(No Model.) 3 Sheets—Sheet 1.

J. F. WILCOX.

METHOD OF OPERATING CONVERTERS.

No. 315,582. Patented Apr. 14, 1885.

Fig. 1.

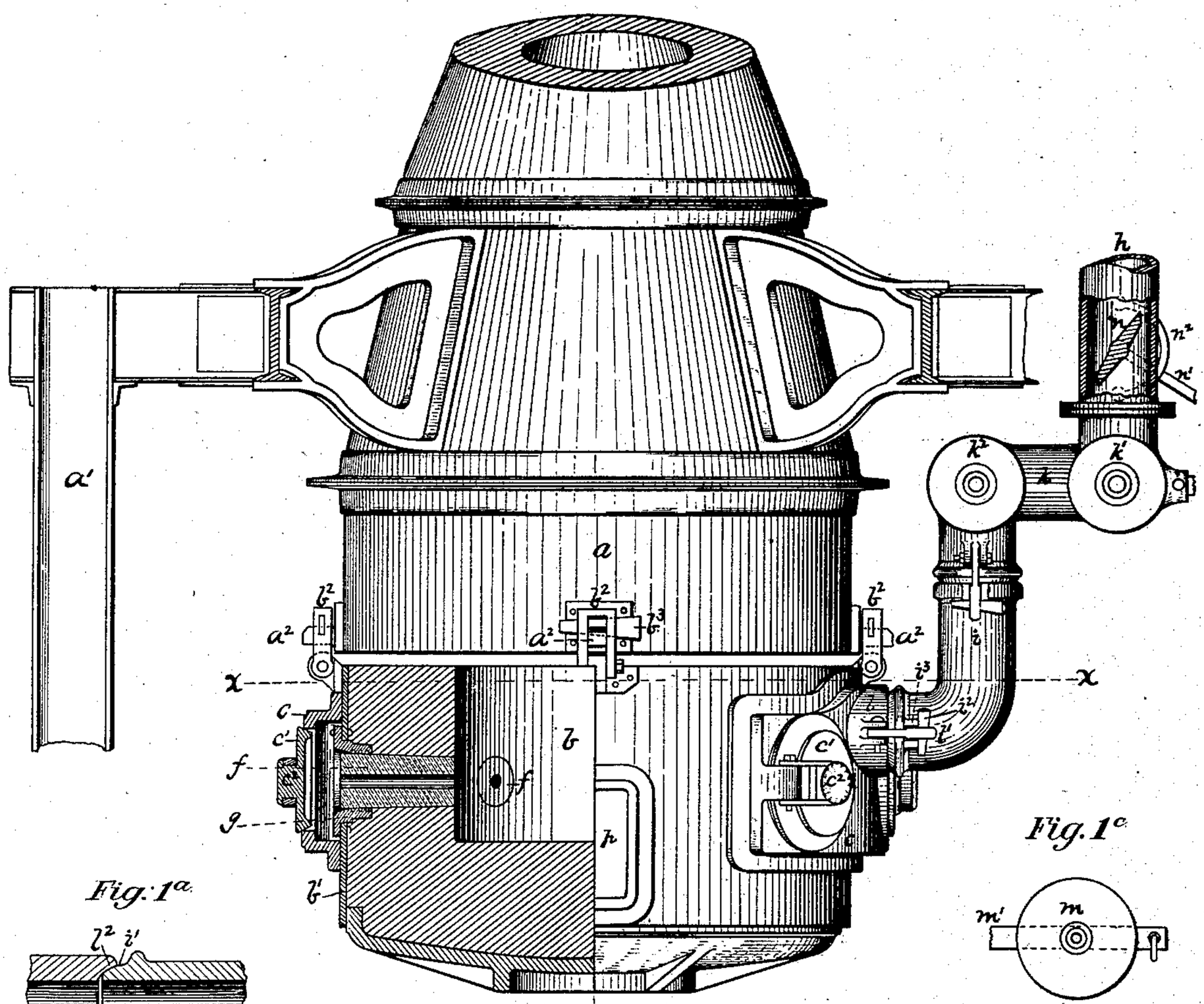


Fig. 1c.

Fig. 1a.

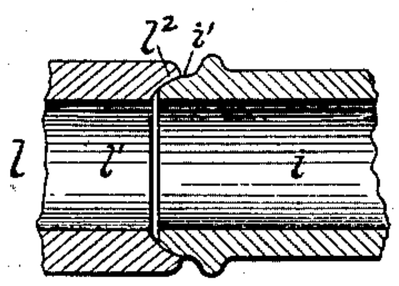


Fig. 1b.

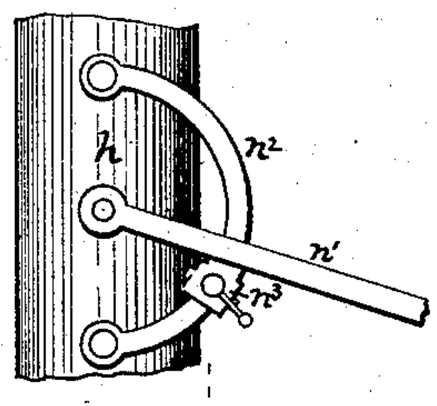
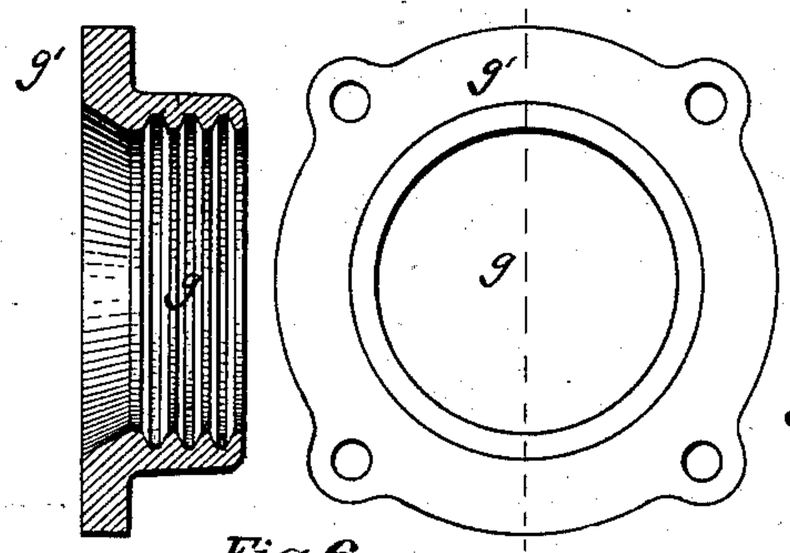


Fig. 6.



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(No Model.) 3 Sheets—Sheet 2.

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METHOD OF OPERATING CONVERTERS.

No. 315,582. Patented Apr. 14, 1885.

Fig. 2.

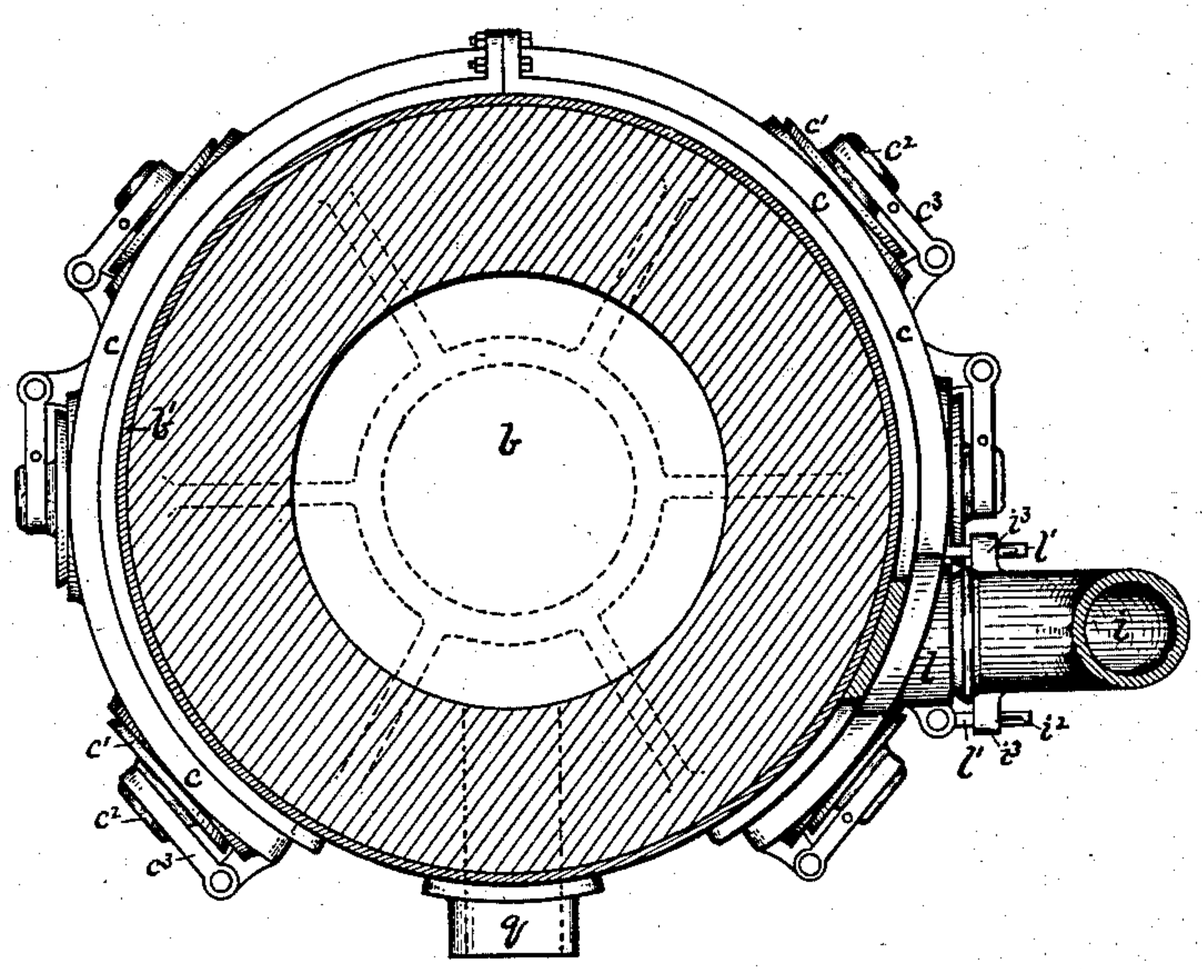


Fig. 3.

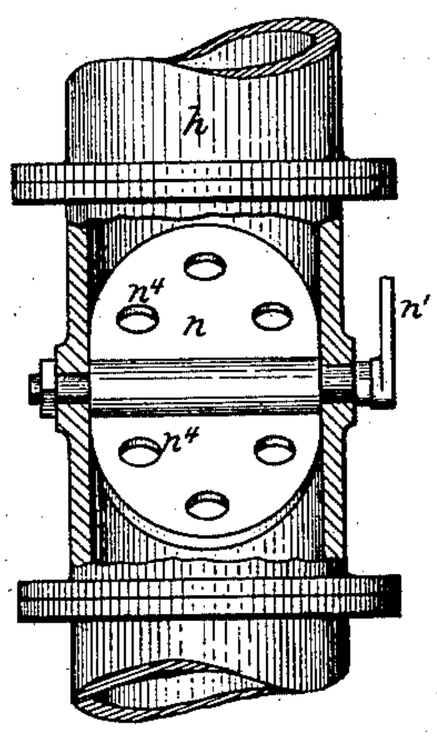
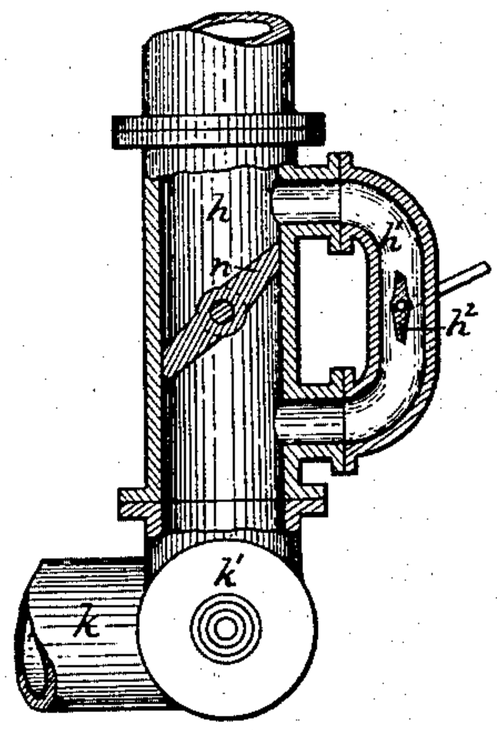


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

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No. 315,582. Patented Apr. 14, 1885.

Fig. 5.

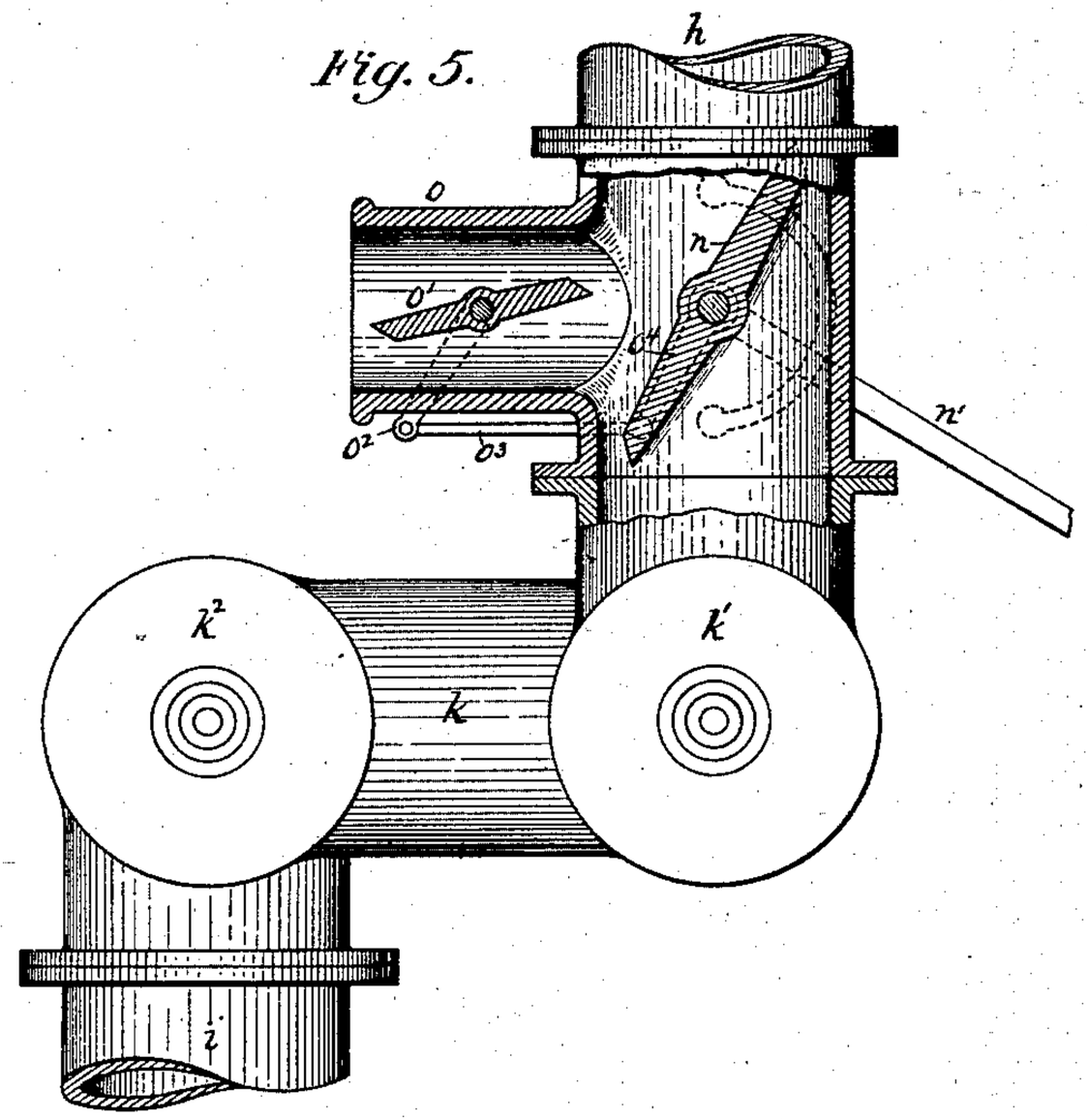


Fig. 7.

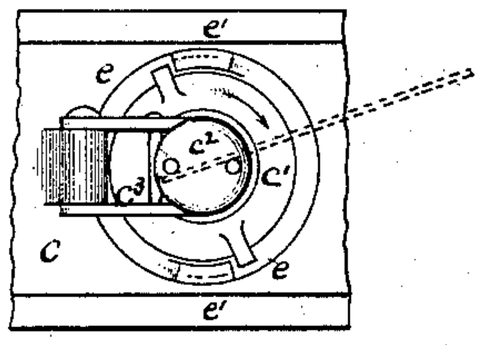


Fig. 9.

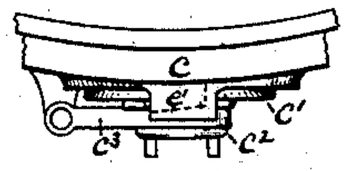
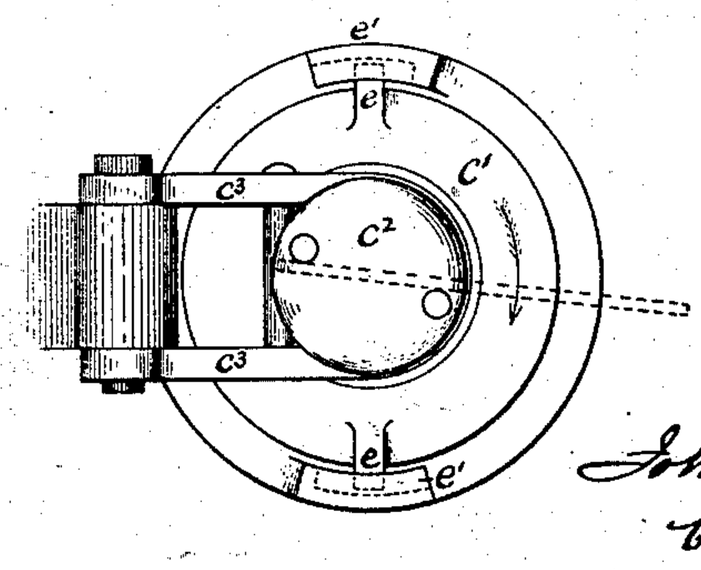


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN F. WILCOX, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO JAMES P. WITHEROW AND HENRY W. OLIVER, JR., OF SAME PLACE.

METHOD OF OPERATING CONVERTERS.

SPECIFICATION forming part of Letters Patent No. 315,582, dated April 14, 1885.

Application filed February 7, 1885. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. WILCOX, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Operating Converters; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates to the protection of the tuyeres in Bessemer converters. The usual practice is to employ a tipping converter, so that the tuyeres can be turned up out of the metal when it is necessary to stop the blast, in order to prevent it from entering and clogging or destroying them. The blast is kept on until the tuyeres are out of the metal, and while the swinging over of the converter relieves the charge from the wasting or oxidizing influence of the excessive blast, yet during the tipping it is exposed to such influence. Frequently the metal is kept in the converter for some time after the blow is finished, and there are various intervals during the operation in which the metal remains in the converter when it is desirable that it should not be blown. The cost of a tipping-converter plant is excessive, and for other reasons a fixed converter is desirable. Therefore, in the use of fixed converters for treating molten metal, which are provided with the pneumatic tuyeres arranged below the molten metal, various provisions have been made for preventing the metal from entering the tuyeres when it is desired to stop the blast. In the Clapp and Griffith converter, patented February 6, 1883, the tuyeres are provided with simultaneously-operated stoppers or valves having ports through them for admitting sufficient air to them from the blast-chambers to prevent the molten metal from chilling in them. Various modifications of construction have since been made for the same purpose; but in all cases a separate valve or stopper has been required at each tuyere.

Broadly stated, my invention consists in keeping the tuyeres clear by maintaining a sufficient minimum pressure in the tuyeres while the metal is not under blow to counterbalance the pressure of the metal in the converter. The column of metal in the ordinary converter is from twelve to fifteen inches deep, and the blast-pressure varies from twelve to twenty-five pounds to the square inch. In converters having side tuyeres the pressure runs from five pounds upward, according to the location of the tuyeres when the blast is on. In the ordinary converter a pressure of from five to six pounds per square inch is necessary to overcome the head of the liquid column of metal.

In carrying this invention into practice, I preferably provide the lower or removable part of the converter with a blast-trunk connecting with all the tuyeres, said trunk having a single detachable connection with the blast-pipe which conducts the blast from the engine. Thus it is necessary to disconnect only one joint when the bottom is removed for renewal or repairs. Another advantage is, that the converter is entirely clear of the valves and their operating appliances, these devices being wholly dispensed with.

To enable others skilled in the art to make and use my invention, I will now describe it in connection with a fixed converter by reference to the accompanying two sheets of drawings, in which—

Figure 1 is an elevation, partly in section, of a converter; and Figs. 1^a, 1^b, and 1^c are details. Fig. 2 is a horizontal section on the line $x\ x$ of Fig. 1. Figs. 3, 4, and 5 are views of modified forms of the controlling-valve. Fig. 6 illustrates the construction of the collar by which the tuyeres are secured in the converter. Figs. 7, 8, and 9 illustrate the construction of the tuyere entering doors.

Like letters of reference indicate like parts.

The upper or stationary part, *a*, of the converter is supported by suitable columns, *a'*, and is provided with lugs or projections a^2, for the attachment of the lower section or bottom, *b*. The bottom *b* is provided with a circular blast-pipe, *c*, which is attached to the metallic shell *b'*, and at suitable intervals is provided with doors *c'*, through which the tuyeres are inspected and kept in order.

In order to make a tight joint at the doors, I provide them with headed stems c^2 and mount them on the hinged straps c^3, so that the stems may be turned radially in the straps. On the edges of the doors are two or more lugs, *e*, which, when the doors are rotated, turn under

inclined surfaces or lugs e' on the shell b and force the doors tightly to their seats. This construction is illustrated in Fig. 7.

Difficulty has heretofore been experienced by reason of the air from the wind pipe or chamber surrounding the outer ends of the tuyeres being forced in through the joint surrounding the tuyere, forming what is known as a "false" tuyere, which is undesirable for obvious reasons.

In order to obtain a tight joint and a firmer setting of the tuyeres f, I insert them through flanged metallic sleeves or collars g, which are fastened to the shell of the converter by bolts through the flanges g', a suitable packing being interposed between the flanges and shell. The inner surface of the collars is grooved, and when the tuyeres are inserted they are thickly daubed with plastic clay or cement, which, when they come to place, enters the grooves and makes a tight joint. The lower or bottom section, b, is provided with pivoted hooks or loops b^2, by which it is suspended on the lugs a^2, said links being secured by keys b^3. The main blast-pipe h is connected to the circular blast-trunk c on the converter by means of pipes i and k, the pipe k being pivoted to the pipe h, as at k', and to the pipe i, as at k^2. The trunk c has a concave or dish-shaped seat, l, around the opening l', by which the air is admitted thereto, and the connecting end of the pipe i is convex, as at i', so as to fit closely inside of the seat. The delivery end of the pipe i is connected to the converter by means of the pivoted straps or hooks l^2, which are secured in place by keys i^2, passing through or back of securing-lugs i^3 on the sides of the pipe i. This construction permits of slight variations of position between the parts l and i' without dislocation or destroying the tightness of the joint, and the construction of the connecting-pipes i and k allows for variations of position of the lower section of the converter, such as are liable to occur in changing or inserting a new bottom.

It is almost invariably the case that when the bottom is changed it will not come exactly to the same position as occupied by it before the change. The pipes i and k are counterbalanced by the weight m, secured to the lever m' back of the joint k'.

Arranged in the pipe h, between the blast-engine and the converter, is a valve, n, having a lever, n', attached to its axle, and operating in connection with a segmental rack, n^2, upon which there is a stop, n^3, capable of being adjusted to any desired position. The purpose of this valve is to control the blast supplied to the tuyeres of the converter. The capacity of the pipe h is such that when the valve n is fully opened the maximum pressure of the blast for treating the metal in the converter is obtained, and the stop n^3 is arranged at a point that will permit the closing of the valve n sufficiently to admit the requisite pressure of blast to sustain the column of metal above the mouths of the tuyeres, so as to prevent the molten metal from entering and clogging up or destroying the tuyeres.

The operations practiced in the converter as used by me require a maximum pressure of about seven pounds, and the charge is such as usually requires a pressure of about three pounds to sustain the column of metal at the mouths of the tuyeres. The stop n^3 is therefore arranged at the proper point to reduce the pressure of the blast at the tuyeres to three pounds, so that when the active treatment of the metal is not desired the lever n' is turned until it comes in contact with the stop, whereby the valve is brought to the position shown in Fig. 1, and the blast-pressure is reduced to the amount stated. The same result may be accomplished in other ways, as indicated in Figs. 3, 4, and 5.

In Fig. 3 the valve n is capable of closing completely, as it is provided with openings n^4, the area of which is sufficient to supply the requisite amount of blast to obtain the minimum pressure at the tuyeres when the valve itself is closed.

In Fig. 4 the pipe h is provided with a by-pass, h', extending around the valve n, which in this case is solid, and capable of being closed entirely, as shown. The capacity of the pipe h' is sufficient to supply the minimum pressure at the mouths of the tuyeres. Preferably the pipe h' is provided with a valve, h^2, for closing it, if desired.

In Fig. 5 the pipe h is provided with a lateral branch or opening, o, in which there is a relief-valve, o', which is coupled to valve n by the lever o^2, pivoted link or rod o^3, and lever o^4, (shown by broken lines,) so that as the valve n is closed the valve o' will be opened sufficiently to permit the amount of blast, which is thereby prevented from passing the valve n, to escape by the branch o, whereby the pressure at the tuyeres will be reduced correspondingly. The metal tap is shown at p, Fig. 1, and the cinder-notch at q, Fig. 2.

My invention enables one to simplify and cheapen the construction and use of the converter, facilitate repairs and the changing of the bottom, effect a saving of time and labor in changing the bottom, and render the operation of the converter more efficient and certain.

While I have particularly described the practice of my invention with a fixed converter having side tuyeres, I do not limit myself thereto, as it can also be practiced in movable converters and in converters having bottom tuyeres. In all cases the minimum pressure of the blast must be sufficient to counterbalance the ferro-static pressure at the tuyeres. By "keeping the tuyeres clear" I mean preventing the metal from entering and chilling therein, and by "under blow" I mean the time of active treatment or conversion by the blast.

The appliances herein described form the matter of a separate application for Letters Patent.

What I claim as my invention, and desire to secure by Letters Patent, is—

In operating a Bessemer converter, the method of keeping the tuyeres clear of metal, which consists in maintaining a sufficient minimum pressure in the blast-pipe and tuyeres during the time the metal is not under blow, to counterbalance the pressure of the column of metal in the converter, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 4th day of February, A. D. 1885.

JOHN F. WILCOX.

Witnesses:
W. B. CORWIN,
THOMAS B. KERR.