

(No Model.)

3 Sheets—Sheet 1.

J. J. FRONHEISER.

APPARATUS FOR INTRODUCING SAND OR OTHER POWDERED OR
GRANULATED SUBSTANCES INTO BESSEMER CONVERTERS.

No. 387,952.

Patented Aug. 14, 1888.

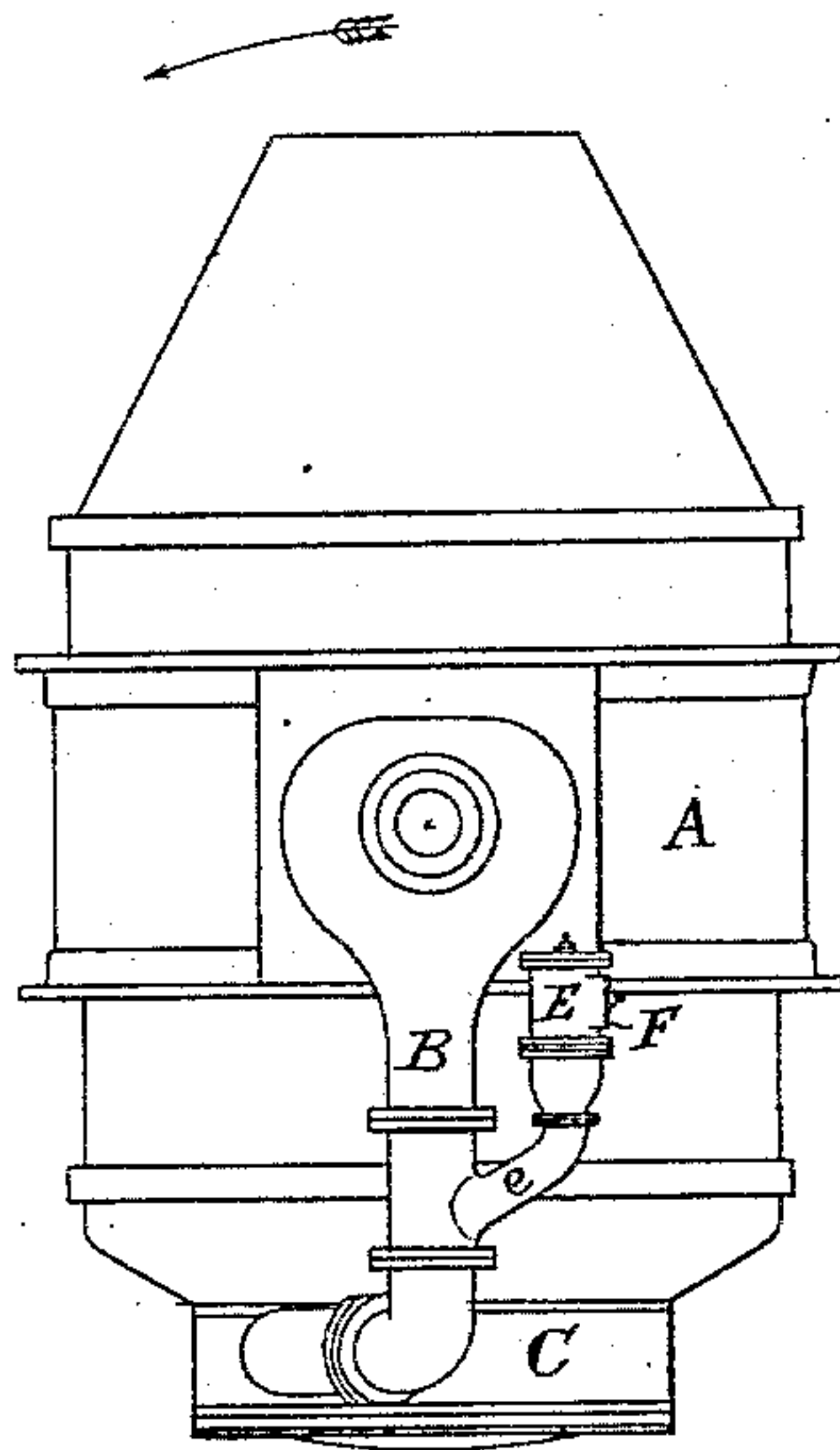


Fig. 1.

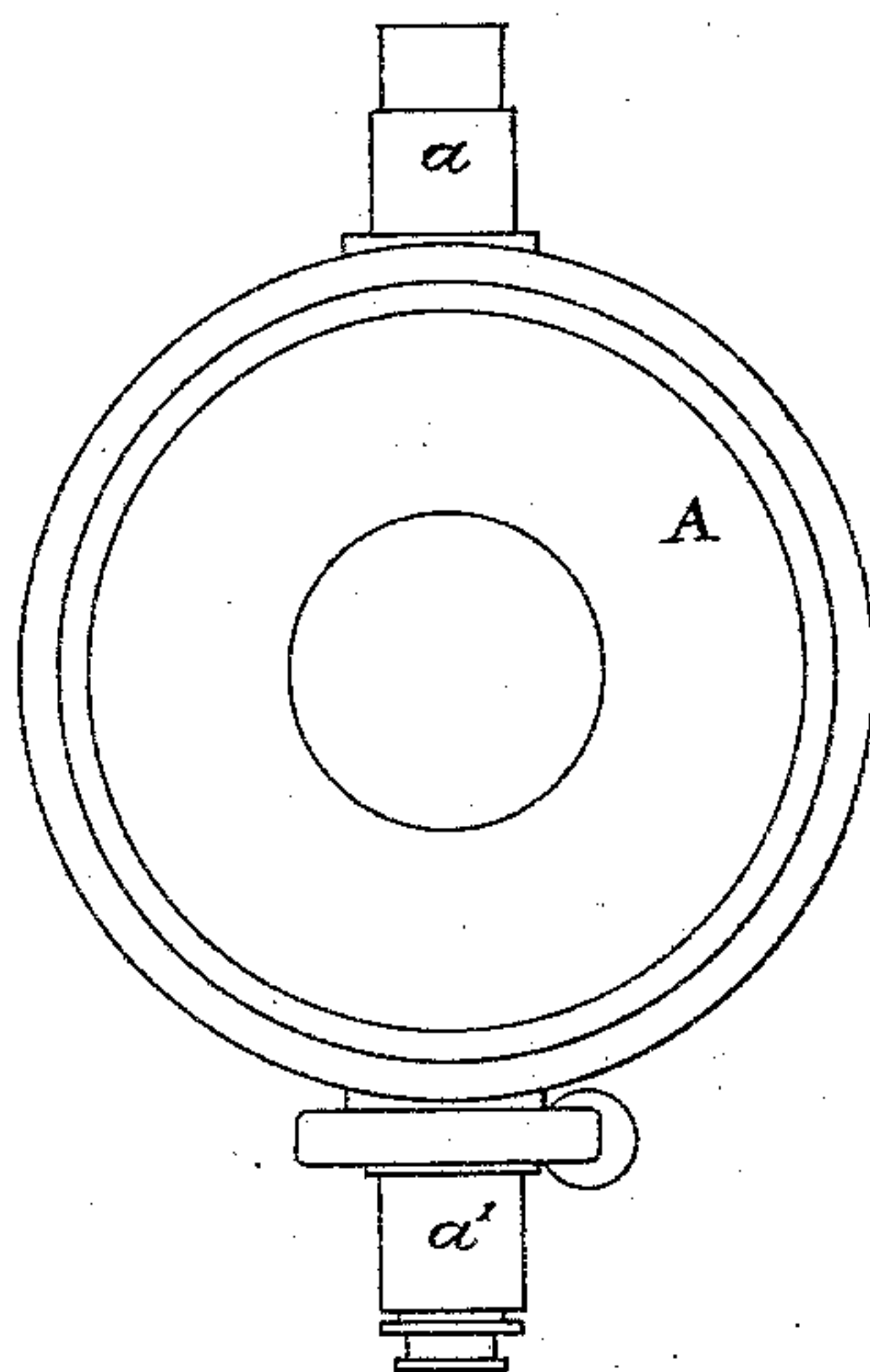


Fig. 2.

WITNESSES.

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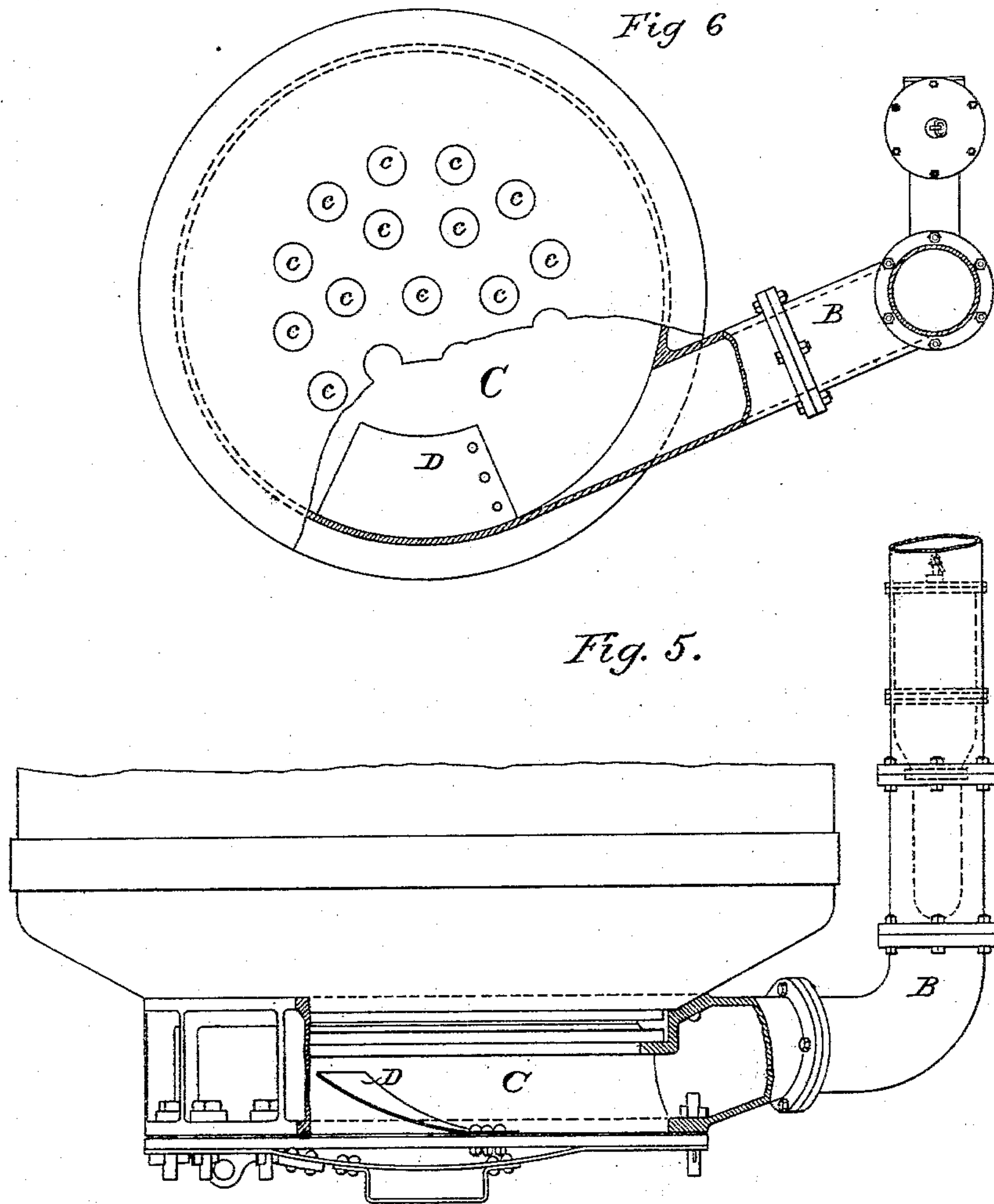
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR INTRODUCING SAND OR OTHER POWDERED OR GRANULATED SUBSTANCES INTO
BESSEMER CONVERTERS.

SPECIFICATION forming part of Letters Patent No. 387,952, dated August 14, 1888.

Application filed May 11, 1888. Serial No. 273,552. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. FRONHEISER, a citizen of the United States, residing at Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Introducing Sand or other Powdered or Granulated Substances into Bessemer Converters through the Blast-Pipes; and I do hereby declare that the following is a full, clear, and exact description of my invention, such as will enable those skilled in the art to make and use the same.

In the manufacture of Bessemer steel it is found advantageous to introduce certain powdered or granulated substances, principally sand, in the bath of molten metal at particular stages of the blow. If the sand is thrown into the mouth of the converter, it cannot pass with certainty into the interior of the bath, but is arrested by the slag or immediately blown out by the blast.

The object of my invention is to provide means for introducing a predetermined charge of sand into the blast-pipe, and distributing it in the blast in such manner as to carry it uniformly through the tuyeres into the bath of molten metal.

Bessemer converters as ordinarily constructed have one hollow trunnion through which the blast passes. The blast-pipe leading to this trunnion is provided with a packing-box at the point of connection with the trunnion, so that a tight air communication is maintained at all times, no matter how the converter is turned on its trunnions.

My invention consists in a receptacle located on the side of the blast-pipe between the blast-trunnion and the wind-box of the converter, this receptacle being adapted to receive the charge of sand through a proper air-tight door. When the converter is turned up in the blowing position, the bottom part of the sand-receptacle communicates with the blast-pipe through a downwardly-inclined passage. The upper part of this passage is closed by a suitable downwardly-opening valve of shape similar to the bell of a blast-furnace until such time as the operator deems suitable for introducing the sand, when the valve is opened by

lowering from its seat, thereby allowing the sand to flow into the blast and be carried into the metal. If no provision were made to prevent it, the sand would lodge in the bottom of the wind-box, which is located under the tuyeres, and would not be carried into the bath of metal at the proper time; but to prevent the sand from so lodging I bring the blast-pipe into the circular wind-box in a tangential direction, thereby causing a whirl or eddy of air in the wind-box, and I locate in the bottom of the box attached thereto an inclined deflecting-plate to continually raise the sand from the bottom of the wind-box and deliver it in the air in such manner as to thoroughly intermix therewith. The particles which fail to be carried up through the tuyeres and fall to the bottom of the box are recaptured by the inclined deflecting-plate during their revolution around the box, and again distributed in the air.

The object in placing the sand-receptacle on the side of the blast-pipe between the blast-trunnion and the wind-box, and not on the main blast-pipe leading to the trunnion, is to prevent scoring of the packing-box of the blast-trunnion by the sand.

Referring to the drawings attached hereto, and which form part of this specification, Figure 1 represents a side elevation of a Bessemer converter with my improvement attached. Fig. 2 is a plan of the same. Fig. 3 is a rear elevation of the sand-receptacle. Fig. 4 is a section of the same through the vertical center line of Fig. 3. Fig. 5 is an elevation of the wind-box with a part broken away. Fig. 6 is a plan of the wind-box with a part broken away. Fig. 7 is a sectional detail on Y Z of Fig. 3.

Like letters of reference refer to like parts throughout.

A represents the converter; a a' , the trunnions thereof, a' being the blast-trunnion; B, the blast-pipe extending from the trunnion a' to the wind-box.

C is a circular wind-box, in the upper part of which is placed the tuyeres, which are secured in the holes c of the upper plate of the wind-box. Riveted to the bottom plate of the wind-box is the inclined deflecting-plate D.

Referring to Fig. 1, E is the sand-receptacle, and *e* the downwardly-inclined pipe connecting bottom part of the sand-receptacle E with the blast-pipe B.

5 The sand-receptacle (shown fully in Figs. 3 and 4) consists in the main of cast-iron flanged sections bolted together.

e' is the sand-receptacle proper. Connected at the lower part of *e'* by the flanged connection is the diaphragm *e²*, which is of the form of an inverted cone, having an opening in its central part.

e³ is a conically-shaped valve adapted to close the opening in the diaphragm *e²*.

15 *e⁴* is a plate forming the head of the sand-receptacle. This plate has a central boss, which is bored and bushed to receive a freely-sliding pin, *e⁵*.

e⁶ is a tapered key passing through a slot in the sliding pin *e⁵*, and having a bearing for its under side on the central boss of the plate *e⁴*. The link-connection, which is obvious from the drawings, connects the sliding pin *e⁵* with the valve *e³*. The office of the tapered key *e⁶* is to force upward the sliding pin *e⁵*, and through the before-described link-connection hold the valve *e³* firmly against its seat. When the key *e⁶* is removed, the sliding pin *e⁵* drops until the shoulder at its upper part comes in contact with the central boss of plate *e⁴*. This motion being communicated to the valve *e³*, opens it to its fullest extent. The hand-ring *e⁸* is secured at the extreme upper part of the sliding pin *e⁵*, and furnishes means for raising the sliding pin *e⁵* and its connection for the insertion of the tapered key *e⁶*.

e⁷ is a lower extension of the sand-receptacle, which is in the form of a reducer and is connected with the inclined passage *e*. The enlargement of *e⁷* also forms a space for the sand to freely pass the valve *e³*, when the valve is lowered to admit the charge.

F is a door for inserting the charge, and is adapted to swing on the pivot *f*, and when closed is held in position by a swinging clamp, *f'*, this clamp being held in place by the thumb-nut *f²* on the hinged screw *f³*.

Having fully described the several parts of my invention, I will now proceed to describe the operation of the same.

The converter being turned down—that is, revolved through ninety degrees from the position shown in Fig. 1, in the direction of the arrow—the door F of the sand-receptacle is brought on top. The sliding pin *e⁵* is now drawn out by the hand-ring *e⁸*, and the tapered key *e⁶* inserted, thus firmly securing in its closed position the valve *e³*. The door F is then opened by releasing the clamp *f'* and swinging the door F on its pivot *f*, and a suitable charge of sand is poured into the recep-

tacle. The door F is now closed and secured. It is presumed by this time that the charge of molten iron has been placed in the converter, which is now turned up and the blowing proceeded with. When the blowing has reached that proper stage at which, in the judgment of the operator, the sand should be introduced, the tapered key *e⁶* is removed, thereby releasing the sliding pin *e⁵*, and allowing it to fall on its shoulder, thus opening the valve *e³* and permitting the sand to flow through the downwardly-inclined passage *e* into the blast-pipe B, from which it is delivered in a tangential direction into the circular wind-box C. The inclined deflecting-plate D immediately raises it from the bottom of the wind-box C, and distributes it in the air contained within the wind-box, whereupon some portions of the sand will be immediately carried by the blast through the tuyeres into the bath of metal, and other portions will fall to the bottom of the wind-box C and be carried around with the eddy of air until they are again caught by the plate D and redistributed in the air above the bottom of the wind-box C.

Having fully described my invention and the manner of operating the same, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for introducing sand or other powdered or granulated substances into a Bessemer converter with the blast, the combination of a wind-box, a blast-pipe with a tangential passage to the wind-box, and an inclined deflecting-plate located in the bottom of the wind-box, substantially as set forth.

2. A sand-receptacle located on the side of the blast-pipe of a Bessemer converter, in combination with a passage connecting the sand-receptacle with the blast-pipe at some point between the converter-trunnions and the wind-box, a controllable valve located between the sand-receptacle and the blast-pipe, and an opening for introducing the sand, provided with a tightly-fitting lid or cover, substantially as set forth.

3. The combination of a sand-receptacle located on the side of a Bessemer converter, a controllable valve located in the outlet of the aforesaid sand-receptacle, a passage connecting the aforesaid sand-receptacle with the blast-pipe of the converter at some point between the trunnion and the wind-box, a blast-pipe entering the wind-box in a tangential direction, and a deflecting-plate located in the bottom of the wind-box, substantially as specified and set forth.

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Witnesses:

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