J. P. DOVEL.

BLAST FURNACE STACK REINFORCEMENT.

APPLICATION FILED OCT. 30, 1917.

1,316,085.

Patented Sept. 16, 1919.

2 SHEETS—SHEET 1.

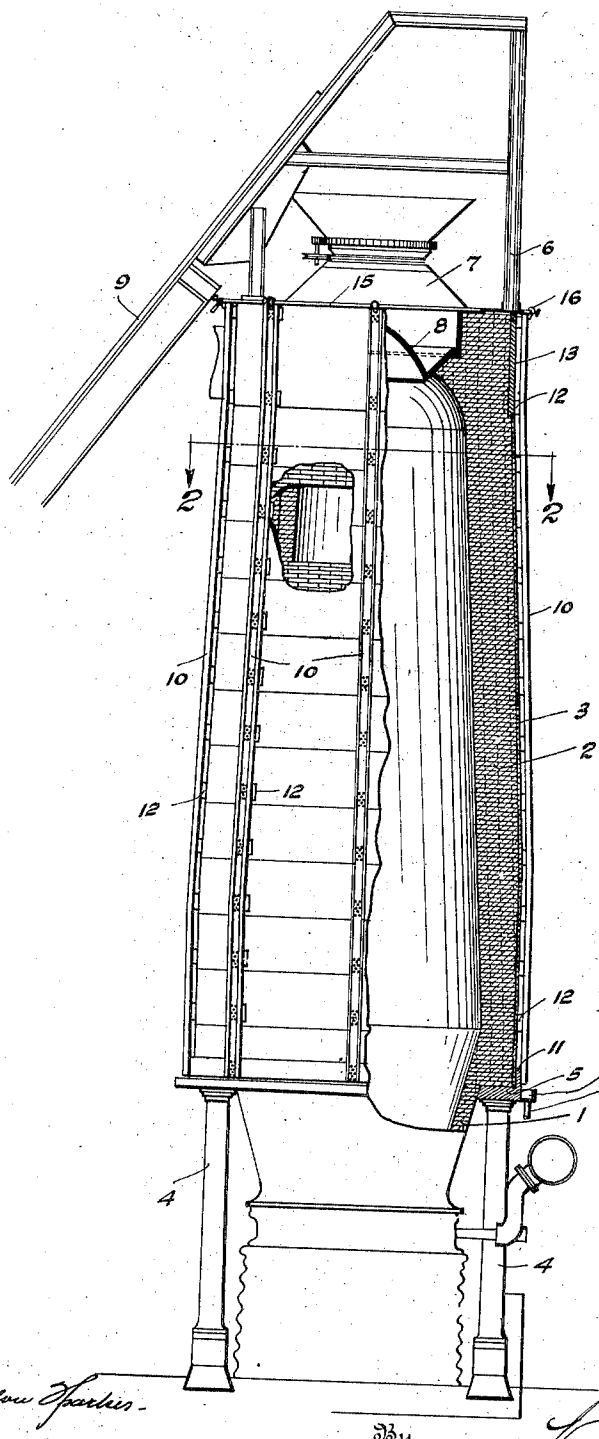


Fig. 1.

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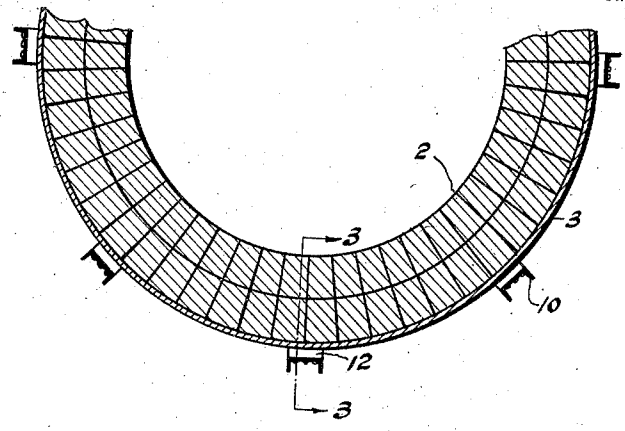


Fig. 2.

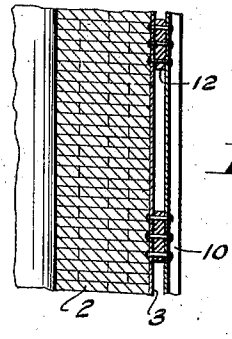


Fig. 3.

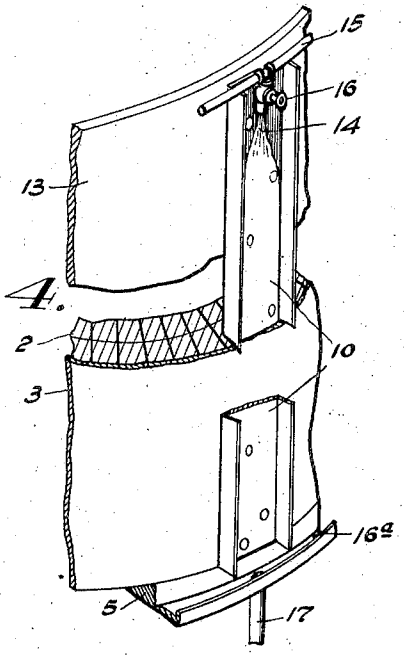


Fig. 4.

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BLAST-FURNACE-STACK REINFORCEMENT.

1,316,085. Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed October 30, 1917. Serial No. 199,344.

To all whom it may concern:

Be it known that I, JAMES P. DOVEL, a citizen of the United States of America, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Blast-Furnace-Stack Reinforcements, of which the following is a specification.

My invention relates to an improvement in blast furnace stacks and the like, and contemplates the provision of external structural reinforcements adapted to support the load of the furnace superstructure and brace the stack in such manner as to prevent any movement thereof out of alinement by reason of the buckling or giving away of the furnace shell from being overheated or otherwise weakened, and which will therefore permit the refractory furnace lining to be repaired from the outside by the removal of sections of the furnace shell without danger to the furnace or to the workmen.

I prefer to use channel bars which are suitably secured at intervals to and spaced from the furnace shell and which preferably extend from or near the base thereof vertically to or near the furnace top. By spacing these vertical members from the shell they will not tend to warp when the furnace shell becomes overheated and will thus serve to reinforce the furnace and hold the superstructure in alinement. If necessary, these reinforcing members can be water cooled. One of the greatest advantages derived from the use of these reinforcing members is that they will permit large sections of the sheets forming the furnace shell to be removed and the inner lining of the furnace repaired without danger to the workmen and without risk of the shell collapsing from the weight of the superstructure.

My invention also involves a very simple and inexpensive arrangement for water cooling these reinforcing members and in carrying off the cooling water.

The preferred embodiment of my invention will be understood by reference to the accompanying drawings, in which:—

Figure 1 shows a furnace equipped with my invention partly in side elevation and partly in vertical section showing a part of the shell removed to permit repairs to the lining from without the furnace.

Fig. 2 is an enlarged partial sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a partial sectional view on the line 3—3 of Fig. 2.

Fig. 4 is a detail view of a modification of my invention showing the water cooling attachments for the reinforcing members riveted directly to the furnace shell.

Similar reference numerals refer to similar parts throughout the drawings.

I have illustrated my invention as applied to a standard type of blast furnace comprising a bosh 1, a stack formed by the inner refractory lining 2 and an outer metallic shell or jacket 3. Columns 4 support a mantle 5 which carries the main load of the furnace stack which in turn supports the superstructure 6, the distributer mechanism 7, the bell 8 and the bridge 9, all of which parts may be of any standard design. In order to reinforce a furnace stack of this construction I provide a series of vertical channel bars 10 which at their lower ends engage the outer face of a vertically disposed annular flange 11 on the mantle 5 and are connected by rivets which pass through the channel bars, mantle flange and the furnace shell. The flange 11 thus serves to space the channels from the metallic shell or jacket of the furnace and to transmit the load on them directly to the mantle 5 and the heavy supporting columns 4. The channels are maintained in spaced relation to the metallic jacket of the furnace by metallic separator blocks 12 disposed at intervals, the channel being riveted to the shell through the blocks. This structural arrangement continues to the top of the furnace where the upper end of the channels are riveted to the heavy top ring 13 on which the superstructure rests. It will thus be seen that the channels are sufficiently tied together by the jacket to hold them in position to take the load of the superstructure and they are preferably of such size as to be capable of supporting such load independently of the furnace stack.

The reinforcing bars being spaced from the jacket will not become so highly superheated as the jacket and will therefore resist any tendency to warp and permit the superstructure to move out of alinement when any side of the furnace jacket gets

overheated and would otherwise give down or buckle under the load. In order, however, to make it impossible for the reinforcing members to become sufficiently heated to warp or fail, I have provided a very simple and inexpensive means for water cooling them. It will be observed that the flanges of the channels are out-turned and that in following the conformation of the stack the channels slope outwardly from the top until they reach a point near the bosh. They thus form natural troughs so that a small stream of water delivered by a jet or spray 14 from a water supply pipe 15 under control of an individual valve 16 will follow down the outer face of each channel the full length thereof and will be caught at the bottom in the annular waste trough 16ª on the mantle which is disposed under the lower ends of the several channels. A drain 17 will conduct the water from this waste trough 16.

A further advantage of my invention is that the reinforcement will carry the load of the superstructure so that it is permissible to cut away large sections of the metallic jacket where necessary to permit the lining 2 to be repaired from the outside without blowing out the furnace, this being readily accomplished by shutting off the blast and opening the bell when cool air will be drawn in through the hole permitting the workmen to repair the lining without inconvenienc or danger. With this reinforcing structure I have from time to time made repairs on a furnace lining without blowing out the furnace, which in extent would be practically the equivalent of relining the upper section of the furnace and this has been done without danger to the workmen at a nominal expense.

While it is preferable to mount the reinforcing bars in spaced relationship with the furnace shell, yet I do not desire to be limited to this spaced manner of attachment as the bars may be directly riveted to the furnace shell as shown in Fig. 4.

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

1. A reinforcement for stacks of blast furnaces and the like, comprising the combination with the metallic furnace shell and its inner brick lining, of a plurality of external vertical reinforcing bars extending substantially from top to bottom of said shell, spacer blocks between the metallic shell and said bars, and means to connect said bars to the stack shell through said blocks, substantially as described.

2. The combination with a blast furnace stack comprising an outer cylindrical metallic shell and a refractory lining in the same, of external reinforcing attachments comprising vertical channel bars connected to the outer face of the metallic shell, and means to water cool said bars.

3. The combination with a blast furnace stack having a metallic outer shell, of reinforcing channel bars having their flanges out-turned, means to connect said channels to the furnace shell, and means to deliver a stream of water in the upper end of the trough formed by each channel.

4. The combination with a blast furnace stack having a metallic outer shell, of reinforcing channel bars having their flanges out-turned, means to connect said channels to the furnace shell, means to deliver a stream of water in the upper end of the trough formed by each channel, and a waste trough into which the lower end of said channels discharge the cooling water, substantially as described.

5. The combination with a blast furnace having a metallic shell, of base supports for the shell, a superstructure mounted on the shell, channel bars connected at their lower ends to base supports and at their upper ends to the superstructure, spacer blocks interposed between the channels and the furnace shell, and rivets connecting the channels through said blocks to the shell, substantially as described.

6. The combination with a blast furnace having a metallic shell, of base supports for the shell, a superstructure mounted on the shell, channel bars mounted at their lower ends on said base supports and at their upper ends connected to the superstructure, spacer blocks interposed between the channels and the furnace shell, rivets connecting the channels through said blocks to the shell, said channels having their flanges out-turned to form water troughs, means to deliver water into the upper ends of the channel troughs, and means to collect the water discharged from the lower ends of the channel troughs, substantially as described.

In testimony whereof I affix my signature.

JAMES P. DOVEL.

Witness:

NOMIE WELSH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."