

Early Device Design—JTST Historical Patent #5*

UNITED STATES PATENT OFFICE

*Ezra A. Mathers of New York, N.Y., Assignor to The Hub Machine,
Welding & Contracting Co., of New York, N.Y., A Corporation of New York*

ELECTRIC-ARC FURNACE-HEATER

1,002,721. Specification of Letters Patent. Patented Sept. 5, 1911. Application filed August 9, 1910. Serial No. 576,306.

Be it known that I, EZRA A. MATHERS, a citizen of the United States, residing in the city, county, and State of New York have invented a new and useful Electric-Arc Furnace-Heater of which the following is a specification.

This invention relates to electric arcs and more particularly to a flaming arc for use as a heater for furnaces wherein it is necessary to employ high temperatures.

It has for an object to provide a flaming arc of low potential and high heat producing intensity, the arc beam directed into a suitable furnace which is heated thereby and may be utilized for welding or other purposes.

It further consists of other novel features of construction, as it will be hereinafter fully set forth

For the purpose of illustrating my invention, I have shown in the accompanying drawing one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a sectional elevation of an apparatus embodying my invention. Figure 2 represents a section on line x-x, Fig. 1. Figure 3 represents a line y-y, Fig. 1.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings: 1 designates a suitable casing, here shown as cylindrical and preferably of iron or steel, said casing being provided at one end with an outwardly extending flange 2 forming a means for attachment of a top plate or closure 3, the same being detachably secured thereto by means of bolts 4 or like fastening means. It will be noted that this top plate is preferably of insulating material, such as soap-stone or the like, in order to prevent short circuiting with the casing 1 of a circuit presently to be described. The closure 3 has an opening 5 therethrough; preferably at the center thereof in order to receive and permit the passage therethrough of a carbon holder 6, said holder having a screw threaded stem 7 engaging a plate 8 and the collar 9, the latter two members being secured to the closure 2 by means of bolts 10, as will be apparent.

The stem 7 has secured thereto the usual hand wheel 11 for operating purposes, whereby the holder 6 may be adjusted as desired. This holder, 6 in the present instance, is provided with a ta-

pered opening 12 adapted to receive a bushing 13 which is likewise tapered for cooperation with the sides of the said opening 12 and carries a carbon pole 14 preferably terminating in a substantially pointed end.

15 designates a jacket enclosing the lower end of the casing 1 and serving as a receptacle of a suitable cooling medium, such as water, which is circulated therethrough by means of the inlet conduit 16 and outlet conduit 17. It will be noted that the jacket 15 is provided with an opening 18 preferably at the center of the bottom thereof and in substantial alignment with an opening 5 in the closure 3.

19 designates a plurality of bushings, here shown as four in number, and suitably disposed in the same plane and screw threaded in the jacket 15 and casing 1, thus forming suitable openings, each adapted to receive a sleeve 20 provided with an apertured cap which furnishes communication with the interior of the sleeves for a purpose to be presently described.

22 designates a carbon bar slidingly mounted in each sleeve 21 and terminating adjacent to the opening 18 and in substantial alignment therewith, it being noted that these bars have suitably curved ends 23 in order to form a suitable passage between the same. These carbon bars 22 are located at a point of very intense heat and the burning away of the carbon necessitates members being provided which can not only be readily replaced but which automatically adjust themselves for wear. This feature obviates frequent replacing of the carbon lining 25. It has been found in practice that these carbons adjust themselves accurately with respect to the flame and the burning take place substantially uniform. It will be noted that the jacket 15 abuts these carbons at the lower side thereof and forms a supporting means for the same, upon which they may be moved, into operative position. As these carbons are located adjacent a point of intense heat and the ends thereof form a discharge orifice, it will be apparent that they will burn away more or less rapidly and therefore I preferably introduce air pressure through the apertured opening 21 to contact with a disk 24 secured to the end of each carbon, and it will be clearly seen that this pressure maintains the carbon always in contact and allows the wear of the same to be taken up as desired.

25 designates a carbon block located within the casing 1 and suitably supported therein, it of course being understood that the carbon bars 22 will move beneath and will be guided by the block in the space 26 therebeneath. This block 25 has an aperture 27 bearing aligned with the opening between the carbon bars 22, the set aperture 27, in the present instance, diverging upwardly at the side of the block 25 in order to form an arc chamber 28, and it will be noted that the block 25 forms a carbon pole adjacent the movable pole 14 with respect to which it is in close proximity.

*This series of historical patents concerned with thermal spray technology has been compiled by C.C. Berndt (SUNY at Stony Brook, NY) and K.A. Kowalsky (Flame-Spray Industries, Inc., NY).

Fig. 1.

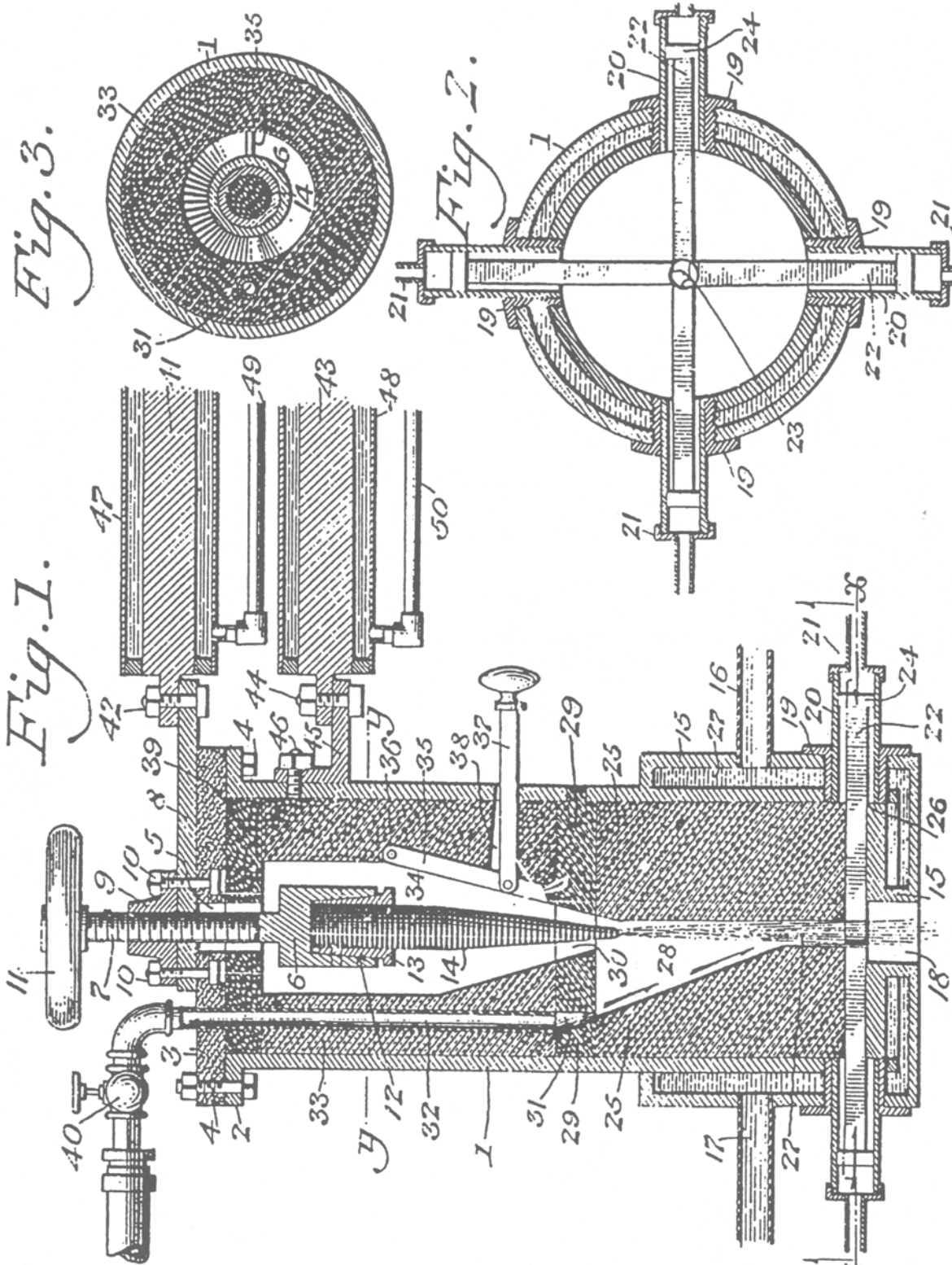


Fig. 3.

Fig. 2.

WITNESSES

P. Fr. Nagel.
H. G. Dieterich

INVENTOR

BY *Ezra A. Mathers.*
Wiederheim & Fairbanks.

ATTORNEYS

29 designates a carbon plate suitably positioned on block 25 and provided with an opening 30 preferably tapered to permit passage of carbon pole 14. 31 designates a second opening in the plate 29, the same being suitably shaped to form a nozzle which, in the present instance, directs a blast of air into the chamber 28, the said blast being conveyed thereto by means of the pipe 32 carried by the carbon block 33. This latter block 33 rests upon the plate 29 and has formed therein a chamber 34 in which the holder 6 and its adjuncts are located.

35 designates a finger suitably pivoted at 36 to the block 33 and having secured thereto an operating arm 37 which projects through a suitable opening 38 to the exterior of the casing 1.

A cap plate 39 also of carbon is disposed between the closure 3 and the carbon block 33 for better insulation purposes. It will be noted that the air conduit 32 extends exterior of the casing 1 and is provided with a suitable valve 40 in order to control the supply of air to the chamber 28.

41 designates a terminal bus-bar suitably bolted at 42 to the plate, whereby current is conducted to the pole 14, and 43 designates a second bus-bar of opposite polarity suitably connected by means of a bolt 44 to an angle iron 45 secured at 46 to the casing 1, thus conducting the current to the carbon lining within the said casing 1.

It will be noted that jackets 47 and 48 enclose the respective bus-bars 41 and 43 and serve as receptacles for cooling means supplied by the pipes 49 and 50, it of course being understood that the two cooling systems are independent in order to prevent short circuiting of the apparatus.

In the operation of the device, the carbon holder 6 is raised or lowered by means of the threaded stem 7, so as to bring the pole 14 into operative position with relation to the carbon block 25, and the circuit having been closed exterior of the casing 1, an arc is produced between the two carbon poles 13 and 25. Particular attention is directed to the fact that the arcing takes place between the extremity of the carbon pole 14 and the lining 25 and flames longitudinally from said and or extremity as though under pressure, thereby forming a blast of intense heating capacity. Air pressure is now admitted through the conduit 32 and enters the flame chamber 28, producing therein vaporous conditions, giving a flame of high intensity, which is forced outwardly through the discharge opening 18 to a suitable furnace which is attached at this point.

In operation the pole 14 is elevated, as far as possible, in order to make a long arc and produce as great a flame as possible. In some instances the arc may be broken for different reasons, and in order to provide for the immediate starting of the arc, I employ the finger 35 which, it will be understood, is formed of any suitable material, preferably of carbon, which can be moved inwardly, in order to contact with the pole 14, immediately upon which the circuit is closed and the arc again started, after which the finger is returned to its normal position as seen in Fig. 1. By this means, I obviate the necessity, should the arc be broken, of screwing down the pole 14 to bring the same in suitable position with respect to the carbon pole 25.

It will now be apparent that I have devised a concrete unitary structure simple in construction, efficient in operation and effective for the purpose intended, whereby an arc flame of exceedingly high temperature is delivered exterior of the casing.

It will now be apparent that I have devised a novel and useful construction of an electric arc furnace heater, which embodies the features of advantage enumerated as desirable in the statement of the invention in the above description, and while I have, in the present instance shown and described a preferred embodiment thereof which has been found in practice to give satisfactorily and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

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

1. In a device of the character stated, the combination of a casing having a discharge opening, adjustable side walls about a portion of said discharge opening, with means for forming an arc flame in said casing, and means for discharging compressed air into said casing adjacent said flange, whereby the latter is forced through said opening.
2. In a device of the character stated, having a discharge opening therein, carbon in said casing provided with a chamber communicating with said opening; a carbon pole adjustably mounted in said chamber, means to supply a current to said pole and carbon to produce an arc therebetween, and means for discharging compressed air into said chamber.
3. In a device of the character stated, the combination of the casing having a discharge, with means for forming an arc flame therein, means for discharging compressed air into said casing adjacent said flame, whereby the latter is forced through the said opening, and a circuit closure adapted to be manually operated should the circuit be broken.
4. In a device of the character described, a casing, a plurality of movable carbons forming a discharge opening therefrom, means for forming an arc flame in said casing and means for discharging compressed air into said casing, whereby the said flame is forced through said opening.
5. In a device of the character described, a casing, a plurality of movable carbons forming a discharge opening therefrom, means for taking up the wear on said carbons, means for forming an arc flame in said casing, and means for discharging compressed air into said casing, whereby the said flame is forced through said opening.
6. In a device of the character described, a casing, a plurality of movable carbons forming a discharge opening therefrom, means for forming an arc flame in said casing, means for discharging compressed air into said casing, whereby the compressed air is forced through said opening, and means for automatically holding said carbon in moving the same into proper relative position.
7. In a device of the character stated, a casing having a flame discharge opening, a carbon lining for said casing, a tapered carbon pole supported with said casing an adjacent said lining, whereby an electric arc flame will pass from the end of said tapered carbon pole to said discharge opening, means to supply an electric current to said lining and to said tapered carbon pole to produce an arc therebetween, and means for discharging compressed air adjacent said arc flame, whereby the latter is forced through said opening.

8. In a device of the character stated, a casing having a discharge opening, a carbon lining for said casing, a carbon pole supported within said casing adjacent said lining, means to supply an electric current to said lining and carbon pole to produce an arc therewith, and means to discharge compressed air axially with respect to said pole whereby said arc flame is forced through said discharge opening.
9. In a device of the character stated, a casing having a discharge opening therein, arcing material in said casing provided with a chamber communicating with said opening, a plurality of slidingly mounted members encircling a portion of said discharge opening, a pole adjustably mounted in said chamber and means to supply a current to said pole and material to produce an arc therebetween.
10. In a device of the character stated, a casing having a discharge opening therein, an arcing lining in said casing, a plurality of slidingly mounted members encircling a portion of said discharge opening, a pole adjustably mounted adjacent said lining, and means to supply a current to said pole and lining to produce an arc therebetween.
11. In a device of the character stated, a casing having a flame discharge opening, a carbon lining for said discharge casing, a plurality of slidingly mounted members encircling a portion of said discharge opening, a tapered carbon pole supported within said casing adjacent said lining, whereby an electric arc flame will pass from the end of sealed tapered carbon pole to said discharge opening, and means to supply an electric current to said lining and to said tapered carbon pole to produce an arc therebetween.
12. In a device of the character stated, a casing having a flame discharge opening, a carbon lining for said casing, a plurality of slidingly mounted members encircling a portion of said discharge opening, a tapered carbon pole supported within said casing and adjacent said lining, whereby an electric arc flame will pass from the end of said tapered carbon pole to said discharge opening, means to supply an electric current to said lining and to said tapered carbon pole to produce an arc therebetween, and means for discharging compressed air adjacent said arc flame whereby the latter is forced through said opening.
13. In a device of the character stated, a casing having a flame discharge opening, a carbon lining for said casing, a plurality of slidingly mounted members encircling a portion of said discharge opening, a carbon pole supported within said casing adjacent said lining, means to supply an electric current to said lining and carbon pole to produce an arc therebetween and means to discharge compressed air axially with respect to said pole whereby said arc flame is forced through said discharge opening.
14. In a device of the character stated, a casing, a plurality of carbons slidingly mounted therein and forming a discharge opening from said casing, and means for forming an arc flame in said casing adapted to be projected through said discharge opening.
15. In a device of the character stated, a casing, a plurality of carbons slidingly mounted therein and forming a discharge opening from said casing, means for forming an arc flame in said casing adapted to be projected through said discharge opening, and means for causing self-adjustment of said carbons.
16. In a device of the character stated, a casing having a discharge opening therein a carbon lining in said casing, a carbon pole mounted adjacent said lining, and adapted to contact with said lining, and means to break contact between said pole and lining.
17. In a device of the character stated, a casing having a discharge opening therein, a carbon lining in said casing, a carbon pole mounted adjacent said lining, and adapted to contact with said lining, and a manually operable member adapted to break contact between said pole and lining.
18. In a device of the character stated, the combination of means for forming an electric arc flame, and means for discharging compressed air axially of said arc flame.
19. The method of operating on material for welding purposes which consists in forming an electric arc, directing a blast of air at a point in advance of the source of the arc, and directing the arc and air blast against a material to be welded.
20. The method of operating on material for welding purposes which consists in forming an electric arc, directing a blast of air substantially axially of said arc, and directing the arc and air blast against a material to be welded.
21. The method of operating on material for welding purposes which consists in forming an electric arc, directing a blast of air at a point beyond the source of the arc and substantially axially of said arc, and directing the arc and air blast against a material to be welded.

Ezra A. Mathers. Witness: B.F. Lare, Joseph A. Laney.