

(No Model.)

3 Sheets—Sheet 1.

W. J. CLAPP & T. GRIFFITHS.

CUPOLA FURNACE.

No. 271,683.

Patented Feb. 6, 1883.

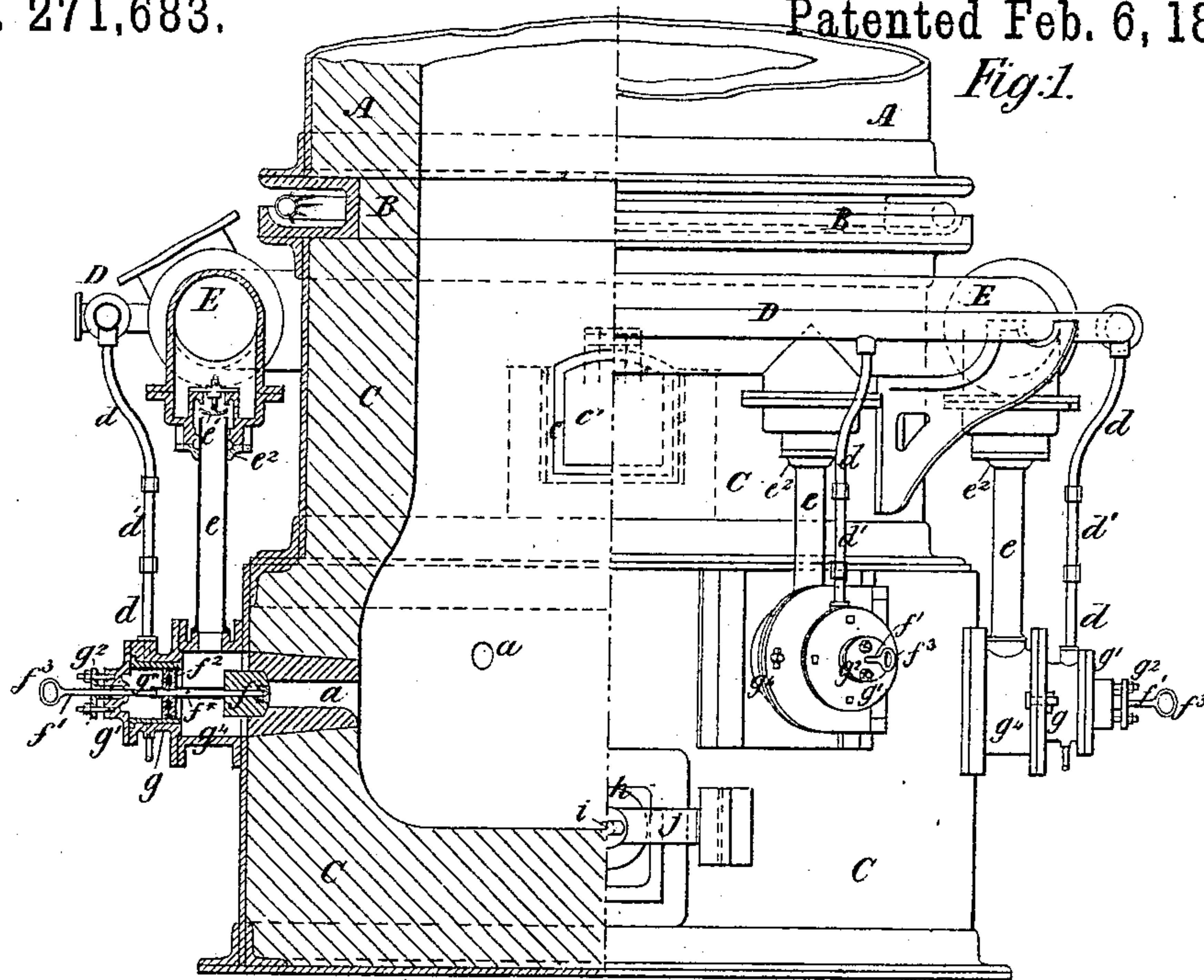


Fig. 1.

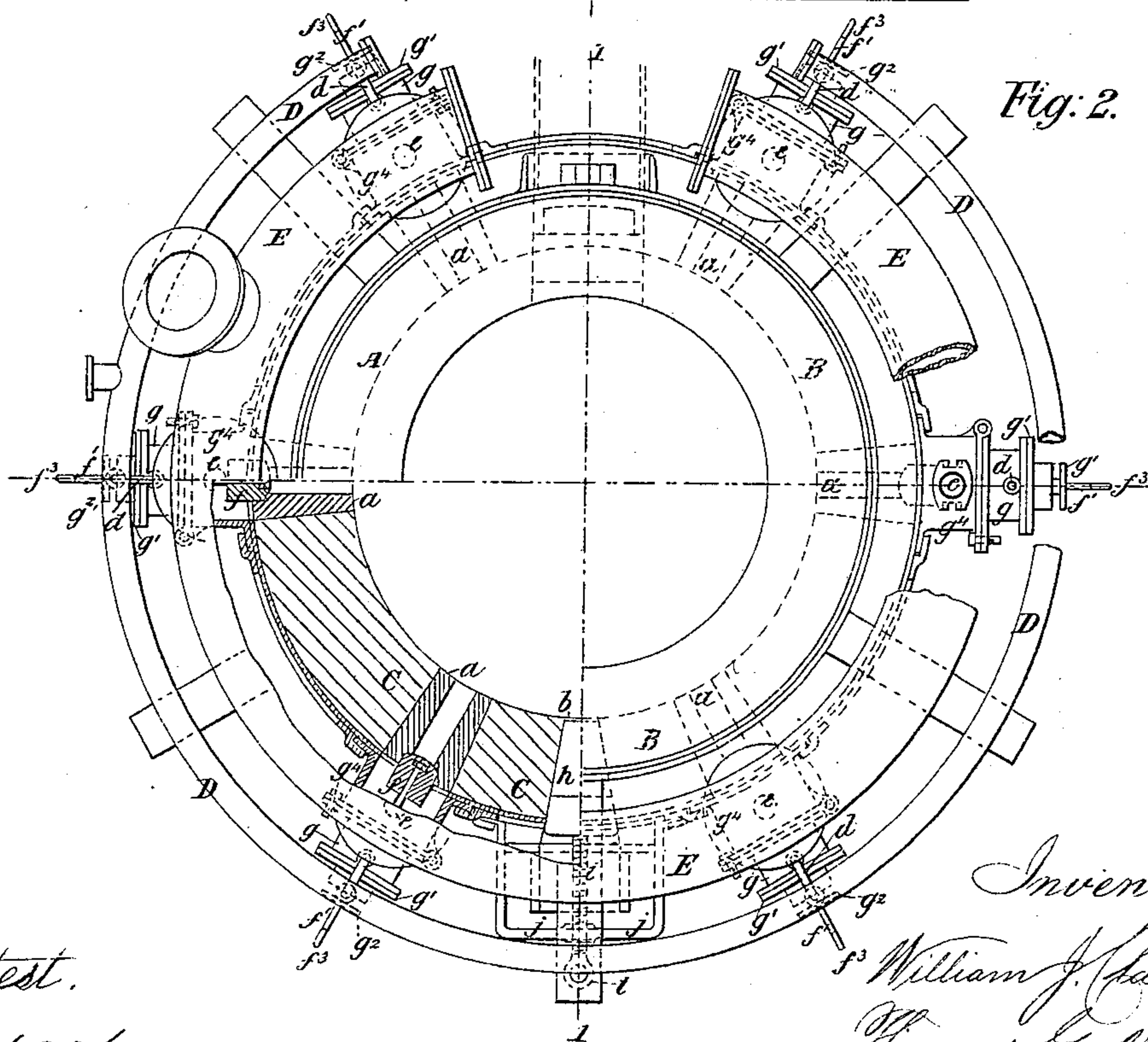


Fig. 2.

Attest.

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Thomas Griffiths.

BY

Knight Bros.
attys.

(No Model.)

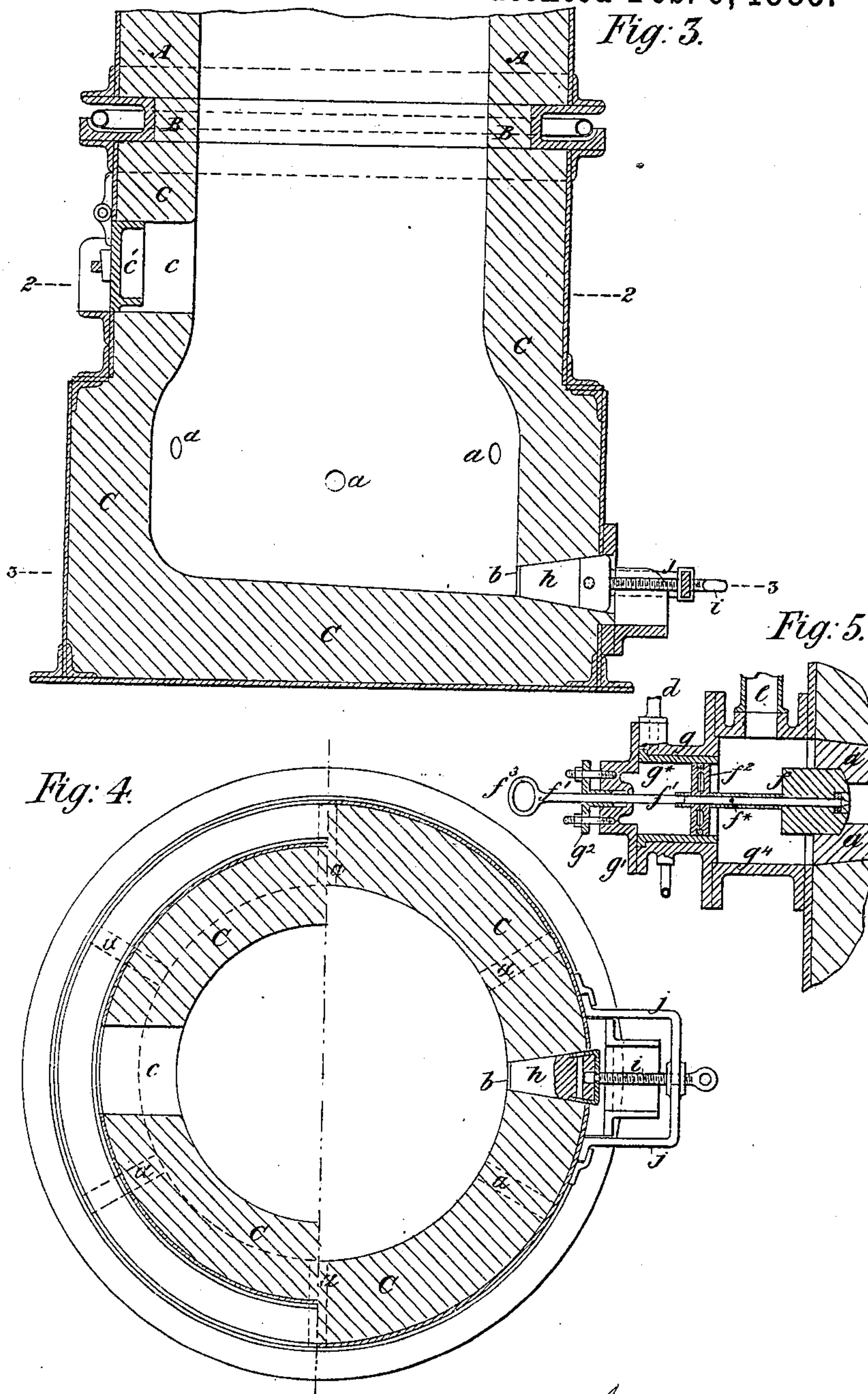
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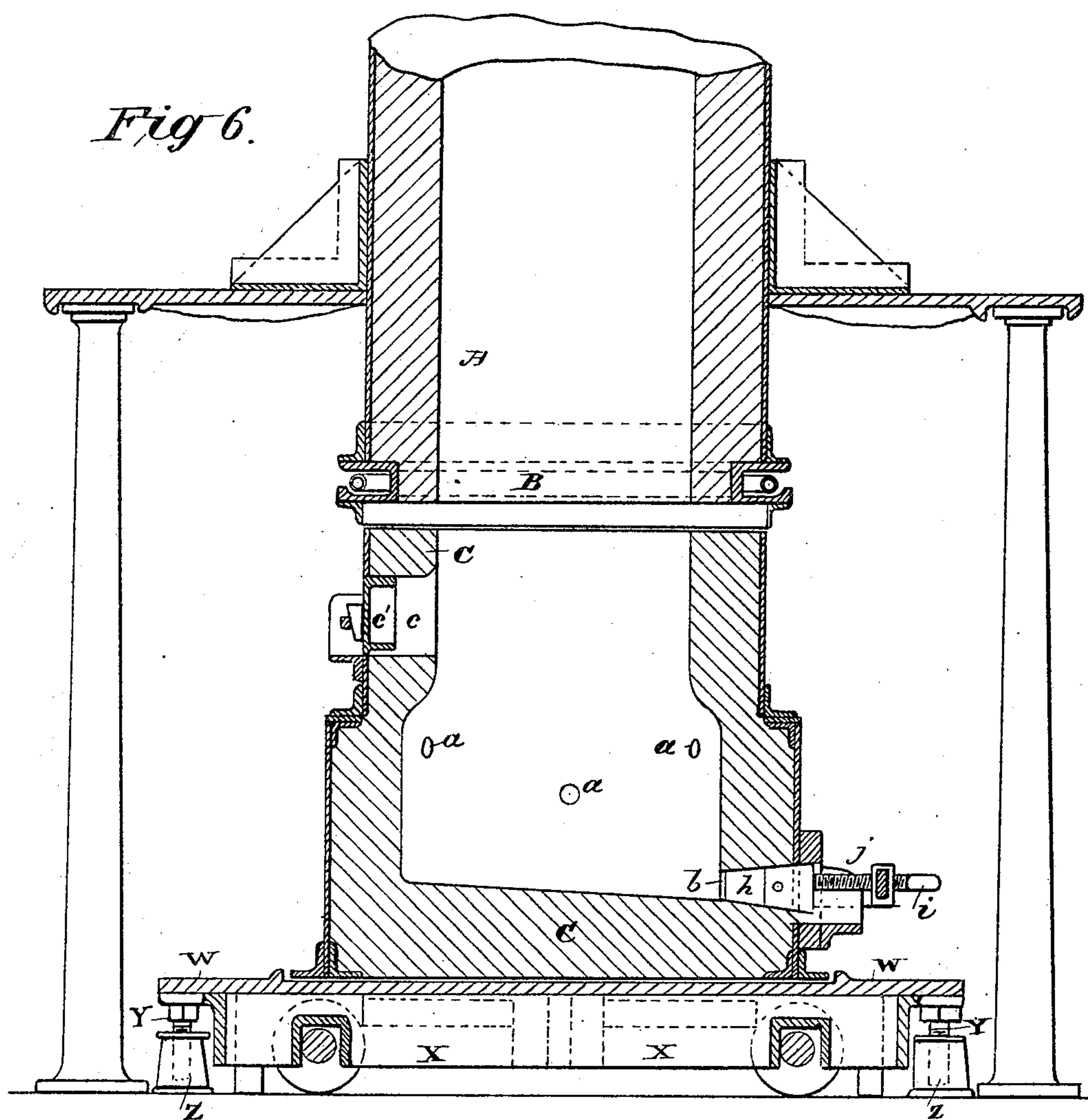
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UNITED STATES PATENT OFFICE.

WILLIAM J. CLAPP, OF NANTYGLO, AND THOMAS GRIFFITHS, OF BLAEN-
AVON, COUNTY OF MONMOUTH, ENGLAND.

CUPOLA-FURNACE.

SPECIFICATION forming part of Letters Patent No. 271,683, dated February 6, 1883.

Application filed October 31, 1881. (No model.) Patented in England March 23, 1881, No. 1,372; in France September 27, 1881, No. 145,039; in Belgium September 27, 1881, No. 55,846; in Germany September 27, 1881, No. 18,250; in Austria September 27, 1881, and in Spain October 1, 1881.

To all whom it may concern:

Be it known that we, WILLIAM JOHN CLAPP and THOMAS GRIFFITHS, subjects of the Queen of Great Britain, residing respectively at Nantyglo and Blaenavon, both in the county of Monmouth, England, have invented certain new and useful Improvements in Cupola-Furnaces Employed in the Manufacture of Iron and Steel, (for which we have received Letters Patent in England, No. 1,372, dated 28th March, 1881,) of which the following is a specification.

The invention has for its object improvements in means or apparatus employed in the manufacture of iron and steel. For this purpose we dispense with the costly converters now in use and obviate the danger incurred in pouring metal therefrom, together with the risk of the metal running back into the tuyeres, while by our invention we obtain facility of manipulation, an effective treatment of the metal, a cheaply-constructed apparatus, and less waste than that incurred by the use of the ordinary converter.

In order that our said invention may be clearly understood and readily carried into effect, we will proceed, aided by the accompanying drawings, fully to describe the same.

In the drawings, Figure 1 represents an elevation, partly in vertical section, of an upright converter constructed according to our invention. Fig. 2 represents partly a plan and partly a horizontal section. Fig. 3 represents a vertical section drawn on the line 1 1 of Fig. 2; and Fig. 4 represents horizontal sections drawn on the lines 2 2 and 3 3 of Fig. 3. Fig. 5 represents a section of parts drawn to a larger scale. Fig. 6 represents a vertical section of the apparatus, showing the carriage for supporting and transporting the lower section of the apparatus.

In all the figures like parts are marked with similar letters of reference.

In carrying our invention into effect we employ an upright furnace formed in three parts, A B C, the upper one, A, forming the stack, and being supported on fixed pillars, or on a fixed framing, (not shown,) the intermediate

part, B, forming a bath or chamber for the circulation of water therein. The steam and blast pipes D E are permanently fixed in position, while the lower part, C, which is to receive the fluid or molten metal to be treated, is mounted upon a frame, W, capable of being raised and lowered upon another frame, X, provided with wheels to run on a railway, as will be readily understood. Screws Y, movable in floor-posts Z, are generally employed for raising and lowering the frame W and the lower section of the furnace, as is shown in Fig. 6.

The lower part of the furnace is provided with tuyeres *a*, fixed in the side thereof, and with a tap-hole, *b*, at the bottom, to permit of the metal, after treatment, being run out therefrom. Another aperture, *c*, fitted with a door, *c'*, is also provided above the level of the fluid metal, which serves as a charging-aperture, and also to permit the slag and other impurities to be raked off the top of the fluid or molten metal and removed from the converter.

Each tuyere *a* is provided at its rear end with a seat for a plug or stopper, *f*, to enable the blast to be shut off when required, and such plug or stopper *f* is fixed to a rod, *f'*, provided with a disk or piston, *f²*, fitting a steam tube or cylinder, *g*, so as to enable the steam, when admitted to the back of the piston *f²*, to press the stopper *f* to its seat; and in order to enable the said stopper *f* to be drawn back from its seat when from any cause the pressure of the blast against the piston *f²* is unable to remove it, we carry the rod *f'* through a stuffing-box, *g²*, and provide the end thereof with a handle, *f³*, by which it can be readily pulled away from its seat when required.

The steam tube or cylinder *g* is formed of a bored tube or bush, *g^x*, fixed in the outer cylinder or box, *g*, which latter is provided with a cover, *g'*, and steam-pipe *d*, and is attached to a box, *g⁴*, to which latter is connected an air-blast pipe, *e*, provided with a valve, *e'*, capable of being closed against the air-blast when from any cause it is desired to shut off the action of one of the tuyeres, in which case the tube *e*, connected with such tuyere, is removed

from the apparatus and a block of wood or metal placed in position to press the valve e' to its seat.

We are by the means above described enabled to send a blast of air into the metal in the furnace-section C, and to shut it off, as may be required.

When the stopper f is pressed against its seat at the rear end of the tuyere a by the steam acting on the back of the piston f^2 , the fluid or molten metal is prevented running back through the tuyere, while when the steam is shut off from the back of the piston f^2 and compressed air is admitted to the box g^4 the pressure of the air acts against the front of the piston f^2 in the contrary direction to that of the steam, and thereby removes the plug or stopper f from its seat, thus enabling the air-blast to enter the tuyere a .

In the drawings we have represented the rod f' as being formed of a tube with an opening, f^x , to the box g^4 ; and we have also represented the plug f as being formed with a small aperture at the center thereof. This construction is to enable a small blast of air to enter the tuyere a when the plug or stopper f is forced to its seat, thereby preventing the metal cooling within the tuyere a , such small blast having no injurious effect on the fluid or molten metal during the short period of its action.

The middle part, B, of the apparatus, having a supply of water, is intended to keep the upper portion or stack, A, comparatively cool, and such part B may be flush on its inner face with that of either the upper or lower portion of the apparatus, or with both, as shown at Figs. 1, 2, 3, 4; or it may be caused to project somewhat into the interior of the apparatus, in which case it will serve as a ledge to catch the slag and other solid impurities boiling up out of the fluid or molten metal.

The lower part, C, being mounted on a frame capable of being raised and lowered, as before described, can be raised into position under the upper parts, A B, and lowered away therefrom and removed, and by being fitted to run on rails it may be readily conveyed to the mills, or to other desired position, and to the repairing and drying shed when required; and in order to facilitate such adjustment in position for use and removal of the lower part, C, we cause the air-blast tubes e to fit and slide in and out through stuffing-boxes e^2 , attached to the tube E, and we form the steam-tubes d with flexible parts d' , capable of being connected and disconnected with the other part or parts by means of union-joints, as will be readily understood.

Instead of forming the movable lower part, C, of the apparatus to fit closely up against the middle part, B, it may be formed and arranged to rise up concentrically a short distance within the upper portion or stack, A, and to leave an annular space between the two, as will be readily understood, by which means the necessity for closely fitting the parts is avoided, and the slag and other solid impurities boiling up from the fluid or molten metal are discharged over the edge of the vessel C and fall down through the space between the two parts, a suitable aperture, c , fitted with a door, c' , being provided, as before described, above the level of the fluid or molten metal, to serve as a charging-aperture and to enable the slag on the surface of the fluid or molten metal to be scraped off.

At $h i j$ in Figs. 3 and 4 are shown an improved plug or stopper and a mode of working the same, which will be made the subject of a separate application.

The apparatus herein described may be employed in the manufacture of steel and homogeneous metal, or in treating fluid or molten metal for other purposes.

Having thus described the nature of our said invention and the mode in which we carry the same into effect, we would have it understood that what we claim is—

1. In a cupola-furnace, the combination of a bottom section or vessel having a tuyere-opening and external blast and steam chambers, and a plug provided with a stem and a piston fitted in said chambers, with a pipe for admitting steam in rear of the piston for forcing the plug into the tuyere-opening, and an air-blast pipe leading into the chamber in front of said piston for removing the plug from the tuyere-opening and admitting air through the latter into the bottom section of the furnace, substantially as and for the purpose set forth.

2. The combination of the vessel C, having the tuyeres a , external air-chamber, g^4 , and vertical pipes e , leading into said chamber, and the stationary air-pipe E, having bottom openings for the reception of the pipes e , and valves for closing said openings, with the shaft of the furnace and means for elevating and transporting the vessel C, as and for the purpose set forth.

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