

(No Model.)

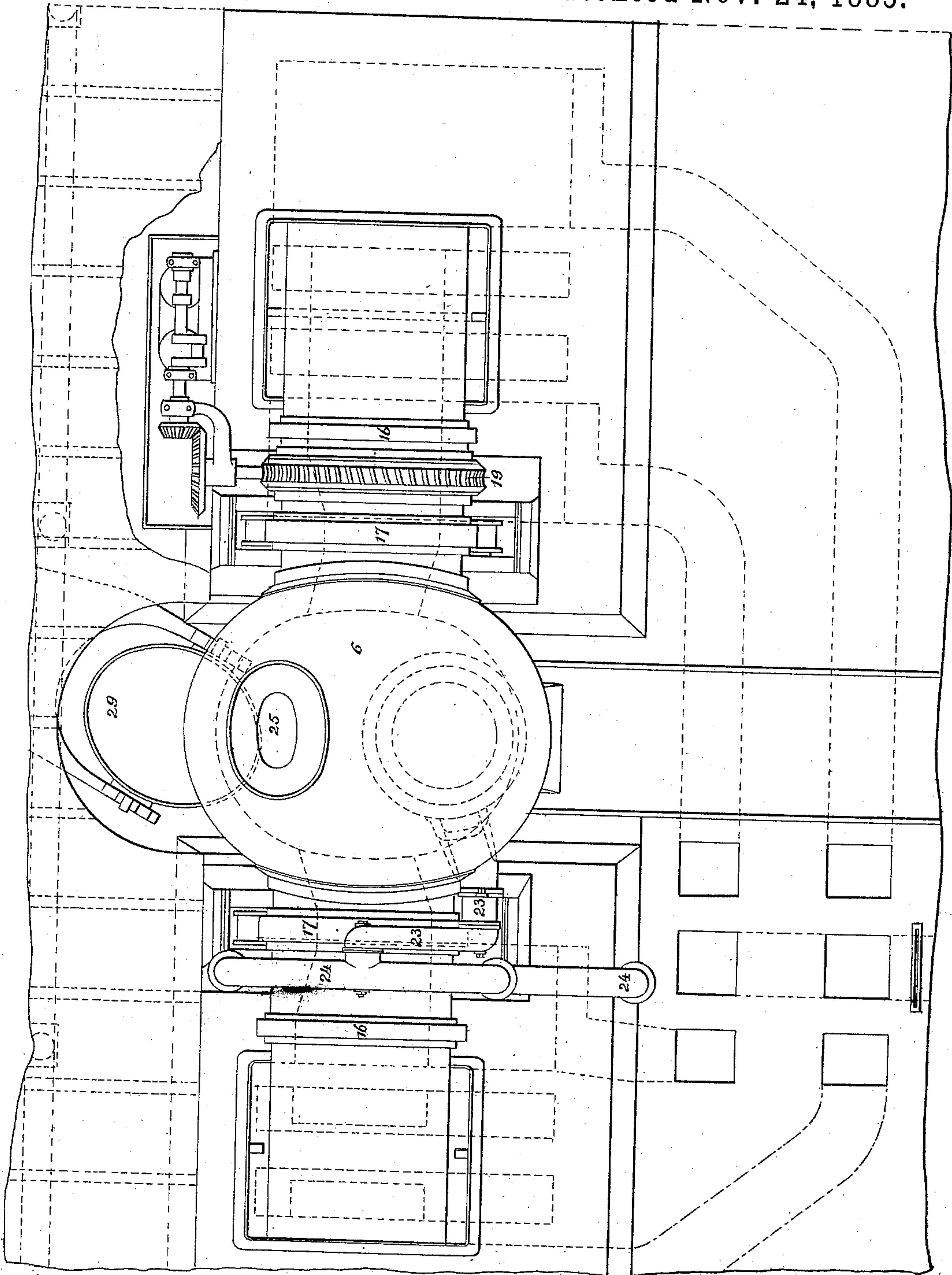
4 Sheets—Sheet 1.

T. WILLIAMSON.

APPARATUS FOR THE MANUFACTURE OF IRON AND STEEL.

No. 331,267.

Patented Nov. 24, 1885.



WITNESSES:

John M. Clayton
Harry Drury

FIG. 1.

INVENTOR:

Thomas Williamson
by his Attorneys
Howson & Sons

(No Model.)

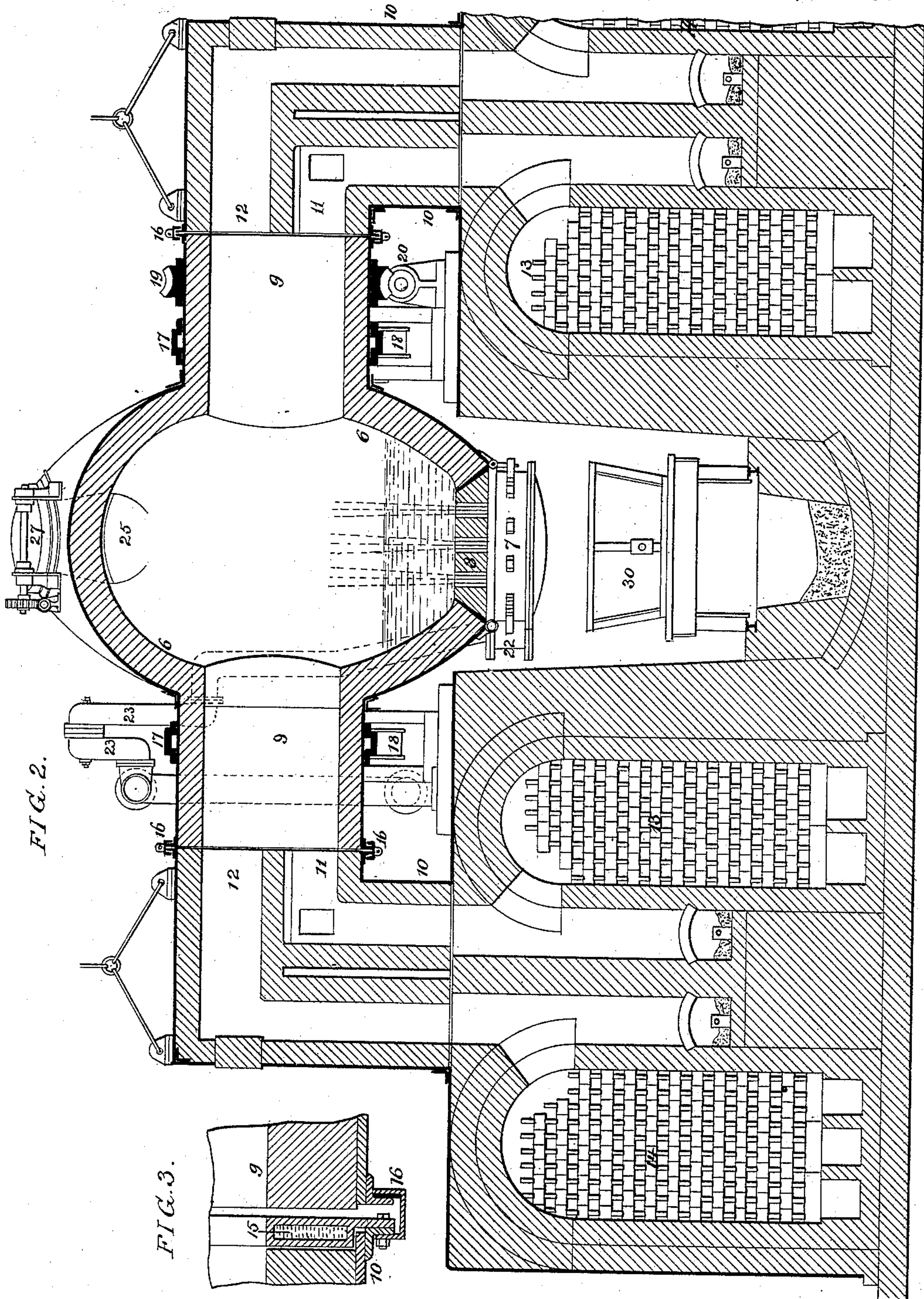
4 Sheets—Sheet 2.

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WITNESSES:

John M. Clayton.
Harry Drury

INVENTOR:

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4 Sheets—Sheet 3.

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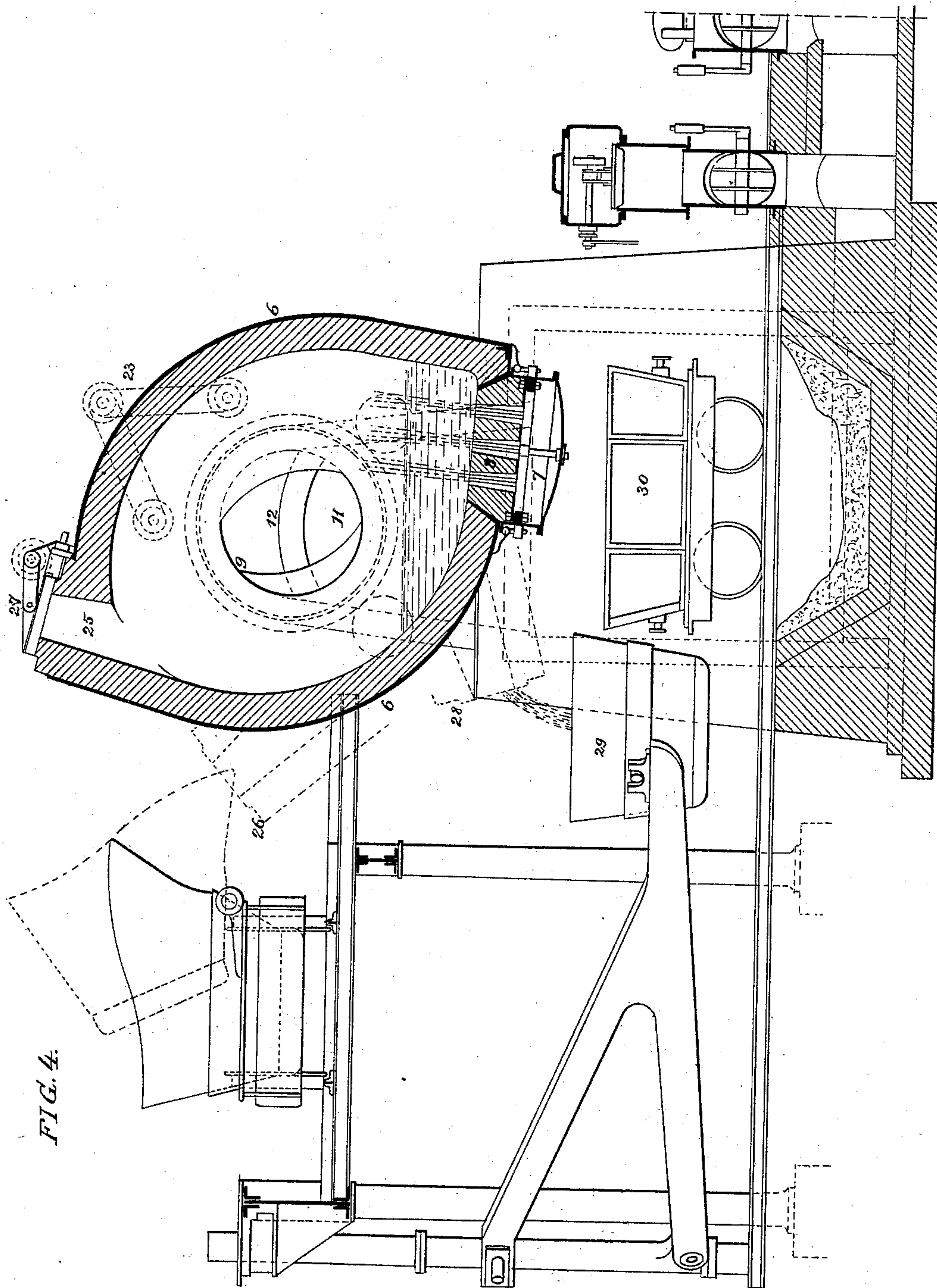


FIG. 4.

WITNESSES:

John M. Clayton
Harry Drury

INVENTOR:

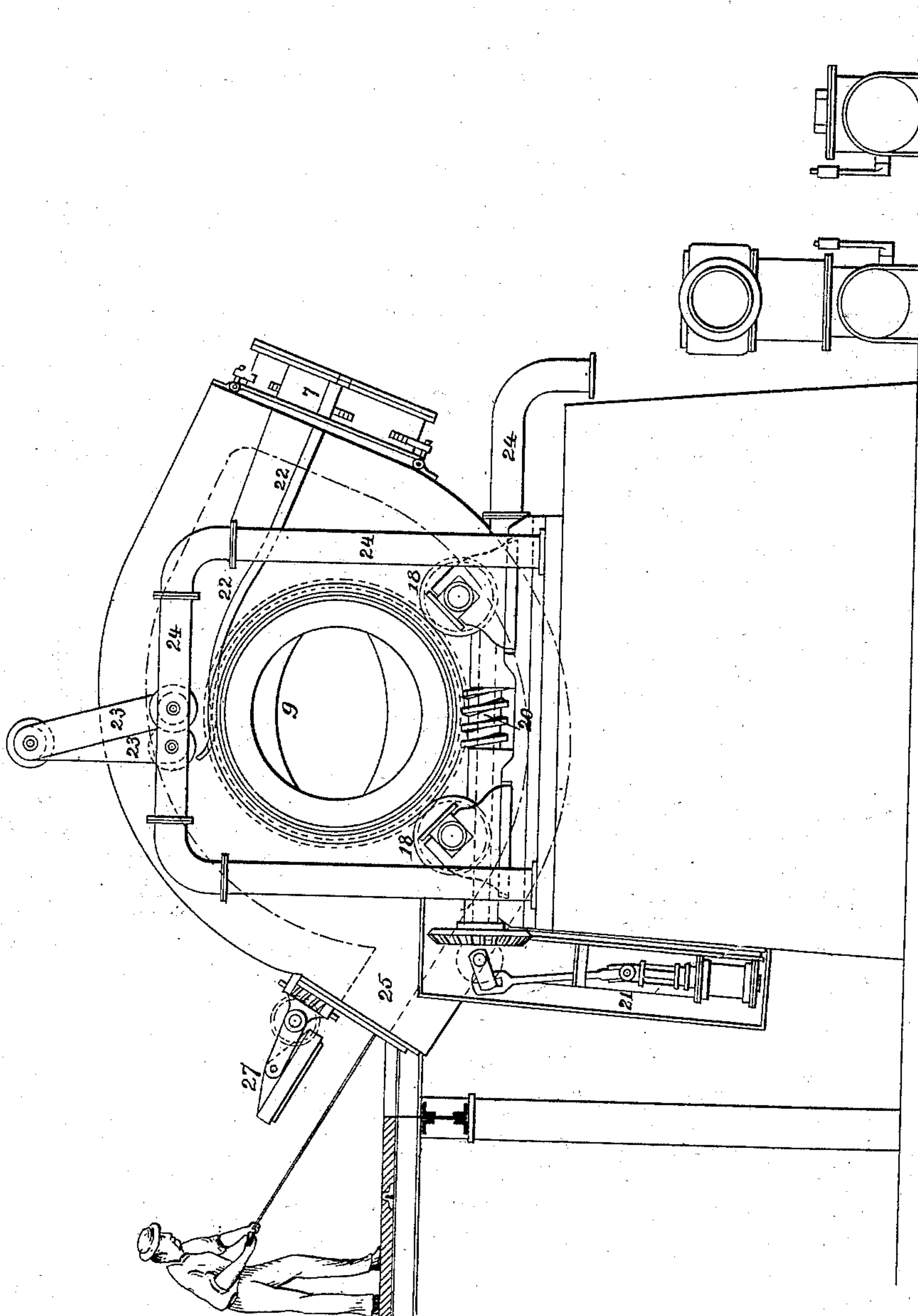
Thomas Williamson
by his Attys.
Howson & Sons

(No Model.)

4 Sheets—Sheet 4.

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FIG. 5.



WITNESSES:

John M. Clayton
Harry Drury

INVENTOR:

Thomas Williamson
by his Attorneys
Howe & Sons

UNITED STATES PATENT OFFICE.

THOMAS WILLIAMSON, OF WISHAW, COUNTY OF LANARK, SCOTLAND.

APPARATUS FOR THE MANUFACTURE OF IRON AND STEEL.

SPECIFICATION forming part of Letters Patent No. 331,267, dated November 24, 1885.

Application filed September 22, 1884. Serial No. 143,744. (No model.) Patented in England April 9, 1884, No. 6,082; in France August 19, 1884, No. 163,837; in Belgium August 21, 1884, No. 66,083, and in Germany August 21, 1884 No. 31,236.

To all whom it may concern:

Be it known that I, THOMAS WILLIAMSON, a subject of the Queen of Great Britain and Ireland, and a resident of Wishaw, county of Lanark, Scotland, have invented certain Improvements in Apparatus for the Manufacture of Iron and Steel, for which I have obtained British Letters Patent No. 6,082, dated April 9, 1884, of which the following is a specification.

My invention consists of certain improvements in the construction of apparatus for the manufacture of iron and steel, and particularly apparatus of that class in which a tilting converter is combined with regenerative furnaces for carrying out both the Bessemer and Siemens process.

My invention relates more especially to the construction of the converter, as fully described hereinafter.

In the accompanying drawings, Figure 1, Sheet 1, is a plan view of the complete apparatus. Fig. 2, Sheet 2, is a longitudinal vertical section. Fig. 3 is an enlarged sectional view. Fig. 4, Sheet 3, is a transverse vertical section; and Fig. 5, Sheet 4, is a sectional elevation.

In Fig. 4 the converter 6 is shown in the position in which it is placed while air is being blown through the molten metal from the blast-box 7 and through the tuyeres 8. The converter is mounted on hollow trunnions 9, which form the outlets for the gases, for during this operation the pouring-aperture 25 is closed by a suitable cover, 26. When the converter is in this upright position, the tuyeres are substantially in a vertical direction at the bottom of the converter; but instead of being arranged at the center, as usual, they are at one side, as shown, adjoining the curved upper wall of the converter, so that the tuyeres direct the blast alongside and against said curved wall on lines tangential to the axis of the converter. The gases are thus caused to revolve or pass spirally around the axis instead of passing directly to the hollow trunnions at the opposite sides, this motion favoring the deposition of particles of metal thrown up mechanically by the blast, and thereby preventing much of the waste which takes place

in working the Bessemer process in the ordinary way. The hollow trunnions 9 connect with blocks 10, having in them passages or flues 11 12, which, like the gas and air ports and passages of a Siemens steel-making furnace, communicate in all positions with regenerative chambers 13 14, containing checker or open brick-work, and while the Bessemer process is in operation the heated gases, instead of being discharged to the atmosphere in the ordinary way, are led through the regenerative chamber 13 14 for the purpose of storing and saving their heat. The blocks 10, containing the passages 11 12, between the hollow trunnions 9 and the regenerative chambers 13 14, are made portable to facilitate examination and repairs. As the joint between the outer end of each hollow trunnion 9 and block 10 is subjected internally to considerable heat, which might act injuriously upon the adjacent surfaces of the fire-brick linings, I introduce a cooling appliance which is shown on an enlarged scale in Fig. 3, and consists of a hollow ring, 15, through which cold water is made to circulate. This ring 15, which is of a flat form, is fixed to the stationary part of block 10, and to the same part there is also fixed a channel-shaped ring, 16, (put on in halves or segments,) which, embracing angle-iron flanges fixed on the trunnion 9 and on the block 10, covers the joint between the two parts, and if required to make the joint sufficiently tight, asbestos may be inserted between one flange of this outer ring, 16, and the angle-iron ring on the trunnion 9.

On the trunnion 9 of the converter 6 there are fixed strong rings 17, which rest on rollers 18, carried by fixed frames, and the converter rests by these rings 17 on the rollers 18, and may be turned into its various positions by means of a worm-wheel or spur-wheel teeth on one of its trunnions gearing with a worm or pinion on a shaft driven by a steam or hydraulic motor details.

The arrangement shown in the drawings consists of a ring, 19, of worm-wheel teeth on one of the trunnions 9, and having in gear with it a worm, 20, on a shaft receiving motion from a steam-engine, 21. The air is led

into the blast-box 7 by a pipe, 23, fixed on the outside of the converter 6, and connected by jointed pipe-lengths 23 to a stationary pipe, 24, which last is connected to the blowing engine or machine, the jointed parts 23 accommodating themselves to the movement of the converter when being turned into its various positions.

With my improved construction of converter the pressure of the blast will not require to be so great as that necessary with ordinary Bessemer converters, and there will in consequence be not only economy in the power required, but also less tendency to throw up and waste the metal.

In working with my improved apparatus a charge of molten pig or crude iron, obtained either directly from a blast-furnace or from a cupola, is introduced into the converter, the converter being turned so as to bring its mouth or inlet 25 into the position indicated by dotted lines at 26 in Fig. 4. The inlet 25 is provided with a cover, 27, which is closed after the charge has been introduced. The converter 16 is then turned into the position in which it is shown in full lines in Fig. 5 and the blast is turned on.

Hot or cold steel scrap is added to the charge if thought desirable, and the charge having been blown during ten or fifteen minutes, and the carbon and silicon in the metal sufficiently reduced, the converter 6 is turned, so as to lower the inlet 25 on one side and raise the tuyeres 8 above the metal on the other side; and the blast having been turned off the air and gas are turned on, and the operations are carried on and completed as in a Siemens furnace, ore and spiegeleisen being added, if necessary, for reducing the carbon to the proper proportion. The inlet-aperture 25 serves as a door for introducing material or stirring-instruments, or for extracting samples for testing, as indicated in Fig. 5, in which figure the converter is shown in the position in which it is placed during the time when the operation is being conducted as in a Siemens furnace. When the process is finished, the converter 6 is turned to lower its inlet into a position indicated by dotted lines at 28 in Fig. 4, for teeming or pouring the metal into a ladle, 29, for distribution among the ingot-molds. The ladle 29 and its moving gear may be such as is used with Bessemer apparatus, and when ferro-manganese is added at the

time of pouring it may be placed in the mouth or aperture 25 of the converter 6 to become heated, so that the molten metal in flowing over it may carry it into the ladle, and thereby insure a proper mixture and a suitable addition of the carbon and manganese to restore the decarbonized metal to the temper or quality required.

The converter may be prepared for working with either the basic or acid process. I prefer, however, to use the acid process with my improved apparatus. After the metal has been poured out the converter 6 is turned to place its mouth or inlet 25 in a still lower position, for the purpose of pouring out the slag into a wagon, 30, placed below to receive it, or into a pit.

I am aware of the British patent of Adamson, No. 3,233 of 1863, in which a converter is shown with a curved wall and tuyeres tangential to the axis; but in that case the tuyeres are arranged in a nearly horizontal position in the side wall of the converter instead of in the bottom adjacent to the curved wall, as in my apparatus, and the gases pass directly to the outlet at the top instead of to hollow trunnions on opposite sides, so that the converter shown in said patent cannot answer the same purpose as my improvement.

I claim as my invention—

1. The converter having a curved upper wall and outlets at the sides, and having substantially vertical tuyeres in the bottom, on the side adjacent to said wall, and directed in lines tangential to the axis of the converter and against said curved wall, substantially as and for the purpose described.

2. The combination of regenerative furnaces, with an intermediate converter having hollow trunnions open to the said furnaces, and having a curved upper wall with substantially vertical tuyeres in its bottom, adjacent to said curved wall, and directed on lines tangential to the axis of the converter and against the curved wall, substantially as and for the purpose set forth.

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

THOMAS WILLIAMSON.

Witnesses:

EDMUND HUNT,
DAVID FERGUSON.