2 Sheets—Sheet 1.

J. I. WILLIAMS.

ROTARY PUDDLING FURNACE.

No. 188,488. Patented March 20, 1877.

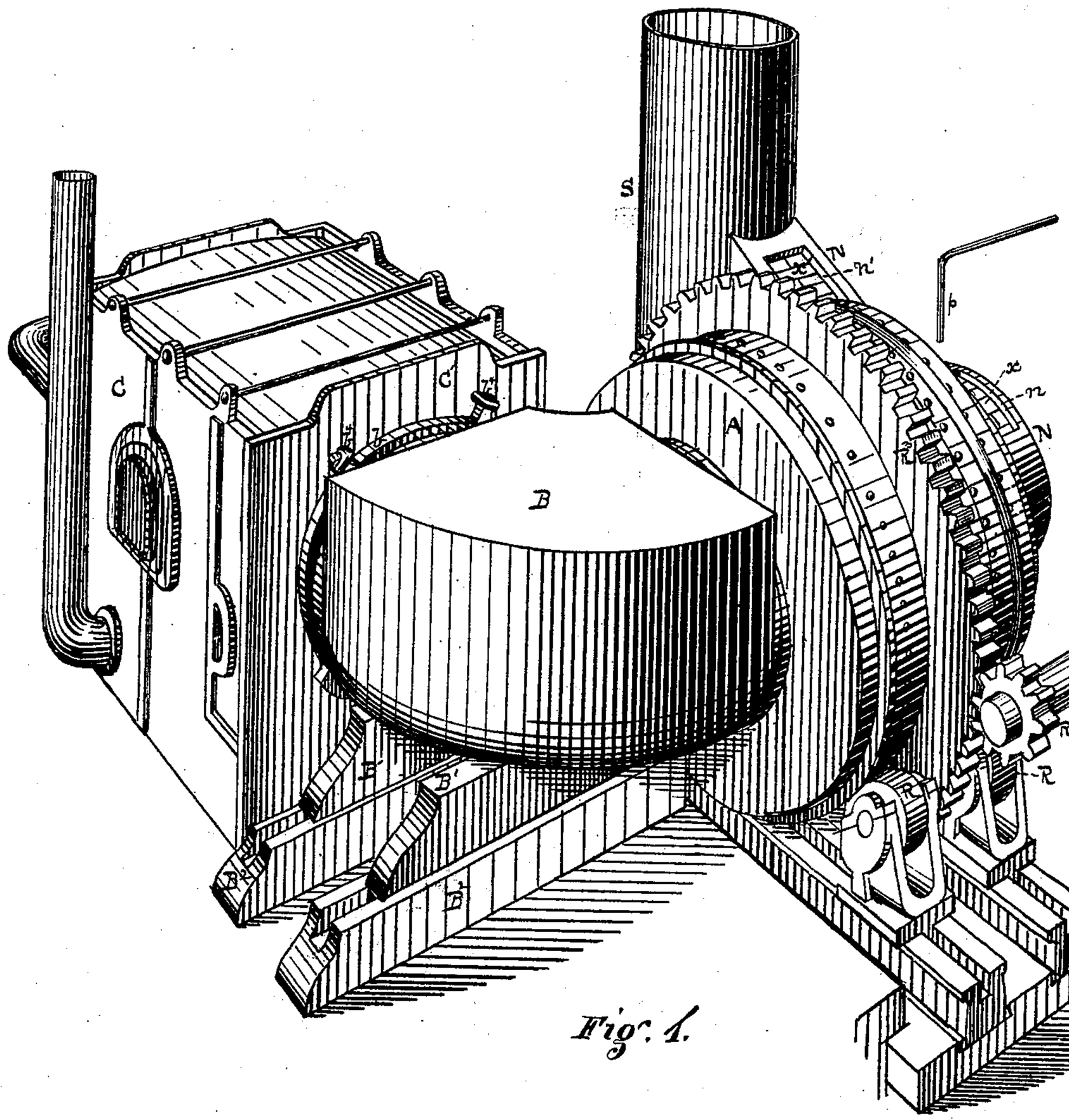

Fig. 1.

Witnesses
Francis L. Clark
Claudius L. Parker

Inventor: John I. Williams.
By Attorney George H. Christy.

2 Sheets—Sheet 2.

J. I. WILLIAMS.

ROTARY PUDDLING FURNACE.

No. 188,488. Patented March 20, 1877.

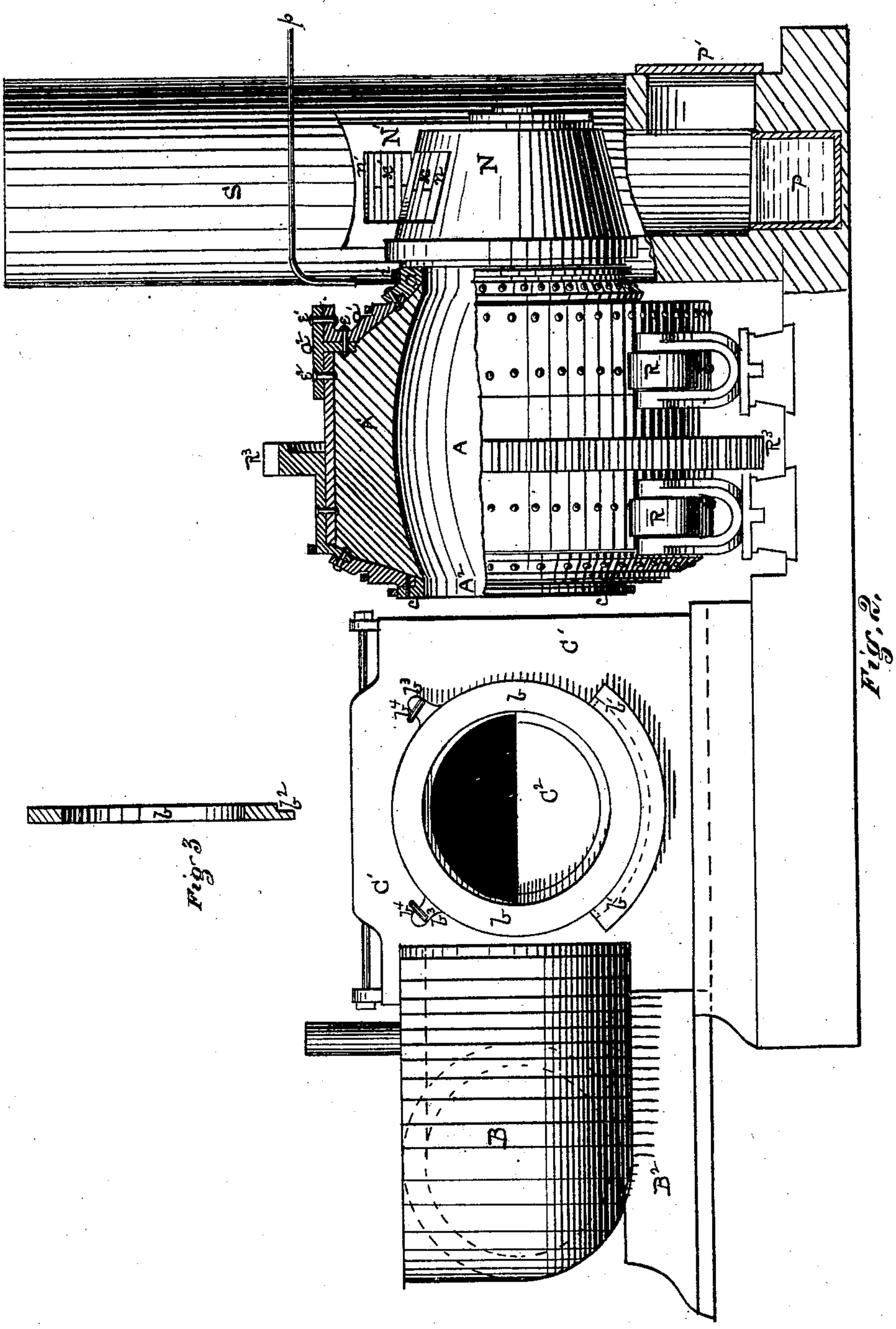

Fig. 1.

Fig. 3.

Witnesses
Francis L. Clark
Claudius L. Parker

Inventor: John I. Williams
By Attorney George H. Christy.

UNITED STATES PATENT OFFICE.

JOHN I. WILLIAMS, OF MILLVALE, PENNSYLVANIA.

IMPROVEMENT IN ROTARY PUDDLING-FURNACES.

Specification forming part of Letters Patent No. **188,488**, dated March 20, 1877; application filed January 8, 1877.

To all whom it may concern:

Be it known that I, JOHN I. WILLIAMS, of Millvale borough, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Rotary Puddling-Furnaces; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a perspective view of my improved furnace. Fig. 2, Sheet 2, shows an end view of the fire-chamber or furnace proper, with the movable flue-section run back, which connects it with the working-chamber, and a view, partly in section, of the working-chamber, the residue being in elevation; and Fig. 3 is a vertical sectional view of the removable water-collar or friction-ring which surrounds the escape flue or opening from the furnace proper.

My present invention relates to certain improvements in the class of puddling-furnaces of which the Danks furnace is an example, and, for convenience, I have illustrated the same, in connection with such a furnace. The rotating working-chamber is represented at A. It is supported and rotated on friction-rollers R, and is driven by suitable power communicated through shaft R^1 and pinion R^2 to the rack R^3.

The usual lining or fettling is represented at A^1. The neck N communicates with the stack S. These parts, as well as the furnace proper or fire-chamber C C^1 are, except as hereinafter explained, of the usual or any desired construction. The fire-bridge of the furnace is shown at C^2. The bridge-opening that leads from the fire-chamber is surrounded by a collar or ring, *b*, which projects a little from or beyond the face of the end wall C^1. This ring has heretofore been fixedly secured in place, so that when it burnt out or wore out, or became broken, the end wall of the furnace and the fire-bridge C^2 had to be torn down and rebuilt in the removal and renewal of the ring. To avoid this necessity, I make the ring *b* removable, by means of any suitable exterior fastening at or about its lower edge, and any convenient detachable fastening at or about its upper edge. As shown in the drawing, a curved cleat, b^1, rabbeted along its inner upper side, is permanently secured in proper position for the ring *b* to rest thereon, and a rib, b^2, on the lower edge of the ring *b*, enters the rabbet. On the upper side of the ring are one or more lugs, b^3, through which screw-bolts may pass to hold the upper part of the ring to the furnace-wall, or swinging hooks b^4 may be employed for the same purpose. The ring *b* can then be renewed without material trouble or expense.

Heretofore the working-chamber A has been arranged with its open end A^2 directly against the fire-bridge opening. I have found this arrangement open to many difficulties, and among others is the fact that the rings *b c*, working closely against each other, wear away rapidly, and it is then impracticable to move either the furnace or working-chamber so as to close up the joint. To remedy this and other evils, I arrange the furnace C and working-chamber A in such relative position that a curved, crooked, or angular removable flue or flue-section B can be made to connect the fire-chamber with the mouth A^2 of the working-chamber. This flue-section is, by suitable sliding rails B^1, mounted on ways B^2, or by other equivalent devices of like function, made removable, for convenience in making repairs, and also adjustable, so that as the rings *b c*, one or both, wear away, it may be slid forward, and thereby close up the joint caused by such wearing. Any suitable brace or support placed against its outer curved side may be employed to hold it in place.

Instead of the ways B^2, the flue-section B may be suspended from an overhanging track or rail by a wheel or truck running thereon, as is common in rolling-mills, and such overhanging track or rails, with suitable means of suspension and movability, I include herein as the mechanical equivalents of the slides and ways shown in the drawing.

The Danks working-chamber, as heretofore constructed, has a shell made at both ends, substantially as indicated at the left hand of A in Fig. 2, with ends approaching so near a right angle to the cylindrical part of the shell. I have found that the expansion of the fettling A' is so great and so strong as to rupture

the case. I have hence made the opposite or right-hand end of the case, as represented by the annular plates *a a'*, with an inner face sloping at a considerable angle to the cylindrical part of the shell—say, about one hundred and fifty degrees, more or less—so that the fettling as it expands, instead of exerting its expansive force to rupture the case, will slide along the slope of such end and extend over the inner face of the end ring *a*, so as, also, to protect it against the destructive action of the heat, which passes over into the neck N; and as a further security to the case, I connect the sloping end ring a^1 to the cylindrical part of the case by a T-ring, a^2, arranged and combined substantially as shown, so as to get three lines of riveting, *e* e^1 e^2, at the angle of the cylindrical and end parts of the case. By this means the durability of the case is largely increased.

As a further means of preserving the ring *a* from the destructive effects of the heat, I play a jet of water onto its upper face, as it revolves, by the use of any suitable pipe, *p*. And partly to convert the outer face of this ring into a kind of annular trough, I encompass it at the extreme outer end of its slope with a band, *i*, which has the effect to prevent the escape of the water in that direction, and so cause it to run down the sides of the ring *a*, with the result of comparatively low temperature in such ring. The neck, which leads from the working-chamber A to the stack S, consists of a drum, N, of the form of the frustum of a cone, made of a cast or sheet iron shell, lined with fire-brick, and a rising flue, N', leading from the side of N to the stack S, and in like manner composed of a cast or sheet iron shell lined with fire-brick. These shells, as heretofore made, could be lined only from the inside, and great trouble has been experienced from the difficulty of keying or properly supporting the top or roof part of the lining.

This difficulty I have overcome by casting the shells each with an opening, *n n'*, respectively, on its upper side, sufficiently large to enable the fire-brick linings *x x'* to be keyed from the outside after the linings have been properly built up within. In this way the shells can be lined so that the linings will be as durable as is usual in similar structures under like conditions of use.

The lining of the stacks of such furnaces is apt to melt and become disintegrated and fall down. If such matter be allowed to accumulate it will fill up the base of the stack and run down the neck N N' into the working-chamber. To prevent this I arrange a water-box, P, at the base of the stack, to receive such detritus, and provide a door, P', for its removal. I have also found that this door answers the purpose of the usual damper at the top of the stack, for regulating the draft. For most purposes the draft can be regulated sufficiently by opening and closing this door, without resorting to the use of the damper. The water in the box P also has the effect of cooling the lining of the stack, and prevent it from being melted down by the heat.

Where gaseous instead of solid fuel is employed, it may be introduced and ignited in the flue section B, or at other desired point back of the working-chamber. The introduction of the flue-section B is secured by throwing the furnace C and working-chamber A out of line with each other. The angle which they make with each other is preferably about ninety degrees, but may be varied considerably and to any extent, as preferred.

I claim herein as my invention—

1. The fire-chamber and rotary working-chamber, angularly arranged to each other, in combination with an adjustable intermediate flue-section, substantially as set forth.

2. The combination, with fire-chamber and rotary working-chamber, of the intermediate removable flue-section, substantially as set forth.

3. The rotating working-chamber A, having the usual angular slope in its shell at the fire-inlet end, and end rings *a* a^1 at its outlet end, at an increased angle relatively thereto, substantially as and for the purposes set forth.

4. The T-ring a^2, in combination with the cylindrical part of the casing, and with the end ring a^1, substantially as set forth.

5. A brick-lined cast-iron flue-case, having an opening in the case through which to key the arch or top of the brick-work, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN I. WILLIAMS.

Witnesses:

JAMES M. CHRISTY,

GEORGE H. CHRISTY.