May 17, 1960 F. J. BORON 2,937,018

FURNACE BLOW PIPES

Filed Aug. 18, 1958

FIG. 1

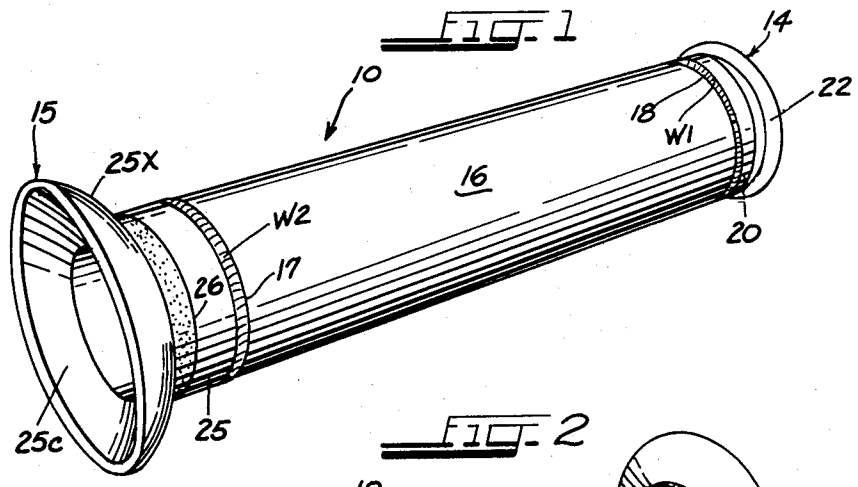


FIG. 2

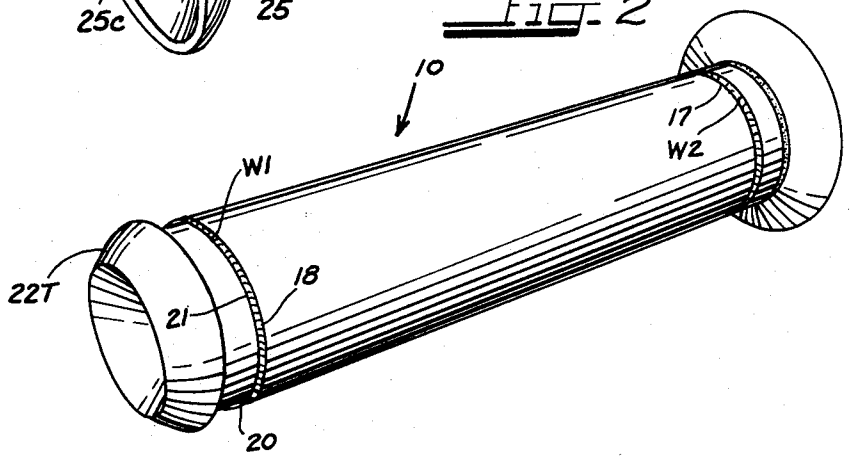
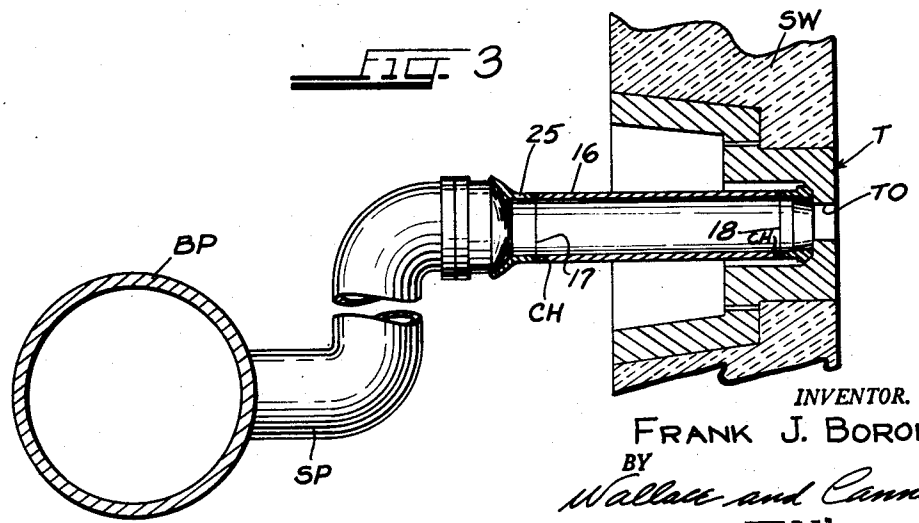


FIG. 3



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FURNACE BLOW PIPES

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2 Claims. (Cl. 266—30)

This invention relates to the construction of blow pipes of the kind associated with tuyeres in a blast furnace.

Air for sustaining combustion in a blast furnace is introduced into the smelting area through a tuyere. This air is furnished under pressure by a pipe in the form of a so-called tuyere stock, and the blow pipe is interposed between the tuyere and the tuyere stock. Historically, tuyere blow pipes are made of cast iron, and this is especially so in view of the peculiar end constructions at the two ends of the blow pipe respectively affording the stock joint and the tuyere joint. While a cast iron blow pipe represents a relatively heavy, rugged and easily cast part, cast iron is not ordinarily considered a thermally resistant material, and I have discovered in accordance with the present invention that a sound, high quality blow pipe can be cast from an expensive heat-resistant alloy flowing at high temperatures, in spite of its peculiar shape which would ordinarily discourage use of such alloys, and I accomplish this by in effect dividing the blow pipe into three sections such that an intermediate section of uniform diameter is centrifugally cast and the two end sections are cast in conventional sand molds. By so casting and constructing a blow pipe, I am able to afford a blow pipe of lighter metal sections in contrast to cast iron blow pipes, and I am able to afford a blow pipe representing an exceptionally sound casting for a part of this kind warranting use of expensive heat-resistant alloys assuring prolonged thermal life of the blow pipe. These achievements represent the primary objects of the present invention.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principle thereof and what is now considered to be the best mode contemplated for applying that principle. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Figs. 1 and 2 are respectively perspective views in opposed attitudes of a blow pipe constructed in accordance with the present invention; and

Fig. 3 is a somewhat schematic sectional view showing the blow pipe of the present invention in its installed state.

In contrast to the standard one-piece cast iron blow pipe in the prior art, a blow pipe in accordance with the present invention is fabricated from three separately cast parts, each of which is preferably cast from a heat-resistant alloy analyzing approximately as follows: chromium, 10 to 30 percent; nickel, 5 to 60 percent; carbon, 0.1 to 0.8 percent; nitrogen, 0.05 to 0.3 percent; iron, balance. The foregoing analysis is, as mentioned, used for all three parts of the present pipe to be described hereinafter, but where a particular installation is subject to rather severe thermal gradients between the tuyere and stock end of the blow pipe then it is possible that heat-resistant alloys of different analyses will be used for the several sections of the blow pipe in accordance with the type of thermal stressing expected to be encountered.

In Figs. 1 and 2 of the drawings, there is shown in perspective two end views of a blow pipe constructed in accordance with the present invention, but so far as shape and configuration are concerned it will be appreciated that this blow pipe **10** is for the most part identical to a standard blow pipe of cast iron construction. Considering the variant section thickness and configurations embodied in the blow pipe **10**, it will be realized that these represent parts wherein it is extremely difficult to achieve a sound, acceptable casting from expensive heat-resistant alloys which must be cast at relatively high temperatures in contrast to cast iron which flows at lower temperatures, and this is especially so in view of the fact that the blow pipe illustrated in Figs. 1 and 2 is approximately four feet in over-all length. In fact, these considerations would ordinarily preclude any idea that such a blow pipe could be cast from alloys which flow only at high temperatures, since some porosity, wall thickness fluctuations and diameter fluctuations of an unacceptable degree would be expected. In this connection, it should be pointed out that the tuyere end **14** of the blow pipe **10** has an outside diameter of approximately ten inches and the outside diameter of the tuyere stock end **15** has an outside diameter of approximately thirteen and one-half inches.

In accordance with the present invention, I have discovered that it is in fact possible to construct a blow pipe for blast furnace installations from an expensive heat-resistant alloy which must be cast at relatively high temperatures by casting the intermediate section **16** of the blow pipe (which is of uniform diameter throughout) centrifugally, and casting the two end parts **14** and **15** separately in conventional stationary sand molds. Thus, as shown in Fig. 3, it will be noted that the intermediate section **16** is of uniform inside and outside diameter and has ends **17** and **18** defined by annular faces.

The tuyere end or joint **14** is cast in a sand mold to include a relatively short stub sleeve or collar **20** having an end **21** which is of the same inside and outside diameter as the corsresponding end **18** of the intermediate tube section **16**. The tuyere end or joint **14** forward of the stub portion **20** is cast on the outside with an enlarged annular flange **22**, and as shown particularly in Figs. 2 and 3 the outer surface of this flange is tapered at **22T** inwardly proceeding in a forward direction so as to complementally engage the inside of the furnace tuyere T which is mounted in the side wall SW of the blast furnace. The tuyere of course includes an opening TO which is coaxial with the inside chamber in the blow pipe **10** through which air or other oxygen-containing combustion supporting medium is directed to emit from the tuyere T.

The opposite end of the blow pipe **10** is to be joined to the stock pipe SP which is located externally of the blast furnace and which conducts the gaseous medium from the so-called bustle pipe BP. Thus, the stock end or joint **15** of the blow pipe **10** includes an annular stub sleeve **25** which has an end **26**, Fig. 1, having the same inside and outside diameters as the corresponding end **17** of the intermediate pipe section **16**. The opposite end of the stock section **15** is flared convex outwardly on the outer side at **25X**, and the inside surface is correspondingly concave at **25C**, this configuration enabling the stock end of the blow pipe to be fitted complementally about the terminal end of the stock pipe SP on the near side of the blast furnace side wall SW.

The two annular ends of the intermediate pipe section

16 are chamfered at CH, Fig. 3, and the corresponding ends 21 and 26 of the end sections 14 and 15 are correspondingly chamfered so that when the three sections are joined in the desired end-to-end relationship there results an annular recess of V-section enabling weldments W1 and W2 to be laid therein thereby rigidly joining the three sections of the blow pipe.

Reference has been made above to dimensions in this instance in order that an appreciation can be had of the relatively large sized parts that are cast under the present invention. In this connection, it should be mentioned that it has been found that intermediate section as 16 of six and eight foot lengths can be cast centrifugally from the above specified alloy with a very high degree of soundness, since it is not necessary to resort to gates and risers. Moreover, the present construction enables section thicknesses and diameters to be controlled within 1/32 of an inch, and of course all of this is made possible in the present instance by the realization that the two end pieces 14 and 15 should be separately cast in conventional stationary molds. Accordingly, it is possible to obtain a high degree of soundness in each of the three members of the three-piece blow pipe in the present instance, and accordingly resort to a heat-resistant alloy is warranted and made possible.

Hence, while I have illustrated and described a preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A blast furnace or like blow pipe to be located between a tuyere and a tuyere stock pipe and comprising, a center part consisting of a centrifugally cast elongated central tube section of a heat-resistant alloy and having substantially uniform inside and outside diameters throughout, said tube section having an inner end to be disposed toward the tuyere and an outer end to be disposed toward the tuyere stock pipe, a separate sand-cast tuyere joint head of a heat-resistant alloy joined to the inner end of said tube section, and a separate sand-cast stock pipe joint head of a heat-resistant alloy joined to the outer end of said tube section, said alloy consisting essentially of and analyzing approximately as follows: chromium, 10 to 30 percent; nickel 5 to 60 percent; carbon, 0.1 to 0.8 percent; nitrogen, 0.05 to 0.3 percent; iron, balance.

2. A blast furnace or like blow pipe to be located between a tuyere and a tuyere stock pipe and consisting essentially of but three main parts, namely, a centrifugally cast elongated central tube section part consisting of a centrifugally cast tube of a heat-resistant alloy having substantially uniform inside and outside diameters throughout, said centrifugally cast tube section having an inner end to be disposed toward the tuyere and an outer end to be disposed toward the tuyere stock pipe, a separate sand-cast tuyere joint head part of a heat-resistant alloy welded to the inner end of said centrifugally cast tube section, said tuyere joint head part having an end surface configured complemental to the surface of the tuyere with which it is to be associated, and another separate sand-cast stock pipe joint head part of a heat-resistant alloy welded to the outer end of said tube section, said other head part having an end surface configured complemental to the surface of the end of the tuyere stock pipe with which it is to be associated, said alloy consisting essentially of and analyzing approximately as follows: chromium, 10 to 30 percent; nickel 5 to 60 percent; carbon, 0.1 to 0.8 percent; nitrogen, 0.05 to 0.3 percent; iron, balance.

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