J. SCOTT.

BLAST FURNACE CONSTRUCTION.

APPLICATION FILED MAY 3, 1910.

1,036,350. Patented Aug. 20, 1912.

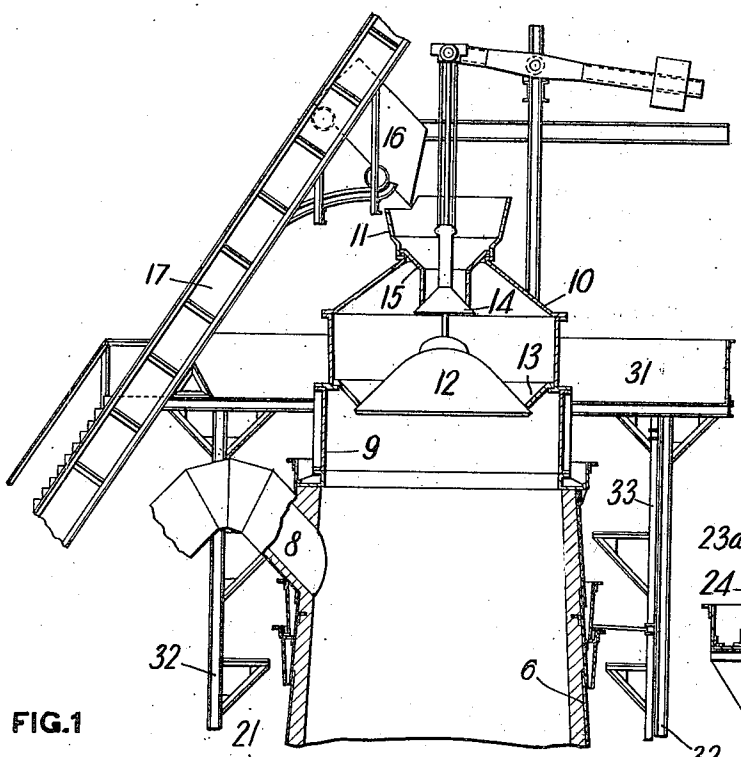


FIG. 1

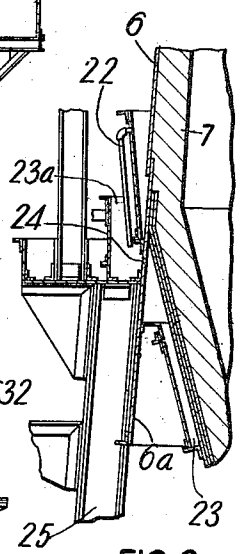
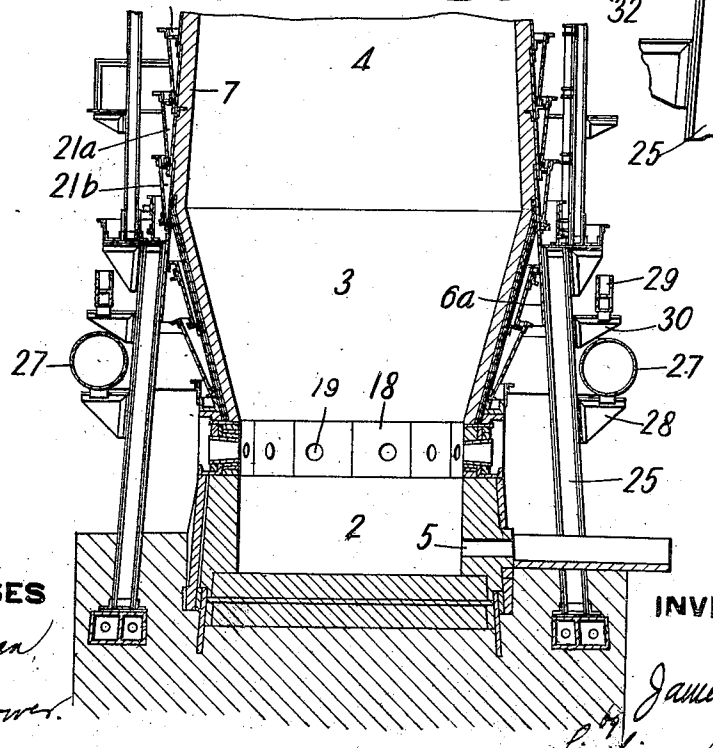


FIG. 2



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BLAST-FURNACE CONSTRUCTION.

1,036,350. Specification of Letters Patent. Patented Aug. 20, 1912.

Application filed May 3, 1910. Serial No. 559,097.

To all whom it may concern:

Be it known that I, JAMES SCOTT, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Blast-Furnace Construction, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the construction of blast furnaces and one object of the invention is to provide improved means by which the lines, (*i. e.* the contour of the inner surface) of the lining in the furnace are maintained for an indefinite time after starting the operation of such furnaces.

A further object of the invention is to provide improved means for supporting the furnace shell upon the columns carrying the shaft of the furnace.

Heretofore, blast furnaces have been provided with relatively thick refractory linings which become reduced in thickness and are cut away in irregular channels or grooves, within a short time after the furnaces are started in operation. It has also been proposed to entirely omit the refractory lining from the upper part of the furnace shell.

Figure 1 of the drawings is a vertical section of a blast furnace constructed and arranged in accordance with my invention. Fig. 2 is a detail sectional elevation, on a larger scale, showing connections between the furnace shell and supporting columns and the means employed for water cooling the furnace at the junction of the bosh with the shaft of the furnace according to my invention.

In the drawings, 2 designates the hearth or well, 3 the bosh and 4 the shaft of a blast furnace. The furnace well is provided with an iron notch or tapping hole 5 constructed in the usual manner.

A metal shell 6 is provided and a thin refractory lining 7 is built within the furnace shell, which preferably extends a short distance above the branches 8 leading to the downcomer and dust-catchers of the furnace. Above the top of the refractory lining 7 is a metal shell 9 having a hood portion 10 and chute 11. The upper portion of the furnace is provided with the usual bottom bell 12 and hopper 13, and top or gas sealing bell 14 and hopper 15, the top hopper 15 being closed by means of the bell 14 and its upper end communicating with the chute 11.

The bells 12 and 14 are connected by suitable bell rods with counter weighted bell levers in the usual manner and any desirable bell operating gear may be employed for manipulating the bells in charging the furnace.

A skip car 16 travels on the skip hoist 17, the skip hoists and cars being constructed and operated in any well known manner, which need not be further described.

Instead of providing twyer openings in the upper part of the well of the furnace in which the twyers and twyer coolers are inserted when the furnace is in operation, I provide an annular metal ring which is made in segments and preferably is water cooled, the segments being securely bolted together. Each of the segments of the ring 18 is provided with an opening 19 through which the twyer cooler extends. The openings 19 in the segmental ring are machined accurately to size, the centers of the openings being at the same level in one plane and on radial lines extending from the vertical center of the ring 18, corresponding to the vertical center of the furnace.

The outer metal shell of the furnace 6 is provided with a series of annular water troughs, 21, 21^a 21^b, with their lower ends extending below the top edge of the next adjacent trough. Water is supplied to the troughs, separately or in any other desirable manner and each of the annular troughs is provided with an overflow pipe 22, which leads the water from the top of the troughs into the next lower trough. By reference to Fig. 2 it will be seen that the water trough 23 is connected by openings 24 with the upper portion of the water trough 23^a and that the lower part 23 of the trough is entirely inclosed instead of being open at its upper end, as are the other troughs.

The gas outlet openings 8 in the top of the furnace are located at some distance below the furnace charging bell 12, in order to provide a dead space in which a body of comparatively cool gases is maintained. This construction results in keeping the bell 12 and hopper 13 at a much lower temperature than when the bell is located closer to the outlet openings 8, and in this way prevents warping and cracking of the thin steel

bells now generally used in such blast furnaces and greatly extends the life of such bells and hoppers.

Instead of supporting the furnace shell upon a mantle plate, which in turn is carried upon the top of the columns, as heretofore, the furnace shell 6 is provided with a heavily reinforced plate 6^a forming an annular extension or ring which extends around the furnace, by which the furnace shell is secured to the columns 25, the usual mantle plate being dispensed with in this construction. The bustle pipe 27 is carried on brackets 28 which are secured to the columns 25 in the usual manner, and the water trough 29 is mounted on similarly constructed brackets 30 also secured to the furnace columns. The top platform 31 of the furnace is carried upon columns 32 whose bases are mounted on the tops of the furnace columns 25.

Water is supplied to the annular troughs 21 through a supply pipe 33, suitable branches preferably leading from this supply pipe to the various troughs in the height of the furnace, although the troughs may be filled by water which overflows from the next higher trough when necessary or desirable.

The furnace is charged in the usual manner and the operation of the furnace is the same as heretofore, the gas being led off from the furnace at a point considerably lower in the furnace than has heretofore been the practice.

The advantages of my invention will be apparent to those skilled in the art.

Instead of providing a thick refractory lining which becomes worn at the beginning of the operation of the furnace, I provide a thin refractory lining and effectively water cool this lining from the time the furnace is put into blast, in this way maintaining the thickness and contour of the inner surface of the furnace lining practically constant throughout the life of the furnace.

The use of a mantle plate is done away with and the furnace shell is connected directly to the furnace columns in a highly novel and efficient manner.

Modifications in the construction and arrangement of the parts may be made without departing from my invention.

I claim:—

1. In a blast furnace, a jacket or shell formed of rolled metal plates, the part of said shell above the bosh line being extended downwardly to form an annular ring and columns connected to said annular ring and directly supporting said shell.

2. In a blast furnace a continuous shaft and bosh jacket or shell formed of rolled metal plates, said shaft jacket having an annular extension forming a ring projecting downwardly below the bosh line of the furnace and a series of columns connected to said ring and directly supporting the jacket.

3. In a blast furnace a continuous shaft and bosh jacket formed of rolled metal plates and having means on the outside of the jacket for water cooling said jacket, said means being arranged to completely surround the jacket with an encircling wall of water extending uninterruptedly from the bottom of the bosh jacket to the upper end of the shaft jacket.

4. In a blast furnace, bosh and shaft jackets formed of rolled metal plates, and having the lower end of the shaft jacket secured to the upper end of the bosh jacket, and a series of water troughs on the outside of said jackets, the jackets forming one side of the troughs, said troughs having means whereby the top of one trough overlaps the bottom of the adjacent trough, and a continuous unbroken wall of water surrounds said jacket from the bottom of the bosh jacket to the gas offtakes in the upper end of the shaft.

5. In a blast furnace a jacket or shell formed of rolled metal plates and extending continuously from the bottom of the bosh jacket to the upper end of the shaft jacket, columns directly connected to and supporting the jacket and a series of water troughs encircling said jacket, said jacket forming one side of the troughs, the top of one trough overlapping the bottom of the adjacent trough and water overflow outlets in said troughs arranged to cause overlapping of the water in said troughs whereby an uninterrupted vertical wall of water surrounds the jacket from the top to the bottom thereof.

6. In a blast furnace the combination with a metal bosh and shaft jacket, and a series of supporting columns directly connected to said jacket, of a series of encircling water troughs surrounding said jacket, said troughs being positioned with the upper end of one trough overlapping the lower end of the adjacent trough, and means on said troughs for maintaining a water level therein whereby an uninterrupted wall of cooling water surrounds said jacket from the top to the bottom thereof.

In testimony whereof, I have hereunto set my hand.

JAMES SCOTT.

Witnesses:
J. P. Collins,
George H. Smith.