

G. H. SMITH.
BLAST FURNACE TOP.
APPLICATION FILED APR. 23, 1912.

1,031,478.

Patented July 2, 1912.

2 SHEETS-SHEET 1.

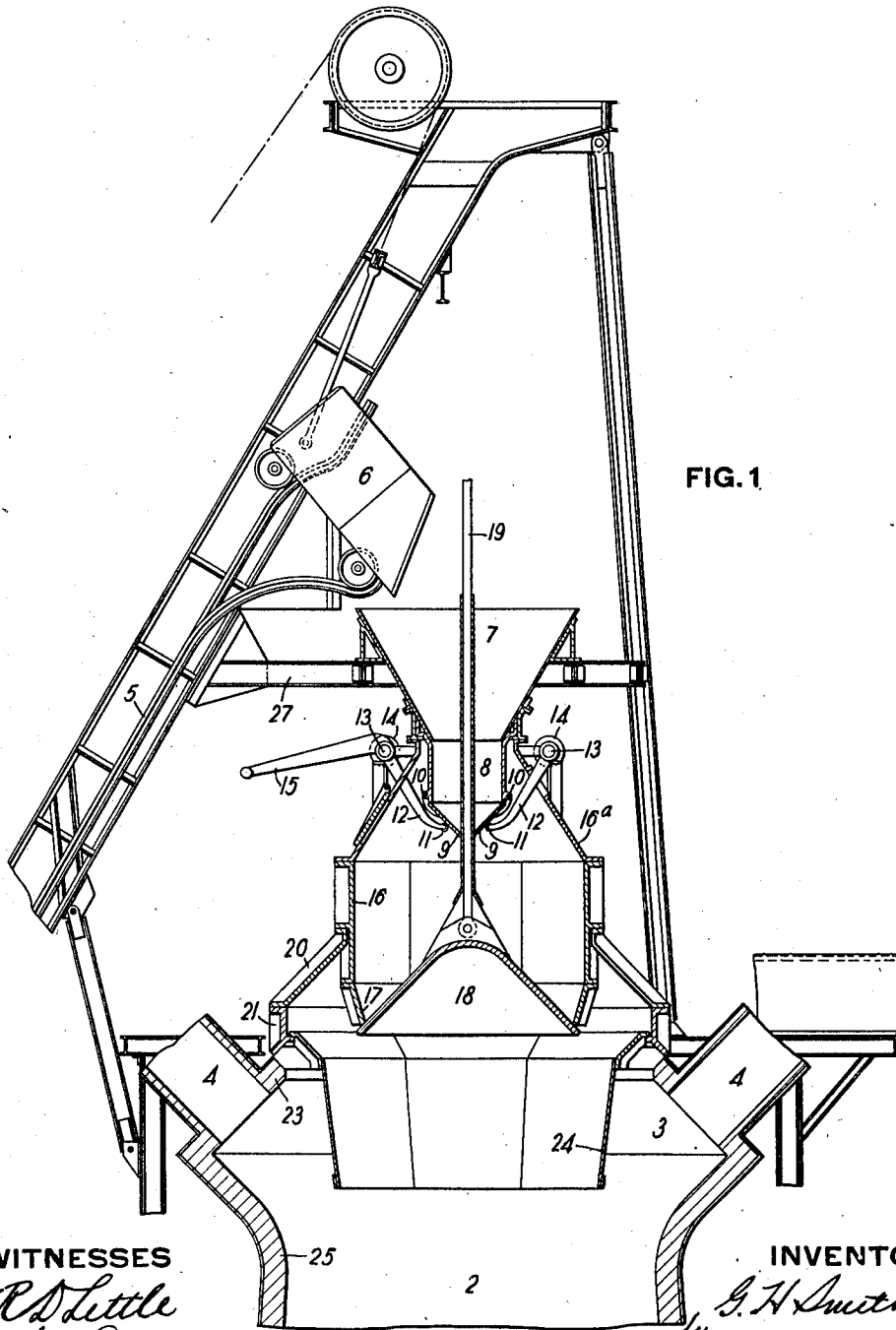


FIG. 1

WITNESSES

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INVENTOR

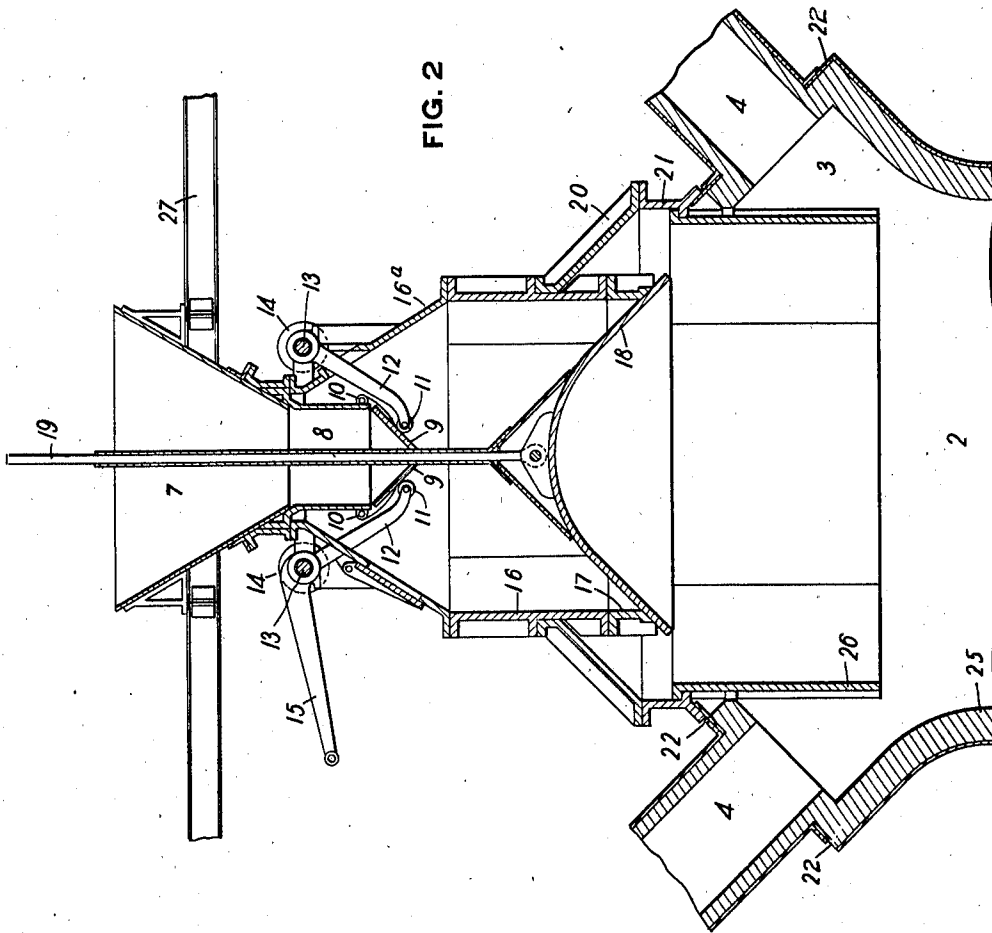
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UNITED STATES PATENT OFFICE.

GEORGE HAMPTON SMITH, OF ASPINWALL, PENNSYLVANIA.

BLAST-FURNACE TOP.

Specification of Letters Patent.

Patented July 2, 1912.

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To all whom it may concern:

Be it known that I, GEORGE HAMPTON SMITH, a citizen of the United States, residing at Aspinwall, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Blast-Furnace Top, of which the following is a specification.

My invention relates to the construction of blast furnaces and more particularly relates to the construction and arrangement of the filling apparatus used on top of the furnace by which the furnace burden is charged into and distributed in the top of the furnace shaft.

In the modern mechanically charged blast furnace it frequently becomes necessary to change the method or way in which the stock is distributed within the furnace on account of irregularities in the working of the furnace. In order to effect this change in distribution it is the practice to substitute bells and hoppers of one size for bells and hoppers which are larger or smaller and to replace a distributing ring of one diameter with one of a different diameter.

My invention is designed to provide novel means whereby the changes in the bells and hoppers and in the distributing rings found necessary in altering or varying the manner of distributing the charged materials entering the furnaces are facilitated, repairs to the apparatus used in charging and distributing the burden forming materials in the furnace are more easily and quickly accomplished and the time lost in operating the furnace is greatly lessened.

Referring to the drawings, Figure 1 is a sectional elevation showing the top of a blast furnace shaft having charging apparatus mounted thereon constructed and arranged in accordance with my invention. Fig. 2 is a similar sectional elevation on an enlarged scale showing a portion of the apparatus illustrated in Fig. 1.

In the drawings, 2 designates the furnace shaft, which is enlarged and flares outwardly and then inwardly at its upper end, and leading from the enlarged flaring upper end 3 are the gas offtakes 4 by which the gases produced in the operation of the furnace are led therefrom to the furnace downcomer (not shown). An inclined skip track 5, which is provided with a skip car 6 in which the materials are hoisted and discharged into the top hopper 7, leads upwardly from the ground level to the top

hopper or chute 7 above the furnace shaft 2. The skip car 6 is arranged to tilt mechanically as it reaches the top of the skip car track 5 and dump materials hoisted therein into the conical hopper or chute 7.

The lower, smaller end of the hopper 7 is provided with a throat 8, preferably cylindrical in cross section, and which normally is closed by means of the swinging gas sealing doors 9 hinged to the lugs 10 on the lower end of the throat 8. Each of the doors 9 is engaged by an anti-friction roller 11 on one end of the door operating levers 12 and the ends of the horizontal shafts 13 on which the levers 12 are keyed or otherwise secured, are connected together by the bevel gears 14. An operating arm 15 on one of the shafts 13 is employed to rock the shafts 13 to close the doors and permit opening thereof, the outer end of this lever 15 being operatively connected to a suitable motor (not shown). Below the top hopper 7 and throat 8 is a charging hopper 16 having a hopper extension 17 thereon and a charging bell 18 engages with the lower edge of the hopper extension 17. The bell 18 is suspended by a rod 19 from a bell operating mechanism in the usual manner so as to raise and lower the bell 18 in discharging materials from the hopper 16 into the top of the furnace 2.

The flanged top of the hopper 16 is connected with the sides of the top hopper or chute 7 by means of the sectional gas sealing hood 16* and the hopper 16 is mounted upon the conical hopper support 20 secured to the ring 21, the ring 21 being fastened to the upper edge of the conical top forming the upwardly and inwardly flared extension of the furnace shell 22.

Suspended within the furnace by its flanged upper end from the upper edge of the conical shell 22 of the furnace is a distributing ring 24. The distributing ring 24 in Fig. 1 is of a diameter considerably smaller at its lower end than the inside diameter of the refractory lining 25 in the upper end of the furnace shaft 2. In the construction of Fig. 2, the distributing ring 26 (which is substituted for the ring 24 of Fig. 1) is much larger in diameter than the ring 24. The large and small distributing rings 24 and 26 are interchanged to vary the manner in which the materials will be distributed in being charged into the furnace, one of these rings being removed and re-

placed by another of different diameter when it is desired to change the distribution of the coarse and fine materials forming the furnace burden as deposited within the top
5 of the furnace.

In some cases the hopper extension 17 and bell 18 of Fig. 1 will be replaced by a larger hopper extension 17 and bell 18, as shown in Fig. 2, in order to effect a greater change in
10 the distribution of the stock as charged into the furnace. To facilitate the removal and the replacement of the hopper extensions, bells and distributing rings without disturbing the gas seal and top hopper, as has heretofore been necessary, the support 20 for
15 the hopper 16 is made in sections and the gas sealing hood 16^a, which also is made in sections, is suspended from the top hopper 7, which will be carried by or supported on the superstructure 27 located above the top
20 of the furnace. The bottom hopper 16 is arranged to be suspended, when necessary, from the gas sealing hood 16^a, and the lower bell 18 which when not removed is suspended so as to be vertically movable, aids
25 in supporting the hopper 16 and gas sealing hood 16^a after one or more sections of the conical support 20 are disconnected and removed. The distributing rings 24 and 26
30 also are made in sections, of such size as can easily be handled, when disconnected in being removed. Each section can be removed separately from the top of the furnace, between the conical top of the furnace and the
35 charging hopper 16. The hopper extensions 17 are also made in sections so that the hopper extension can be removed and replaced by disconnecting and removing the sections of the support 15 and taking the
40 disconnected sections of the hopper extension 17 out of the furnace between the hopper 16 and the top shell 22 of the furnace.

The advantages of my invention will be apparent to those skilled in the art. The
45 construction of the top of the furnace shaft providing the enlarged upper end of the furnace shaft which is utilized to provide a convenient means for attaching the gas off-takes 4 to the furnace and enlarges the area
50 of the furnace shaft at the point therein that the gases are taken from the furnace, the enlarged area reducing the velocity of the gases passing out of the furnace so as to prevent or lessen to a large extent the
55 amount of finely divided solids carried from the furnace by the outgoing gases. By providing means whereby the bells, hopper extensions and distributing rings in the furnace are readily removed and easily replaced changes in the distribution of the
60 stock in the furnace are readily accomplished without disturbing the top rigging

above the charging bell other than the hopper support and with a minimum amount of delay to the iron making operations of the 65 furnace.

Modifications in the construction of the parts may be made without departing from my invention, as defined in the claims.

I claim:—

1. In a blast furnace, a closed top furnace comprising a sectional hopper support mounted on the top of the furnace shell, a charging hopper thereon, a closing bell for said hopper, and a sectional distributing
75 ring suspended from the furnace shell, said distributing ring being removable in sections from the furnace between the hopper and the top of the furnace shell.

2. In a blast furnace, a closed top furnace 80 comprising a sectional hopper support mounted on the top of the furnace shell, a charging hopper thereon having a detachable sectional hopper extension, a closing bell for said hopper engaging with said
85 hopper extension, and a sectional distributing ring suspended from the furnace shell, said distributing ring and hopper extension being removable in sections from the furnace between the hopper and the top of the 90 furnace shell.

3. In a blast furnace, a closed top furnace comprising an enlarged flaring furnace shell having an open upper end, a sectional hopper support detachably mounted thereon, a
95 charging hopper mounted on and extending downwardly within said support, and a sectional distributing ring suspended from the top of the furnace shell, the hopper being smaller than the opening in the top of the 100 furnace shell to permit the removal and replacement of the sectional distributing ring with the hopper in position on the furnace top.

4. In a blast furnace, a closed top furnace 105 having a metal shell flaring outwardly and then inwardly, a refractory lining therefor, gas offtakes in the inwardly flaring portion of the shell, a hopper supported on said furnace shell having a hopper closing bell, a
110 support for said hopper forming a gas seal therefor, and a sectional extension on the hopper, said hopper support being arranged in sections, the sections being removable to permit the insertion and removal of the 115 hopper extension with the hopper supported on the furnace shell.

In testimony whereof, I have hereunto set my hand.

GEORGE HAMPTON SMITH.

Witnesses:

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