W. P. ZABEL AND L. E. REAKES.

WIRE CLEANING METHOD AND APPARATUS.

APPLICATION FILED MAR. 12, 1919.

1,403,727.

Patented Jan. 17, 1922.

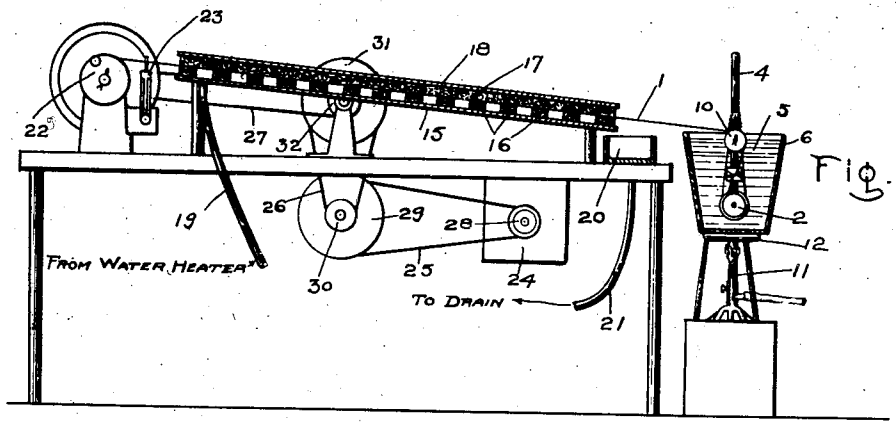


Fig. 1

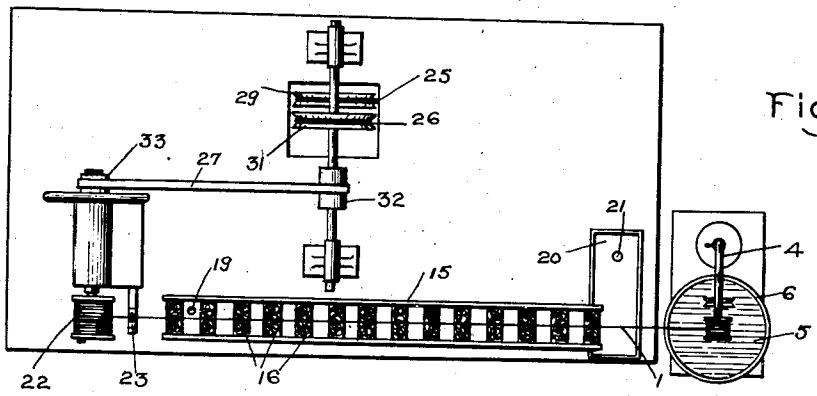


Fig. 2

Fig. 3

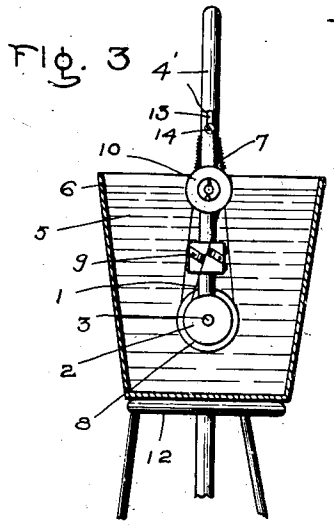


Fig. 4

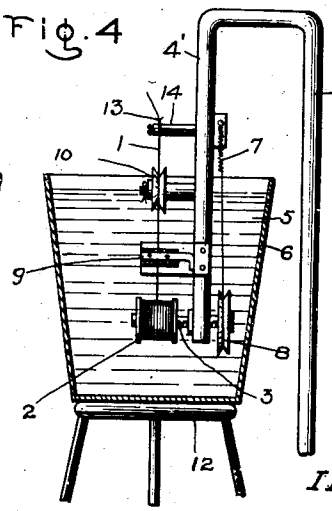
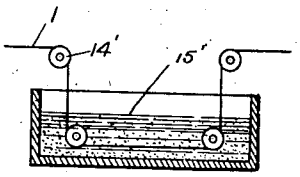


Fig. 5



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WIRE-CLEANING METHOD AND APPARATUS.

1,403,727. Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed March 12, 1919. Serial No. 282,124.

To all whom it may concern:

Be it known that we, WILLIAM PAUL ZABEL and LYLBURN EUGENE REAKES, citizens of the United States, residing at Cleveland, county of Cuyahoga, State of Ohio, have invented certain new and useful Improvements in Wire-Cleaning Methods and Apparatus, of which the following is a specification.

Our invention relates to methods of cleaning wire and, more particularly, wire used for filaments and supports in incandescent lamps.

A carbonaceous lubricant is ordinarily applied in drawing such wire and the wire as finally produced carries a coating of impurities consisting of this carbonaceous material and more or less oxides formed on account of the heating which the wire ordinarily receives during the drawing process.

Heretofore it has been customary to purify such wire in two ways. The straight wire which is used for vacuum lamps has been treated by the process disclosed in Pacz Patent No. 1,280,825 of October 8, 1918. This consists in heating the wire while passing it successively through oxidizing and reducing atmospheres. The other method has been applied in the case of filament wire which has been coiled and has ordinarily been used in gas-filled lamps. Such wire must have more elasticity than is present in the wire treated by the Pacz method and it has been customary to boil this wire in a solution of potash to loosen the carbonaceous coating, then to wash it thoroughly with water, and finally to heat the wire in a reducing atmosphere to remove any metallic oxide which may have formed. This method has the objection that it requires a number of distinct steps and, moreover, entails the use of a disagreeable chemical. Our invention is intended to take the place of this second method and also, to a certain extent, of the first method.

According to our invention, the wire is first chemically treated to loosen up the graphitic or other carbonaceous coating and to dissolve any of the metal oxides which may be present. The wire is then scrubbed to remove the loosened coating. The result is wire having a clean surface but otherwise retaining its original characteristics such as elasticity. This wire is particularly suitable for use in coil filaments. Moreover, it is suitable for use for straight filaments being superior to the so-called black wire which was used for this purpose at one time.

The cleaning medium we prefer to use in the case of tungsten wire is a saturated solution in water of sodium tetra-borate, commonly called borax. Ordinary household borax has been found suitable. The chemically pure material has also been tried but has proved to be of no advantage over the household variety. Other solvents for metallic oxides may be used, for example, caustic soda or potash, but they are not as efficient as borax. The solution is heated to a temperature just below its boiling point, about 98 degrees centigrade, and water is added from time to time to take care of losses due to evaporation.

The mechanical removal of the loosened graphite is preferably accomplished by passing the chemically treated wire through sand and water and finally between wipers which may be of yielding material such as felt. On the smaller sizes of wire, it is not necessary to pass the wire through the sand and water as the felt thoroughly removes the loosened graphite.

In the accompanying drawing, Fig. 1 is a side elevation partially in section of apparatus for carrying out the process of our invention; Fig. 2 is a plan view of the same with the wiper cover removed; Fig. 3 is a sectional side elevation of the solution container and associated parts; Fig. 4 is a sectional rear elevation of the same; and Fig. 5 is a sectional elevation of a sand scrubbing apparatus.

Referring to the accompanying drawing, the wire 1 wound on a spool 2 is placed on a shaft 3 having a bearing at the end of leg 4′ of a U-shaped standard 4 which allows the spool to be submerged in or removed from the borax solution 5 in the container 6. The wire is uncoiled from the spool 2 as hereinafter described and is prevented from uncoiling too rapidly by a spring drag 7 acting on a wheel 8 fastened to the opposite end of the shaft 3. The wire 1 passes between the preliminary wipers 9, preferably faced with felt, attached to the leg 4′, and up over the pulley 10 rotatably held on the standard leg 4′. The pulley 10 is preferably partially submerged in the solution 5 so as to keep it clean. The solution 5 is heated by a burner

11 under the container 6 which rests on a tripod 12. All pulleys and parts which come into contact with the borax solution 5 are preferably made of brass or other metal which will not be corroded.

While the wire is being treated in the hot solution 5, the loose end is held in a spring clip 13 attached to an arm 14 on the standard leg 4'. In the case of the larger sizes of wire, it is prefered to next pass it through a scrubbing apparatus such as illustrated in Fig. 5, which is mounted adjacent to the container 6 and receives the wire which is passed through the said container. This comprises a series of rolls 14' over which the wire travels and a moist sand bath 15' through which the wire passes and is scrubbed. This may be called an intermediate treatment and is desirable in the case of the larger sizes of wire because of the greater amounts of deposit thereon. With the smaller sizes of wire this intermediate treatment is unnecessary and the wire is passed directly to an inclined trough 15 and over pads 16 preferably of felt extending across the bottom of the trough and preferably spaced apart. In order to keep the wire pressed down into the pads and also to act on the upper surface of the wire, a felt pad 17 mounted on a board 18 to facilitate handling is preferably used as a cover for the pads 16. Warm water is supplied as through the pipe 19 to the upper end of the inclined trough 15 and passes over and soaks through the pads 16. This assists in the cleaning action and at the same time serves as a lubricant. At the lower end of the trough 15 a rectangular basin 20 receives the water and through the pipe 21 conducts it to a drain.

It has been found that in most cases, a sufficient scrubbing is secured by simply passing the wire over the felt pads without utilizing the sand bath. This is true even for the larger sizes of wire. The scrubbing action of the pads may be supplemented by adding sand either on the pads, or in the spaces therebetween. In place of sand, very fine tungsten wire scrap, mineral wool or other abrasive may be utilized and it is feasible to make one or more of the pads of such materials.

The wire 1 is drawn through the trough 15 and wound on collecting spool 22 and through the distributing guide 23 by means such as the motor 24 which drives by means of the belts 25, 26 and 27 the pulleys 28, 29, 30, 31, 32 and 33, the last named being mounted on the shaft carrying the spool 22.

What we claim as new and desire to secure by Letters Patent of the United States, is:—

1. The method of treating tungsten wire of lamp filament proportions which has been subjected to a carbonaceous lubricant during drawing, which consists in treating it with a solvent for tungsten oxides to loosen the impurities therefrom and subsequently passing it through an abrasive.

2. The method of treating tungsten wire of lamp filament proportions which has been subjected to a carbonaceous lubricant during drawing, which consists in passing it through a solution containing a solvent for tungsten oxides and then passing it through an abrasive.

3. An apparatus for cleaning wire comprising a solution container, wire carrying means supported therein, a scrubbing means comprising one or more pads, means for supplying liquid to said pads and means for causing the wire to travel successively through said container and said pads.

4. An apparatus for scrubbing wire comprising a trough having therein one or more pads, liquid supplying means for said pads, and means for causing the wire to pass through said pads.

In witness whereof, we have hereunto set our hands this tenth day of March, 1919.

WILLIAM PAUL ZABEL.
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