UNITED STATES PATENT OFFICE.

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FORMING DEVICE FOR METALLIC FILAMENTS.


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To all whom it may concern:

Be it known that I, HENRY W. JACKSON, a citizen of the United States, and resident of East Orange, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Forming Devices for Metallic Filaments, of which the following is a specification.

My invention relates to the manufacture of metallic filaments for incandescent lamps, such, for example, as filaments of tungsten or molybdenum. The handling of such filaments in the preliminary stages of the manufacture is a matter requiring delicate treatment owing to the fragile nature of the filaments, particularly in their pasty or unreduced condition. For example, a tungsten filament, when first sintered, consists of metallic tungsten, tungsten oxides, and a carbonaceous binder. The reduction of this heterogeneous pasty strip to metallic tungsten consists broadly in introducing the same into a reducing atmosphere, say of hydrogen and nitrogen in equal parts, and passing a current of electricity through the strip while held within the reducing atmosphere, whereupon the oxygen of the oxides and the carbon of the binder combine to form carbonic oxide or carbon dioxid which, being heavy, falls down out of the way leaving the strip or filament in a partial or complete metallic condition.

Up to the time of the present invention, it has been customary to mount a number of the untreated filaments in clamps and suspend them within a metallic air-tight receiver, the said receiver being connected with suitable devices whereby it can be exhausted. The remainder of the operation has heretofore consisted in exhausting the air from the metallic receiver, admitting the reducing atmosphere in sufficient quantity, and then applying the electric current to produce the heating and metallization of the filaments.

Owing to the fact that air currents or gaseous currents are liable to be set up within the receiver in the process of exhausting the receiver and admitting the reducing gases, and to the further fact that it is difficult to get at the filaments in the box or receiver in such a way as to give them careful handling, there has been an undue amount of breakage of the filaments in their delicate state before treatment. By the present invention I obviate the greater part of this breakage by providing a preliminary treatment in which the untreated filaments are handled individually and are always in a position where they can be readily seen and carefully manipulated. When this preliminary treatment is concluded, and a complete or partial metallization of the filaments has taken place, they are placed in groups in the receiver already mentioned and are given the treatment above described.

But, since the elements of each filament have been sintered together and compacted by the preliminary treatment, the filaments in the receiver are in much better condition for undergoing the final treatment by which complete metallization is insured.

I prefer to utilize the present invention as a preparation for the final treatment, although it should be understood that it is possible to complete the reduction of the filaments to pure metal by the process which I have here called a preliminary process.

My invention will be understood by reference to the accompanying drawing in which—

Figure 1 is an elevation of an apparatus adapted to the carrying out of my invention; Figs. 2 and 3 are detail views of the clamps in which the untreated filaments are hung or supported; and Figs. 4 and 5 are details of the slide rods I use in carrying out my invention.

In the drawing 1 is a base, support, or table of wood or other suitable material, and 2 is a frame, preferably of metal, secured to the said base. Below the base I show a bracket, 3, in which a large pulley, 4, and small pulleys or rollers 5 and 6 are suitably journalled. The pulley, 4, is capable of being operated in reverse directions by means of treadsles, 7 and 8, and a belt or cord, 9. In being so operated the pulley serves through the medium of a cord, 10, to move alternately upward two hollow slitted slide rods, 11 and 12. These slide rods are guided in their upward movement by screws, 13 and 14, entering slits, 15 and 16, in the respective rods and by the heads, 17 and 18, on the frame 2. The slide rods may be returned to their lowermost positions by hand or any suitable means, or they may be so weighted as to drop down of themselves when released from suspension by a reverse movement of the pulley 4.

On the top of each slide rod is mounted a
pair of clamps, 19 and 20, the details of which are shown in Figs. 2 and 3. Referring to Fig. 6, it will be seen that each clamp consists of a movable portion (say 20) pivoted at 21 and pressed by a spring 22 so as to bring its lower end into contact with a stationary metallic part, 23, attached to an insulating back or plate, 24. The parts 20 and 23 are cut away slightly near their lower ends so as to leave a narrow opening, 25, the sides of which press upon the ends of the untreated filaments which are supported by the clamps.

Through the interior of the hollow slide rods, 11 and 12, pass circuit wires, 26 and 27, which are connected at the top of each slide rod with contact springs, 43 and 44, respectively, the same being mounted on an insulating block 45 secured to the top of the slide rod. Corresponding to the contact springs 43 and 44, there are secured to the plate, 24, on each clamp two contact pieces, 46 and 47, which can readily be set in under the springs so as to form the means of electrical connection with the clamps 19 and 20. The clamps can thus be readily inserted and removed. When the clamps are inserted with the filament in place, and current is turned on through the wires 26 and 27 from a suitable source, this current will pass through the filaments and do its work of assisting in the reduction thereof. The slide rods, 11 and 12, may be conveniently constructed of brass or other suitable metal, but each rod is insulated from the clamps by means of the insulating back or plate, 24, and the back or head, 46.

The untreated filaments are inserted in the clamps not yet mounted, which clamps are afterward placed on the top of the slide rod, as described. Referring to Fig. 1, a filament, 28, may be assumed to have just been inserted in the clamps and to be ready for the preliminary treatment. Now by operating the treadle, 8, the slide rod, 11, will be lifted and the filament carried up into the interior of a receiver, 29, preferably of glass or other transparent material, this receiver being open at the bottom and allowing the filament to pass freely inside. The top of this receiver is connected by a rubber tube, 30, with a tube, 31, passing through a suitable stopper, 32, into a vessel, 33, the mouth of which is closed by the said stopper. Another tube, 34, passing through the said stopper enters a liquid 35, inside the vessel, and is connected at its outer end by a rubber tube, 36, with any suitable reservoir adapted to supply under pressure a proper mixture of some reducing gas, such as hydrogen and nitrogen in equal part. The function of the liquid, 35, is that of washing and purifying the gas before it passes into the top of the receiver, 29, where, being lighter than air the reducing gaseous mixture remains in the top of the receiver when the pressures are properly adjusted. A suitable liquid for the purpose may be composed of a solution of paraaffin acid and caustic potash. The same connection exists from the corresponding receiver, 37, to the vessel, 38, and the connections generally are so entirely similar that it is not thought necessary to recite them with further detail. The receivers, 29 and 37, are themselves supported by clamps or brackets, 39 and 40, mounted on an extension, 41, of the frame 2. This extension forms a convenient means for holding the rubber tubes in place, which is done by the bands 42, 45, as shown.

Having mounted the filament, 28, in its untreated state upon the clamps, 19 and 20, as already described, the operator may now press upon the treadle 8 so as to lift the slide rod, 11, with the clamps and the filament, up into the receiver, 29, carrying it far enough so that the filament will hang within the reducing atmosphere near the top of the receiver. Then by means of any suitable switch (not shown) the appropriate current may be turned on and a reduction of the filament, either partial or complete may take place within the receiver. At all times, the filament is under the observation of the operator and inasmuch as each filament is handled and treated separately and under favorable conditions, there is less danger of breakage than there would be otherwise. Meanwhile the operator can take out the clamps at the upper end of the rod, 12, together with their attached filament (having pushed down the said rod for that purpose or the rod itself having descended by its own weight), it being assumed that this filament has undergone sufficient treatment to change it partially or completely into pure metal. The removed filament, if only partially treated, may then be subjected to the treatment now commonly employed, that is to say, it may be mounted with others within a metallic receiver and treated as described in the early part of this specification. A new clamp with a fresh filament can then be applied to the top of the rod 12 and the movement of the pulley, 4, being reversed by operating the treadle, 7, a similar course of procedure may go on with the filament 28, and so on.

I claim as my invention:

1. In apparatus of the character described, the combination with receivers open at the bottom and connected with means for supplying gas thereto, of reciprocable supports movable into and out of said receivers and having terminal devices, means for effecting simultaneous movement of said supports in opposite directions, and mechanically connected insulated filament clamps detachably engaging the said terminal devices.

2. In apparatus of the character described,
the combination with receivers, of reciprocable supports movable into and out of said receivers, means for effecting simultaneous movement of said supports in opposite directions, and filament clamps detachably carried by the said supports.

3. In apparatus of the character described, the combination with reciprocable supports having terminal devices, and means for effecting simultaneous movement thereof in opposite directions, of filament clamps detachably carried by the said supports and engaging the terminal devices.


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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."