provided with suitable covers 18 to exclude cold drafts of air from entering the interior. There is also a hole 19 at the rear end of the vessel near the top, through which a rabble may be inserted for the purpose of assisting or accelerating the mixing of the molten metal, and at the other end, at the level of the bottom of the interior, there are holes 20, provided with suitable spouts to enable all the molten contents to be drawn off when it becomes necessary to do so. (See Fig. 3.) The holes 20 should be provided with suitable stoppers.

I do not desire to limit myself to the precise form of the apparatus which I have shown and described, since many modifications in form and relative location of the parts may be made by the skilled mechanic; but

What I claim is—

1. An apparatus for receiving successive charges of molten metal from a blast furnace or furnaces and mixing the same previous to further treatment, consisting of an iron vessel having a refractory and heat-retaining lining, and being of substantially rectangular and trapezoidal shape in longitudinal cross-section, covered on top with a removable refractory-lined cover or covers, and furnished with suitable man-hole or man-holes, and having a charging-hopper at or near the top at one end and a discharge-



opening at the other end placed above the surface level of the fluid metal when the vessel is in its normal position, said vessel resting on a pivotal support or supports located  
5 nearer to the discharge end than the center of gravity of the vessel, in combination with mechanism for rocking the vessel on its pivotal support, substantially as and for the purpose hereinbefore described.

10 2. A mixing-vessel for molten metal, said vessel having a refractory lining, a heat-retaining cover, a charging-opening, and a discharging opening or spout, and provided with a pivotal support arranged forward of the

center of gravity of the vessel, whereby the floor of the said vessel will normally incline  
15 downwardly from the discharge opening or spout toward the rear of the vessel, in combination with power mechanism for rocking the vessel on its pivotal support, substantially as  
20 and for the purposes described.

In testimony whereof I have hereunto set my hand this 9th day of August, A. D. 1888.

WILLIAM R. JONES.

Witnesses:

E. J. SMAIL,  
W. BAKEWELL.