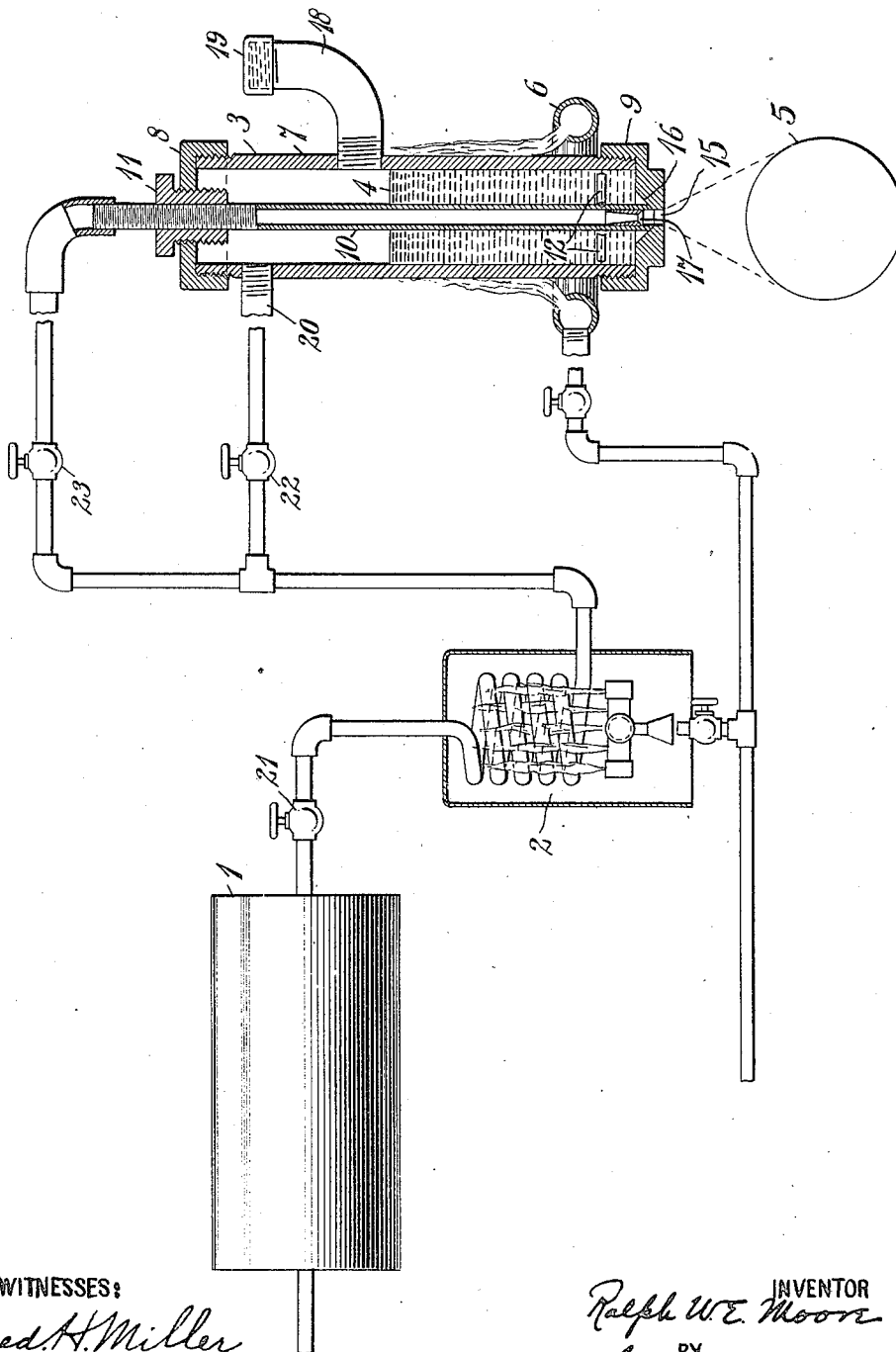


1,164,008.



WITNESSES:

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METAL-SPRAYING PROCESS.

1,164,008.

Specification of Letters Patent.

Patented Dec. 14, 1915.

Application filed March 13, 1911. Serial No. 614,250.

To all whom it may concern:

Be it known that I, RALPH W. E. MOORE, a citizen of the United States, and a resident of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Metal-Spraying Process, of which the following is a specification.

My invention relates to processes and apparatus for producing metal coatings or films, and it has special reference to the production of such coatings by means of a spraying process.

The object of my invention is to provide a simple and commercial process whereby coatings of the above-indicated character may be effectively and cheaply applied either to metallic or non-metallic bodies.

In recent years, there has been an increasing demand for a commercial and economical method of coating various bodies with thin metallic films for protection against weather conditions and acid fumes, for soldering and ornamental purposes, and for purposes of electrical conductivity.

According to my present invention, I produce thin coatings of metal by mechanically subdividing and disintegrating the metal in a molten state, and projecting the disassociated particles at a high velocity upon the bodies to be coated, by means of a spraying process.

Although various mechanical methods may be employed for "breaking-up" and atomizing the molten metal, I shall set forth in detail only the process and means which I consider preferable from a commercial stand-point and which produces superior results.

The success of a process for spraying metals depends upon the degree of subdivision and disassociation of the metal, and upon the velocity with which it is projected upon the body to be coated. In order to obtain a sub-division of the highest degree, I have devised a peculiar type of spraying device or nozzle for splitting up the molten metal into minute particles which substantially constitute a mist or vapor.

By means of my nozzle, an exceedingly thin film of molten metal is forced, under pressure, out of an outer containing vessel and is acted upon by a rapidly expanding and diverging jet of air or gas which is

compressed and heated to a high degree. The jet of air or gas is delivered from a centrally disposed orifice which is so designed and located with respect to the outer portion of the nozzle that the thin annular film is projected at a high velocity against the sides of an annular baffle-plate or deflecting surface, where it impinges with such force that it is broken up into a mist of minute particles. This mist is then projected at a high velocity against the body to be coated, and the impingement thereon causes the individual particles to flatten out and reassociate themselves into a thin, integral and homogeneous film.

I have found by experiment that it is unnecessary to pre-heat the bodies to be coated and that cloth, wood and paper may be treated as readily as metallic bodies, which demonstrates the fact that the mist or spray is of comparatively low temperature at the instant of impingement. It is, therefore, evident that the success of my process depends upon the degree of disintegration and the velocity with which the particles are projected against the body to be coated.

I do not wish to be restricted to the specific means or mode of operation herein described, as various devices and methods may be employed which embody the principle of my invention and which secure the benefits thereof to a greater or less degree.

My invention may be best understood by reference to the single figure of the accompanying drawing, which is a diagrammatic view of suitable apparatus for practising my invention, a portion thereof being shown on an enlarged scale and in cross section.

Referring to the drawing in detail, the apparatus here shown comprises a tank or reservoir 1 adapted to contain air or gas under compression, a heater 2 for raising the temperature of said air or gas, a spraying device or nozzle 3 adapted to contain a body of molten metal 4 and to discharge it in the form of a spray upon a body 5 to be coated, a heater 6 to maintain the metal 4 in a molten state, and suitable piping and fittings for practising my invention.

The tank or reservoir 1 and the heater 2 may be of any well-known construction, and are only illustrative of any suitable devices for use in practising my process.

The heater 6 is annular in form and sur-

rounds the lower portion of the spraying device 3, although it is not restricted to any particular construction or location.

The spraying device 3 comprises an outer cylindrical member 7 which is provided with an upper cap portion 8 and a lower cap portion 9, a centrally disposed pipe 10, the upper end of which is adjustably supported in the cap portion 8 by means of an adjustable bushing 11 and the lower portion of which is maintained in position by means of guides 12 which are secured to the outer cylindrical member 7 in a suitable manner.

The bushing 11 is screwed into the upper cap portion 8 and the pipe 10 is similarly associated with the bushing 11, the pitch of the threads upon the pipe 10 being considerably less than that of the threads on the cap portion 8. It is therefore evident that, if the bushing 11 be turned by a wrench, or other suitable instrument (not shown), a vertical adjustment of the pipe 10 may be effected, the degree of which depends upon the difference in pitch of the threads hereinbefore mentioned. Thus, a ready and fine adjustment may be secured, as will be readily understood.

The lower cap portion 9 is provided with a centrally disposed circular opening 15, the lower walls of which are substantially vertical while the upper walls are beveled to form an inclined surface 16 which constitutes a seat for the lower extremity of the pipe 10. The vertical walls of the opening 15 constitute an annular baffle-plate or deflecting surface for a purpose to be hereinafter set forth.

In order to obtain a diverging stream of air or gas, an internally tapered bushing 17 is disposed within the lower end of the pipe 10 to form a contracted orifice which is adapted to produce the desired results. An elbow 18, having a removable cap 19, is provided in the side of the outer member 7 for the purpose of introducing metal, and a pipe 20 is also provided and connected to the reservoir 1 in order to maintain a high pressure upon the molten metal 4. In some instances, it is found unnecessary to employ additional pressure, but, in general, superior results are obtained by its use.

Assuming the various parts of the apparatus to occupy the positions shown, the mode of procedure and the operation are as follows: The reservoir 1 is first filled with air or gas under pressure, after which the heaters 2 and 6 are lighted. When the metal contained within the spraying device 3 is heated sufficiently to become molten, valves 21 and 22 are opened and the molten metal is subjected to pressure. The bushing 11 is then turned until the pipe 10 is raised very slightly from the seat 16, whereby a very thin annular film of molten metal is forced downwardly through the discharge opening

15. Valve 23 is then opened, thereby causing the air or gas under pressure to be discharged at a high velocity through the contracted orifice formed by the bushing 17. The shape and location of the bushing 17 are such that the discharged air or gas is caused to expand and diverge rapidly, whereby it acts upon the thin annular film of molten metal in such manner as to project it at a high velocity against the vertical walls of the opening 15 which constitute a baffle-plate. Here the impact is sufficient to "break up" the film of molten metal into minute particles, which are further projected at a high velocity upon the body 5 to be coated.

By suitably adjusting the various parts of the spraying device 3, the properties of the mist may be so controlled that the impingement thereof upon the body to be coated causes the individual particles to flatten out and form themselves into a homogeneous and integral coating or film.

Variations in the mode of procedure hereinbefore set forth may be effected without departing from the spirit and scope of my invention, and such variations are intended to be covered by the appended claims.

I claim as my invention:

1. The method of producing a metallic coating which consists in mechanically subdividing molten metal into minute particles by impingement against a heated deflecting surface, and causing said particles to be projected at high velocity upon the body to be coated.

2. The method of producing a metallic coating which consists in projecting a stream of air or gas at a high velocity into contact with a stream of molten metal, whereby said metal is caused to impinge against a heated deflecting surface and is sub-divided into fine particles which are projected upon the body to be coated.

3. The method of producing a metallic coating which consists in producing a thin annular film of molten metal, projecting a jet of compressed air or gas at a high velocity outwardly against said film, whereby said metal is finely sub-divided, and causing said sub-divided metal to impinge upon the surface of the body to be coated.

4. The method of producing a metallic coating which consists in projecting a fine jet of molten metal against a heated surface at great velocity, whereby said jet of metal is disassociated into minute particles, and causing said particles to impinge with great velocity upon the surface of the body to be coated.

5. The method of producing a metallic coating which consists in producing a thin annular film of molten metal, projecting a jet of pre-heated air or gas outwardly against said film of metal, whereby said film

is caused to impinge at a high velocity and
at an inclined angle against a heated surface
to sub-divide said metal into fine particles,
and finally projecting said particles at a
5 high velocity upon the surface of the body
to be coated.

In testimony whereof, I have hereunto

subscribed my name this 1st day of March
1911.

RALPH W. E. MOORE.

Witnesses:

B. B. HINES,
M. CLARA MERZ.