Aug. 20, 1935. O. N. TEVANDER 2,012,176

APPARATUS FOR PRODUCING WIRE

Filed June 6, 1929 2 Sheets-Sheet 1

Fig. 1.

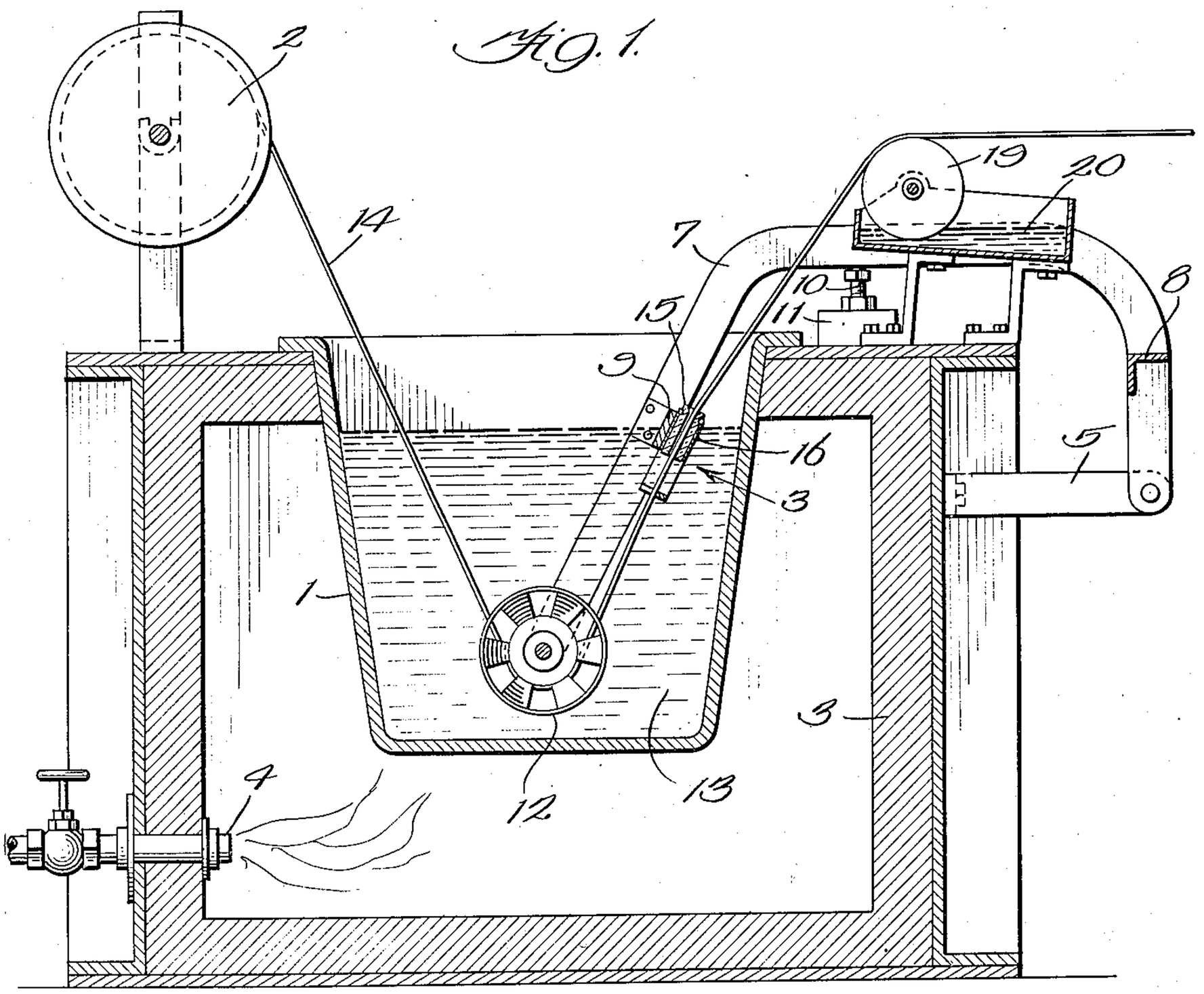

Fig. 2.

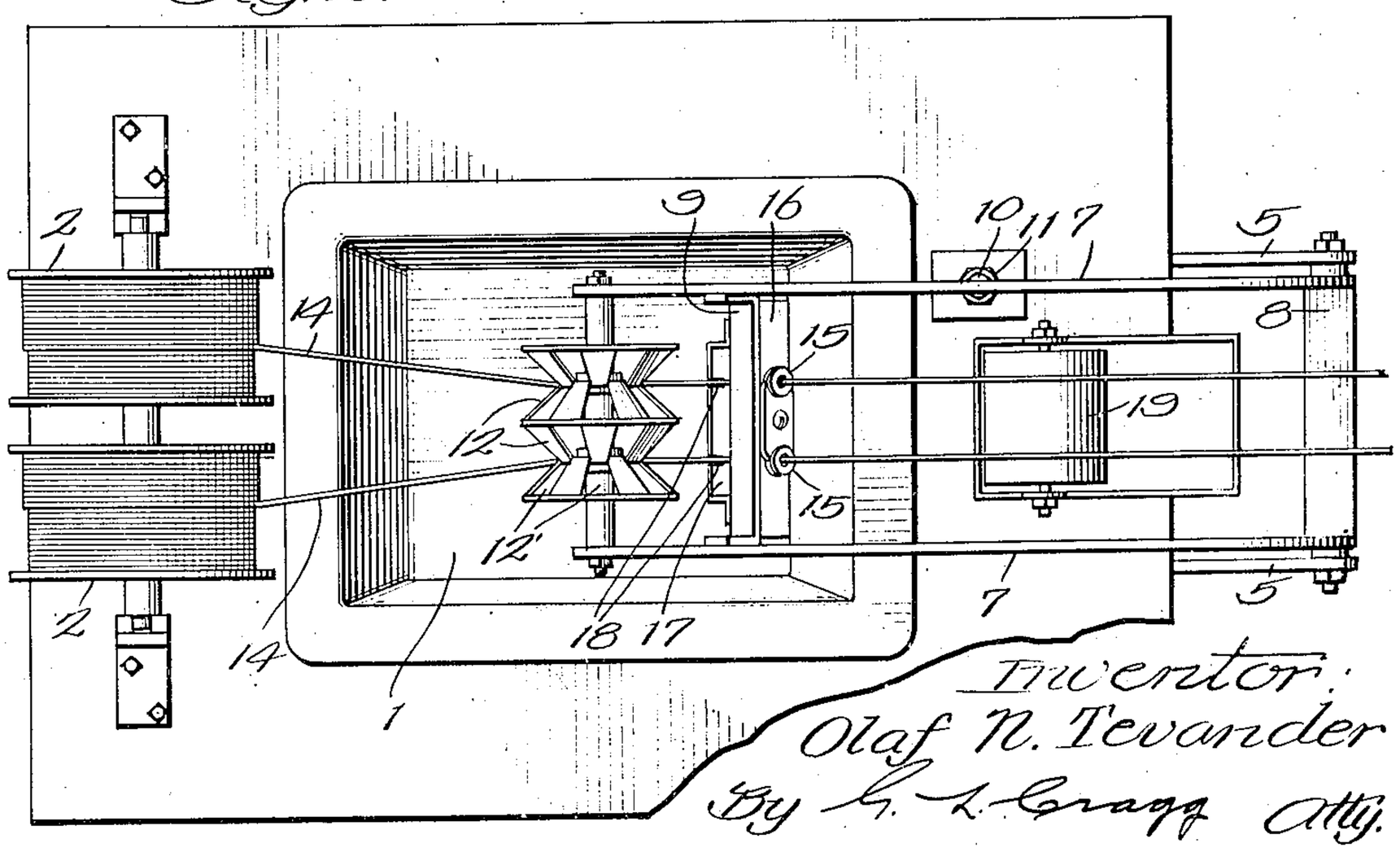

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Fig. 3.

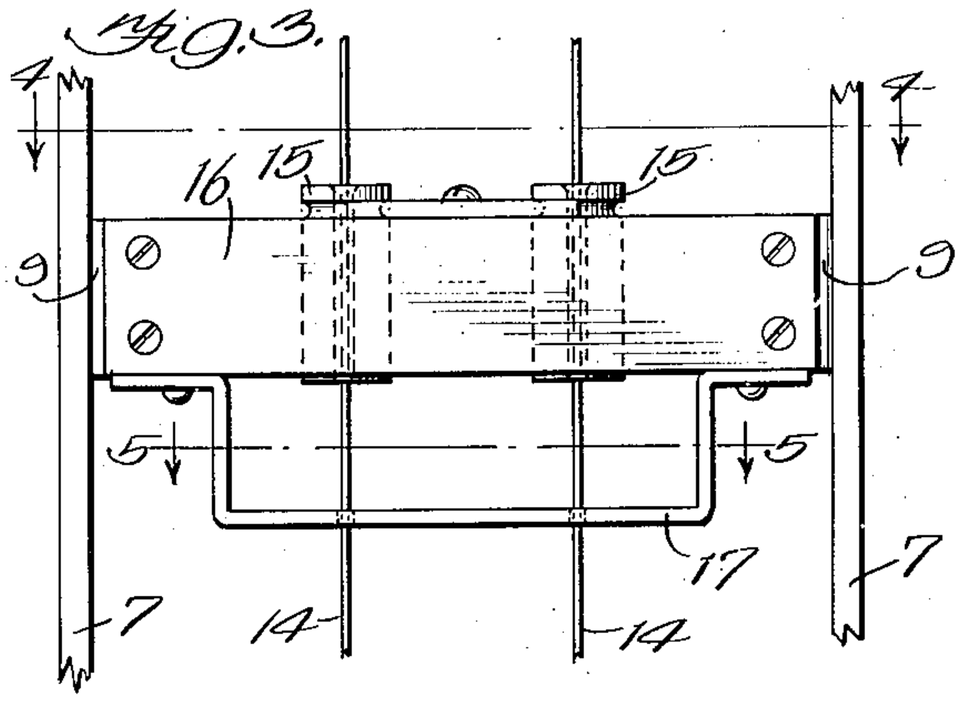


Fig. 4.

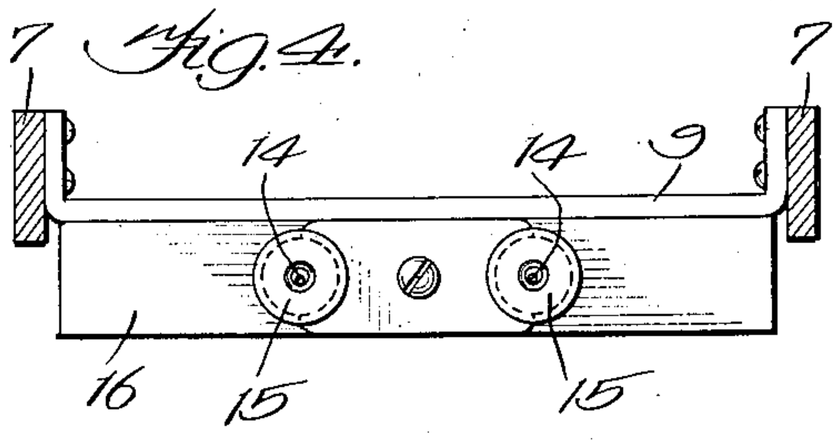


Fig. 5.

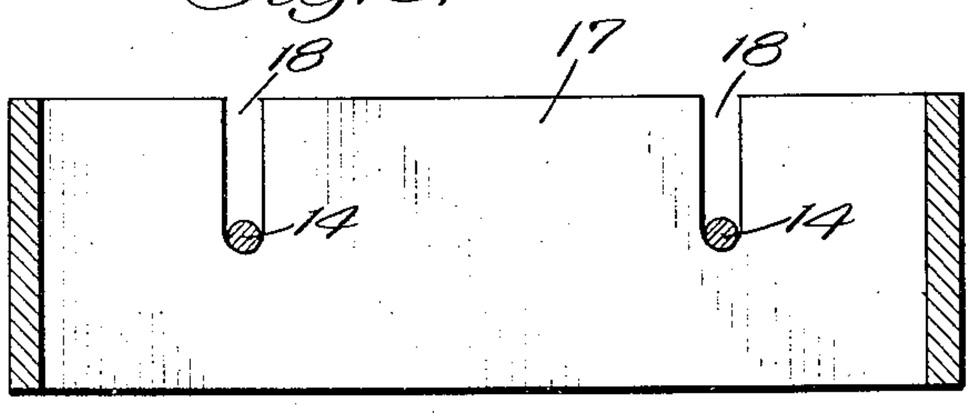


Fig. 6.

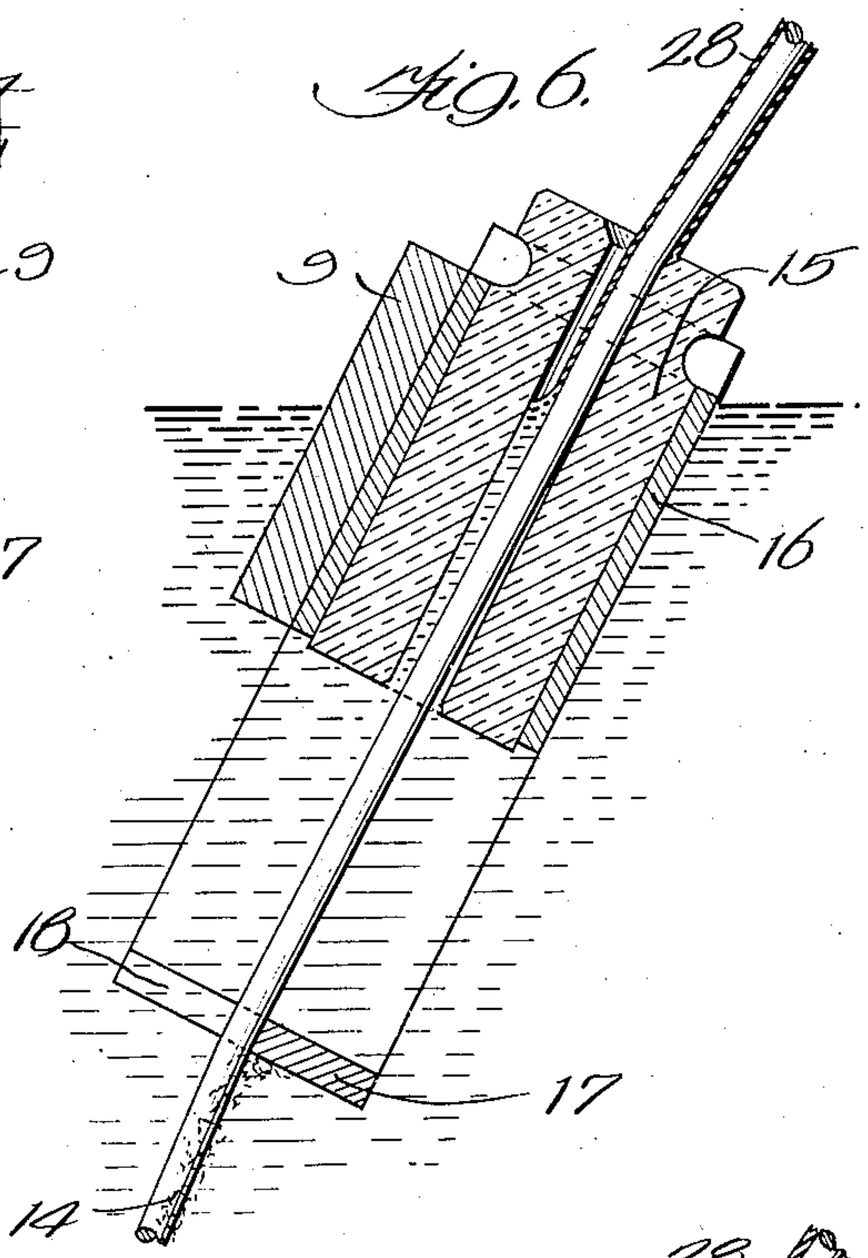


Fig. 7.

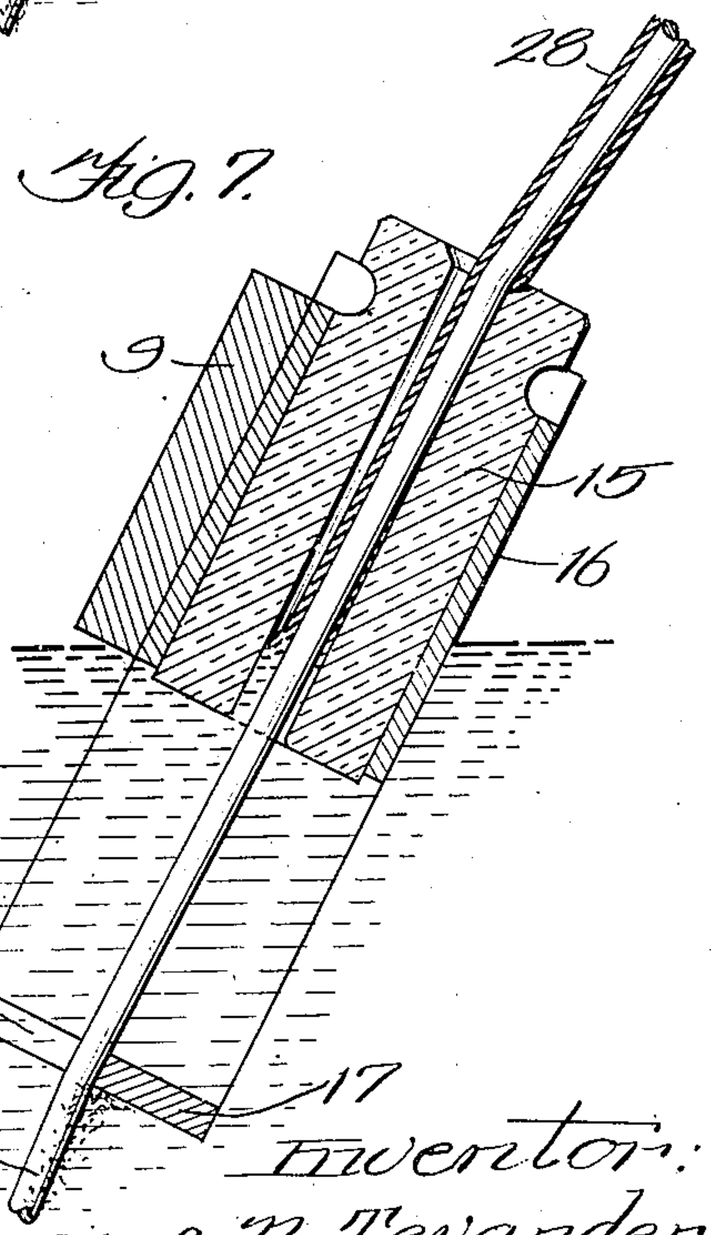


Fig. 8.

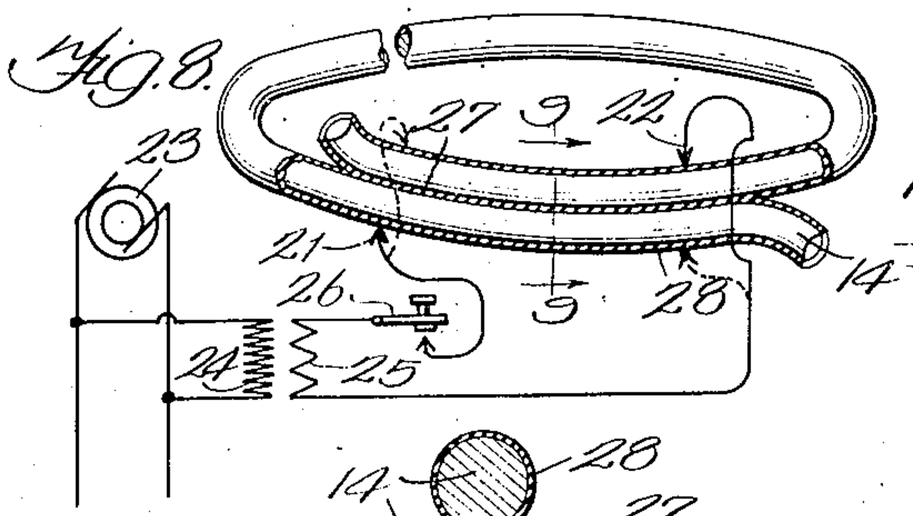
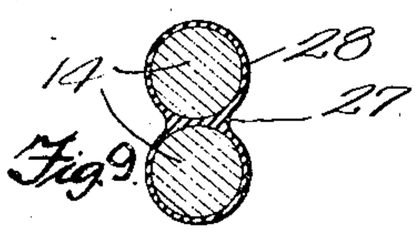


Fig. 9.



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Patented Aug. 20, 1935 2,012,176

UNITED STATES PATENT OFFICE

2,012,176

APPARATUS FOR PRODUCING WIRE

Olof N. Tevander, Chicago, Ill., assignor to Standard Cap & Seal Corporation, Chicago, Ill., a corporation of Virginia

Application June 6, 1929, Serial No. 368,924

10 Claims. (Cl. 91—59.4)

My invention relates to apparatus for producing wire, the wire produced by my apparatus forming the subject matter of the division of this application Serial No. 433,318 filed March 5, 1930. I coat the wire with fluxible material, such as solder, the apparatus of my invention being of particular service in preparing fine wire for use in holding the skirts of closure caps upon the necks of milk bottles, though the invention is not to be thus limited.

In my Patent No. 1,635,510, dated July 12, 1927, I have disclosed a machine for tightly wrapping coated wire about the closure caps of milk bottles and for fluxing the coating upon the mutually lapping ends of the applied wire to hold these ends together to form a band or ring that contracts and holds the cap skirts upon the bottles. This fluxing of the wire coating is acomplished, in the machine of that patent, by means of an electric current which is passed through the wire to heat its coating to flux it and enable the adjacent parts of the coating to fuse together to have a bond between the lapping ends of the wire to hold these wire ends together. Wire coated by means of the apparatus of my present invention is well adapted for use in such a machine, the coating being sufficiently smooth and free of dross to permit the coating upon the overlapping wire ends to have direct and intimate contact in preparation for the fluxing operation and to enable the circuit terminals to have good contact with the coating.

The apparatus of my invention is inclusive of a receptacle containing a bath of molten fluxible material such as solder and a guiding structure through which the wire is passed and serving to remove the dross and define the thickness of the coating. This guiding structure is preferably open between its ends to directly receive molten material from the receptacle and is preferably inclined and arranged to position the leading portion of the wire above it and above or clear of the bath of molten material and the trailing wire portion, that approaches the guiding structure from beneath, below the level of the molten material. The dross which generally accumulates upon the upper surface of the molten material does not find access to the space within the guiding structure and the dross which is carried by the wire toward the guiding structure is removed from the wire by the lower part of the guiding structure so that as the wire passes upwardly through the guiding structure it collects its final portion of a pure coating from the pure material within the guiding structure.

Additional guiding means are desirably also employed for directing the wire into the aforesaid guiding structure, such additional guiding means preferably serving to direct one side of the wire against the lower and scraping part of the aforesaid guiding structure to remove the dross from the wire before it enters the pure molten material within said guiding structure. The additional guiding means desirably includes a hollow sheave immersed in the molten metal and having a concave periphery, preferably V-shaped in cross section, with its deepest portion substantially in alignment with the scraping lower portion of said guiding structure. This periphery has openings in its sloping sides, which terminate in the region of the deepest portion of the periphery. Such a sheave presents a continuous surface for engagement with the wire, the sheave, in being hollow and having the openings in its sloping sides as described, being relieved of the accumulation of the fluxible material upon its periphery.

The invention will be more fully explained in connection with the accompanying drawings in which Fig. 1 is a sectional elevation illustrating the preferred embodiment of the invention; Fig. 2 is a plan view of the structure shown in Fig. 1; Fig. 3 is a view of a part of the structure, on a larger scale, taken in the direction of arrow 3, Fig. 1; Fig. 4 is a sectional view on line 4—4 of Fig. 3; Fig. 5 is a sectional view on line 5—5 of Fig. 3; Fig. 6 is an enlargement of a portion of Fig. 1; Fig. 7 is a view similar to Fig. 6, showing the scraping and guiding structure at a higher level; Fig. 8 illustrates one method of using the wire of my invention; and Fig. 9 is a cross sectional view of the wire on line 9—9 of Fig. 8, on a larger scale.

The apparatus illustrated includes a receptacle 1 which may be a melting pot for the fluxible material, such as solder, which is to be coated upon the wire that may be fed from supply reels 2 through the molten material. Said receptacle is passed downwardly through the opening in the top of the furnace or heating chamber 3 through a side of which the gas nozzle 4 is passed, the gas being admitted into the furnace and ignited in order to heat the receptacle and melt its contents. Two brackets 5 are secured upon one side of the furnace 3, each bracket having an inverted U shaped arm 7 in pivotal connection therewith, the two arms being joined by a strut 8 that is near the brackets and another strut 9 which is remote from the brackets where-

by said arms are in rigid relation. An upright post 10 is screwed into a support 11 which is provided upon the top of the furnace, this post engaging one of the arms 7 at an intermediate horizontal portion thereof. By screwing said post, the arms are raised and lowered and are consequently turned upon their pivots that connect them with the brackets 5.

The supplemental guiding means is preferably in the form of two sheaves 12 that are immersed in the fluxible material 13. This fluxible material is desirably a solder constituted of the following ingredients in proportion by weight: 3 pounds of tin, 50 pounds of lead and 3 ounces of bismuth. The wire 14 that is supplied from the reels 2 is guided through the molten solder by the aforesaid sheaves. Each of the sheaves is hollow and has a concave periphery formed with openings 12' therethrough in its sloping sides that terminate in the region of the deepest part of the periphery, which is preferably V shaped in cross section. These sheaves are mounted to turn upon and between the lowermost ends of the arms 7 that extend into the molten bath 13 nearly to the bottom of the receptacle or pot 1. The guiding structure at which the dross is removed from the wire is inclusive of two open ended porcelain tubular conduits 15 that are held in a block 16 which is secured to the strut 9. The bores of these conduits are larger than the wire that is to be coated. Each wire strand has a conduit individual thereto through whose bore it passes. Said conduits desirably incline or slope and are positioned to have their upper ends above the molten metal and their lower ends below the top of the molten metal and above the bottom of the receptacle. The lower ends of the conduits are in communication with the receptacle to receive molten metal therefrom, the bores of the conduits being materially larger than the wire to hold smaller baths of molten material for the wire.

The guiding structure that is inclusive of the aforesaid conduits 15 is also inclusive of a U shaped member 17 which is secured to block 16 to be in one unitary structure with the aforesaid conduits and the strut 9. The conduits 15 terminate above the molten bath and sufficiently far beneath the top of this bath as to enable the molten metal within the space between the lower ends of the conduits and the base of the member 17 to be free of dross. Such space enables the molten metal to surround said U shaped member. The base of the U shape member 17 is perpendicular to the adjacent portions of the wire and is formed with U shaped notches 18 which closely approximate the diameter of the wire that is passed therethrough. The dross that has been carried along with the wire is scraped from one half of the wire by the semicircular ends of the recesses, the dross upon the other half of the wire flowing away with the other dross. This dross does not enter the space within the U shaped member 17 but falls from the base portion of this member. The cleaned wire enters the space within the member 17 and the bores of the conduits 15 and there takes up whatever additional molten metal that is required to finish the coating. I find that the dross which generally accumulates upon the top of molten metal does not form upon the upper surface of the portion of the molten metal that is within the bores of the conduits so that the wire does not there gather impurities. The wire passes somewhat diagonally through the bores of the conduits and is slightly bent where leaving the conduits by contacting with the upper edges of the conduit bores. Such contacting of the wire with the upper ends of the conduits takes part in regulating the thickness of the coating. The thickness of the coating may be further varied by changing the elevation of the conduit with respect to the molten bath as illustrated in Figs. 6 and 7, the adjustable post 10 serving this purpose. After the wire leaves the conduits 15 it passes over the idler sheave 19 which is immersed within an oil bath 20 whereby a slight film of oil is applied to the coated wire to permit it to be wound upon spools without the merging of the coating portions upon adjacent turns.

In preparing wire for use in applying closures to small containers of the size of milk bottles and the like, I procure upon the market an annealed circular iron wire having a thin film of solder "tinned" thereon which is applied by the manufacturer to prevent the iron from rusting. This wire with its film coating has a diameter of about .021 of an inch. As this initial coating is altogether too thin to be fluxed to form bonds between lapping portions of the wire, I increase the thickness thereof by the apparatus of my invention to bring it to a desired maximum thickness of about .00125 of an inch, the desired overall maximum diameter of the coated wire becoming about .0235 of an inch.

In wrapping the "tinned" wire about closure cap skirts to hold the caps in place I employ the method set forth in my copending application Serial No. 368,923 filed June 6, 1929. I use a piece of wire, which has its metallic coating thus thickened, of such length that, after it has been wrapped about the cap skirt, the ends thereof will be in lapping relation, such as that illustrated in Fig. 8, one end portion of the wire being desirably over the other. The adjacent "tinned" surfaces are placed closely together and the terminals 21 and 22 of a heating electrical circuit are applied to the wire at points to bring the lapping portions of the wire between these terminals and in serial relation therewith and with each other as illustrated in full lines in Fig. 8 or with these wire portions in parallel as further illustrated by dotted lines so that the heating current will flow through both lapping portions and the coating portions therebetween. The resistance offered by the iron wire to the flow of current aids in the production of the fluxing heat. The heating current may be supplied from any suitable source. I have illustrated a generator 23 of alternating current having a pressure of, say, two hundered and twenty volts. The primary 24 of a transformer is in metallic circuit with this generator. A pressure of, say, about six volts with an amperage of nearly sixty amperes is induced into the secondary 25 of the transformer, there thus being about three hundred and fifty watts in the heating circuit when its terminals 21 and 22 are applied, as described, and the suitable switch 26 in this circuit is closed. The closure of the heating circuit is of short duration but sufficient to flux or fuse the adjacent parts of the coating together to produce the bond 27 that unites the lapping ends of the wire, when the bond is cooled. The preferred solder will flux at a temperature of about 950 degrees Fahrenheit. The current as shown passes through the entire wire and particularly through the lapping portions thereof. The fluxed

solder will flow sufficiently to thicken the bond 27 from its mid-portion to both of its ends, the bond preferably increasing from a thickness, at its middle, of about the original thickness of the coating 28 to a thickness at the ends of the bond of more than double this thickness, so that the bond may be sufficiently strong to securely hold the lapping ends of the wire together against the tension to which the wire is subject in tightly applying it to the closure cap, this tension upon the band of wire being supplied during the fluxing and being maintained until the bond is cooled. The bond is of such a nature that it may be torn when the extremity of one end of the wire ends is pulled upon with sufficient force, whereby the ring may be torn asunder when the closure cap is to be removed.

Changes may be made without departing from the invention.

Having thus described my invention, I claim:

1. Apparatus for coating wire including a receptacle containing a bath of molten material; and a guiding structure through which the wire is guided from the molten material, this guiding structure being inclusive of an open ended conduit through which the wire may be passed and that is positioned to have one end clear of the bath of molten material and its other end below the top of said bath of molten material, said guiding structure also including a portion below and spaced apart from said conduit and positioned to enable the wire to have scraping engagement therewith to remove dross from the wire, the space between the conduit and scraping portions of the guiding structure being in communication with the receptacle to receive molten material.

2. The structure of claim 1 wherein means are employed for directing one side of the wire against a portion of the margin of the upper end of the conduit bore.

3. The structure of claim 1 wherein the conduit is inclined.

4. The structure of claim 1 wherein the conduit is inclined and wherein means are employed for directing one side of the wire against a portion of the margin of the upper end of the conduit bore.

5. The structure of claim 1 wherein means are employed for positioning the conduit at different levels to regulate the thickness of the coating.

6. The structure of claim 1 wherein means are employed for positioning the conduit at different levels to regulate the thickness of the coating and wherein means are employed for directing one side of the wire against a portion of the margin of the upper end of the conduit bore.

7. The structure of claim 1 wherein means are employed for positioning the conduit at different levels to regulate the thickness of the coating and wherein the conduit is inclined.

8. The structure of claim 1 wherein means are employed for positioning the conduit at different levels to regulate the thickness of the coating and wherein means are employed for directing one side of the wire against a portion of the margin of the upper end of the conduit bore.

9. Apparatus for coating wire including a receptacle containing a bath of molten material; an open ended conduit having a bore through which the wire may be passed; and a wire guiding hollow sheave immersed in the molten material and having a concave periphery with its deepest portion substantially in alignment with the bore of the conduit, said periphery having openings therethrough and terminating in the region of the deepest portion of the periphery.

10. Apparatus for coating wire including a receptacle containing molten material, an open ended inclined conduit having a bore larger than the wire that is to be coated and through which the wire may be passed, said conduit having a wall engaging the wire and changing the angular direction of travel of the wire and positioned with one end above the molten material and its other end below the surface of the molten material in communication with the receptacle to receive molten material therefrom.

OLOF N. TEVANDER.