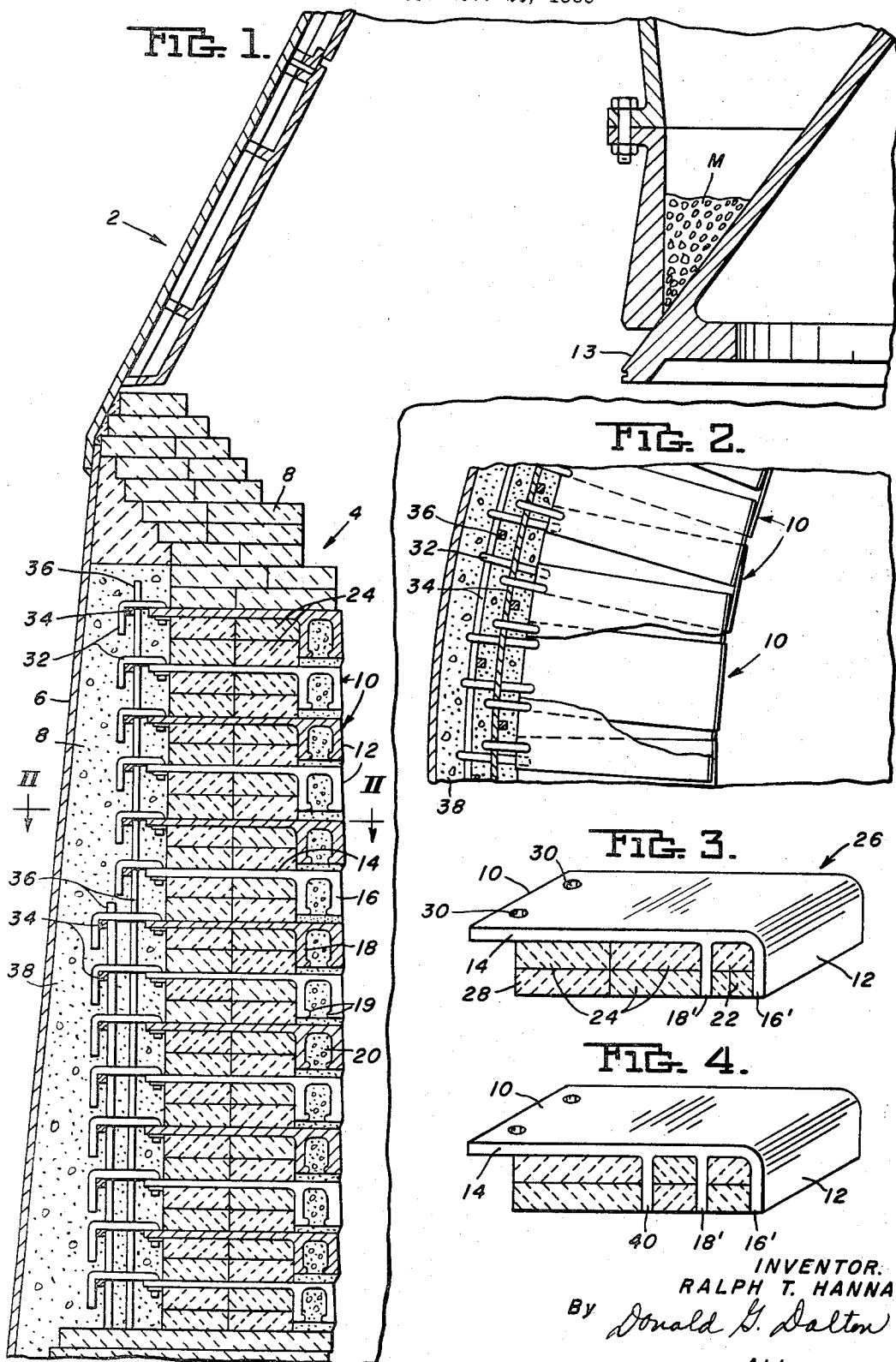


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R. T. HANNA
BLAST FURNACE STOCK LINE WALL AND METHOD OF
CONSTRUCTING THE SAME
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INVENTOR:
RALPH T. HANNA
By *Donald S. Dalton*
Attorney

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BLAST FURNACE STOCK LINE WALL AND METHOD OF CONSTRUCTING THE SAME

Ralph T. Hanna, Fox Chapel Borough, Allegheny County, Pa., assignor to United States Steel Corporation, a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

A novel blast furnace stock line wall with metal wear elements, each having a horizontal plate and spaced apart, parallel vertical flanges facing the inner area of the furnace. Prior to building the wall, the area between the flanges is filled with a castable ceramic material or with bricks of appropriate size.

This invention relates to a novel construction for a blast furnace stock line wall. More particularly, it relates to a novel metal wear element that is incorporated in the stock line wall and to a novel method of building a stock line wall having this metal wear element.

In the past, metal wear elements for blast furnace stock line walls have taken many forms and shapes. However, all have had the common features of at least one plate embedded in the ceramic portion of the wall and a flange which extends substantially at right angles from the embedded plate and along the inner surface of the stock line wall.

In constructing a stock line wall, the procedure has been to embed metal wear elements in the ceramic material as the wall was being built. This necessitates a two-step operation in the laying of each layer of metal wear elements and surrounding ceramic material. First the metal elements are cemented in place, and then a layer of either castable ceramic material or bricks and mortar is placed on top of the metal elements or in the voids between the portions of the metal elements that are to be embedded in the wall.

Several problems have arisen with respect to these metal wear elements and the method of incorporating them in the stock line wall of a blast furnace. One is that it is difficult to estimate how much longer the metal wear elements of a particular stock line wall will last. The inwardly facing flange of each metal element wears down gradually, until it disappears, leaving only the stub end of the embedded plate from which the worn-off flange extended. Then, the ceramic material that was behind the metal flange wears away very quickly. Thus, it is common for portions of the stock line wall to deteriorate from an acceptable condition to an extremely poor condition in a very short time.

Another problem is the length of time that is required to build or replace a stock line wall, because of the two-step process that is required with the embedding of each row of metal elements. The production time lost in embedding the metal elements in the ceramic material row by row as the wall is built is very costly to the overall efficiency of the furnace.

Therefore, an object of my invention is to provide a stock line wall for a blast furnace that will have an increased life and will enable an operator to judge better the remaining life of the wall.

Another object of my invention is to provide an article of manufacture to be incorporated in the stock line wall of a blast furnace, which will increase the life of the wall and will make possible a faster construction of the wall and a reduction of furnace shut-down time when the wall is to be repaired or replaced.

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Still another object of my invention is to provide a method of constructing a stock line wall of a blast furnace that will require a shorter furnace down-time while a wall is being repaired or replaced.

These and other objects will appear more readily from the following detailed description of my invention and the attached drawings, in which:

FIGURE 1 is a fragmentary vertical sectional view of the stock line zone of a blast furnace in which my invention is incorporated;

FIGURE 2 is a fragmentary sectional view of the blast furnace of FIGURE 1, taken along line II—II of FIGURE 1;

FIGURE 3 is a detail view of a component part of a blast furnace stock line wall, showing another embodiment of my invention; and

FIGURE 4 is a detail view of a component part of a blast furnace stock line wall, similar to that shown in FIGURE 3, but showing still another embodiment of my invention.

Referring to FIGURE 1, a blast furnace 2 has a stock line wall 4, made of an outer metal shell 6 and a combination ceramic and metal lining 8. Included in the lining 8 are metal wear elements 10 having wear surfaces 12 exposed to the inside of the furnace. These wear surfaces 12 are designed to receive impacts from particles of material M that fall at an oblique angle from a charging bell 13 suspended above the stock line zone. A plan view of the metal wear elements 10 may be seen in the sectional view of FIGURE 2.

Each metal wear element 10 includes a horizontal metal plate 14 (FIGURE 1) and two parallel, spaced apart, vertical flanges 16 and 18. Between the flanges 16 and 18 is a castable ceramic material 20 that is precast between the flanges prior to building the stock line wall 4. The flanges 16 and 18 have lips 19 on their bottom edges to hold the ceramic material 20 in place.

An alternative to the ceramic material 20 is shown in the embodiment of FIGURE 3. Bricks 22 of a standard size are cemented by mortar between flanges 16' and 18'. In this case, the lips 19 on the ends of the flanges of the first embodiment are eliminated, as they would interfere with the placement of the bricks between the flanges.

With both embodiments, ceramic bricks 24 are cemented between the rear portions of the metal plates 14 and these bricks may also be fixed by mortar to each metal wear element 10 before the wall 4 is built.

Each wear element 10, its associated ceramic material 20 or bricks 22, and bricks 24 form a substantially rectangular block 26, as shown in FIGURE 3. A plurality of these preformed blocks 26 can be laid quickly and easily in circular rows to build the stock line wall 4. Thus, the building of the wall 4 requires a shorter furnace shut-down time than in the past, because the laying of each row of wear elements and surrounding ceramic material is now a one-step operation of setting in place the preformed rectangular blocks 26.

As can be seen in FIGURE 3, each wear element 10 overhangs the rear edges 28 of bricks 24 and has two holes 30 extending through its overhanging portion. These holes enable the wear elements 10 to be anchored in place in a conventional manner shown in FIGURES 1 and 2, so that they are restrained from movement toward or away from the interior of the furnace. Hook members 32 (FIGURE 1) fit through holes 30 in the wear elements 10 (FIGURE 3) and secure these wear elements to circular horizontal bars 34, which are in turn supported by vertical bars 36. To anchor the wear elements 10 and complete the stock line wall 4, a castable ceramic material 38 is poured in between the wall of rectangular blocks 26 and metal shell 6.

The provision of two flanges 16 and 18 on each wear

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element 10 provides added life to the stock line wall 4 and enables the operator of the furnace to judge more accurately the remaining life of a partially worn stock line wall. When the front flange 16 wears completely off, the ceramic material 20, or bricks 22 in the embodiment of FIGURE 3, will be quickly worn away, leaving the rear flange 18 exposed to absorb the impacts of the material M falling from the furnace bell 13. The furnace operator can expect the flanges 18 to last as long as the flanges 16 lasted, and thus he will be able to plan on replacing the wall when that known length of time elapses.

An even longer stock line wall life can be obtained by adding still another flange to the wear element 10, as shown by flange 40 in the embodiment of FIGURE 4.

While several embodiments of my invention have been shown and described herein, other adaptations and modifications will be apparent within the scope of the appended claims.

I claim:

1. An article of manufacture to be incorporated in the stock line wall of a blast furnace, comprising:

(a) a metal element including

- (1) a horizontal plate,
- (2) a plurality of parallel ribs extending from said plate in a direction substantially perpendicular to the plate, said ribs being spaced one behind the other and one of said ribs being positioned to form the inner wall surface of said furnace when said article of manufacture is incorporated therein, and
- (3) a rear extension on said horizontal plate, extending away from said ribs and adapted to be embedded in said stock line wall; and

(b) a mass of ceramic material occupying the space between said ribs and cemented to said metal element.

2. The article of manufacture of claim 1 wherein said mass of ceramic material is of a castable ceramic material.

3. The article of manufacture of claim 1 wherein said solid mass of ceramic material includes individual bricks held in place by mortar.

4. A blast furnace characterized by a novel stock line wall comprising:

- (a) a plurality of metal elements each including:
 - (1) a horizontal plate,

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- (2) a plurality of parallel ribs extending from said plate in a direction substantially perpendicular to the plate, said ribs being spaced one behind the other and one of said ribs being positioned to form the inner wall surface of said furnace,
- (3) a rear extension on said horizontal plate extending away from said ribs,

(b) a mass of ceramic material cemented to said metal elements and occupying the spaces between the ribs of said metal elements and between said rear extensions of said horizontal plates.

5. The blast furnace of claim 4 wherein said solid mass of ceramic material is of a castable ceramic material.

6. The blast furnace of claim 4 wherein said solid mass of ceramic material includes individual bricks held in place by mortar.

7. A method of constructing a stock line wall of a blast furnace, comprising the steps of:

- (a) cementing a ceramic material between a plurality of spaced apart ribs of a metal element, and then
- (b) cementing together a plurality of said metal elements with ceramic material cemented thereto so that one rib of each element forms part of an inner stock line wall surface for said furnace, and other ribs of said elements line up to form a secondary wall surface behind said stock line wall surface.

8. The method of claim 7 including the step of cementing ceramic material behind the rib of each of said metal elements that is furthest from said stock line wall surface, prior to cementing together a plurality of said metal elements.

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FREDERICK L. MATTESON, JR., *Primary Examiner*.
H. B. RAMEY, *Assistant Examiner*.

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