

No. 695,886.

Patented Mar. 18, 1902.

C. I. RADER.
BLAST FURNACE.

(Application filed May 22, 1901.)

(No Model.)

3 Sheets—Sheet 1.

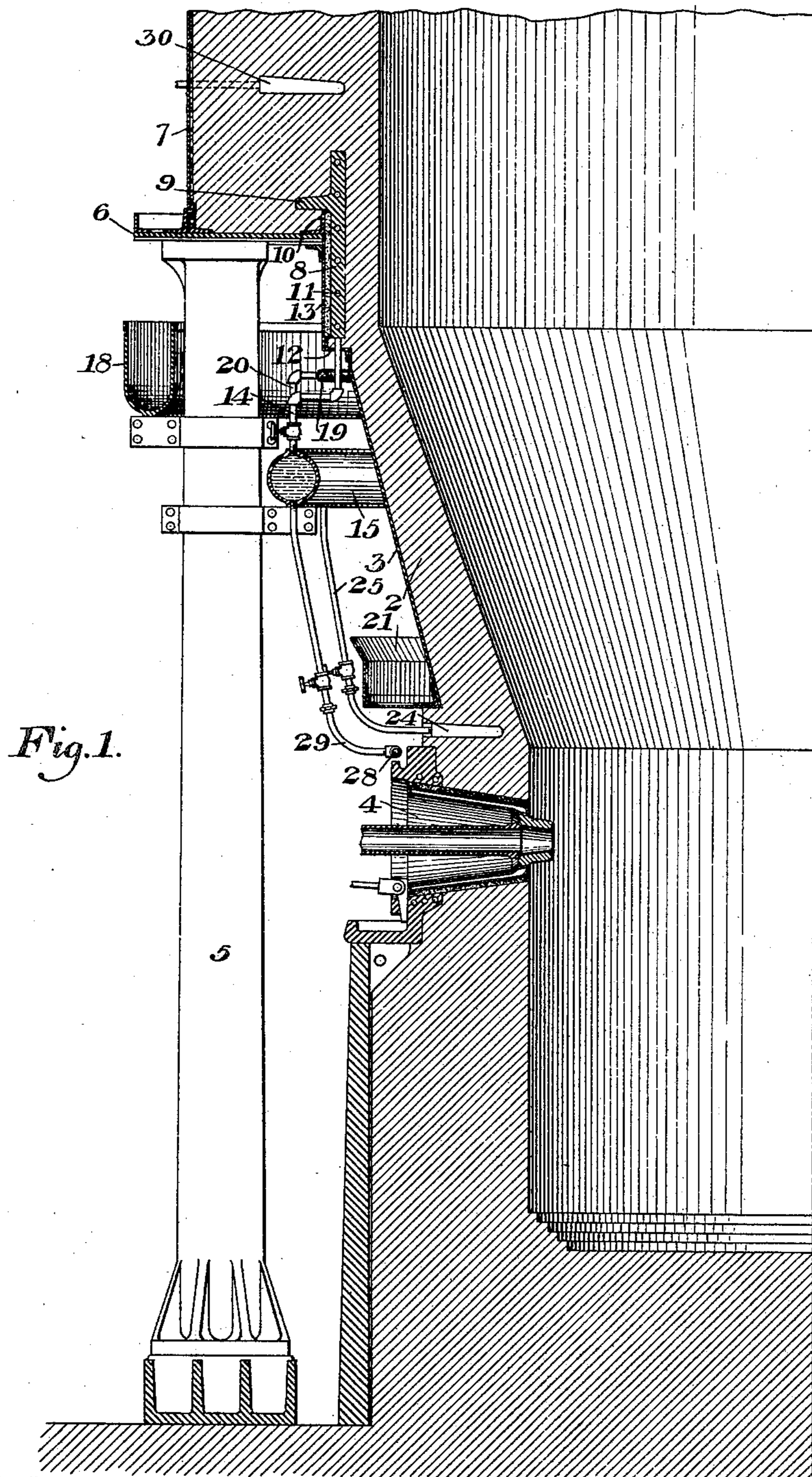


Fig. 1.

WITNESSES

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J. M. Corwin

INVENTOR

Charles I. Rader
by Baker & Byrnes
his attys.

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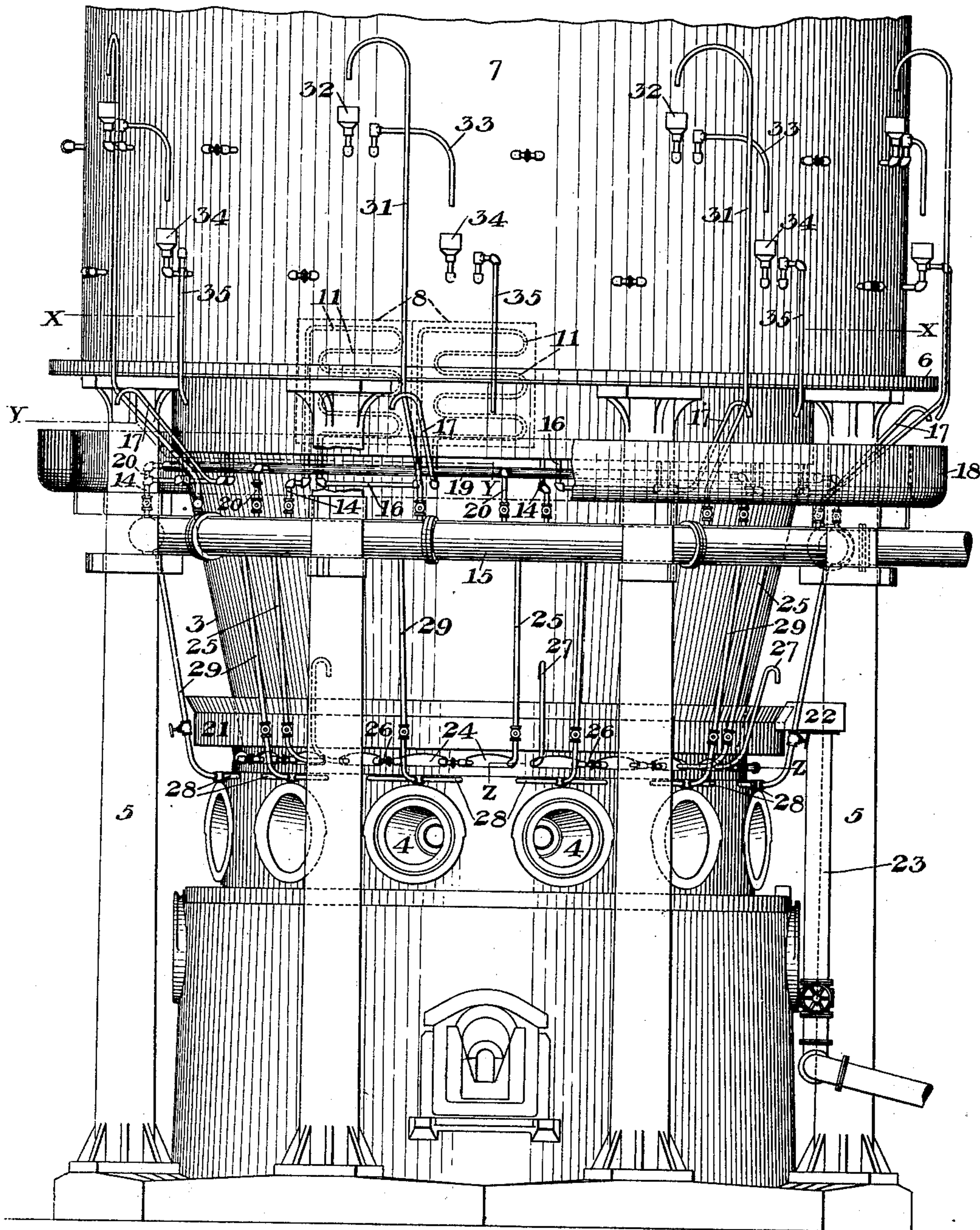
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Fig. 2.



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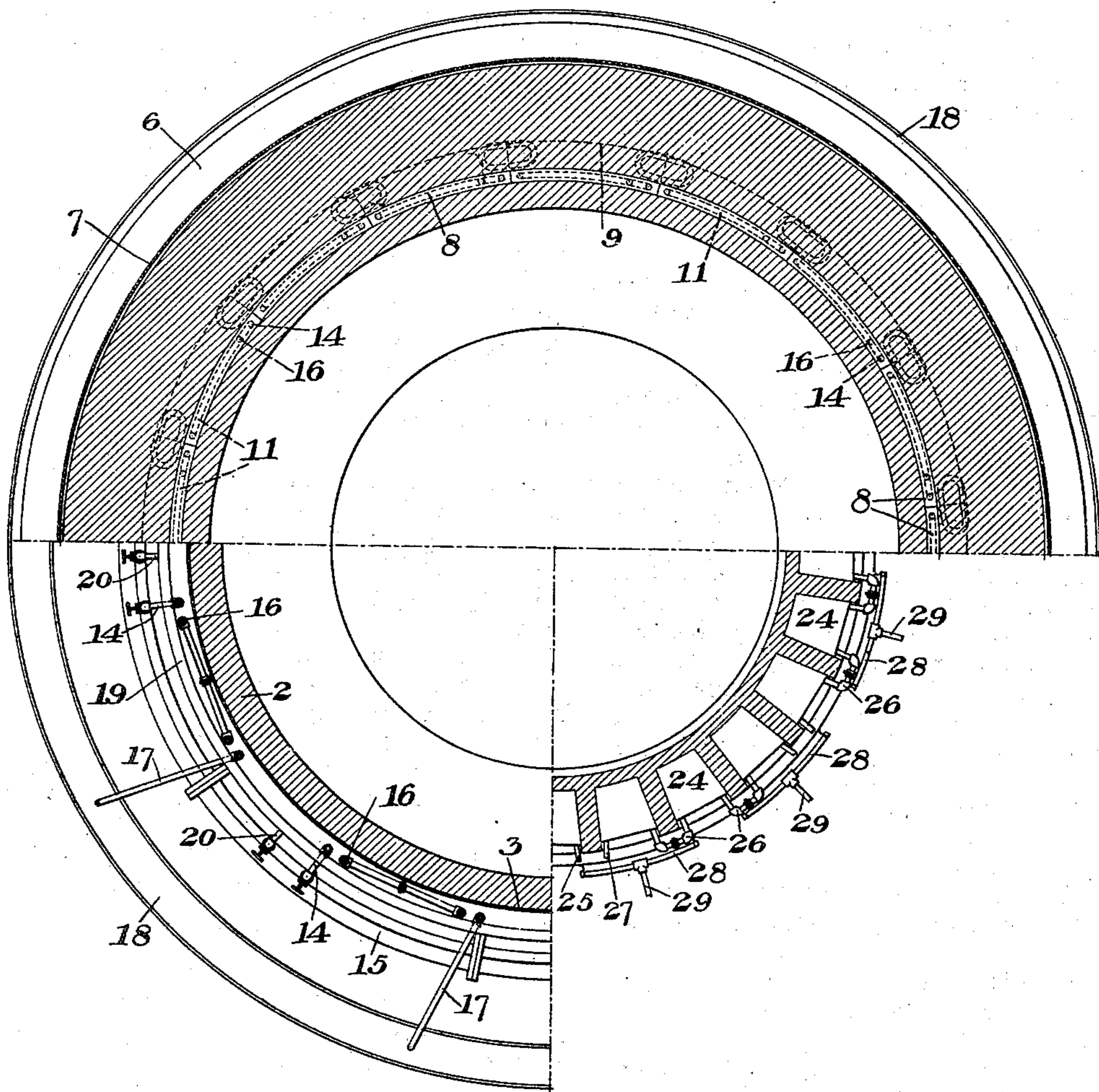
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Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES I. RADER, OF YOUNGSTOWN, OHIO, ASSIGNOR OF ONE-HALF TO
WILLIAM H. HASSINGER.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 695,886, dated March 18, 1902.

Application filed May 22, 1901. Serial No. 61,386. (No model.)

To all whom it may concern:

Be it known that I, CHARLES I. RADER, of Youngstown, Mahoning county, Ohio, have invented a new and useful Blast-Furnace, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a partial vertical section of a blast-furnace constructed in accordance with my invention. Fig. 2 is a side elevation of the same, partly broken away; and Fig. 3 is a horizontal section, the upper half of the figure being on the line X X, the lower left-hand portion on the line Y Y, and the lower right-hand portion on the line Z Z of Fig. 2

My invention relates to the construction of blast-furnaces, and particularly to the bosh portions thereof; and it is designed to prevent the formation of corrugations or ridges in the bosh-lining, such as result from the use of the horizontal rows of cooling-plates now used. It is further designed to reduce the expense of constructing the bosh portion of the furnace, to prevent the forming of openings and the forcing out of gases at the juncture of the jacket and the mantle, where a bosh-jacket is used, and to improve the action of the furnace and prolong its life.

In the drawings, 2 represents the bosh-lining, and 3 the bosh-jacket, of a blast-furnace, having the usual twyers 4 arranged around the crucible.

5 represents the supporting-columns for the furnace, 6 the annular mantle-plate, and 7 the cylindrical shell of the furnace.

In order to prevent buckling of the bosh-jacket at the point where it joins the mantle, which causes openings through which the gases escape, I provide vertically-extending water-cooled plates 8, which extend from above the mantle-plate to a level below it and are provided with outer lateral flanges 9, which rest on angles 10, resting upon or secured to the mantle-plate. These plates 8 may be water-cooled in any desirable manner, and I have shown them as cast about serpentine pipes 11, both ends of which project downwardly through a jog or offset portion 12 in the bosh-jacket.

A small space for rivet-heads is shown be-

tween the outer face of the vertical plate 8 and the inner face of the cylindrical portion 13 of the bosh-jacket, which space is preferably filled with grouting. The offset 12 is designed to protect this plate, so that the blast or gases, which arise with more or less velocity, are prevented from impact with the under side of the plate, which is set above the shelf or offset portion.

I have shown the water connections for the plates 8 as connected in pairs. Thus the supply-pipe 14 leads from the annular supply-pipe 15 and is connected to the serpentine pipe of one of the plates, while the outlet-pipe 16 of this plate is connected with the inlet for the next plate. The outlet for this next plate of the pair is connected to a U-shaped pipe 17, which discharges into the annular trough 18, surrounding the bosh.

The jacket 3 is cooled by means of a circular spray-pipe 19, which surrounds it beneath the offset and discharges the water directly upon the jacket. This spray-pipe may be fed from the supply-pipe 15 through pipes 20. The lower end of the jacket is provided with a catch-trough 21, from which the water passes through overflow 22 (shown in Fig. 2) and through waste-pipe 23 to the sewer or well.

Between the lower part of the bosh-jacket and the twyer-coolers are placed the horizontal cooling bosh-plates 24. These plates are located in the wall and may be fed from the supply-pipe through feed-pipes 25. I have shown these plates as connected by the short pipes 26 in sets of three, the third plate having the waste-pipe 27, which is curved over to discharge into the trough 21. This row of plates is placed as closely above the twyer-coolers and below the lower end of the bosh-jacket as will allow their ready removal and prevent the impingement of the blast upon the bosh-jacket, and consequently prolong its life. They also act as a support for the brick lining or other refractory wall which may be formed or produced in the melting zone and prevent it from sliding into the hearth or crucible.

The twyer spray-pipes 28 may be fed from the supply-pipe 15 through the feed-pipes 29.

In order to prevent recesses being formed

in the lining above the plates 8, I provide above the mantle one or more horizontal rows of cooling-plates 30. The inner ends of these plates 30 are preferably flush with the vertical plane of the inner faces of the plates 8, so that the cooling action holds the lining from recessing back of the plane of these plates.

In Fig. 2 I have shown the water-supply connections for two rows of such plates, 31 being the feed-pipe leading from the supply and discharging into receptacles 32, connected to the inlet of one set of plates, through which the water is fed and from which it passes through pipe 33 to a receptacle 34, feeding a set of plates in the lower row and from which the waste is led through pipe 35, which discharges into the trough 18.

The advantages of my invention result from the use of the vertically-extending cooling-plates at the juncture of the bosh and mantle in combination with the water-cooled bosh-jacket, since the escape of the gases is prevented and the jacket is prevented from buckling. These vertical water-cooled plates thoroughly protect this level and are especially important with the low boshes now being universally adopted. The lowest parts of these plates are above the melting zone and are not liable to burn or melt while water is supplied thereto. If from any cause any section of these plates should become useless, the spray on the jacket will prevent serious trouble. The shelf or offset portion of the bosh-jacket assists in protecting this plate and places it outside the cutting action of the gases.

The use of the sprayed bosh-jacket with the row of cooling-plates between it and the twyers prevents ridges or corrugations forming in the bosh, the cooling-plates preventing the blast from injuring the jacket, and also supporting the lining.

The water-cooled plates above the mantle are important in preventing injury to the vertical mantle-plates, and they prevent recesses forming above these plates and insure a more even flow of the stock.

With my construction of bosh the stock is less liable to bridge, the working of the furnace is more regular, and the cost of the bosh is much less than those of the ordinary construction.

Many changes may be made in the form and arrangement of the jacket, the cooling-plates, and the cooling connections without departing from my invention as defined in the claims. I claim—

1. A blast-furnace having a mantle, vertical water-cooled plates in its walls at the level of the mantle, a jacket surrounding the plates, means for cooling the plates, a bosh-jacket surrounding the furnace-bosh, and means for

cooling the said bosh-jacket; substantially as described.

2. A blast-furnace having a mantle, vertical plates embedded in the masonry wall of the furnace at the level of the mantle, and containing cooling-passages, the furnace-bosh having a surrounding jacket, and means for cooling said plates and bosh-jacket; substantially as described.

3. A blast-furnace having a mantle, vertical plates at the level of the mantle, means for water-cooling said plates, a jacket surrounding the furnace-bosh, means for cooling said bosh-jacket, and an offset jacket portion extending from the bosh-jacket around the water-cooled mantle-plates; substantially as described.

4. A blast-furnace having a mantle, vertical plates at the mantle level, and having outwardly-projecting lips or flanges, supports for said lips, and means for water-cooling the plates; substantially as described.

5. A blast-furnace having a bosh-jacket, means for water-cooling the same, twyer-coolers below the bosh-jacket, a row of horizontal plates between the twyer-coolers and the lower part of the bosh-jacket, said plates extending inwardly beyond the jacket and acting as shelves for the wall or lining and means for water-cooling said horizontal plate; substantially as described.

6. A blast-furnace having a mantle, vertically-extending plates embedded in the masonry wall at the mantle level, means for water-cooling said plates, and a horizontal row of cooling-plates embedded in the furnace-walls above the level of the mantle; substantially as described.

7. A blast-furnace having a mantle, vertically-extending plates at the level of the mantle, means for water-cooling said plates, and a horizontal row of cooling-plates embedded in the furnace-wall above the mantle, said upper plates extending inwardly to the vertical plane of the plates at the mantle level; substantially as described.

8. A blast-furnace having a mantle, vertically-extending plates at the mantle level, means for water-cooling the plates, a bosh-jacket, means for water-cooling said jacket, twyer-coolers below the bosh-jacket, a row of horizontal plates embedded in the bosh between the lower end of the jacket and the twyer-coolers and acting as shelves, and means for cooling said horizontal plates; substantially as described.

In testimony whereof I have hereunto set my hand.

CHAS. I. RADER.

Witnesses:

H. M. CORWIN,
C. P. BYRNES.