

Nov. 3, 1931.

B. J. HARLAN

1,830,318

WELDED STEEL COOLING PLATE

Filed Nov. 18, 1927

2 Sheets-Sheet 1

Fig. 1.

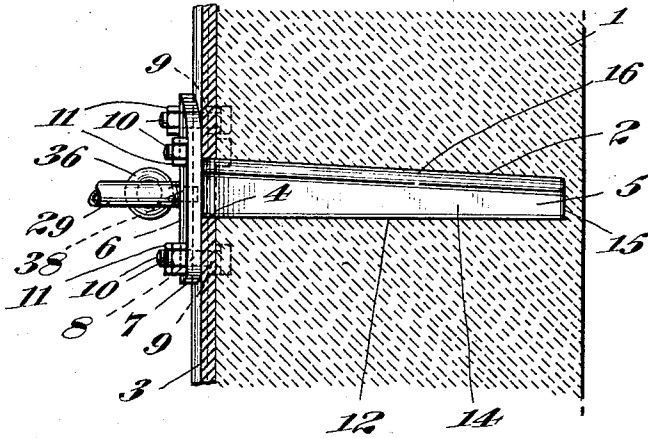


Fig. 2.

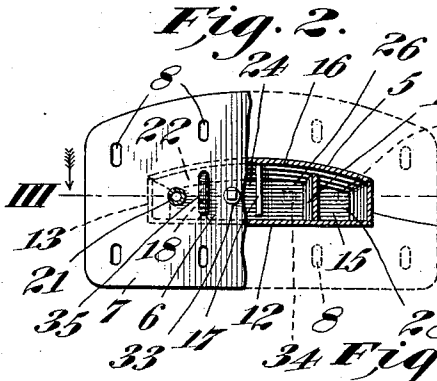


Fig. 3.

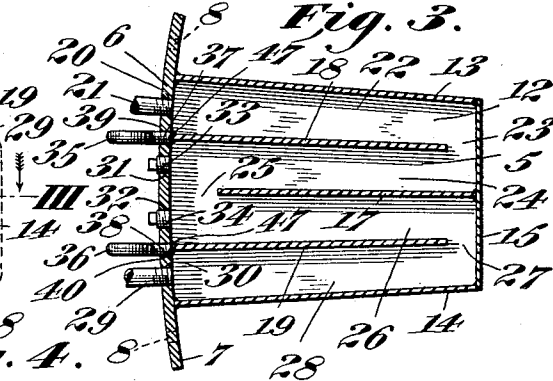
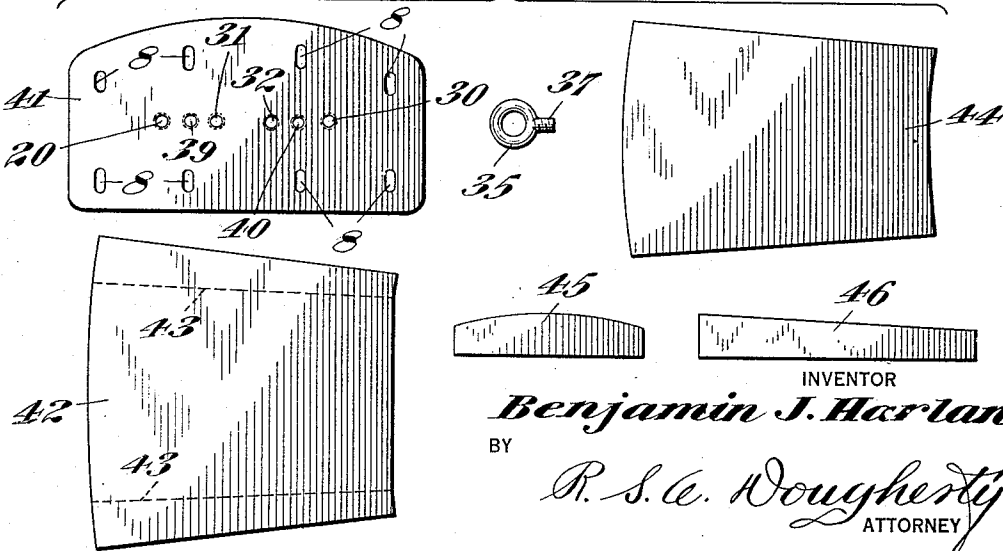


Fig. 4.



INVENTOR
Benjamin J. Harlan
BY
R. S. C. Dougherty
ATTORNEY

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B. J. HARLAN

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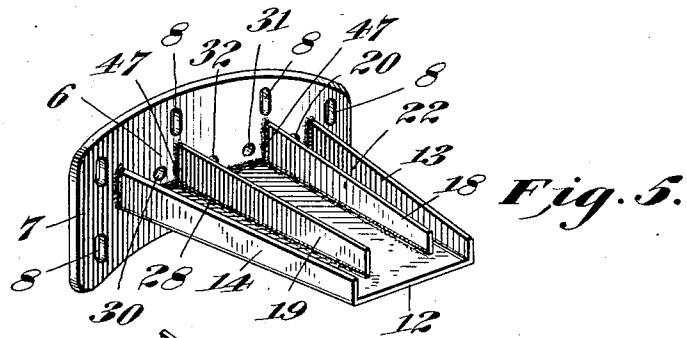


Fig. 6.

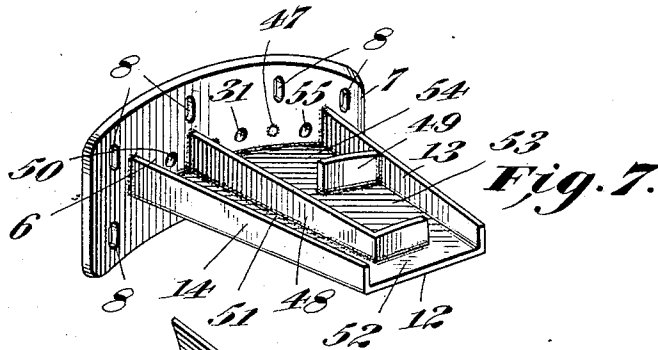
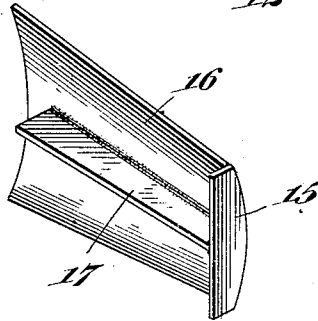
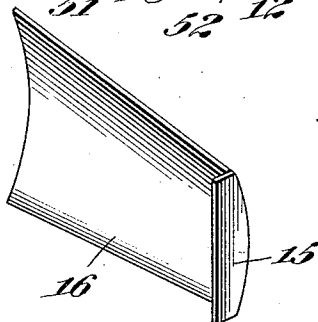


Fig. 8.



INVENTOR

Benjamin J. Harlan

BY

R. S. C. Dougherty
ATTORNEY

UNITED STATES PATENT OFFICE

BENJAMIN J. HARLAN, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNOR TO BETHLEHEM STEEL COMPANY

WELDED STEEL COOLING PLATES

Application filed November 18, 1927. Serial No. 234,162.

My invention relates to cooling plates for use in connection with blast furnace construction. These cooling plates are usually inserted in walls of the lower portion of blast furnaces and form a part of the wall structure and have pipe connection by means of which water is kept constantly circulating through the plates for cooling purposes. This type of cooling plate is commonly called a bosh plate because it is usually inserted in the bosh wall of the blast furnace, which is that part of the lower portion of the furnace wall which extends downwardly and inwardly from the mantle of the furnace, to the wall which surrounds the hearth. These cooling plates are also sometimes used in the stack wall of the furnace above the mantle and in the side walls which surround the hearth.

Heretofore it has been the usual practice to make bosh plates of a single piece by casting, and generally they were made of copper or bronze. These castings are expensive and are often found to be defective on account of the difficulty in casting the baffles and outer walls of the bosh plates in one piece and in removing the core material; after casting the inner wall remains rough which allowed the collection of sediment and prevented uniform water circulation throughout the entire plate.

One of the objects of my invention is to make a bosh plate of rolled plate metal preferably of steel of the required thickness, the parts of which are first cut from a flat plate and, where required, bent into the desired form and then welded together.

Another object of my invention is to produce a bosh plate in such a manner that its installation will not weaken the furnace stack.

Another object of my invention is to construct the back wall of the bosh plate with a laterally extending flanged edge having vertical slots formed therein through which bolts are inserted for securing the bosh plate to the outer shell of the blast furnace thereby allowing the bosh to move vertically, should the furnace lining move, but the plate will remain fixed should the refractory lining fail above or below the bosh plate.

Another advantage of my invention is that

the strength of steel makes the replacement easier and more desirable, should the bosh plate have to be changed. Ever so often the eyes or lugs will pull off when attempting to remove from the furnace, bosh plates made of copper or bronze; and still another object of my invention is the cheapness of construction, as the cost of a bronze or copper bosh plate is about six times greater than that of applicant when constructed of rolled steel plates.

With these objects in view my invention consists in the construction and novel combination and arrangement of parts, herein after more fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

Having thus given a general description of my invention, I will now, in order to make the same more clear, refer to the accompanying two sheets of drawings in which like characters of reference indicate like parts:—

Fig. 1 is a side elevation of one form of my improved bosh plate, and showing enough of the blast furnace wall in section to illustrate the application of my invention;

Fig. 2 is a rear end elevation of the bosh plate shown in Fig. 1 with a portion of the bosh wall plate broken away to more clearly show its construction;

Fig. 3 is a longitudinal section taken on the line III—III of Fig. 2;

Fig. 4 illustrates in detail the different parts from which the bosh plate is constructed;

Figs. 5 and 6 are perspective views illustrating the manner of assembling, and welding the different parts together and just before the final operation of welding the nose and top plates to the rear sides and bottom walls respectively; and

Figs. 7 and 8 are perspective views similar to Figs. 5 and 6, but showing a modified form of construction.

Referring now to the characters of reference on the drawings; and more especially to Figs. 1 and 6 both inclusive: 1 indicates a portion of the refractory lining of a blast furnace having a recess formed therein as at 2. The refractory lining is surrounded by

an outer shell or casing 3, having an opening therein as at 4 which registers with the open end of the recess 2 formed in the refractory lining. 5 indicates the bosh plate which is inserted through the opening 4 and seated in the recess 2 of the refractory lining. The back wall 6 of the bosh plate is formed in a single piece from a flat rolled plate and extends laterally, all around the rear end of the bosh plate as at 7, having vertical slots formed therein as at 8 which register with holes 9 in the casing through which bolts 10 are inserted for securing the bosh plate to the casing 3. The heads of the bolts 10 being embedded in the refractory lining and the shanks of the bolts are inserted through the holes 9 in the furnace casing, while the threaded ends of the bolts extend outwardly through the slots 8 and have nuts screwed thereon as at 11. With this construction of having slots in the back wall of the bosh plate allows for a slight vertical movement should the furnace lining move, but will remain fixed should the refractory lining fail above or below the bosh plate. 12 indicates the bottom wall of the bosh plate, 13 and 14 the side walls, 15 the forward end or nose, 16 the top wall, 17 the central baffle and 18 and 19 the two intermediate baffles located between the central baffle 17 and the side wall. The intermediate baffles are welded to the inside of the back wall and to the top of the bottom wall 12, the forward ends being spaced apart from the nose wall to allow for water circulating passages around their ends, while the central baffle is welded at one end to the nose wall and the top wall and stops short of the back wall to allow for a water circulating passage at this point. It will also be noted that the intermediate baffles are not attached to the top wall of the bosh plate and the central baffle is not attached to the bottom wall which adds greatly to the ease of assembling as will be readily understood by referring to Figures 5 and 6.

The back wall 6 of the bosh plate is provided with a screw threaded inlet opening 20 for receiving pipe connection 21 by means of which water under pressure is admitted to the bosh plate, passes through the channel 22 formed between the side wall 13 and one of the intermediate baffles 18, thence into passage 23 between the end of baffle 18 and nose wall 15 into channel 24, between baffles 18 and 17 and through passage 25; channel 26, passage 27, channel 28 and then passes out of the bosh plate through the outlet pipe 29 which is connected to the screw threaded opening 30 formed in the back wall 6. Openings 31 and 32 are also provided in the back wall 6 normally closed by means of plugs 33 and 34. These holes provide means for inspecting and cleaning out in bosh plate while it is in service in the blast furnace.

Eyes 35 and 36 having screw threaded

shanks 37 and 38 are screwed into openings 39 and 40 in the back wall and welded thereto.

In Fig. 4 I have illustrated in detail the different parts from which the bosh plate is constructed, these parts with the exception of the eyes are cut of flat rolled plates. The back wall plate 41 is preferably made of thicker material than the other parts and is formed with the vertical slots 8 and screw threaded holes for receiving the inlet and outlet pipe connection, the inspection holes for receiving the plugs and for the shanks of the eyes. The back plate is then cambered to correspond to the contour of the outer shell of the blast furnace wall. The bottom and side walls are formed integral, the blank being cut from a plate to the form indicated at 42, the sides being bent at right angles to the bottom plate on the dotted lines 43. 44 indicates the blank for the top wall of the bosh plate which is first cut from a flat plate in the form shown and then cambered to arched shaped form.

The part which forms the nose or front wall of the bosh plate is shown at 45, and one of the three baffle parts as at 46 all of which are of the same size and shape.

After the different parts from which the bosh plate is constructed have been formed, they are assembled, as illustrated in Figs. 5 and 6, the shanks of the eyes are first screwed into the threaded openings formed in the back wall and are welded thereto on the inside as at 47. The rear edges of the bottom and side walls are then welded to the inside of the back wall and the intermediate baffles are then welded to the bottom and back walls, as illustrated in Fig. 5. The top wall, nose and central baffle are then welded together, as illustrated in Fig. 6.

The two assembled parts shown in Figs. 5 and 6 are then welded together the top having its edges welded to the sides and inner side of the back plate and the edges of the nose to the front edges of the bottom wall and sides respectively.

In Figs. 7 and 8 I have shown a modified form of bosh plate in which the baffles are arranged differently, but otherwise the outside wall construction is the same and the same reference numerals will be given them. In this modified construction I have shown an intermediate L-shaped baffle 48 welded to the bottom wall and the rear side of the back plate, and a short transverse side baffle 49 welded at an intermediate point to the bottom and inside of one of the side walls. Water enters the inlet port as at 50, circulates through the channel 51 through passage 52 into compartments 53 and 54 and then passes out through the outlet opening 55.

In both of the constructions illustrated and described the cooling fluid is adapted to flow in continuous sinuous channel or pas-

sageway from the inlet to the outlet connections.

Bosh plates formed in the manner described can be made much quicker and cheaper than by the usual method of casting, will have a smooth interior surface thereby preventing, to a great extent the collection of sediment and allowing a free circulation of cooling medium at all times and at the same time have greater strength and durability than those now in general use.

Although I have shown and described my invention in considerable detail, I do not wish to be limited to the exact and specific details shown and described, but may use such substitutions, modifications or equivalents thereof as are embraced within the scope of my invention or as set forth in the appended claims.

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

1. A water cooled bosh plate, comprising a hollow sheet metal body portion, a back wall having a lateral extension extending entirely around the back end of the bosh plate, slots formed in the lateral extension in spaced relation to each other near the end and at intermediate points above and below the body of the bosh plate, said upper row of slots being in vertical alignment with the lower row of slots, baffles secured to the bottom and back walls at an intermediate point and unattached to the top wall, and a central baffle secured to the top and forward walls and unattached to the bottom and back walls of the bosh plate.

2. A water cooled bosh plate, comprising a hollow sheet metal body portion, side walls formed integral with the body portion, a top plate secured to the side plates, a front end plate secured to the bottom, side and top plates, a back wall plate secured to the top side and bottom plates of larger area than the rear end of the bosh plate and adapted to form a lateral extension extending entirely around the back end of the bosh plate, slots formed in the lateral extension near the ends and at intermediate points, the slots near the top edges of the flange being in vertical alignment with the slots at the bottom edge of the flange, baffles secured to the bottom and back wall at intermediate points and spaced apart from the top wall, and a central baffle secured to the top and forward walls and spaced apart from the bottom and back walls of the bosh plate.

In testimony whereof I hereunto affix my signature.

BENJAMIN J. HARLAN.