JTTEES 6:302-304

Early Thermal Spraying—*JTST* Historical Patent #4*

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COMPLETE SPECIFICATION

IMPROVEMENTS IN THE METHOD AND APPARATUS FOR MELTING AND SPRAYING FUSIBLE SUBSTANCES

We, THE BRITISH METAL SPRAY COMPANY LIMITED, of 6 Bennett's Hill, Birmingham, Manufacturers, British company, Assignees of FRANZ HERKENRATH of 25 Lägernstrasse, Zurich VI, Switzerland, German nationality, Assistant to Max Ulrich Schoop, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

The object of this invention is to provide improved means for melting and spraying fusible substances, such as metals, metal alloys, glass, enamel and the like, for the purpose of coating surfaces therewith.

To this end a stream of heated gas is used in the path of which is placed the fusible substance, the temperature of the gas being sufficiently high to melt the substance. The function of the gas is thus in part analogous to that of the blow pipe flame used in some forms of the so-called "Schoop" process, but the gas also has a propulsive effect on the molten substance, and thus effects the spraying, or assists in that operation. In general it has been found more economical to use, in addition to a stream of heated gas for melting the substance, a blast device acting in conjunction with the said stream of gas.

Four embodiments of apparatus suitable for carrying this improved method into effect are shown in the accompanying drawing, in Figures 1, 2, 3, and 4 respectively, parts of the apparatus in all the figs. being shown in section.

Referring in the first instance to Figure 1, a designates a coiled tube of electrically conductive but resistant material and b a feed pipe through which a stream of gas is supplied to the tube a, so that the gas issues from the tube at c. Around the discharge end c of the tube a and concentric therewith, is an annular blast nozzle d, to which a stream of gas is fed through a pipe e. Electric current is supplied through the tube a by means of wires n and heats said tube sufficiently to raise the gas therein to the temperature required for melting a rod or wire f of the fusible substance held in front of the nozzle and fed forwards through a guide g at the rate required.

In the modification shown in Figure 2, a tube a^1 of the refractory material encloses an electrical resistance r through which current is supplied by means of wire w^1. A stream of gas is fed into the tube a by means of pipe b^1 and passes out through a short pipe b^2 the discharge end of which is surrounded by the annular blast nozzle d^1. The stream of gas flowing through the tube a^1 is heated by the resistance r to the temperature required for melting the fusible substance.

In the modification shown in Figure 3 a tube a^2 of refractory material such as carbon, graphite, carborundum or the like is partly enclosed by a metal tube b^3 into which a stream of gas is fed through a pipe b^4. The tube a^2 which projects at c^1 from the tube b^3 is electrically insulated from the latter by collars m, n, and by a holder k which embraces the inner end of the tube a^2 and is movable in the tube b^3, so that the tube a^2 can expand freely. The holder k has ducts d^3 terminating inside the holder at orifices in the wall of the tube a^2, so that the stream of gas fed through the pipe b^4 into the interior r^1 of the tube b^3 passes through the ducts d^3 into the tube a^2 and is discharged from the latter outside the tube b^3. The outer end c^1 of the tube a^2 is surrounded by an annular blast nozzle d^2. Electric current is supplied through the tube a^2 by means of wires n^2 and the connections n^7, so that the tube becomes hot and heats the gas passing therethrough to the required temperature. A temperature of 2000 °C can easily be attained with this arrangement, and gas can fed through the tube a^2 at high pressure without the risk of bursting the same, the pressure outside the said tube being equal to that inside.

In the modification shown in Figure 4 a tube a^3 of fire-clay or other refractory material is filled with granular heat-conducting mass b^5, for example with particles of carbon the interstices of which are adequate to give the passage to a stream of gas fed into the tube through a pipe b^6 and discharged through a nozzle a^4 arranged in proximity to a guide g^1, through which a wire f^1 of the substance to be melted and sprayed is fed.

The tube a^3 and the granular carbon therein are heated by a burner t. combustible or non-combustible gas may be used and acquires reducing properties, by contact with the carbon in the tube a^3.

With the appliances shown in Figures 1, 2, and 3, preferably gases of a chemically neutral or reducing quality are used in order to prevent oxidation of the electric conductors and of the substance melted.

*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).

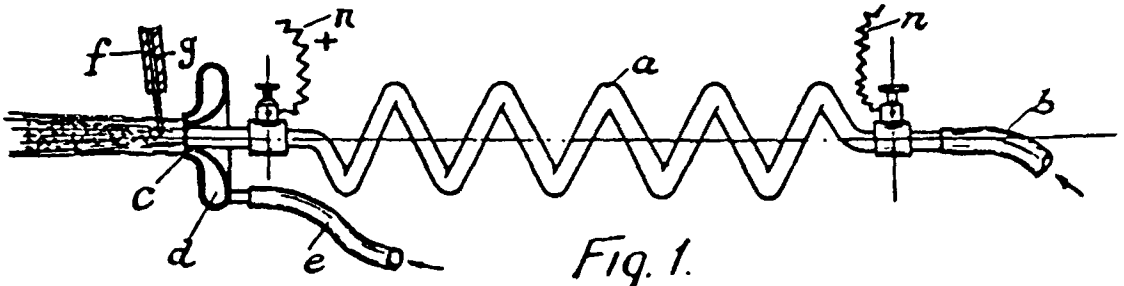

Fig. 1.

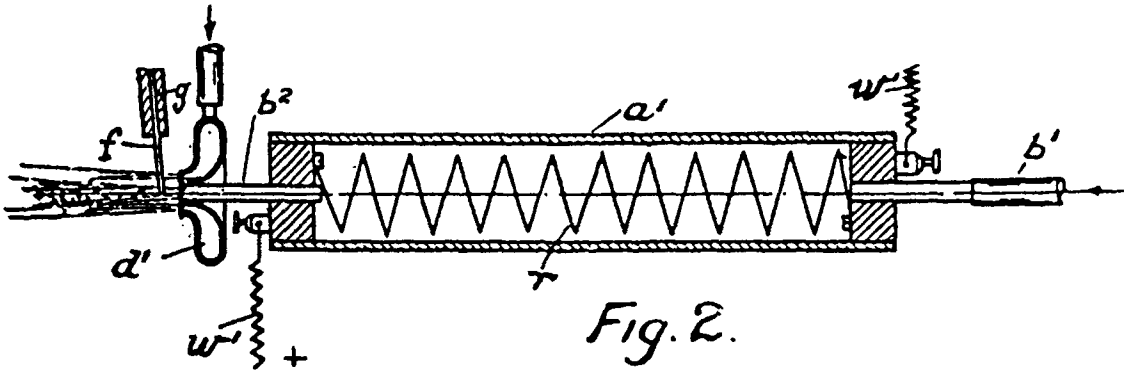

Fig. 2.

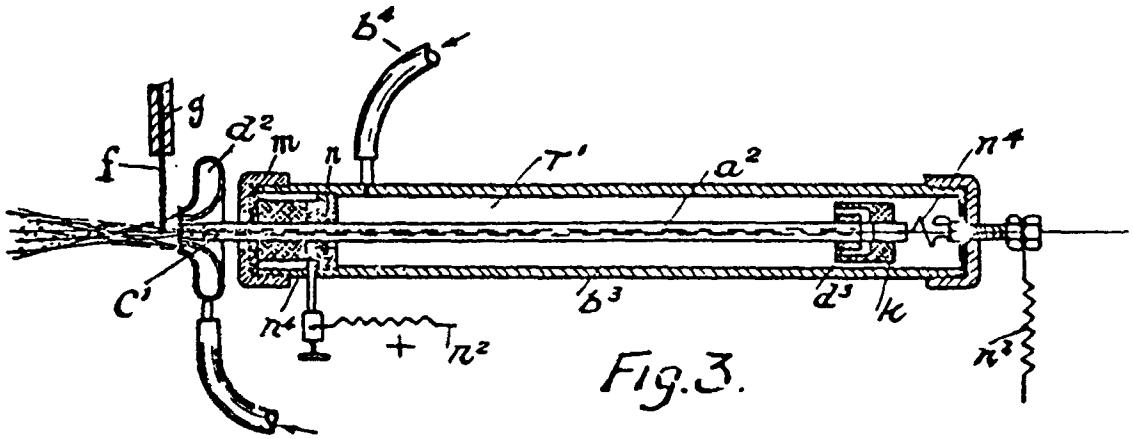

Fig. 3.

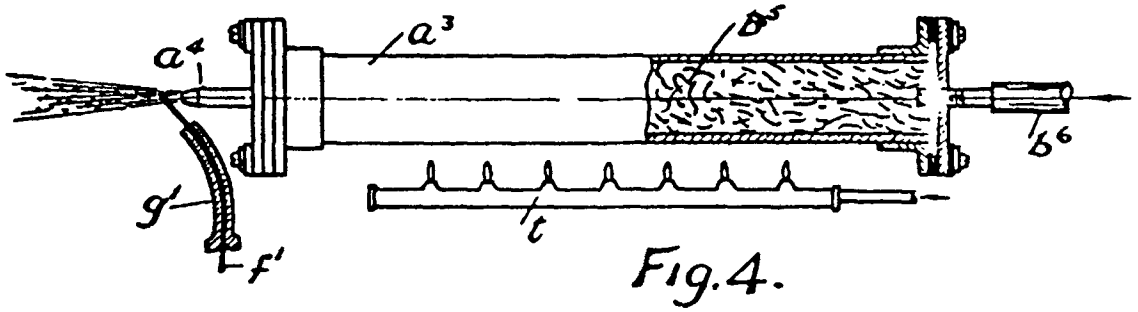

Fig. 4.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. Apparatus for melting and spraying a fusible substance comprising the combination of a gas conduit having a discharge orifice, means for heating said conduit, and means for holding the fusible substance in front of said orifice.
2. In the apparatus as set forth in Claim 1, the provision of a granular mass such as carbon, in the conduit.
3. In an apparatus as set forth in the preceding claims, a blast nozzle adjacent to the discharge orifice and preferably annular and concentric with said orifice.
4. In an apparatus as set forth in claims 1 and 3, means for heating the conduit by electric current.
5. An apparatus as set forth in Claims 1, 3, and 4, in which the gas conduit is of electrically conductive material, and in which means are provided for passing electric current through the wall of said conduit.
6. In an apparatus as set forth in Claim 5, the provision of a tube closed at both ends, partly enclosing the conduit, the discharge orifice of said conduit being outside said tube.
7. In an apparatus as set forth in Claim 6, means for feeding a stream of gas into the tube and conduit.
8. In an apparatus as set forth in Claims 1, 3, and 4, the provision of an electric resistance in the conduit, and means for supplying electric current through said resistance.
9. The method of melting and spraying a fusible substance which consists of placing said substance in the path of a stream of heated gas which may be chemically neutral or reducing, and of a blast jet, if desired, substantially as-described.
10. The apparatus for melting and spraying a fusible substance and the method of doing so, constructed, arranged and operating and working substantially as described with reference to the accompanying drawings.

Dated this 9th day of July, 1920

ALBERT L. MOND
19, Southampton Buildings,
Chancery Lane, London W.C. 2
Agent for the Applicants.