5 Sheets--Sheet 1.

S. DANKS.

Rotary Puddling, Melting, and Heating Furnaces.

No. 142,152. Patented August 26, 1873.

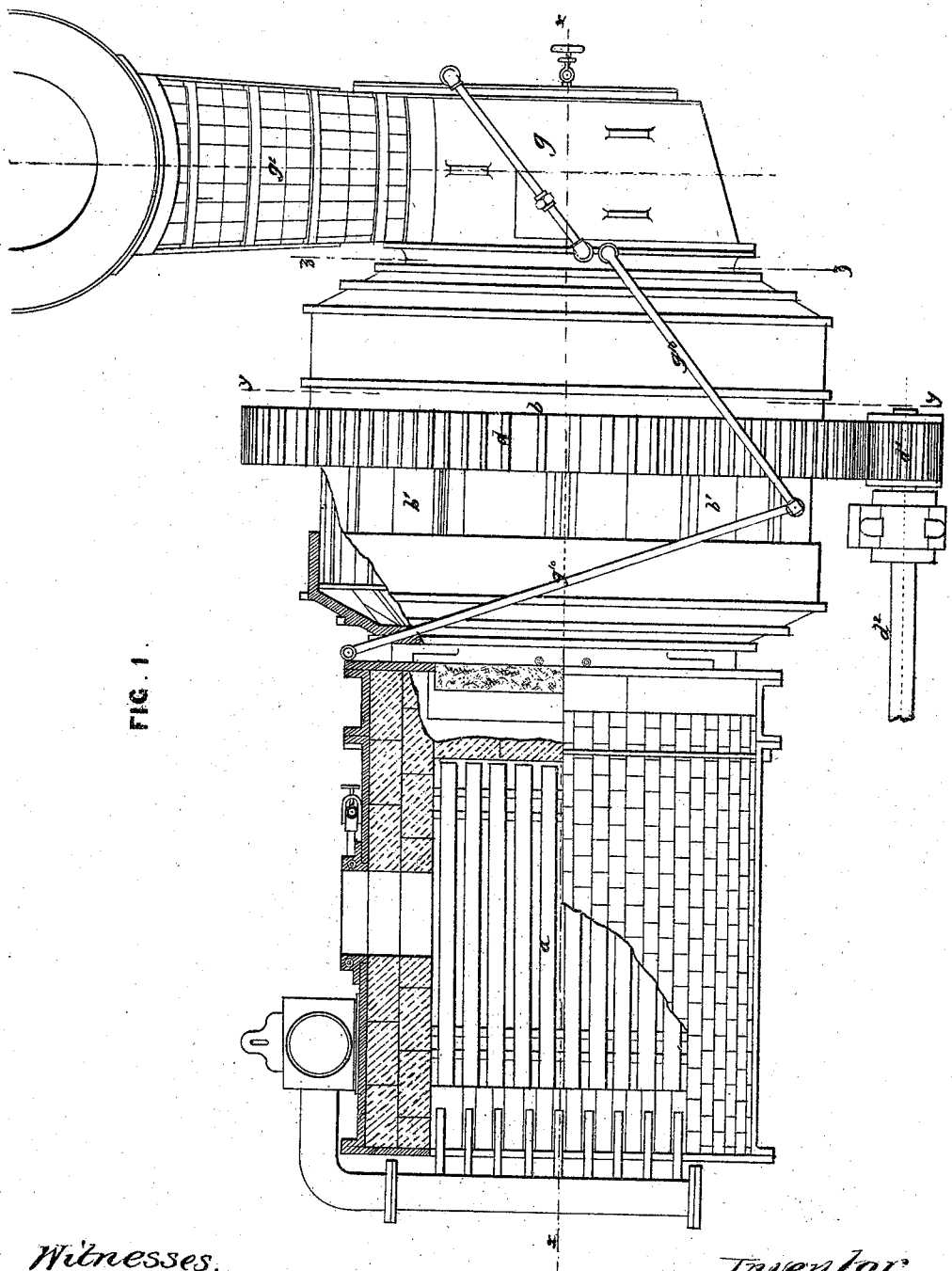

FIG. 1.

Witnesses.
Charles H. Smith
Jeremiah F. Turhig.

Inventor;
Samuel Danks
By Fisher & Duncan
his attys.

5 Sheets--Sheet 2.

S. DANKS.

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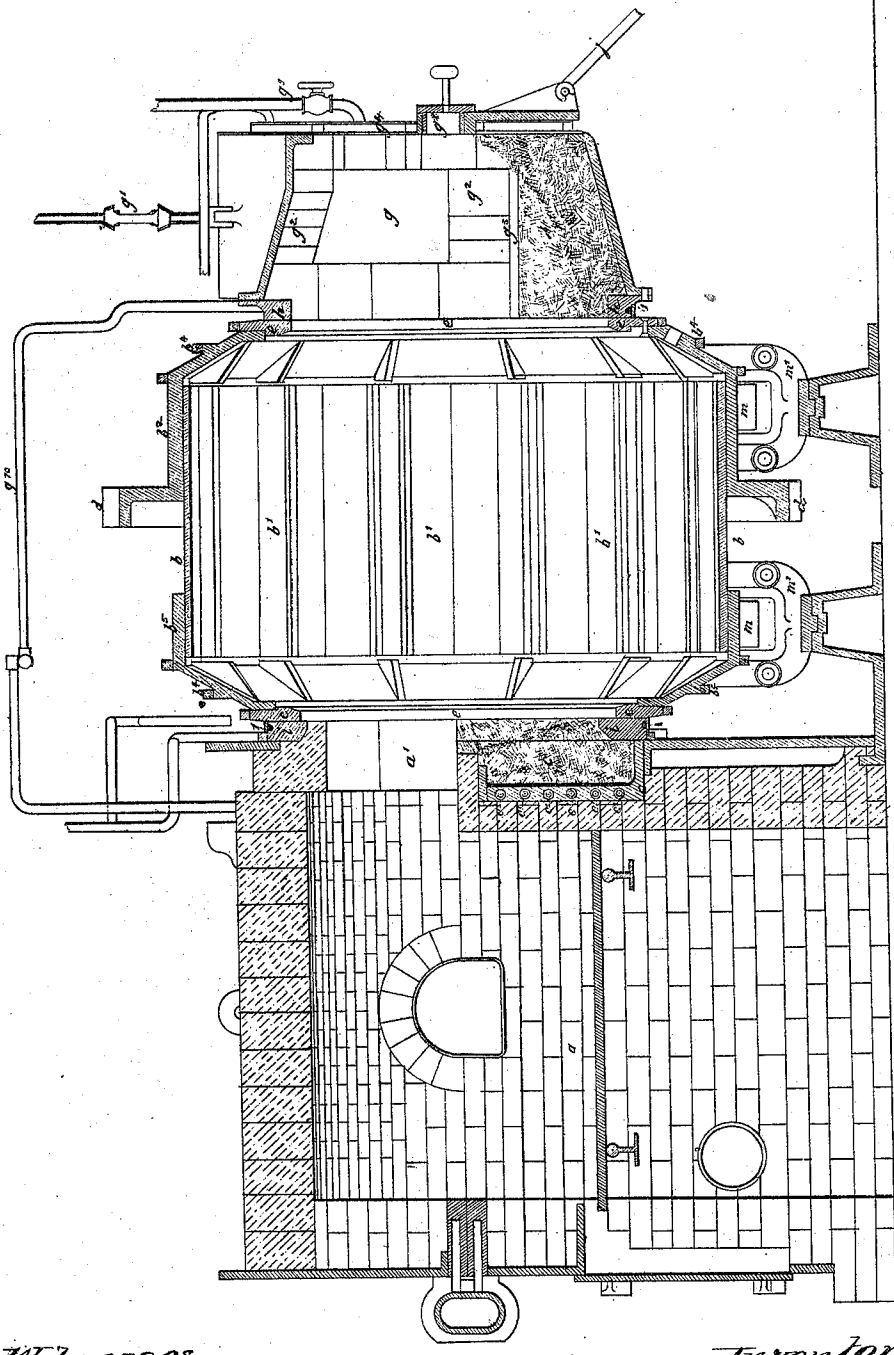
FIG. 2.



Witnesses.
Charles H. Smith.
Jeremiah H. Turchig.

Inventor.
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5 Sheets--Sheet 3.

S. DANKS.

Rotary Puddling, Melting, and Heating Furnaces.

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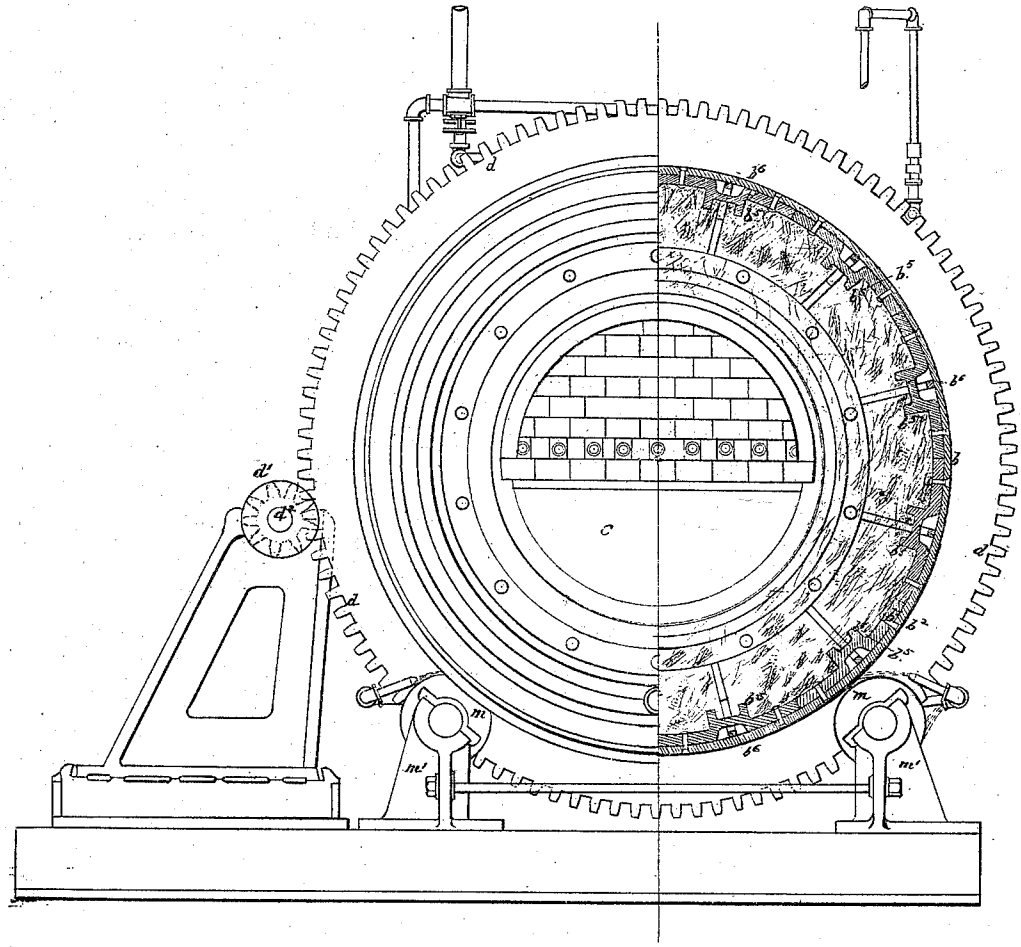
FIG 3



Witnesses.

Charles H. Smith.
Jeremiah T. Tibbig.

Inventor.

Samuel Danks
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5 Sheets--Sheet 4.

S. DANKS.

Rotary Puddling, Melting, and Heating Furnaces.

No. 142,152. Patented August 26, 1873.

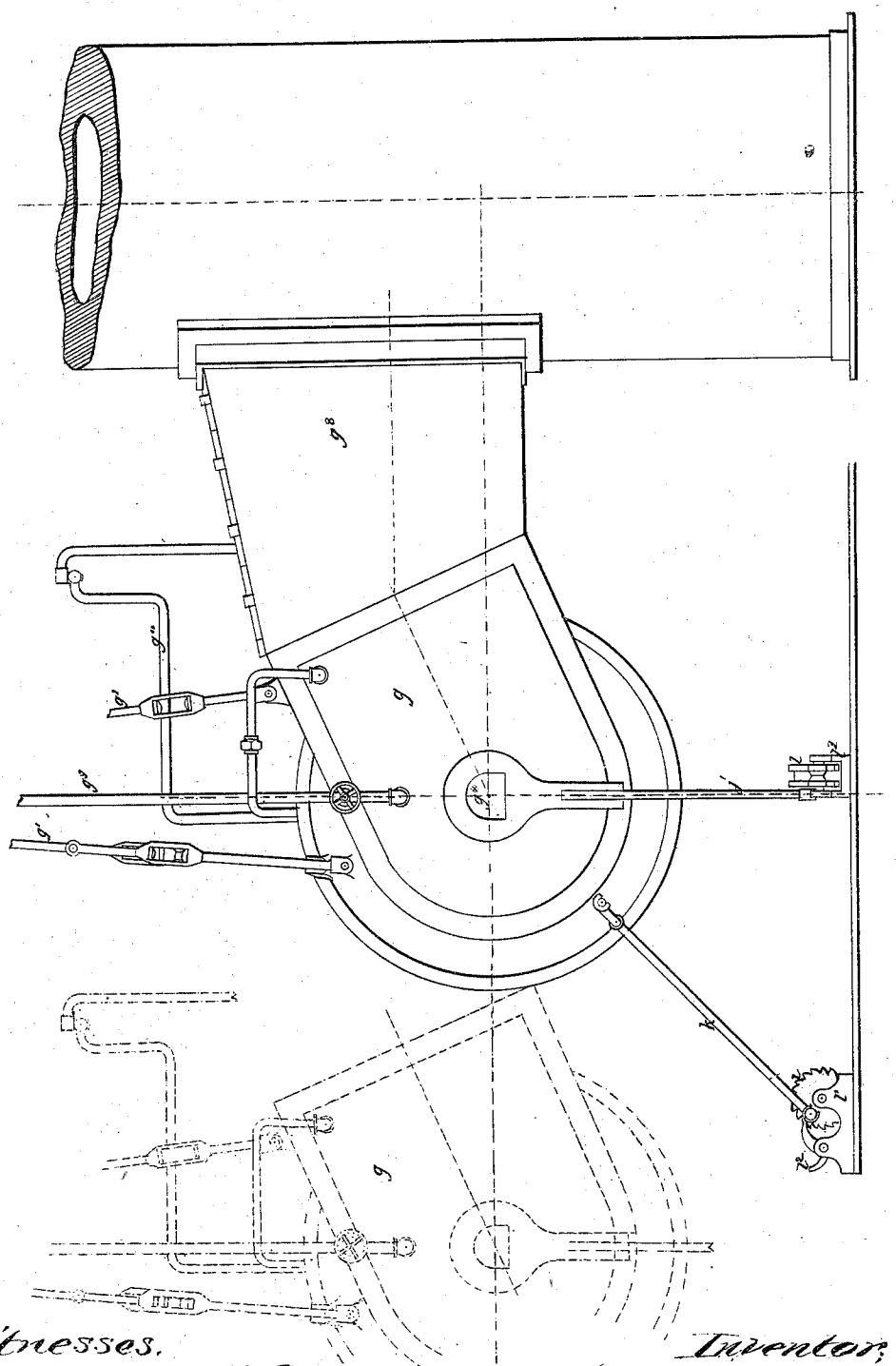

FIG. 4.

Witnesses.
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5 Sheets--Sheet 5.

S. DANKS.

Rotary Puddling, Melting, and Heating Furnaces.

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FIG. 6.

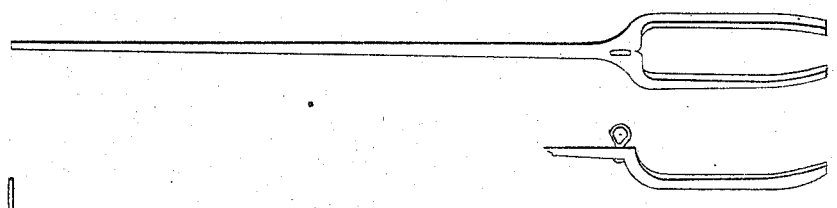


FIG. 5.

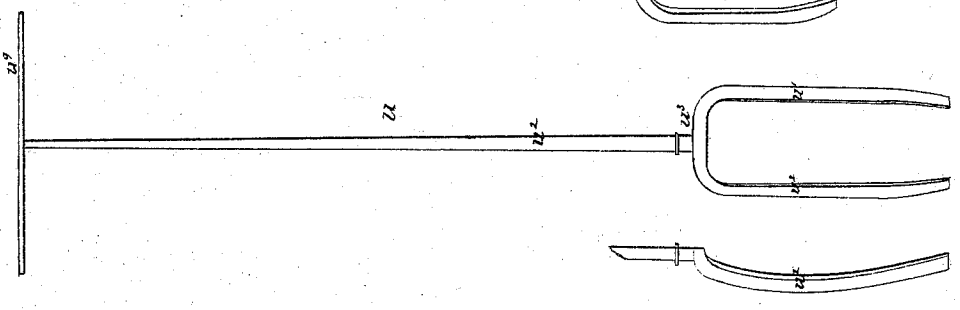
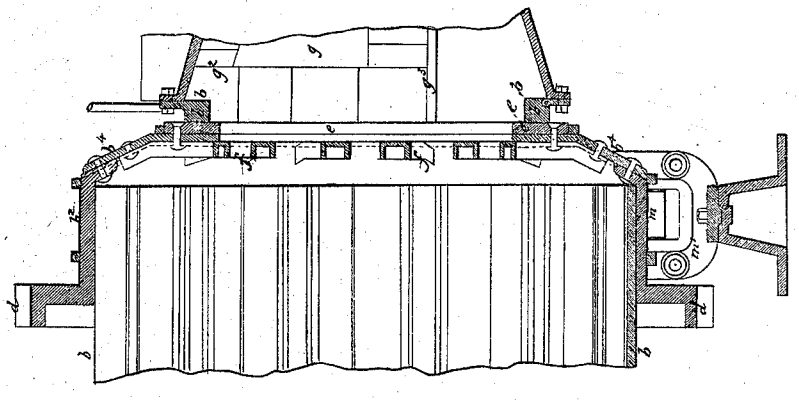


FIG. 4.



Witnesses.

Charles H. Smith,
Jeremiah Dunlap.

Inventor.

Samuel Danks
By Fisher & Duncan
his attys.

UNITED STATES PATENT OFFICE.

SAMUEL DANKS, OF CINCINNATI, OHIO.

IMPROVEMENT IN ROTARY PUDDLING, MELTING, AND HEATING FURNACES.

Specification forming part of Letters Patent No. **142,152**, dated August 26, 1873; application filed May 1, 1873.

To all whom it may concern:

Be it known that I, SAMUEL DANKS, of Cincinnati, Ohio, have invented certain Improvements in Rotary Puddling, Melting, and Heating Furnaces, and in the apparatus to be employed in connection with the same, of which the following is a specification:

My said invention relates to improvements in the construction of the rotary puddling, melting, and heating furnaces described in the specifications of former Letters Patent heretofore granted to me, and to apparatus employed in connection with the said furnaces.

Figure 1 is a plan, partly in section, of my improved puddling-furnace. Fig. 2 is a longitudinal vertical section on the line *x x*, Fig. 1. Fig. 3 is a transverse vertical section on the lines *y y* and *z z*, Fig. 1. Fig. 4 is a front elevation of the said furnace. Fig. 4ª is a section of the end of the revolving cylinder, showing modifications in its construction. Figs. 5 and 6 show forks for manipulating the balls and blooms, as hereinafter described.

Like letters indicate the same parts throughout the drawings.

a is the grate or fire-chamber, which communicates by the aperture a^1 with the revolving cylinder or chamber *b*, which forms the puddling-chamber or refinery. At the lower side of the said aperture is the bridge *c*, which is provided with pipes *c'*, through which water or other cooling fluid is conducted. The said revolving cylinder may be formed of either wrought or cast iron, and its body or circular portion may be made in one piece, with ends of either wrought or cast iron secured thereon; but I prefer that the said cylinder should be formed of a number of staves or plates, b^1, properly fitted together, as shown in the drawing, and riveted or bolted at the ends to rings or hoops b^2 b^3 of wrought or cast iron. These rings and the ends b^4 may be cast in one piece, as shown in Fig. 2, or the ends b^4 may be of wrought-iron riveted on the said rings, as shown in Fig. 4ª. I cast upon or in one piece with the said staves the hollow ribs b^5, which serve to hold the felting or lining. Inside each of these hollow ribs I place a bar, b^6, of wrought-iron, whose ends are dovetailed and secured by casting them in the stave. These wrought-iron bars strengthen the staves, and retain them in place if they should be fractured. When the body of the cylinder is cast or formed in one piece, I form in the same longitudinal apertures or slots, in which I place the hollow ribs b^5, the same being secured in the said slots by bolts or rivets, or the said hollow ribs may be cast in the cylinder. I sometimes use a fixed casing, surrounding the revolving cylinder, to form an air or water chamber for cooling the said cylinder. The ring or hoop b^2 has cast or fixed on it the toothed wheel *d*, whereby the cylinder is rotated. If the wheel is not cast upon the said ring, the latter is formed with a flange or collar, to which the wheel is attached by bolts or otherwise. The said wheel gears with the pinion d^1 on the shaft d^2, which is driven by a steam-engine or other motor. Both of these rings b^2 or hoops have an inclined flange to hold the cylinder-ends b^4, which are made of wrought or cast iron, pressed or otherwise worked into the proper shape, and each end is preferably made of one plate or sheet of iron. These ends are somewhat of a dished form, as shown—that is to say, they have an inclined or sloping portion—whereby they are secured to the flanges of the rings, and a flat portion square or perpendicular to the cylinder's axis, and to this flat portion I attach facing or abrasion rings *e*, made of either wrought or cast iron. To the inside of the end pieces I secure channel-pieces *f*, of angle or other iron, to hold the lining or felting. The removable or shiftable piece *g* is suspended by rods g^1 to rollers on an overhead track, or is otherwise supported, in such a manner as to permit its adjustment to be conveniently effected. In combination with the abrasion-rings *e* on the cylinder ends, I arrange fixed abrasion-rings *h* and *i* on the shiftable or movable piece *g* and on the bridge *c*. The abrasion-rings on the cylinder are fitted to turn freely against the faces of the said fixed rings, while forming with the same a tight joint, which prevents the escape of any molten metal from the furnace. The said abrasion-rings, when worn, are readily removed and replaced by new rings. The fixed rings are provided with a pipe, 1, or other suitable channel, for water, steam, or other fluid, to keep the adjacent parts cool. I pre-

fer to arrange the water pipe or channel 1 to conduct the water down on both sides of the rings; and I also prefer to divide the latter, either at the top or bottom, or both, into two portions to prevent their fracture by unequal expansion. I also arrange perforated pipes or other similar contrivances to throw jets of water upon the cylinder ends b^4 to keep them and their lining cool.

The upper part of the shiftable piece is lined internally with fire-bricks g^2, as shown, but the lower portion of the said piece is exposed to the action of the molten metal, which sometimes flows into the same from the cylinder. It must, therefore, be lined or felted with the compound described in the specification of my patent of 1867; and I provide the interior of the said shiftable or removable piece with a shelf, g^3, on each side. These shelves carry the internal brick-work g^2, and permit the lower part of the said piece to be suitably lined or felted, and this lining to be readily repaired or renewed when required. The outer end of the piece g is provided with a chamber, g^4, for the passage of air, water, steam, or other fluid to protect it from the heat. g^* is a stopper-hole, which permits the inspection or manipulation of the metal in the furnace. The aforesaid movable or shiftable piece g is supported by props j k against the cylinder b and the stationary part g^6 of the flue in such a manner as to allow of its adjustment to compensate for the wear of the aforesaid abrasion-rings or other parts, and the expansion and contraction of the cylinder, while it permits the ready removal or adjustment of the said piece g to one side of the cylinder. These props are rods or bars of iron, or other suitable metal. The prop j rests against the front and the prop k against the sides of said piece, as shown in Fig. 4. At their upper end they rest against studs or projections on the said shiftable piece. At their lower ends they have jaws, which take hold of pins on the side of the ratchet-wheels l. The latter are supported in blocks l^1, firmly bolted down upon the floor or foundation, and are provided with pawls l^2, which allow them to turn only in one direction. I prefer to use double ratchet-wheels, with the teeth of one alternating with those of the other. By turning these ratchet-wheels the props j k are made to press forcibly against the shiftable piece g, which is thereby forced into close contact with the cylinder, as shown in Fig. 4. It may be released therefrom, when required, by raising the pawls and turning back the ratchet-wheels to allow the piece g to be moved away from the cylinder's mouth, as shown in dotted lines in the same figure. Instead of ratchet-wheels and pawls I may use eccentrics, screws, or other similar contrivances, for adjusting the props. The said shiftable piece, as above stated, is suspended by chains or rods from a crane or over-head track, and is moved to or away from the cylinder and flue by a handle or winch, through the medium of a rack and pinion, or other suitable apparatus. The pipes g^9 g^{10}, which conduct the water to and away from the shiftable piece g, are jointed to allow them to follow the said piece in its adjustment. Flexible hose may be used to connect the pipes. The revolving cylinder or chamber is supported upon rollers, which are carried in blocks or brackets m, secured to the foundation or floor. I prefer to have a separate block or bracket for each roller, so that the rollers or blocks may be readily adjusted to compensate for wear, and the cylinder thus be conveniently maintained in its proper position.

I prefer that the cylinder of each furnace should be driven by a separate double-crank engine, to permit the speed to be conveniently varied, as required, and also to permit the motion of the said cylinder to be readily reversed. The employment of a separate engine permits the attainment of these objects much more advantageously than if a number of cylinders were connected to a single large engine, which would necessitate a complicated and costly arrangement of gearing.

I claim—

1. The cylinder of a rotating puddling, heating, or melting furnace, constructed of separate staves b with hollow ribs and wrought-iron bars cast in the said ribs, substantially as herein set forth, for the purpose specified.

2. The end rings b^2 for securing the said staves, constructed in one piece with the end plates b^4, as shown in Fig. 2, or secured to the said end plates by bolts or rivets, as shown in Fig. 4^a, for the purpose specified.

3. The fixed rings e h i, Fig. 2, in combination with the channel for keeping them constantly supplied with water or other cooling fluid, substantially as herein set forth.

4. The fire-brick, or its equivalent, and the lining or felting compound, described herein, for protecting the interior of the shiftable piece g, in combination with the shelves g^3 in the interior of said shiftable piece, for the purposes described.

5. The adjustable props j, or their equivalents, constructed to be used in combination with the said shiftable piece, substantially as herein set forth, for the purpose specified.

6. In combination with the rotating cylinder b, the adjustable blocks or brackets m' carrying the rollers, substantially as herein set forth, for the purpose specified.

SAMUEL DANKS.

Witnesses:

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JEREMIAH F. TWOHIG.