

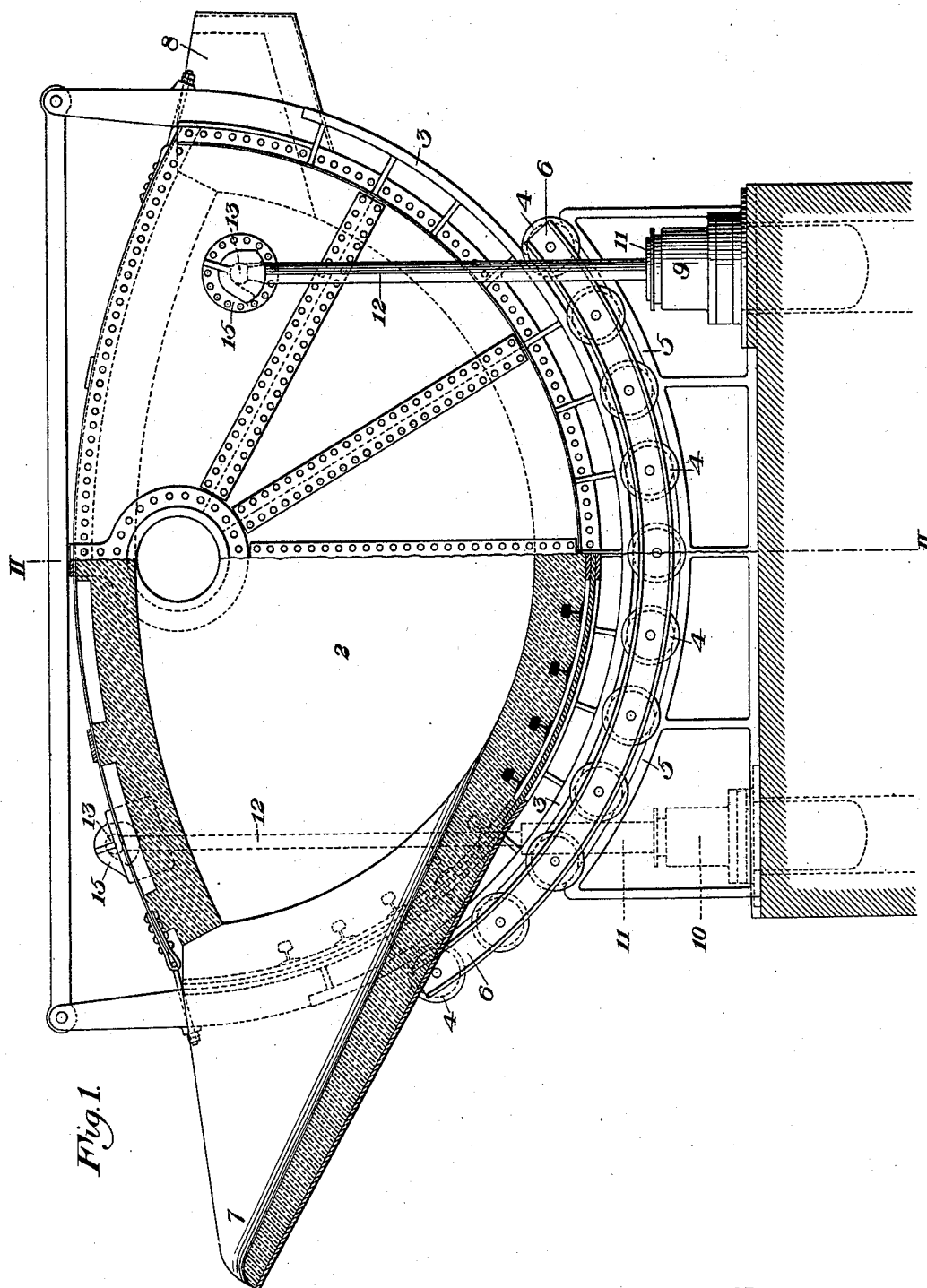
(No Model.)

4 Sheets—Sheet 1.

H. AIKEN.
TIPPING METALLURGICAL VESSELS.

No. 569,987.

Patented Oct. 27, 1896.



WITNESSES

Warren W. Swartz
George D. Blumming.

INVENTOR

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(No Model.)

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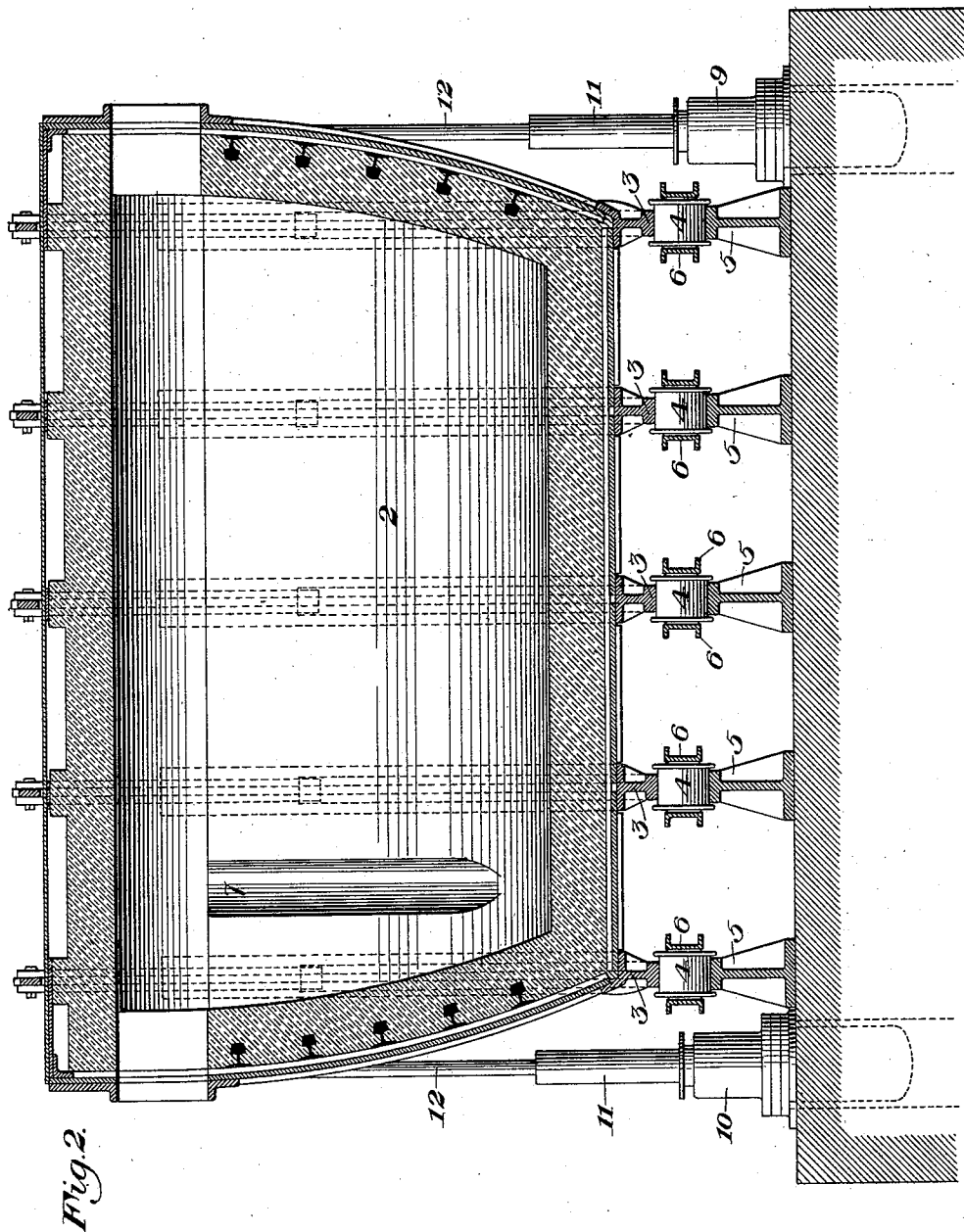


Fig. 2.

WITNESSES

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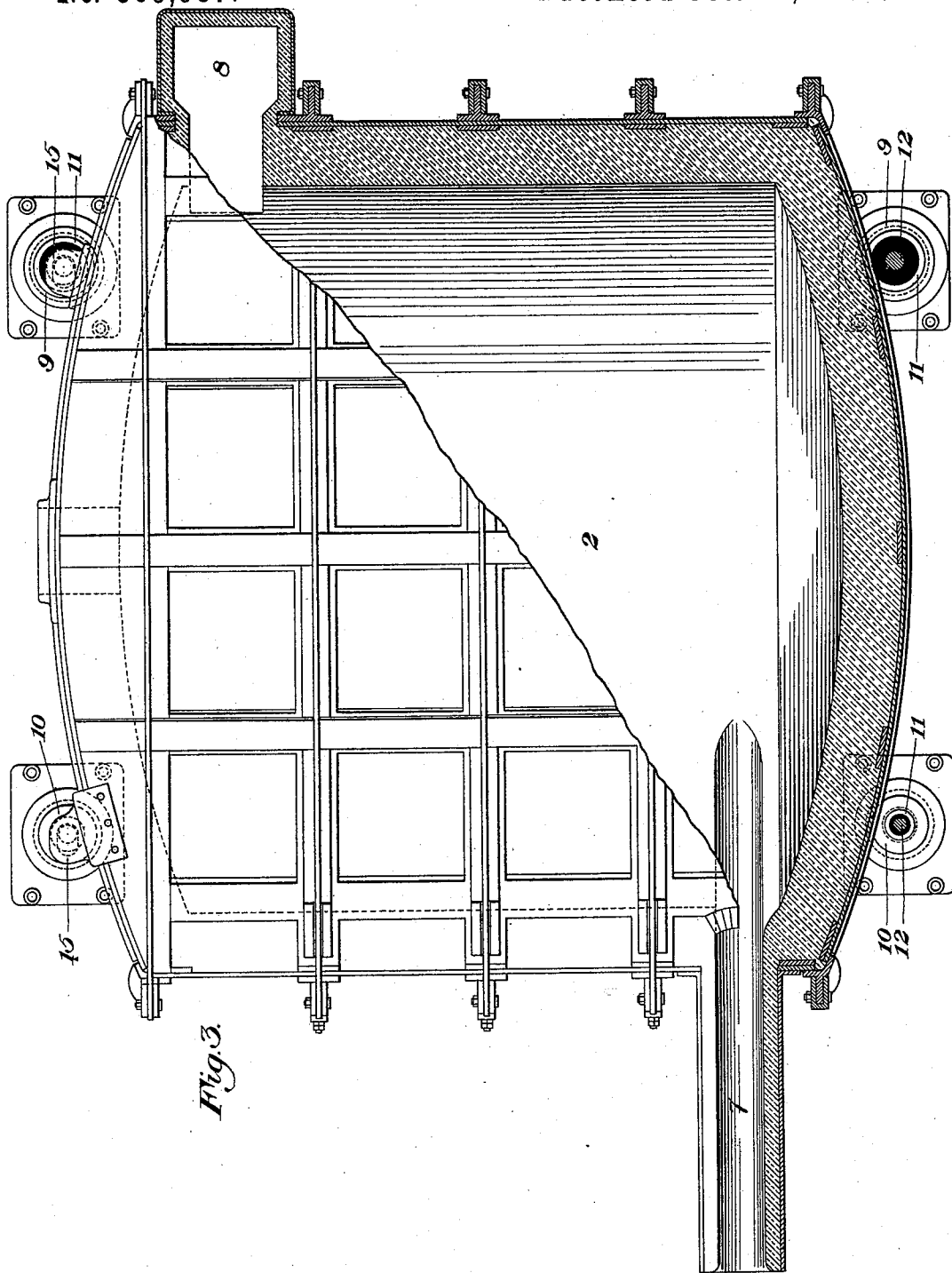


Fig. 3.

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Fig. 4.

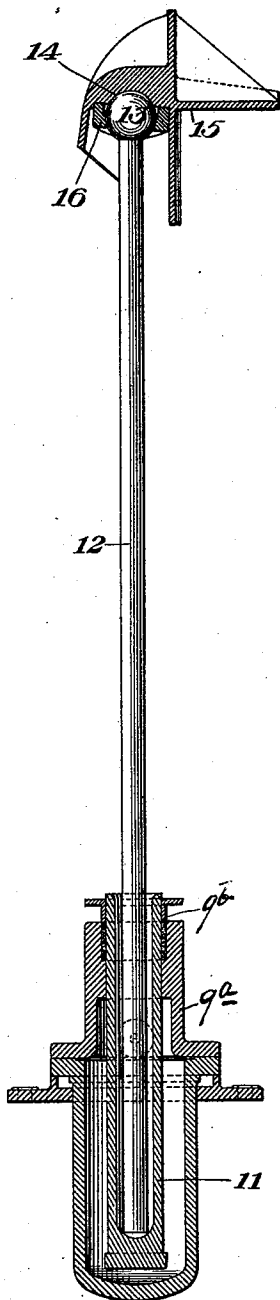


Fig. 5.

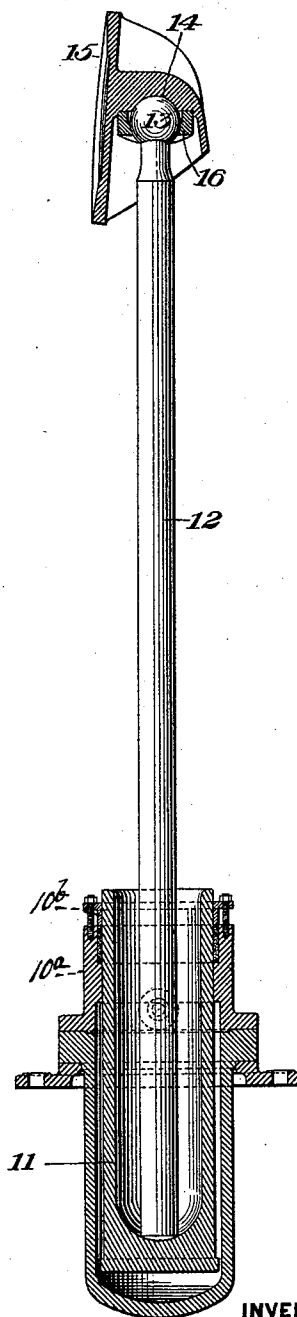
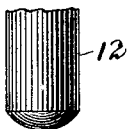


Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA.

TIPPING METALLURGICAL VESSELS.

SPECIFICATION forming part of Letters Patent No. 569,987, dated October 27, 1896.

Application filed February 18, 1896. Serial No. 579,771. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Tipping Metallurgical Vessels, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows in side elevation, partly in longitudinal section, a metal-receiver constructed in accordance with my invention. Fig. 2 is a vertical section on the line II II of Fig. 1. Fig. 3 is a plan view partly in horizontal section. Fig. 4 is a vertical sectional view of the counterbalancing cylinder and plunger with its attachments, by which the receiver is restored to normal position after having been tipped. Fig. 5 is a similar view of the cylinder and plunger for tipping the receiver. Fig. 6 is an enlarged detail view of the lower end of one of the connecting-rods 12 to more clearly show the curved surfaces on which they rock.

Like symbols of reference indicate like parts in each figure.

In the drawings, 2 represents the receiving vessel, in which the molten pig metal is received from the blast-furnaces and is stored until required for use in the converters of a steel-making plant. The bottom of this vessel, which externally is shaped on the arc of a circle, is provided with rails or shoes 3 3 of circular form, each of which bears upon a series of rollers 4 4, supported by circular tracks 5 5. Each series of rollers is journaled between confining plates or beams 6, which are separate from the shoes and rails and serve to connect the rollers in tandem. The construction in this regard is the same as that illustrated in a prior patent, No. 481,885, granted to me with others on August 30, 1892. The rollers are therefore traveling rollers, and when the vessel is tipped they move laterally on their supporting-rails, and thus enable the tipping to be accomplished with very little frictional resistance.

7 is the discharge-spout, and 8 is the charging-hole of the receiver.

To tip and right the receiver, I employ a plurality of single-acting hydraulic cylinders arranged on opposite sides of the center of ro-

tation of the vessel, those at the front end (indicated by 9) being righting-cylinders, and those at the rear, and indicated by 10, being tipping-cylinders, and by preference I employ two of each, thus cushioning and balancing the vessel in both of its movements and obtaining such a control of the vessel as will enable its movement to be arrested at any desired point and will obviate any surging of the molten metal when the movement of the vessel is arrested.

The tipping-cylinders 9 are set at the rear corners of the receiver and are of somewhat larger diameter than the righting or counterbalancing cylinders 10, which are set at the forward corners thereof, and I prefer that the counterbalancing-cylinders shall be constantly in communication with the source of water-pressure, so that they shall tend always to lift the receiver into and to maintain it in horizontal position, and so that when water under pressure is admitted to the larger tipping-cylinders they shall tip the receiver and shall displace the water from the counterbalancing-cylinders. When the tipping-cylinders are disconnected from the pressure-port and connected with the exhaust-port, the counterbalancing-cylinders will then be free to act and will right the receiver, displacing the water from the tipping-cylinders.

The construction of the cylinders and their connection with the receiver are shown in detail in Figs. 4 and 5, respectively. Each cylinder is upright and has a cylinder-head (9^a or 10^a) provided with a stuffing box or gland (9^b or 10^b) through which moves a cup-shaped or hollow plunger 11, open at the upper end, and a connecting-rod 12 is set within this plunger, its lower end being rounded and the base of the cavity of the plunger on which it fits being correspondingly rounded. At the upper end of the connecting-rod it is connected loosely or movably to the receiver by a ball-and-socket joint, the ball 13 being formed at the end of the rod and the socket 14 being formed in a bracket 15, fixed to the side of the receiver. A cap 16, fitted on the under side of the ball 13 and fixed to the socket, holds the ball in place in the socket. The consequence of this construction is that the rod 12, not being rigidly fixed at either end, will permit the relative rocking motion

of parts which results when the plungers move and will prevent them from binding, thus affording a universal-joint connection which compensates for the changed relation 5 of the upper socket 14 to the cylinder and plunger 11 incident to the rotation of the vessel, the fixed position of the vertical cylinders, and the vertical movement of the plunger.

- 10 The operation of the apparatus will be readily understood from the foregoing description. The molten metal is introduced into the receiver at 8, and is discharged therefrom as required through the spout 7 by tipping the receiver. The use of the upright 15 cylinders operating at the ends of the vessel, instead of horizontal cylinders, gives perfect control of the tilting operation, so that it can be stopped and started at any point, and just as little or as much metal can be discharged 20 as may be required. It also reduces the foundation-space occupied by the vessel to a minimum.

One advantage incident to the employment 25 of single-acting cylinders is that they can be operated by a single-acting three-way valve, and the pipe connections can be fixed and simple.

It will be understood that my invention, as 30 defined in the claims, is not limited to receivers for molten metal; but the apparatus may be applied to tipping furnaces, &c., since What I claim is—

1. In a metallurgical apparatus, the combination with a tipping vessel, of upright single-acting cylinders arranged on opposite 35 sides of the center of rotation of the vessel, means for connecting the cylinders and vessel, and means for simultaneously applying pressure in the cylinders on opposite sides of 40

the vessel; substantially as and for the purposes specified.

2. In a metallurgical apparatus, the combination with a tipping vessel, of a single-acting tipping-cylinder on one side of the 45 center of rotation of the vessel, a single-acting counterbalancing-cylinder on the opposite side of the vessel, and means for maintaining the latter cylinder in constant communication with the source of pressure during the operation of the apparatus; substantially as and for the purposes specified. 50

3. In a metallurgical apparatus, the combination with a tipping vessel, of two upright single-acting tipping-cylinders bearing thereon 55 at the rear corners, two upright single-acting righting-cylinders bearing thereon at the forward corners, means for connecting the cylinders with the tipping vessel, and means for simultaneously applying pressure 60 in the cylinders on both sides of the vessel; substantially as and for the purposes specified.

4. In a metallurgical apparatus, the combination with a tipping vessel, of a single- 65 acting tipping-cylinder, and a single-acting counterbalancing-cylinder, the tipping-cylinder being of greater diameter than the counterbalancing-cylinder, and means for maintaining the counterbalancing-cylinder in 70 constant communication with the source of pressure; substantially as and for the purposes specified.

In testimony whereof I have hereunto set my hand.

HENRY AIKEN.

Witnesses:

F. E. YOUNGS,

GEORGE B. BLAMMING.