

(No Model.)

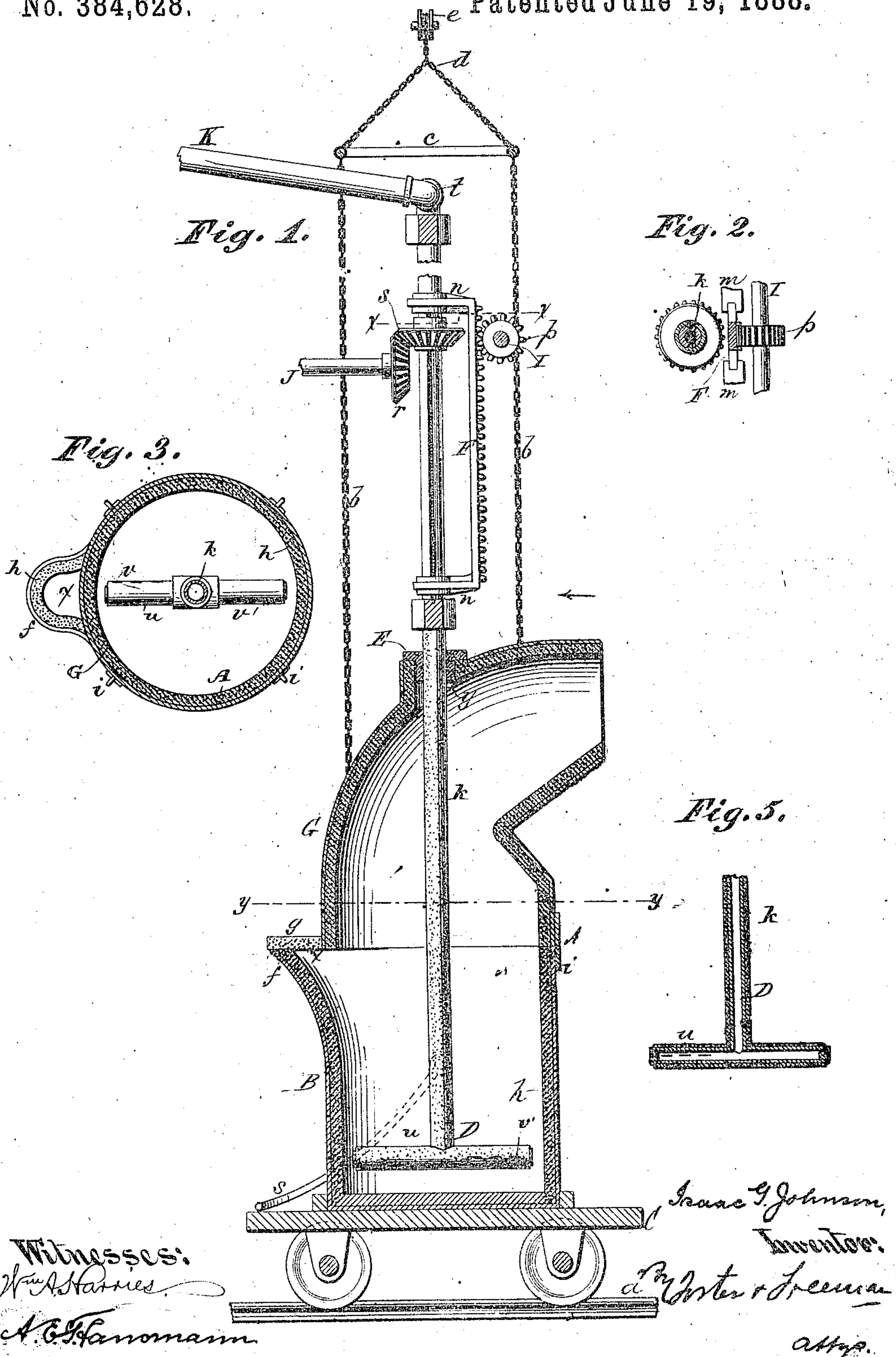
2 Sheets—Sheet 1.

I. G. JOHNSON.

CONVERTER FOR REFINING MOLTEN IRON.

No. 384,628.

Patented June 19, 1888.



(No Model.)

2 Sheets—Sheet 2.

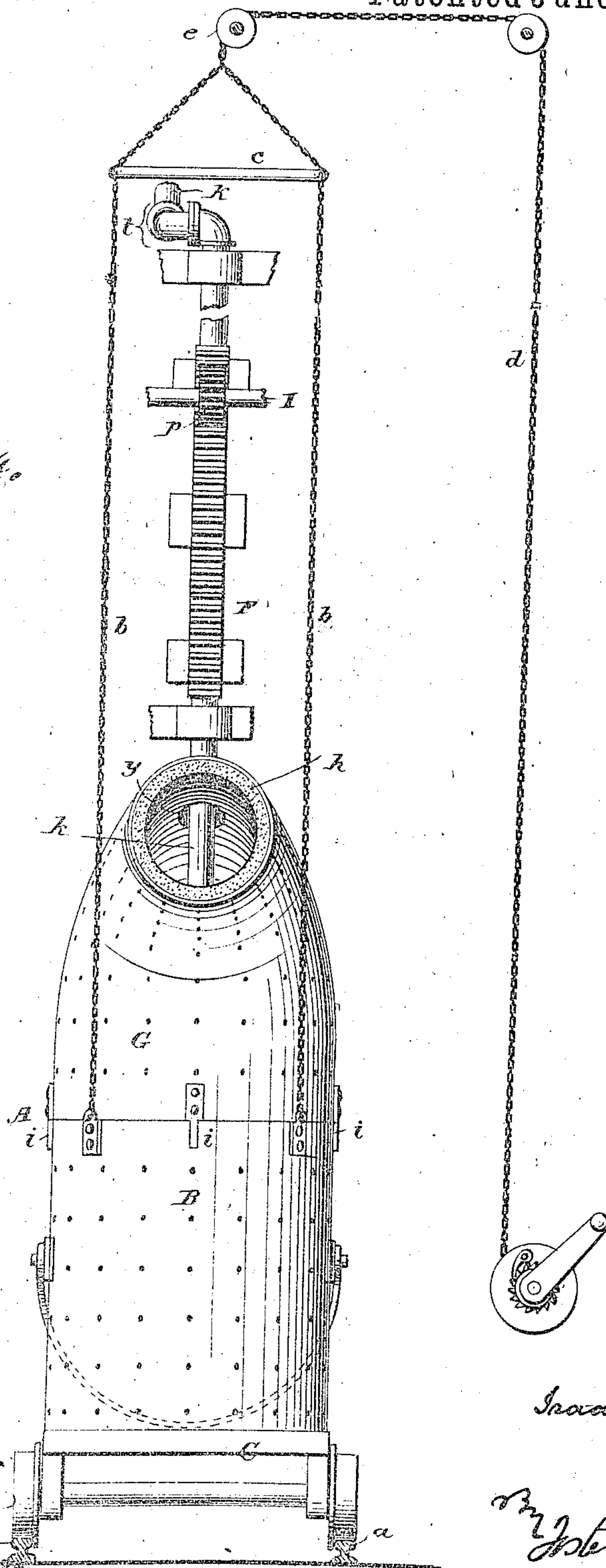
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Fig. 4.



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UNITED STATES PATENT OFFICE.

ISAAC G. JOHNSON, OF SPUYTEN DUYVIL, NEW YORK, N. Y.

CONVERTER FOR REFINING MOLTEN IRON.

SPECIFICATION forming part of Letters Patent No. 384,628, dated June 19, 1888.

Application filed February 8, 1886. Serial No. 191,224. (No model.)

To all whom it may concern:

Be it known that I, ISAAC G. JOHNSON, of Spuyten Duyvil, city, county, and State of New York, have invented a new and useful Improvement in Converters for Refining Molten Iron, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

My invention relates to improvement in that class of apparatus for converting crude iron into steel of different grades wherein a vertically-adjustable tuyere is employed; and my invention consists in constructing the apparatus as hereinafter fully set forth, whereby its manipulation is greatly facilitated and an improved product obtained.

In the drawings, Figure 1 is a sectional elevation of the apparatus. Fig. 2 is a section on the line *x x*, Fig. 1. Fig. 3 is a section on the line *y y*, Fig. 1. Fig. 4 is a side view, in elevation, looking in the direction of the arrow, Fig. 1; and Fig. 5 is a section illustrating the construction of the tuyere.

The converter A consists of two sections, the kettle B, which rests upon a truck, C, running upon rails *a*, and the hood G, which rests detachably upon the kettle and may be elevated bodily therefrom when required. Different elevating means may be employed. I have shown in the drawings chains *b b*, suspended from a spider, *c*, which may be raised and lowered by a chain, *d*, passing over a guide-pulley, *e*, to a windlass operated by any suitable appliance.

From one side of the kettle B, near the top, extends a spout or lip, *f*, which projects beyond the outline of the hood G at the rear of the latter, so as to present an opening, *x*, through which metal may be drawn from time to time in order to make tests to determine its quality, the opening at other times being closed by a slab, *g*, of fire-clay or other refractory material.

The kettle and hood are provided each with the usual refractory lining, *h*, and the hood is provided with lugs *i*, extending downward and serving to properly center it upon the kettle. The tuyere is vertically adjustable and extends through a suitably-packed opening in the hood G, so that it can be raised or lowered independently of the hood. The shank *k* of the

tuyere D is preferably cylindrical in form, so that it may be turned in a cap, E, fitting the opening *y* in the hood, as well as slide in the said cap, and the vertical adjustment of the tuyere is effected by means of a rack-frame, F, sliding vertically between guides *m m*, the frame having arms *n*, through which the shank of the tuyere extends and in which it turns without sliding.

A pinion, *p*, on a shaft, I, serves as a means for raising and lowering the frame F, together with the tuyere, and the latter is rotated by means of a revolving shaft, J, carrying a bevel-gear, *r*, meshing with a similar gear, *s*, through which the shank *k* slides, a key or feather preventing the gears from turning upon the shank. Air is conducted to the tuyere through a pipe, K, connected with the upper end of the hollow shank *k* by a universal pipe-joint, *t*, so that the shank can both revolve and move vertically, while the pipe K has only a vertical movement.

The tuyere may terminate at the lower end in a nozzle of any suitable construction. As shown, it terminates in a cross-bar, *u*, centrally connected to the hollow shank *k* and having outlet-openings *v v'* upon opposite sides, near the opposite closed ends, so that the rotation of the tuyere may be assisted, or in some cases effected, by the reaction of the outflowing current.

I prefer to rotate the tuyere positively by mechanical means and with great rapidity, as I have found that by agitating the metal during its treatment in the converter I am enabled to produce a product of a higher grade.

It will be seen that the structure described permits the air to be introduced at any desired distance below the surface, and by the use of a movable tuyere the entire body of metal may be so agitated as to bring it all under the influence of the air, a result which could not be perfectly effected if the air were introduced near the surface, but without any other agitation of the metal than results from the action of the inflowing currents.

It will be of course understood that the portion of the tuyere that is within the converter is composed of or covered with suitable refractory substance—for instance, the said portion consists of a metallic tube covered with

sleeves of fire-clay or other refractory material.

The contents of the converter may be inspected or tested from time to time by removing the cap *g* and introducing proper appliances through the opening *a*, or the hood may be lifted bodily, so as to permit the kettle to be run out from time to time in order to make any tests that may be required, the construction of apparatus shown and described permitting this to be done with great facility and with the loss of but little time.

I do not limit myself to the use of a single tuyere, as two or more tuyeres may be employed with each converter, the shape of the latter being modified accordingly, and it will be evident that other means may be employed for raising and lowering the tuyere independently of the converter.

By the combination, in a converter, of a kettle and a movable hood carrying the adjustable tuyere I am enabled to introduce the air at any point desired within the metal in the kettle without the use of kettles having perforations at different points and without connecting the tuyeres in any manner with the kettle, while at the same time I am enabled to close the kettle by its cap and to uncover it and wholly remove the kettle from the position below the cap and tuyere, the latter being drawn up into the hood to permit the lateral withdrawal of the kettle. These features distinguish my invention from the contrivances heretofore employed, in which each kettle is perforated or connected with the tuyere or is stationary when combined with a movable hood, or in which the tuyere is movable and combined with a stationary cover which is not fitted to and does not seal the kettle.

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

1. The combination, in a converter, of a kettle movable upon rails, a hood fitted to the upper end of the kettle and removable bodily therefrom, a tuyere passing through the hood, and mechanism, substantially as described, for both revolving the tuyere and for adjusting it vertically without moving the hood, substantially as set forth.

2. The combination, in a converter, of a kettle mounted upon wheels and carried on rails, a hood fitted thereto, mechanism, substantially as described, for vertically withdrawing the hood bodily from the kettle, a revolving tuyere passing through said hood and moving independently thereof, and mechanism, substantially as described, for simultaneously revolving and vertically adjusting said tuyere, as set forth.

3. The combination, in a converter, of the kettle *B*, hood *C*, fitted to said kettle, means, substantially as described, for vertically adjusting the hood, a revolving tuyere having one or more projecting arms, miter-gears *R S* for revolving the tuyere, said miter-gear *S* being vertically adjustable on the stem, and mechanism for elevating and depressing the tuyere, all substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ISAAC G. JOHNSON.

Witnesses:

GEO. H. EVANS,

WM. A. POLLOCK.