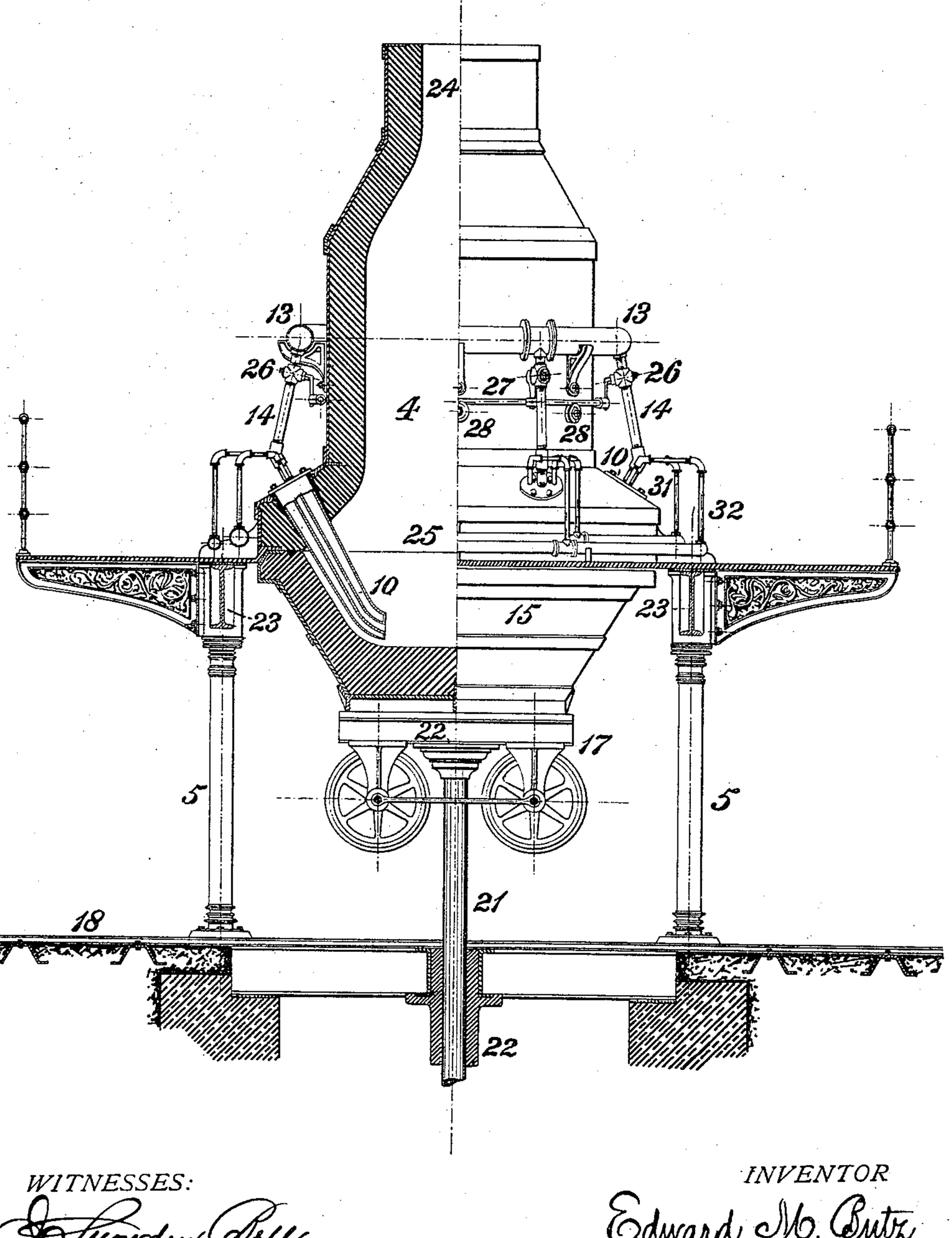
(No Model.) 2 Sheets—Sheet 1.

E. M. BUTZ.

CONVERTER FOR THE MANUFACTURE OF IRON AND STEEL.

No. 332,636. Patented Dec. 15, 1885.

Fig: 1.



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(No Model.) 2 Sheets—Sheet 2.

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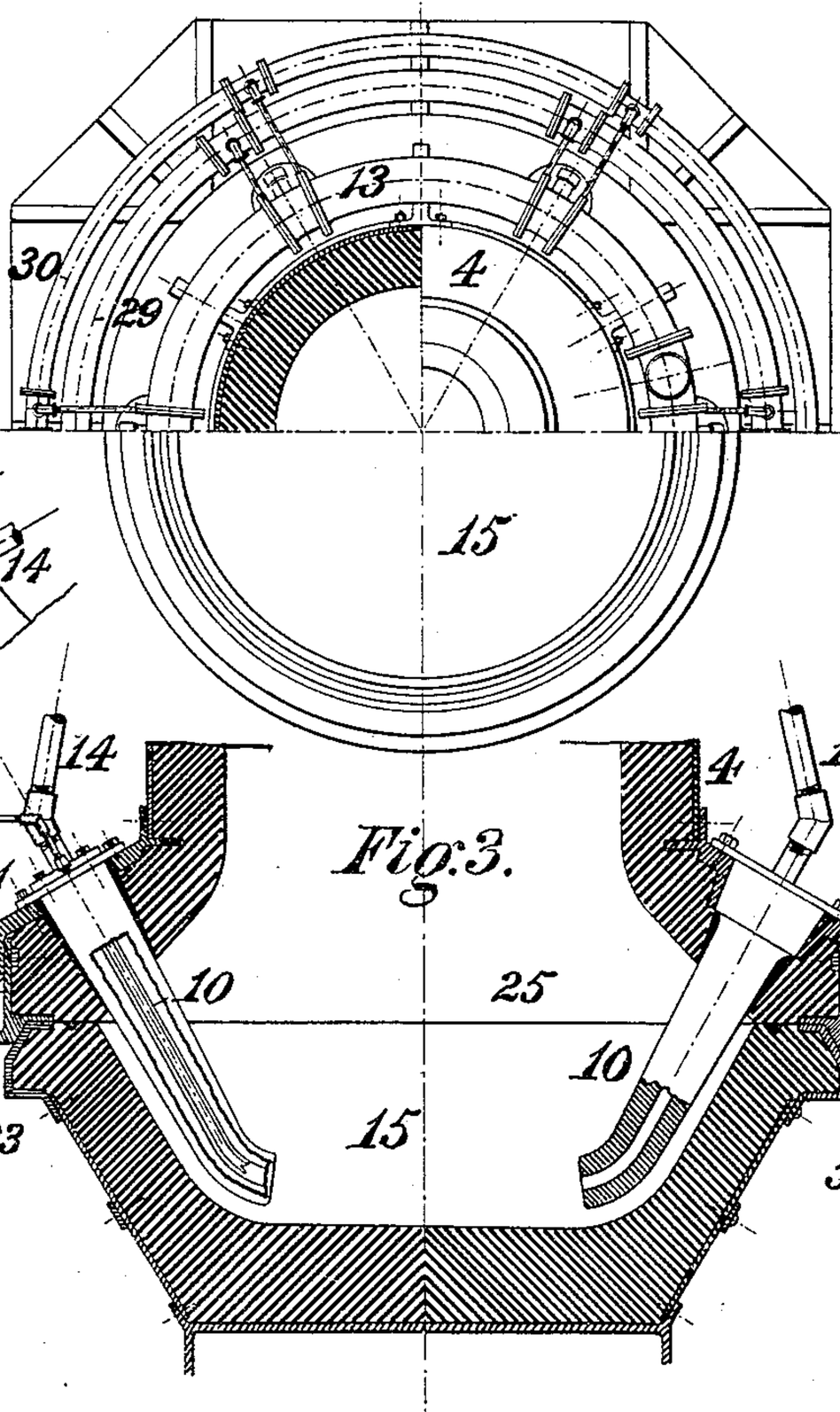
Fig: 2.



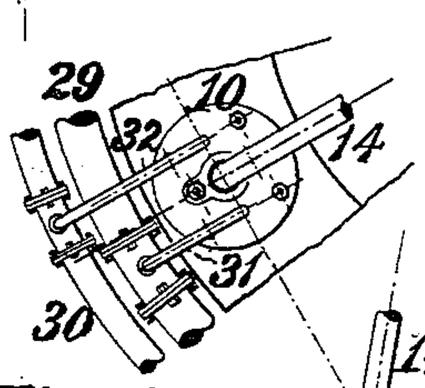


Fig: 4.

Fig: 3.

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UNITED STATES PATENT OFFICE.

EDWARD M. BUTZ, OF ALLEGHENY, PENNSYLVANIA.

CONVERTER FOR THE MANUFACTURE OF IRON AND STEEL.

SPECIFICATION forming part of Letters Patent No. 332,636, dated December 15, 1885.

Application filed June 1, 1885. Serial No. 167,148. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BUTZ, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Converters for the Manufacture of Iron and Steel, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1, Sheet 1, is a view, half in elevation and half in vertical central section, of a converter embodying my invention; Fig. 2, Sheet 2, a plan view, partly in section, the upper half showing the body of the converter and the lower its bottom; Fig. 3, a vertical central section through the converter-bottom and a portion of the body, and Fig. 4 a plan view showing one of the tuyeres and the pipes connected thereto.

My invention relates to converters for the manufacture of iron and steel under the "Bessemer" or pneumatic process, of the type known as the fixed or "Swedish," as contradistinguished from those which are charged and discharged by tipping or rocking upon fixed pivots or trunnions; and its object is to provide a converter of such type in the use of which the charging and discharging of the molten metal may be readily and expeditiously effected, and which shall afford improved facilities for the renewal or repair of the portion most subject to wear and deterioration without interfering with the operation of the remaining portions.

To this end my invention, generally stated, consists in a converter having a fixed body or main portion provided with a central gas-escape opening at top and a flaring bottom or lower throat, in the sides of which are fixed a series of inclined tuyeres or blast-pipes, and a separable and removable bottom, serving as the receptacle for the molten metal, and unconnected with the body or blast apparatus.

The improvements claimed are hereinafter fully set forth.

In the practice of my invention the body or main portion 4 of the converter, which is formed of stout sheet metal, properly strengthened by bands and lined with ganister or other suitable refractory material, is fixed to and supported upon a substantial frame composed of posts or columns 5 and beams or girders 23. The body is of substantially cylindrical form for the major portion of its height, and is tapered inwardly at top to an upper throat or discharge-flue, 24, and outwardly at bottom to form an enlarged lower throat, 25, which presents a surface of the refractory lining of the body on its end or face. A series of tuyeres or air-blast pipes, 10, is fixed in the lower throat, 25, of the converter-body, said tuyeres projecting inwardly obliquely to the axis of the body, and downwardly below the face of the throat, so as to enter without coming in contact with the converter-bottom, to be presently described, and to discharge the air supplied to them in the direction of the central portion of said bottom, and not directly upon its face, which forms the lower supporting-bed of the charge of metal. Air under pressure is supplied from a blowing-engine and blast-main to an annular air-trunk, 13, which communicates by branch pipes 14, governed by valves 26, with the tuyeres 10. The valves of the several tuyeres may be simultaneously operated by a circular rod, 27, traversing on rollers 28 on the outside of the converter-body, and coupled to each of the valve-stems. The tuyeres 10 may be either formed of fire-clay, as shown on the right of Fig. 3, or of metal surrounded by a water-jacket, within which a constant circulation of water is maintained from a supply-pipe, 30, through pipes 32, to an exhaust-pipe, 29, through discharge-pipes 31. The converter-body is preferably seated upon its supporting-frame by an annular base-piece, 33, which surrounds the lower throat, 25, and is provided with an inwardly-projecting flange which is flush with the face of the throat, so as to form a portion of the surface thereof.

The charge of molten metal which is to be acted upon by the blast of the tuyeres is supplied to and contained in a separable and removable bottom, 15, formed of sheet metal lined with refractory material and of capacity proper for the determined charge to be worked. The bottom 15, which has no connection with the body 4 or tuyeres 10, is entirely open on its upper end, which corresponds, substantially, in diameter with the face of the lower throat, 25, of the body, against which it abuts and closely fits, the faces of the throat and of the bottom being trued off as accurately as practicable, and provided, if desired, with a packing of non-conducting material, to promote the tightness of the joint between them. The

tuyeres 10 project within the bottom to a level slightly above its floor or base, and are inwardly inclined correspondingly with the taper of the bottom, which, as shown, is preferably made in the form of a frustum of an inverted cone.

The bottom, with its charge of molten metal, may be brought into and out of operative position relatively to the body of the converter—that is to say, position proper for the blast of the tuyeres to be applied to its charge—by means of a crane or any other suitable raising and lowering mechanism, which, in the instance illustrated, consists of a hydraulic lift or elevator having a piston or plunger, 21, fitting a vertical cylinder, 20, properly adapted to receive fluid-pressure and located in line axially with the converter body. The bottom 15 rests upon a truck or carriage, 17, which is in turn supported by the cross-head or end plate 22 of the plunger 21, and by the application of pressure to the plunger the bottom with its charge may be raised into and maintained in contact with the lower throat of the converter, and lowered therefrom at the completion of the blow to deliver the charge to the ingot-molds. The truck 17 rests when lowered upon a track, 18, extending from a cupola or blast furnace to the converter, and thence to a suitable point of delivery to the molds, and the bottom which serves the additional function of a ladle for conveying the charge to and from the converter, may be readily and quickly transported from the furnace to the converter, and from the converter to the molds.

A plant for the manufacture of steel embodying a converter, as above described, a cupola or blast furnace, an elevator and railroad-tracks for the conveyance of the bottom and its supporting-carriage to and from the furnace, the converter, and the ingot-molds, is set forth in another application for Letters Patent filed by me of even date herewith, and the same is not therefore herein claimed as of my invention.

In practice I prefer to provide each converter with a series of bottoms, so that in the operation of a plant the charge in one bottom may be blown while another bottom is receiving its charge and another is delivering its charge to the molds.

Inasmuch as wear and deterioration are most severe upon those portions of converters which are exposed to the direct contact of the molten metal, renewals and repairs will be required much more frequently to the bottoms than to the bodies of the converters, and under my invention such can be made without in any wise delaying the operation of the apparatus by the substitution of another bottom whenever needed, and the repairs to that which has been removed can be made at leisure, and when the latter, being cold, can be conveniently and effectively worked on. The complete exposure of the tuyeres and the interior of the converter-body by the removal of the bottom also enables practically unobstructed access to be had to said parts and correspondingly facilitates examination and repair thereof.

The term "fixed tuyeres," as applied herein, designates tuyeres which are fixed to the body of the converter during the operation thereof, in contradistinction to those which are insertible and removable before and after each blowing operation.

I am aware that portable converting-vessels adapted to be transported from a furnace to a movable dip-pipe which is inserted into the vessel for the purpose of blowing its charge have been heretofore known. Such construction, which is exemplified in the patent of A. Davy, No. 302,712, dated July 29, 1884, and which I hereby disclaim, differs from my invention in the essential particular that, no fixed body and tuyeres being provided, the entire vessels required to be moved, and, further, in failing to afford the facility of access to the interior of the converter, which is attained in the application of my improvements.

I am further aware that a furnace provided with a removable hearth or bottom acting as a receptacle for molten iron, said furnace being provided with openings for the insertion and removal of pipes through which a blast of air may be delivered to the molten metal, as in the English Patent of A. Berard, No. 3,237, and United States Patent No. 65,333, June 4, 1867, is old, and such construction I likewise disclaim.

I further disclaim the combination of a removable bottom and a fixed lid or cap provided with a discharge-flue and a blast pipe or pipes which do not vary materially from a vertical line and having no chamber or space for the elimination and expulsion of gaseous and solid products, such construction being exemplified in English Patents Nos. 3,840 of 1874 and 2,514 of 1883.

I claim herein as my invention—

A Bessemer converter having in combination a hollow or chambered main body or upper section provided with a gas-escape or blowing-hole in or approximately in line with its vertical axis, and a flaring or outwardly-tapered lower throat or opening, a series of fixed tuyeres entering the same through its flaring portion, said tuyeres being oblique to and having their discharge-openings directed toward the vertical axis of the converter-body, a series of columns or standards supporting the body at points adjacent to the outer edge of its lower throat, and a separable and removable bottom of suitable capacity to contain the entire charge of molten metal to be treated, substantially as set forth.

In testimony whereof I have hereunto set my hand.

EDWARD M. BUTZ.

Witnesses:

J. SNOWDEN BELL,

R. H. WHITTLESEY.