UNITED STATES PATENT OFFICE.

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APPARATUS FOR SPRAYING MOLTEN METAL AND OTHER FUSIBLE SUBSTANCES.

1,133,507. Specification of Letters Patent. Patented Mar. 30, 1915.

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To all whom it may concern:

Be it known that I, MAX ULRICH SCHOOP, a citizen of the Swiss Republic, residing at Zurich, in Switzerland, have invented certain new and useful Improvements in Apparatus for Spraying Molten Metal and other Fusible Substances, of which the following is a specification.

The object of this invention is to effect improvements in the art of coating surfaces or articles of various kinds with metal and other fusible substances, by projecting the substance in a molten state, in the form of a spray.

According to my invention the melting is effected by means of electric current passing through two electrodes consisting of pieces of wire or filament of the substance in questions, these two electrodes being fed toward each other at the requisite rate.

An embodiment of the invention is shown in the accompanying drawing, in which—

Figure 1 is a front elevation of my apparatus, and Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, showing the operation of the electromagnet employed.

In the drawing, *a* and *b* designate two feed tubes, which terminate in nozzles and are preferably made of iron, the tube *b* forming the armature of an electromagnet *c*. Through these tubes two wires w^1, w^2 are fed by means of feed rolls *d*, so that the ends of the wires, issuing from the nozzles, cross each other as shown in the drawing. The two feed tubes, and the wires issuing therefrom, form parts of an electric circuit, other parts of which are shown at l^1, l^2, and current flows in this circuit, as indicated by arrows. The coils of the electromagnet also form part of the circuit. The tube *b* is elastically supported, so that it can vibrate, and the tubes are placed at an angle of about 90° to each other, with the wires making slight frictional contact where they cross, and with the nozzles spaced apart only a few millimeters. When the electromagnet *c* is energized it attracts the tube *b* and by this means slightly withdraws the wire electrode w^2 from the wire electrode w^1. A blast pipe *n* has its nozzle directed toward the place where the wire electrodes cross, in order to direct a stream of air or other gas on to the electrodes. The blast apparatus may be used for driving a turbine whereby the wire feed mechanism is actuated.

The action of the apparatus is as follows:—Current flowing through the circuit, while the electrodes are in touch, energizes the electromagnet *c*, whereby the electrodes are drawn apart, and a small arc is formed, accompanied by melting of some of the metal. This molten metal is at once driven away, in the form of a fine spray, by the stream of gas from the pipe *n*, which also blows out the arc *in statu nascendi*, so that the magnet allows the electrodes to approach each other again. The magnet is then again energized, and another arc is formed, and so on, the action being repeated with great rapidity, so that a continuous stream of spray is driven from the electrodes and projected on to the surface to be coated.

The potential difference at the electrodes varies, of course, according to the conductivity of the metal or other substance, and the thickness of the filament, values ranging from 40 to 75 volts are generally suitable. The rate of consumption of the positive electrode is somewhat higher than that of the negative electrode, so I use a more rapid feed, or a thicker wire, for the positive electrode.

The vibratory arrangement which I have described may be applied to both the electrodes. Its advantage lies in the fact that it produces a more uniform and localized consumption of the electrodes. If the electrodes are merely fed toward each other, without vibration, there is a tendency for the arc to flicker or to spread and roast the tubes, and in some cases the electrodes tend to become sweated to each other, if a lower potential difference is used in order to avoid an excessive arc.

An angle of about 90° for the two electrode tubes is found most advantageous for most purposes, but the angle may vary. The best angle for the blast nozzle is easily ascertained in each particular case, as is also the most advantageous distance of the blast nozzle from the electrodes; in some cases it is best to have the blast nozzle close to the electrodes, but in others a distance of 20 or 30 mm. from the arc is better.

In the case of some metals, especially those of low melting point, part of the metal