F. HERKENRATH.

METHOD OF MELTING AND SPRAYING FUSIBLE SUBSTANCES.

APPLICATION FILED JULY 6, 1914.

1,157,984. Patented Oct. 26, 1915.

Fig. 1.

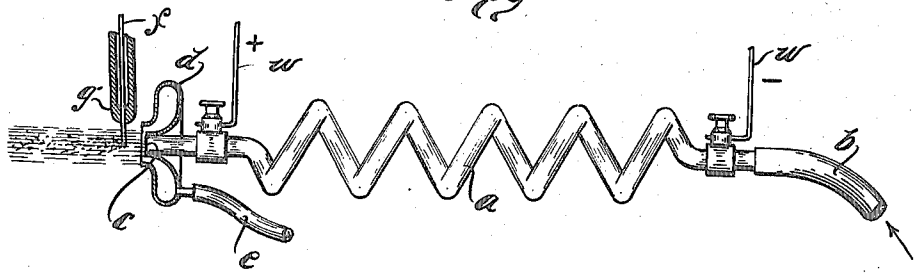


Fig. 2.

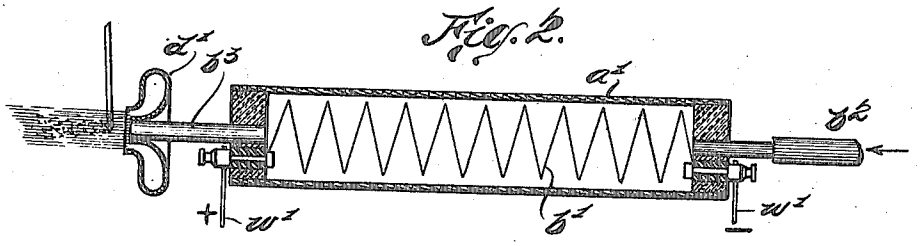


Fig. 3.

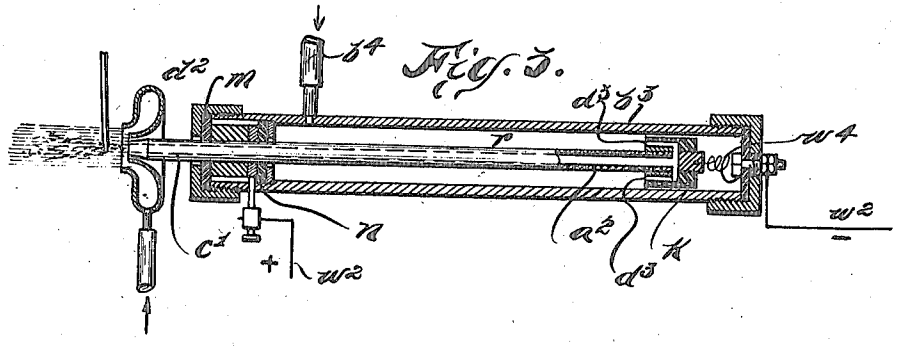
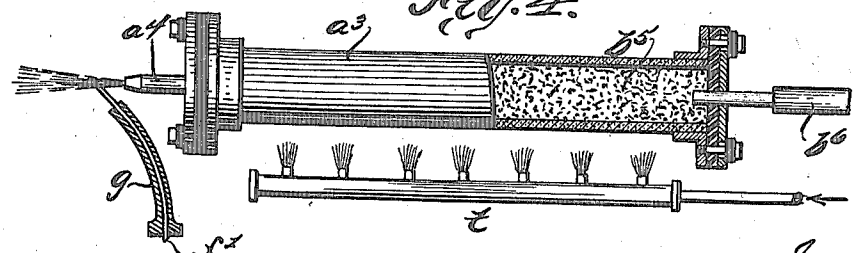


Fig. 4.



Witnesses
C. A. Jarvis
William J. Hopkins.

Inventor
Franz Herkenrath
by Philip B. Kelly
attorney.

UNITED STATES PATENT OFFICE.

FRANZ HERKENRATH, OF ZURICH, SWITZERLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO METALS COATING COMPANY OF AMERICA, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

METHOD OF MELTING AND SPRAYING FUSIBLE SUBSTANCES.

1,157,984. Specification of Letters Patent. Patented Oct. 26, 1915.

Original application filed March 31, 1914, Serial No. 826,137. Divided and this application filed July 6, 1914. Serial No. 849,211

To all whom it may concern:

Be it known that I, FRANZ HERKENRATH, a citizen of the German Empire, residing at Zurich, Switzerland, have invented certain new and useful Improvements in the Methods of Melting and Spraying Fusible Substances, of which the following is a specification.

This invention relates to an improved method of melting and spraying fusible substances as required for the formation of adhering or detachable coatings made by the Schoop process described in application Serial No. 552,800, filed April 1st, 1910, and the present invention has been divided out from my application Serial No. 826,137 filed March 31st 1914.

To this end I use a stream of heated gas, in the path of which I place 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 metal spraying but the gas also assists in subdividing the molten substance and projecting it at the requisite velocity to form an impacted coating. It is usually more economical to use a separate blast device acting in conjunction with the stream of hot gas as in such a case the required energy of spraying blast may be obtained without heating an excessive quantity of spraying gas.

Suitable apparatus for carrying this improved method into effect are shown in the accompanying drawings, in Figures 1, 2, 3 and 4 respectively, parts of the apparatus in all the views being shown in section.

Referring in the first instance to Fig. 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 is fed a stream of gas through a pipe e. Electric current is fed through the tube a by means of wires w and heats the 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 forward through a guide g at the rate required.

The concentric arrangement of the hot and cold blasts has the effect that the substance is melted by a relatively small quantity of air or gas while the blast which supplies the necessary energy for subdivision and projection does not require to be heated and does not interfere with the proper melting of the point of the fusible substance which is preferably fed forward in wire or filamentary form.

In the modification shown in Fig. 2 a tube a^1 of refractory material incloses an electric resistance b^1, through which current is fed by means of wires w^1. A stream of gas is fed into the tube a by means of a pipe b^2, and passes out through a short pipe b^3, the discharge end of which is surrounded by an annular blast nozzle d^1. The stream of gas flowing through the tube a^1 is heated by the resistance b^1 to the temperature required for melting the fusible substance.

In the modification shown in Fig. 3 a tube a^2 of refractory material such as carbon, graphite, carborundum or the like is partly inclosed 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 freely expand. 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 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 fed through the tube a^2 by means of wires w^2 and connections w^4, 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 be fed through the tube a^2 at high pressure without risk of bursting the same, as the pressure outside the said tube is equal to that inside.

In the modification shown in Fig. 4, a tube a^3 of fire-clay or other refractory material is filled with a granular heat conducting mass b^5, for example with particles of carbon, the interstices of which are adequate to give 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 through which a filament or 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 which acquires reducing properties by contact with the carbon in the tube a^3.

With the appliance shown in Figs. 1, 2 and 3, I preferably use gases of a chemically neutral or reducing quality in order to prevent oxidation of the electric conductors and of the substance melted.

I claim:

1. In the method of melting and spraying a fusible substance, the step which consists in simultaneously subjecting the substance to a blast of unignited gas heated to a temperature above the melting point of said substance and at a pressure sufficiently high to disintegrate and project said substance while melting, and directing a separate blast on the fused portion of said substance.

2. In the method of melting and spraying a fusible substance, the step which consists in subjecting the substance to a blast of chemically neutral unignited gas heated to a temperature above the melting point of said substance and at a pressure sufficiently high to disintegrate and project said substance while melting.

3. In the method of melting and spraying a fusible substance, the step which consists in subjecting the substance to a blast of chemically neutral unignited gas heated to a temperature above the melting point of said substance and at a pressure sufficiently high to disintegrate and project said substance while melting, and directing a separate blast on the fused portion of said substance.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANZ HERKENRATH.

Witnesses:
CARL GUBLER,
FRANK BOHR.