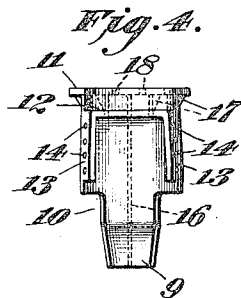
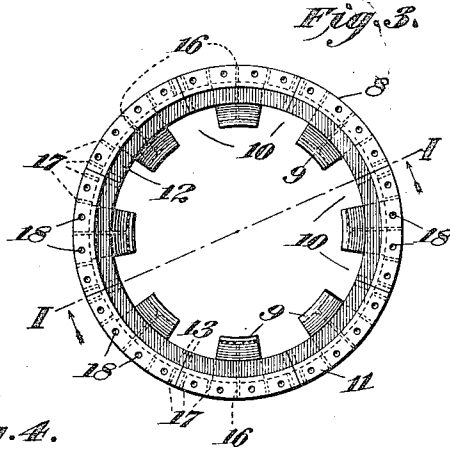
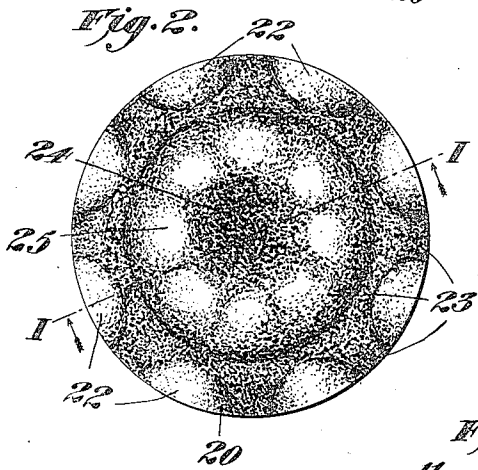
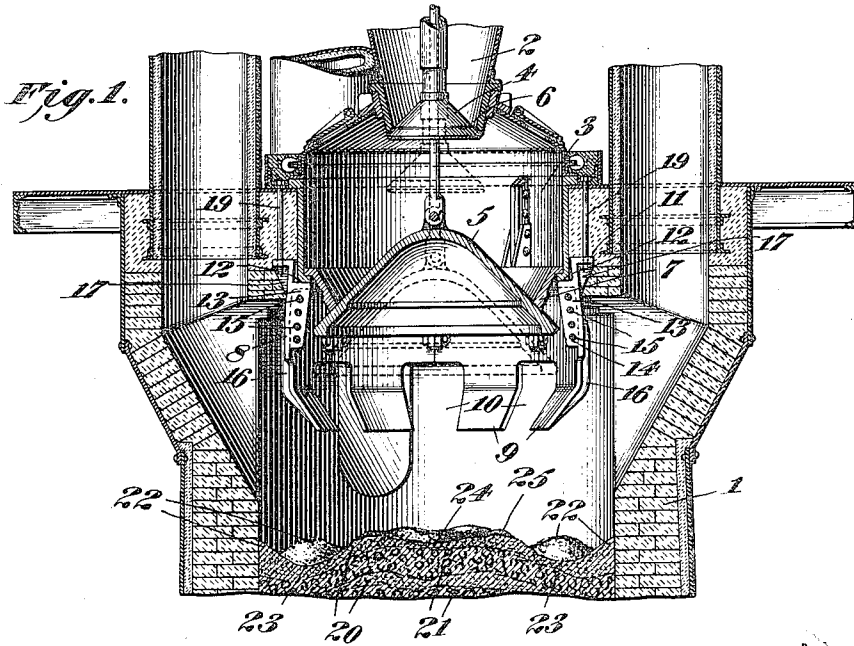


E. E. SLICK.
BLAST FURNACE.
APPLICATION FILED JUNE 29, 1914.

1,267,004.

Patented May 21, 1918.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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BLAST-FURNACE.

1,267,004.

Specification of Letters Patent.

Patented May 21, 1918.

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To all whom it may concern:

Be it known that I, EDWIN E. SLICK, a citizen of the United States, residing in the borough of Westmont, in the county of Cambria and State of Pennsylvania, (whose post-office address is Johnstown, Pennsylvania,) have invented certain new and useful Improvements in Blast-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in blast furnaces with special reference to the top portion thereof, whereby the stock charged therein is distributed.

One of the essential parts of the construction of a blast furnace is the top thereof, whereby the materials which are charged therein, such as coke, ore, limestone, or other fluxes, are deposited in the upper part of the stack portion of the furnace in such a way as to produce the best results in reduction and smelting.

I have found by actual trial and experimentation that it is exceedingly desirable to distribute the charge in approximately uniform layers, providing, however, certain cleavage planes and arrangements of minor concentrations whereby the major portion of the cross section of the stack, including the charge at any point, is more uniformly subjected to the reducing action of the gases and fuels. Under certain prior conditions of the arrangement of bells and hoppers of blast furnaces, the stock is distributed in layers, that is, with a large part of the fines in one place and a large part of the coarse material in other places, in such a way that the gases passing therethrough follow the lines of least resistance and so-called chimneys are formed through the charge, with the result that a blast furnace does not produce an output corresponding to its size or desired capacity.

By means of my apparatus these difficulties are obviated and I obtain a distribution of the stock such that the largest possible proportion of the cross section of the blast furnace is operative in all parts, without the tendency to the formation of deposits on the walls, local chimneys through

the charge, and my arrangement also prevents hanging, slips and scaffolds.

My arrangement is also such that lines of cleavage are formed in the various layers of stock so that when the layers below settle, due to the operation of the furnace, the charge above them gradually breaks on its cleavage lines, allowing the whole mass to settle with reasonable uniformity and thereby preserve the desired arrangement.

Having thus given a general description of my invention, I will now, in order to make the matter more clear, refer to the accompanying sheet of drawings which form part of this specification and in which like characters refer to like parts.

Figure 1 is a vertical transverse sectional elevation of the top portion of a blast furnace showing the application of my invention.

Fig. 2 is a top plan view of the surface of the materials after they are charged into the furnace, showing the conformation or the manner in which they are distributed.

Fig. 3 is a top plan view of the distributor detached, and

Fig. 4 is a detail in side elevation of one of the sections of the distributor, showing the inner face thereof.

Referring now to the characters of reference:—1 indicates the top of the furnace generally, 2 the upper or receiving hopper, and 3 the lower or charging hopper. 4 represents a small distributing bell and 5 is the large charging bell. A small bell seat ring is indicated as 6; 7 indicates a seal ring for the large charging bell, while 8 indicates my distributor in general. 9 are the fingers of my distributor, 10 the openings in, or spaces between, the same, and 11 indicates the top flange of the distributor. A flanged shelf upon which the hopper 3 rests, is indicated as 12. 13 indicates inner flanges for securing together the sections of the distributor; 14 are bolt holes in the flanges 13, while 15 indicates bolts for attaching together the sections of my distributor. 16 is a vertical central rib on each section of the distributor, 17 are integral brackets connecting the top flange 8 and the sides of the distributor. 18 indicates holes through the top flange 8, while 19 indicates rods for securing the distributor to the top of the furnace. 20 indi-

cates ore and 21 coke and limestone, as deposited in the blast furnace. 22 are small piles of ore or finer materials around the sides of the blast furnace, and 23 indicates
 5 the low point between small piles 22 and in front of the same. 24 indicates the central low point of the charge and 25 the intermediate high point of the charge between 23 and 24.

10 In the charging of blast furnaces, successive quantities of coke, ore and limestone are fed therein through the distributing and charging bells. When the receiving hopper of my arrangement has obtained a charge,
 15 the charging bell is lowered, whereupon the material slides down on the surface of said bell and portions impinge against the fingers 9 of my distributor. This deflects those portions of the charge toward the center of the
 20 furnace, while those portions which pass between the fingers continue in their travel outwardly toward the walls of the furnace. A cross section of an actual arrangement of materials which have been charged with the
 25 use of my apparatus, is as shown in Fig. 1 and an actual plan view of the same is illustrated in Fig. 2.

It will be noted from Fig. 2 that there are certain locations where the layers of
 30 material are of greater thinness than at others, and this, together with the dome-like form of the deposits, forms cleavage or breaking lines which will allow the stock to settle quietly and regularly, as the portions
 35 below it move downwardly.

The dotted lines in Fig. 1 represent the lower positions of the bells. The lower charging bell may be so adjusted as to be
 40 moved downwardly, more or less, than as indicated by dotted lines, in order to adjust the distribution of the material.

A distinctive feature of my invention is the arrangement of the distributor 8, provided with fingers 9, the upper portions of
 45 which are substantially vertical, while the lower portions are inclined toward each other inwardly, leaving spaces between the adjacent fingers. This distribution is made in sections so as to be easily placed and removed. I prefer to make the spaces between
 50 the fingers slightly wider than the width of the fingers themselves, but this may be varied within the scope of my invention; and it should also be understood that the
 55 arrangement of these fingers is such that large particles of ore or coke cannot be lodged between the fingers, but on account of the clearances provided, will readily pass them and be distributed in the furnace.

60 Although I have shown and described my improvements 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
 65 equivalents thereof, as are embraced within

the scope of my invention, or as pointed out in the claims.

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

1. In a blast furnace charging apparatus adapted to operate on substantially the entire charge, a bell and hopper, a stationary distributor extending downwardly below
 75 said hopper, provided with a plurality of fingers, the lower portions of which extend inwardly toward each other.

2. A blast furnace charging apparatus adapted to operate on substantially the entire charge, a bell and hopper, a stationary
 80 distributor extending below the hopper and surrounding said bell, the upper portion of the distributor being substantially vertical and adapted to contact with the material of the charge and the lower portion provided
 85 with a plurality of fingers, the lower ends of which are inclined inwardly toward each other.

3. In a blast furnace charging apparatus adapted to operate on substantially the entire charge, the combination with a bell and
 90 hopper, of a stationary distributor below said hopper and surrounding the charging bell, the upper portion of said distributor being continuous, the lower portion
 95 being provided with a plurality of fingers extending below the same, the lower portions of said fingers being inclined inwardly toward each other, the central portion between the fingers being unobstructed.
 100

4. The combination with a blast furnace charging bell and hopper, of a stationary distributor extending below said hopper, the upper portion of the distributor being continuous, integral fingers extending below
 105 said distributor, the upper portions of the fingers being substantially vertical and the lower portions inclining inwardly toward each other, and spaces between said fingers.

5. Blast furnace charging apparatus
 110 adapted to operate on substantially the entire charge, comprising a charging hopper, a hopper extension, a charging bell, arranged to direct the charged materials toward the furnace wall and a series of depending def-
 115 flectors secured to the hopper extension to extend below the charging bell around the periphery thereof and arranged to engage and deflect portions of the charged materials toward the center of the furnace, the central
 120 portion between the fingers being unobstructed.

6. Blast furnace charging apparatus comprising a charging hopper, a hopper closing
 125 bell, and a distributor below the hopper, said distributor forming a series of spaced deflectors arranged to engage and arrest movement of portions of the charged materials toward, while permitting movement of
 130 other portions toward the side wall of the

furnace, and inclined shelves on said deflectors arranged to deflect some of the charged materials toward the center of the furnace.

7. Blast furnace charging apparatus having means to direct the charge downwardly and outwardly substantially in the form of a cone; and distributing means allowing spaced portions of the charge to freely pass, to form an outer circle of heaps, and deflecting other portions inwardly to form an inner ring of heaps.

8. Blast furnace charging apparatus having means to direct the charge downwardly and outwardly substantially in the form of a cone; and distributing means allowing spaced portions of the charge to freely pass, to form an outer circle of heaps, and deflecting other portions inwardly to form an inner ring of heaps; whereby the finer and coarser particles are arranged in different areas.

9. Blast furnace charging apparatus comprising a charging hopper, a hopper extension, a charging bell arranged to direct the charged material toward the furnace wall and a series of depending deflectors secured to the hopper extension to extend below the charging bell around the periphery thereof and arranged to engage and deflect portions

of the charged materials toward the center of the furnace, the space within the hopper extension and deflectors and below the bell being substantially unobstructed.

10. A blast furnace charging apparatus comprising a charging bell and hopper adapted to receive and deliver an entire charge, a stationary distributor extending below said hopper and adapted to surround the lower portion of the bell when the same is lowered, the upper portion of the distributor being continuous and provided with a plurality of fingers spaced apart and extending below said upper portion, the upper parts of the fingers being substantially upright and the lower portions thereof inclining inwardly toward the center of the furnace, whereby portions of the charge are discharged toward the furnace wall, other portions toward the center and other portions intermediate thereof, forming a plurality of columns separated by the coarser materials to facilitate the smelting thereof.

In testimony whereof I hereto affix my signature in the presence of two witnesses.

EDWIN E. SLICK.

Witnesses:

A. DIX TITTLE,
PLUMA F. LONGSHORE.