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PATENTED NOV. 17, 1903.

A. FARRELL.

SUPPORT FOR COOLING PLATES OR COILS IN BLAST FURNACES.

APPLICATION FILED JULY 19, 1902.

NO MODEL.

3 SHEETS—SHEET 1.

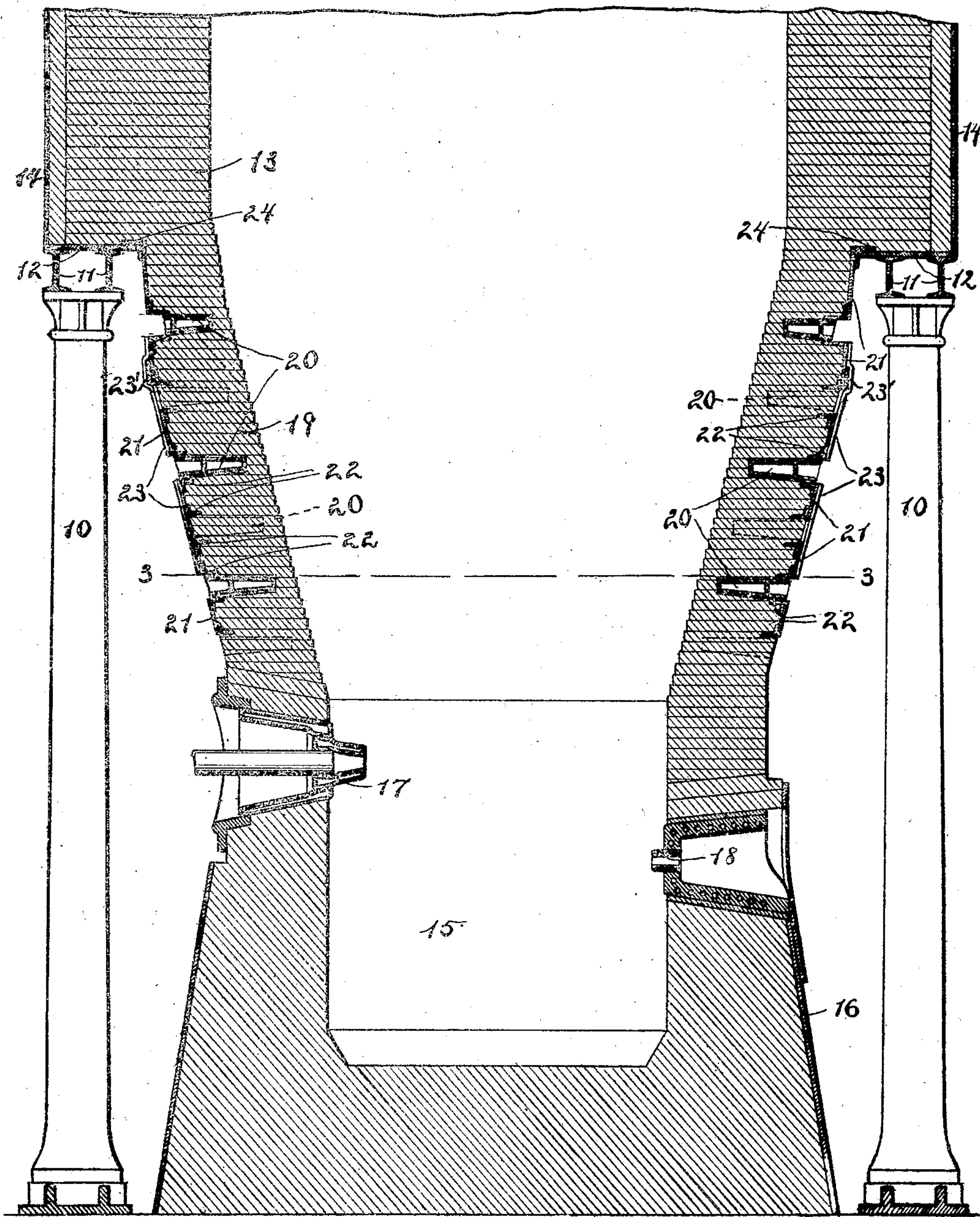


Fig. 1.

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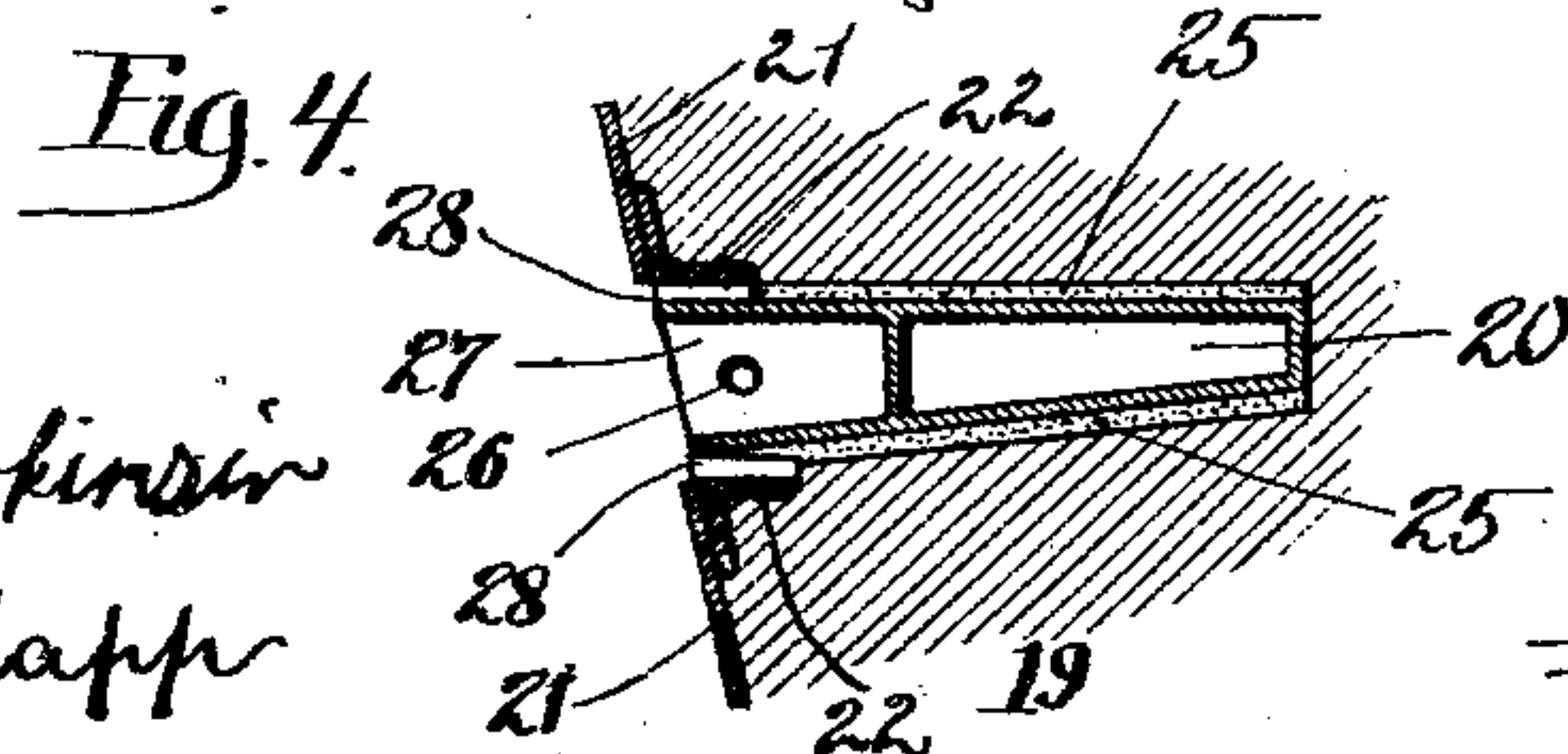
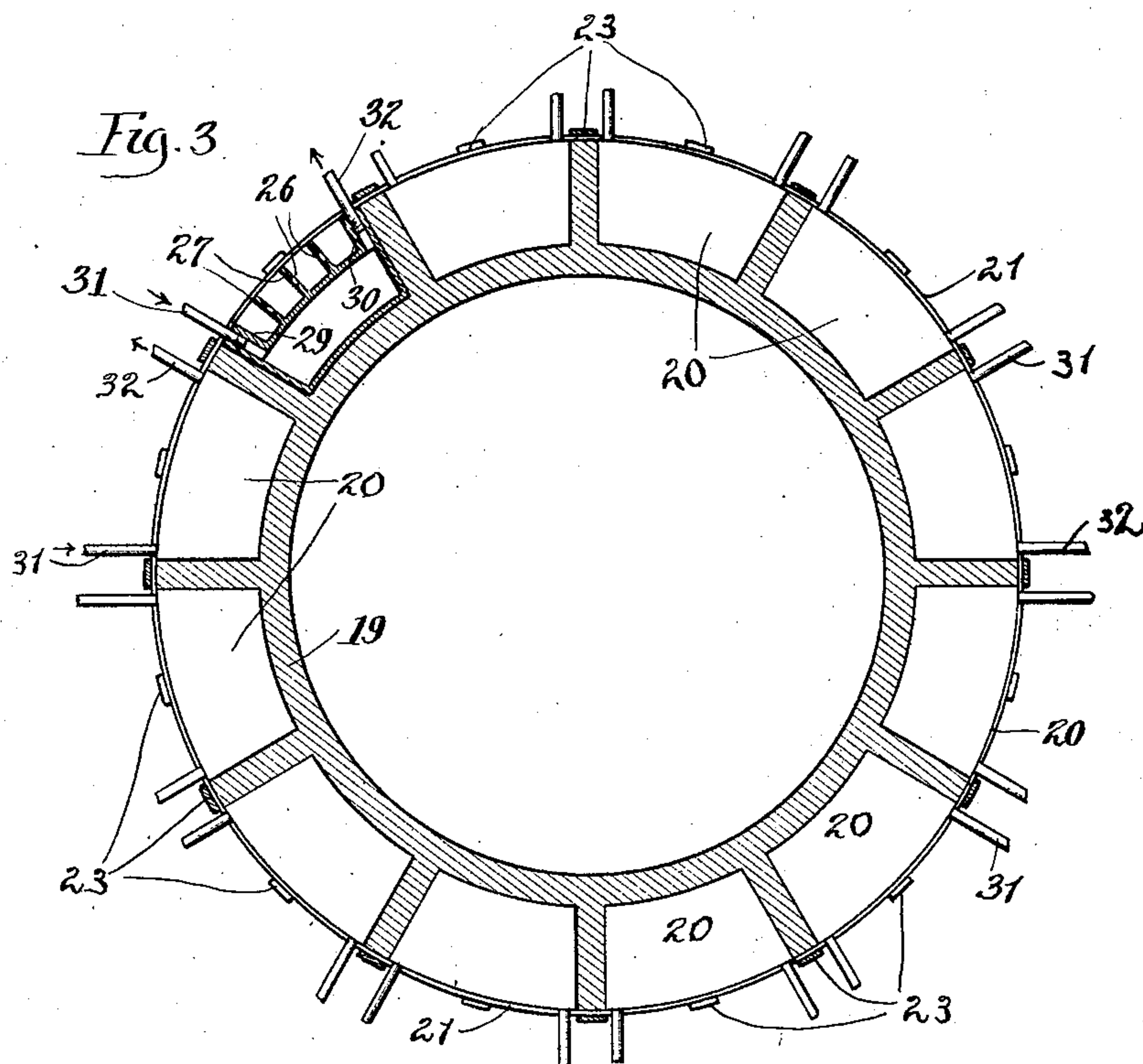
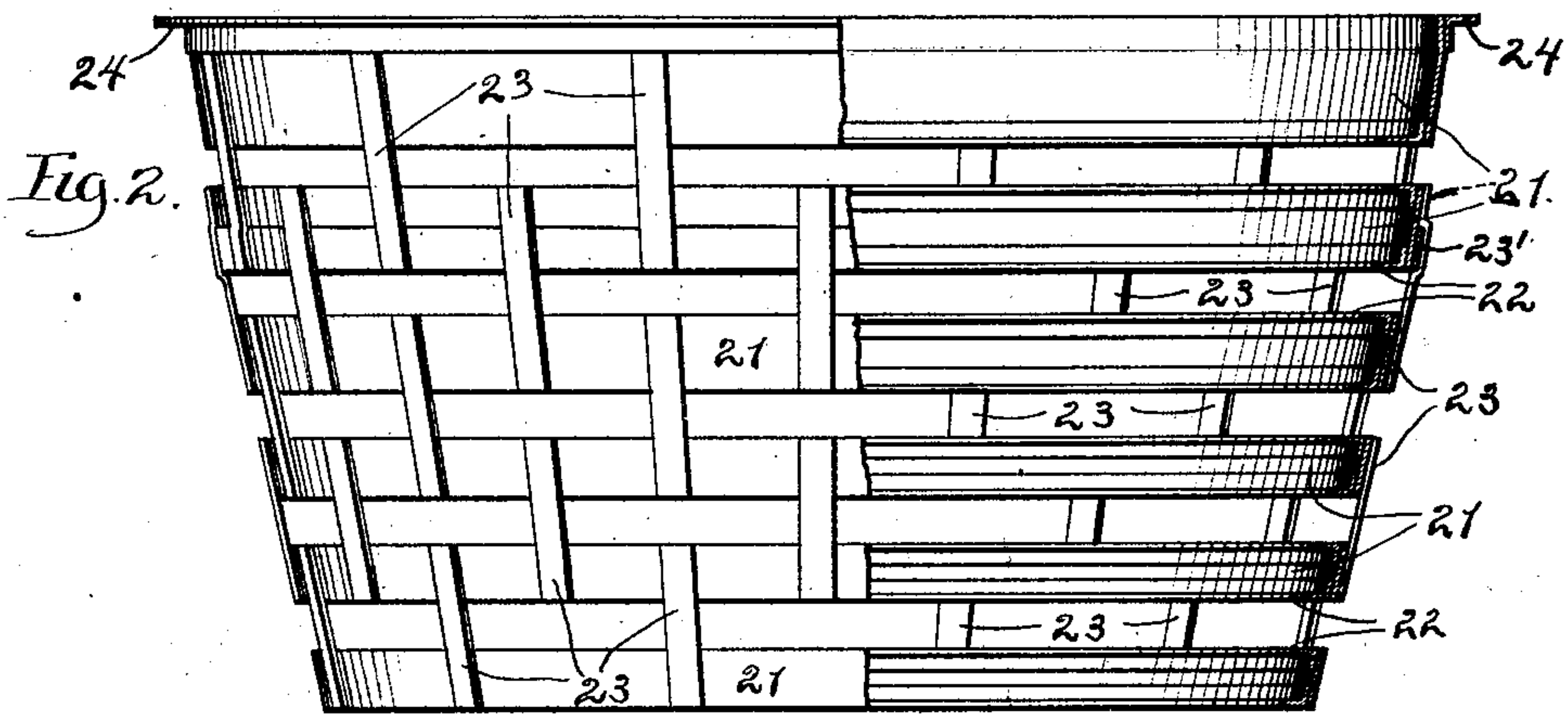
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NO MODEL.

3 SHEETS—SHEET 2



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3 SHEETS—SHEET 3.

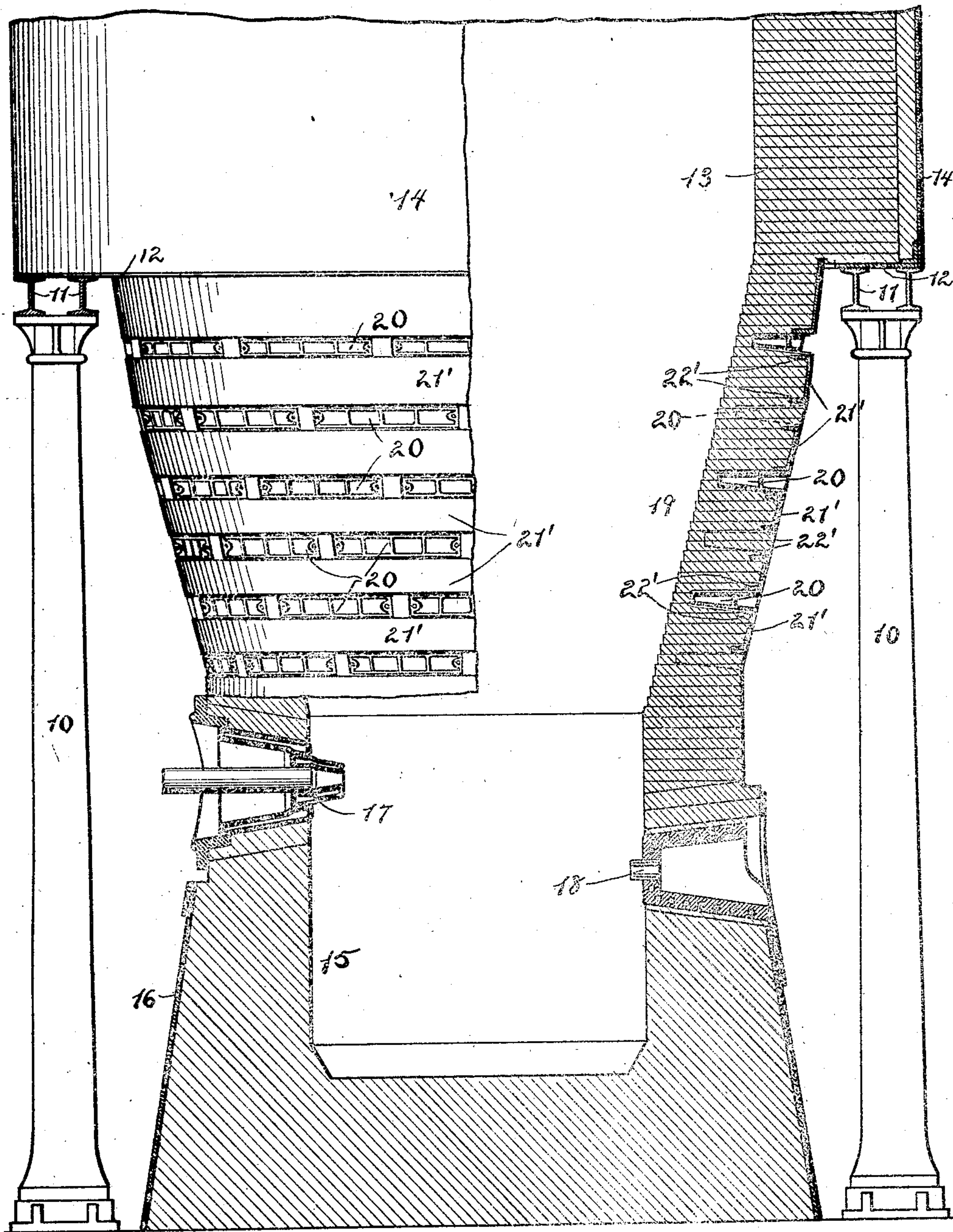


Fig. 5.

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UNITED STATES PATENT OFFICE.

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SUPPORT FOR COOLING PLATES OR COILS IN BLAST-FURNACES.

SPECIFICATION forming part of Letters Patent No. 744,319, dated November 17, 1903.

Application filed July 19, 1902. Serial No. 116,140. (No model.)

To all whom it may concern:

Be it known that I, AUSTIN FARRELL, a citizen of the United States, and a resident of Gladstone, county of Delta, and State of Michigan, have invented certain new and useful Supports for Cooling Plates or Coils in Blast-Furnaces, of which the following is declared to be a full, clear, and exact description.

The invention relates to improved means for supporting cooling plates or coils in blast-furnaces, and more particularly to cooling devices employed in the furnace-boshes.

To preserve the life of the bosh-wall, at which the highest temperature is maintained, cooling means are provided and preferably comprise superposed circular rows of cooling plates or coils, which extend horizontally within the fire-brick body of the wall. Such constructions have been found defective in that after the furnace has been in operation for some time the fire-brick supporting the cooling-plates burns out or breaks away and the latter dip or sag from position, frequently breaking the water connections and occasioning considerable delay in the operation of the furnace.

Broadly stated, the present invention consists in providing the bosh-wall of the furnace with a surrounding metal frame or support provided with means for securing thereto the outer portions of the cooling plates or coils in manner permitting the plates or coils to be removed without disturbing the surrounding metal frame.

The invention also consists in features of construction hereinafter described, illustrated in the accompanying drawings, and more particularly pointed out in the claims at the end of this specification.

In the drawings, Figure 1 is a vertical section of a blast-furnace with the improvement applied. Fig. 2 is an elevation, partially in section, of the series of supporting rings or bands. Fig. 3 is a horizontal section on line 3-3 of Fig. 1. Fig. 4 is a detail vertical section illustrating the manner of supporting one of the plates. Fig. 5 is a view, partly in elevation and partly in vertical section, showing a modified form of the invention.

In the construction illustrated the supporting-columns 10 carry I-beams 11, upon which

rests the mantle 12. The shaft 13 of the furnace is surrounded by the shell 14, which rises from the mantle 12. The hearth 15 is shown surrounded by a jacket or sheathing 16 and is provided with the usual tuyere-opening 17 and cinder-notch 18. The fire-brick bosh-wall 19, of the usual inverted-cone-shape formation, extends between the hearth 15 and the shaft 13.

The parts thus far described are of common design, form no part of the present invention, and may be modified as desired, it being understood that the present improvement could be applied to a furnace of any suitable construction.

Superposed circular rows of hollow plates or coils extending horizontally at intervals within the bosh-wall have been found effective for cooling this part of the furnace. Such horizontal cooling plates or coils for the purposes of this invention may be of any suitable construction; but, preferably, flat hollow sectional plates 20 are employed, which are arranged in superposed rows extending horizontally within the fire-brick body of the wall with their outer ends flush with or near its face. The separate plates of each row are arranged in circular series (see Fig. 3) and spaced slightly apart from one another, and the plates of the separate rows are staggered to cool all portions of the bosh-wall. Such cooling plates or coils as previously arranged are dependent for their support upon the fire-brick body of the wall itself. Under the intense heat to which these walls are subjected considerable expansion and contraction take place, and after the furnace has been in operation some time the fire-brick burn out and tend to work loose, thus breaking away the support from beneath the horizontal cooling plates or coils. The latter frequently sag or dip from place, the water connections break loose, expense and delay in operating the furnace are experienced, and dangerous break-outs of the furnace-wall itself are apt to occur.

The present invention provides the bosh-wall of the furnace with a surrounding metal frame consisting, preferably, of a series of cast or wrought metal rings or annular bands 21, which conform to the general shape of the

bosh-wall 19 and extend around the same between the circular rows of horizontal cooling-plates 20. The rings or bands 20 extend, preferably, externally in horizontal direction about the bosh-wall 19, and each ring or band extends vertically between the upper and lower face of each pair of adjacent rows of cooling plates or coils in such manner that the latter are supported at their outer ends independently of the brick body of the wall, and thus prevented from tipping. The cooling-plates 20 may be sustained at their outer ends between adjacent rings or bands 21 in any suitable manner; but preferably each band is provided at its upper and lower edge with an inwardly and horizontally projecting support or ledge 22, which are thus arranged in pairs and between which the outer ends of the cooling-plates 20 are sustained against tipping. The supports or ledges 22 may be formed integrally with the body of the rings or bands 21, as shown in Fig. 5—that is to say, the latter may be formed of channel-bars with the flanges turned inwardly. Preferably, however, for cheapness of construction the supporting-ledges are formed of angle-bars (see Figs. 1 and 2) riveted or otherwise secured to the upper and lower edges of the separate bands. Preferably, also, the separate supporting-rings 21 are connected by butt-straps 23, which extend between each pair of adjacent rings, (see Figs. 1 and 2,) so that the entire series is rigidly connected together and the cooling-plates given additional support. The butt-straps 23 are staggered, as shown in Figs. 1 and 2, in keeping with the staggered arrangement of cooling-plates in the separate rows. These butt-straps may, however, be dispensed with, as shown in Fig. 5, and the separate rings 21, extending between the rows of cooling-plates, alone depended upon to sustain them in position and prevent them from tipping.

In the form shown in Figs. 1 and 2 the series of connected rings are preferably hung from the furnace-mantle and there supported independently of the bosh-wall 19. For this purpose the topmost ring is provided at its upper end with an outwardly-projecting annular flange 24, which engages the inner edge of the mantle base-plate 12. Flange 24 may, if desired, be formed integrally with the topmost band 21, but for cheapness of construction is preferably formed of an angle-bar properly shaped and riveted or otherwise rigidly secured to the band.

The cooling plates or coils 20 are arranged with their outer ends between the pairs of ledges 22 upon the adjacent supporting-rings 21 and are preferably embedded between layers of mortar 25, (see Fig. 4,) formed of mixed fire-clay and ground fire-brick. The rings or bands 21 and their supporting-ledges 22 are preferably spaced somewhat farther apart than the thickness of the cooling-plates 20 in order that the latter may be removed by

the use of a suitable tool engaging openings 26, formed in radial webs 27 upon the plates, (see Figs. 3 and 4,) and so that the plates may be conveniently reset in position after removal for repairs or the like. Wedges 28 are preferably driven between the outer end of each of the cooling-plates 20 and the adjacent supporting-ledges 22 to more firmly secure the plates in place.

Each cooling-plate 20 is provided with an inlet 29 and an outlet 30 for cooling-water, to which are connected the inlet and outlet pipes 31 and 32. These water connections may be arranged as desired. Each plate 20 may be connected separately to the source of supply, or the plates may be connected in series of two, three, or four.

It is to be observed that by sustaining the outer ends of the cooling-plates 20 between the ledges 22 of the supporting-rings 21 they cannot be displaced or tipped, even though the brickwork may be burned out or broken away beneath them. In case one of the rings themselves becomes overheated because of the displacement of the brickwork, warning is immediately given, and a spray may be applied and the plate kept cool before any damage is done. Moreover, the rings 21 cover the larger part of the brickwork 19 between the rows of plates, and in the form shown in Figs. 1 and 2 the butt-straps 23 cover the brickwork between the separate plates of each row, so that the entire wall is firmly held in place and the tendency of the brick to work loose by the expansion and contraction of the wall is obviated.

It will be noticed that the supporting-rings sustain the separate cooling-plates against tipping, and yet are not so embedded within the bosh-wall 19 or otherwise so arranged as to weaken the fire-brick construction in any way.

The supporting-rings 21 may be of cast or wrought iron or steel and may be formed in separate pieces bolted or riveted together or in a single piece, as may be most easy of manufacture. The supporting ledges or flanges may be formed in piece with the separate rings, as shown in Fig. 5, or of separate angle-bars riveted in piece, as shown in Figs. 1 and 2. Means other than the ledges 22 may be employed for sustaining the cooling-plates 20 between the edges of the adjacent rings, and the details of construction may be otherwise modified without departure from the essentials of the invention.

I am aware that bosh-walls of blast-furnaces have heretofore been provided with encircling metal frames formed either of a series of superposed horizontal bands or of an encircling metal plate having cut-away spaces therein for the admission of the cooling plates or coils to the furnace-wall; but so far as I am aware the present invention presents the first instance of a blast-furnace the bosh-wall of which is provided with a metal frame and with a series of cooling

plates or coils extending inwardly from said frame and means for securing the outer portion of said cooling plates or coils to said frame in such manner that the plates or coils shall be suspended by said frame, but may be removed without disturbing said frame.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

10 1. A blast-furnace having a metal frame encircling its bosh-wall and provided with a series of cooling plates or coils extending inwardly from said frame, and means for securing the outer portion of said cooling plates
15 or coils to said frame in a manner permitting said plates or coils to be removed without disturbing said frame.

2. A blast-furnace having a metal frame extending about its bosh-wall, said frame being provided with horizontally-projecting supports or ledges, and a series of cooling plates or coils extending within the body of the bosh-wall and suspended in position by the supports or ledges of said frame.

25 3. In a blast-furnace, a metal frame extending about but supported independently of the bosh-wall, and a series of superposed cooling plates or coils extending within the body of the wall, and means for securing the outer
30 ends of said plates or coils to said frame.

4. In a blast-furnace, a series of superposed cooling plates or coils extending into the bosh-wall of the furnace and a series of metal bands extending about the furnace-wall between the rows of cooling-plates, the outer
35 ends of said cooling-plates being secured to said metal bands in manner permitting said plates to be withdrawn without disturbing the bands.

40 5. In a blast-furnace, a series of superposed horizontal bands spaced apart and extending about the bosh-wall of the furnace, a series of cooling plates or coils extending between each pair of adjacent bands and horizontally
45 within the furnace-wall and means for supporting said cooling-plates by said bands in manner permitting the plates to be withdrawn without disturbing the bands.

6. A blast-furnace having encircling bands and provided with a cooling-plate located between the lines of the bands and secured to them by mechanism arranged to allow removal without disturbing the bands.

7. A blast-furnace having its bosh provided with encircling bands arranged one above the other and cooling-plates having their outer portion secured to said bands, said plates being arranged for removal without disturbing the furnace-bands.

60 8. A blast-furnace having its bosh provided with encircling bands, spacers extending vertically between them, and cooling-plates secured to the bands.

9. In a blast-furnace, a series of superposed
65 horizontal bands or rings spaced apart and extending about the bosh-wall, said bands or

rings being provided with laterally-projecting supports or ledges, and a series of cooling plates or coils extending horizontally with the wall and sustained at their outer ends by said supports or ledges.

10. In a blast-furnace, a series of superposed rows of cooling plates or coils extending horizontally within the furnace-wall, a series of superposed supporting bands or
75 rings spaced apart and each extending horizontally about the furnace-wall and vertically between a pair of adjacent rows of cooling plates or coils and inwardly and horizontally extending ledges at the upper and lower
80 edges of each of said bands arranged to engage the outer ends of said plates or coils.

11. In a blast-furnace, a series of superposed horizontal bands or rings spaced apart and extending about the bosh-wall, each of
85 said bands being provided at its upper end with an inwardly and horizontally projecting ledge and rows of cooling-plates arranged in circular series extending horizontally between the supporting-ledges of each pair of
90 adjacent bands or rings and within the body of the bosh-wall, whereby said plates or coils are held against tipping.

12. In a blast-furnace, a series of superposed, horizontal bands spaced apart and extending about the bosh-wall of the furnace,
95 and a row of cooling-plates extending into the bosh-wall and having their outer ends arranged between adjacent bands and means for keying the outer ends of said cooling-plates between the adjacent bands.

13. In a blast-furnace, a series of superposed horizontal bands or rings spaced apart and extending about the bosh-wall, angle-bars secured to the upper and lower edges of each
105 of said bands or rings and forming inwardly-extending supporting-ledges, and a row of cooling plates or coils secured in position at their outer ends between the ledges of each pair of adjacent rings and extending horizontally within the body of the bosh-wall.

14. In a blast-furnace, a series of superposed horizontal bands or rings spaced apart and extending about the furnace-wall, connections between said rings, and cooling
115 plates or coils extending horizontally between said rings and within the body of the bosh-wall, and means for securing the outer ends of said cooling plates or coils to said bands or rings, whereby said plates or coils are held by
120 said rings against tipping.

15. In a blast-furnace, a series of superposed horizontal bands or rings spaced apart and extending about the bosh-wall, connecting butt-straps between each pair of adjacent
125 bands or rings, means for sustaining the series of connected bands or rings from the furnace-mantle, and a row of cooling plates or coils extending horizontally between each pair of adjacent bands or rings and within
130 the body of the bosh-wall the outer ends of such cooling plates or coils being secured to

said bands or rings, whereby said plates or coils are sustained in position at their outer ends by said bands or rings.

16. In a blast-furnace, a series of super-
5 posed horizontal metal bands or rings spaced apart and extending about the bosh-wall, connections between each pair of adjacent rings, each of the latter being provided at its upper and lower edges with inwardly and horizon-
10 tally projecting supports or ledges, and a number of rows of cooling plates or coils extending horizontally within the body of the bosh-wall and sustained at their outer ends between the supports or ledges of two adja-
15 cent bands or rings and water connections for said plates or coils.

17. In a blast-furnace, a series of super-

posed horizontal metal rings spaced apart and extending about the bosh-wall, connecting butt-straps between each pair of adjacent
20 rings, means for supporting the series of connected rings from the furnace-mantle, each of said rings being provided at its upper and lower edge with an inwardly-projecting ledge, and a row of cooling-plates extending horizon-
25 tally between the ledges of each adjacent pair of rings and within the body of the bosh-wall, said cooling-plates being keyed in position at their outer end between said ledges and water connections for said cooling-plates.

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