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H. M. WILLIAMS.

PROCESS OF MAKING INGOTS FOR SEAMLESS GOLD PLATED WIRE.

APPLICATION FILED APR. 22, 1904.

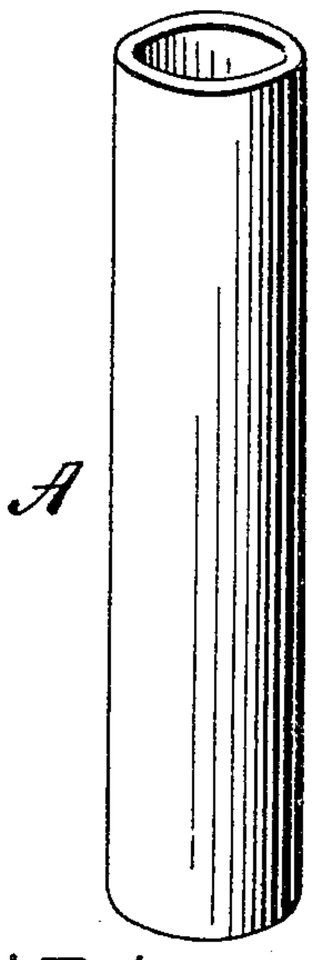

FIG. 1.

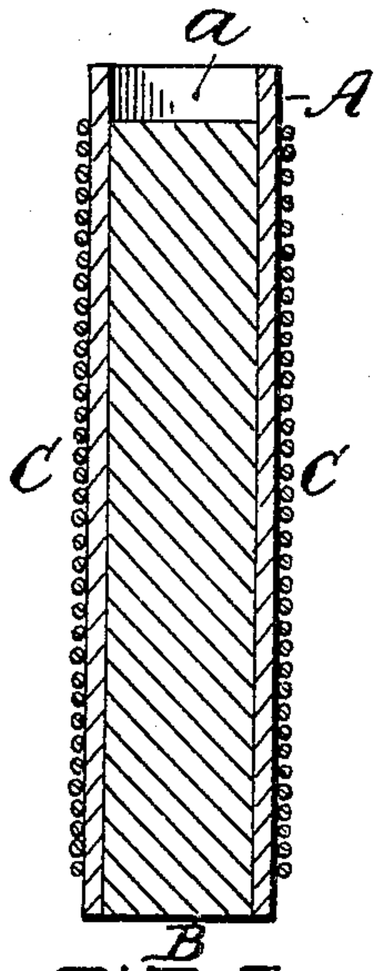

FIG. 2.

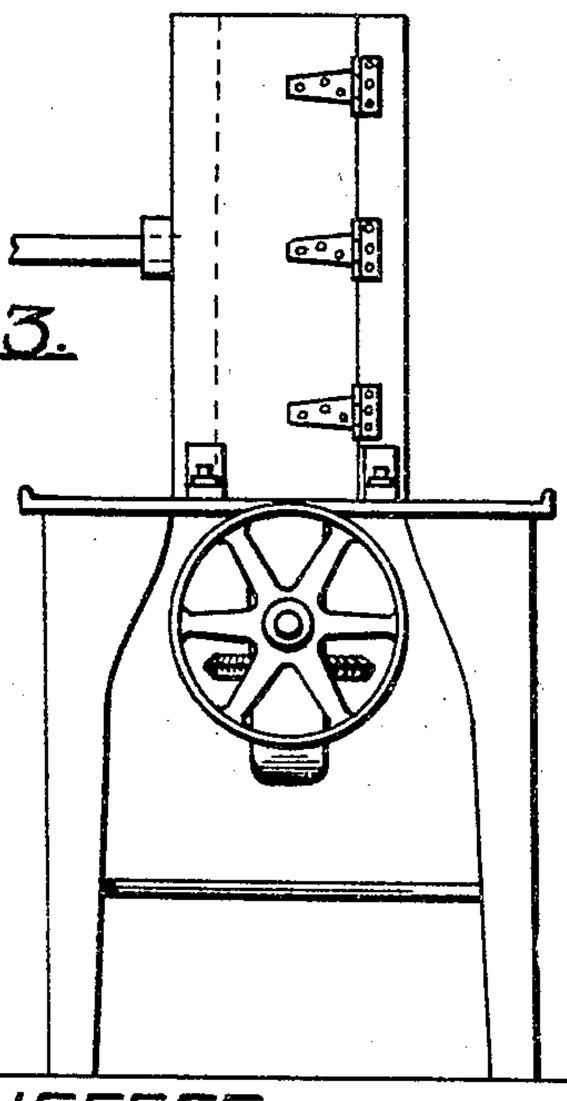

FIG. 3.

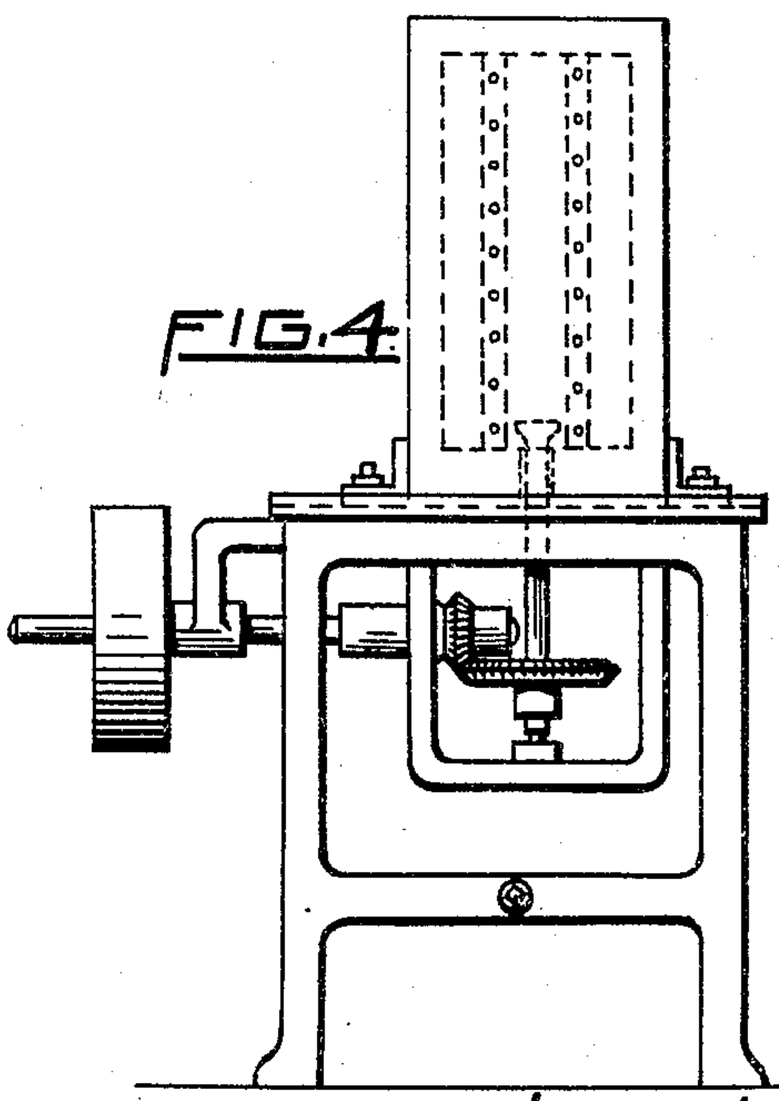

FIG. 4.

WITNESSES.

C. A. Hannigan

Howard A. Lamprey

INVENTOR.

Herbert M. Williams

By Warren R. Pence

Attorney

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UNITED STATES PATENT OFFICE.

HERBERT M. WILLIAMS, OF ATTLEBORO, MASSACHUSETTS.

PROCESS OF MAKING INGOTS FOR SEAMLESS GOLD-PLATED WIRE.

SPECIFICATION forming part of Letters Patent No. 792,099, dated June 13, 1905.

Application filed April 22, 1904. Serial No. 204,428.

To all whom it may concern:

Be it known that I, HERBERT M. WILLIAMS, a citizen of the United States, residing at Attleboro, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Processes of Making Ingots for Seamless Gold-Plated Wire, of which the following is a specification, reference being had therein to the accompanying drawings.

Like letters indicate like parts.

Figure 1 is a perspective view of a gold tube or shell. Fig. 2 is a central vertical longitudinal section of a gold tube, a base-metal core therein, and a coil of iron wire wound around the gold tube. Fig. 3 is a side elevation of a furnace which may be used in my improved process. Fig. 4 is a front elevation of the same elevation.

My invention relates to processes of making ingots for the manufacture of seamless gold-plated wire; and it consists of the novel combination of the successive operations hereinafter particularly described, and specifically set forth in the claim.

In the manufacture of ingots for seamless gold-plated wire it has been customary to use a gold tube and a cylindrical bar of base metal inserted therein and to interpose between them a sheet or layer of solder, which when fused unites the gold tube and cylindrical bar of base metal together.

In the drawings, in Figure 1 is shown a gold tube A. The interior surface of this tube is thoroughly cleaned, and a cylindrical bar B, of brass, composition, or base metal, is thoroughly cleaned and coated with borax or other flux. This cylindrical bar B is inserted and driven into the tube A, as shown in Fig. 2, preferably with a tight fit, but not so as to increase the diameter of the gold tube A.

The cylindrical bar B is shorter than the tube A, and as the bottoms of both are flush or even with each other the top of the tube A extends up beyond the top of the bar B, and thus there is formed a circular chamber *a*, whose bottom is the top of the bar B and whose wall is the upper projecting end of the tube A.

After the cylindrical bar B has been driven or forced into the tube A, as already described, wire C (preferably of iron) is wound in close coils upon the exterior of the tube A, as shown in Fig. 2.

In Figs. 6 and 7 is shown a furnace used in my improved process, consisting of an oven or chamber upon a table, the latter being supported upon standards or legs. A horizontal shaft driven by power is mounted in suitable bearings and has a beveled gear upon its inner end, which gear meshes with the beveled gear of a vertical shaft mounted in suitable bearings. The upper end of said vertical shaft extends up into the oven or chamber and is enlarged to form a base, as indicated in Fig. 7 in dotted lines. A pipe enters the oven or chamber on one side thereof and discharges therein hydrocarbon gas or mingled gas and air under pressure.

The compound piece A B C (shown in Fig. 2) is put into said oven or some other similar furnace or chamber. It rests upon the enlarged upper end of the vertical shaft and rotates with said shaft as the latter is turned by power. Thus every part of the exterior surface of said compound piece A B C is subjected to the blast of the flame in said oven or chamber. Although this compound piece A B C is exposed at the same time to the intense heat of the hydrocarbon gas (or mingled gas and air under pressure) in the oven, yet the metals being dissimilar differ from each other as to their conductivity and expansion when so subjected to said heat. The iron wire is first affected by the blast, because it is on the outside of the compound piece and is consequently the most exposed. This wire being of comparatively small diameter, as seen in Fig. 2, is elongated by the expansion caused by this intense heat, and the result is that the coils become somewhat increased in diameter. The gold, however, is more expansible than the iron, and therefore the tube A expands radially just as far as the less expansible iron wire C permits. Thus although both the tube A and the wire C expand in consequence of the heat to which they are subjected the wire C is still a retaining means and prevents any unsymmetrical distortion of the tube A, which tube, pressing outwardly against the restraining-coils of

the wire C, is forced to maintain a true tubular form. The bar B, of base metal, is somewhat expanded by the heat, but being remoter from the flame than the tube A and less easily fusible and more refractory in nature does not expand to the same degree as the gold tube. Thus while the blast is on there is formed an annular space between the gold tube A and the base-metal bar B, and whereas at first the bar B had a driven fit in the bore of the gold tube A they now, by reason of their unequal expansion under the action of the intense heat, stand apart, leaving this annular space between them all around from top to bottom. When the tube A has thus expanded to the utmost extent allowed by the restraining-coils of wire C and while said compound piece A B C is still exposed to the full heat of the oven and is still supported on the enlarged end of the vertical shaft and rotating therewith I pour into the chamber *a* from a crucible (held by long tongs or other suitable handle) a quantity of melted solder, which flows down into and completely fills the annular space which has been temporarily formed between the tube A and bar B on account of the dissimilarity of the metals of which they are made and their unequal expansion, as already explained. The solder so introduced between the tube and bar in said annular space unites them together. The behavior of these metals in cooling also helps to the desired final result. The base-metal bar B being less affected by the heat and only slightly expanded thereby because of its own nature and because it is more remote from the flame is first to cool when the blast or flame is turned off and slightly contracts to its original size. The gold tube A having been the most fused is slowest to contract and in shrinking compresses the molten mass of solder, (which has been poured into the annular space between said gold tube and base-metal bar,) and thus uniformly distributes said solder and gives it the same thickness from one end of the ingot to the other. The enormous power of the contraction of the gold tube A compresses the solder to the utmost possible limit. The iron wire C, because of its small diameter and the openness of its coils and because it expanded less than the gold tube A during the heat-blast, cools and contracts quickly and with enormous power, which is uniformly exerted throughout the whole length of the wire C. Thus the gold tube A in contracting is forced to maintain its true tubular form. The ingot when so formed and cooled is ready to be subjected to the swaging, reducing, and drawing operations usually performed in the manufacture of seamless gold-plated wire from compound ingots.

Ingots for the manufacture of seamless gold-plated hollow wire can be made in the same manner as above described by substituting for the solid cylindrical bar B of base metal a tube of base metal of a diameter to fill the bore of the gold tube A.

I claim as a novel and useful invention and desire to secure by Letters Patent—

The improved process of making an ingot for the manufacture of seamless gold-plated wire herein described, consisting of cleaning the interior surface of a gold tube, cleaning and covering with a suitable flux the surface of a cylindrical bar of base metal, driving the said bar into said tube with a tight fit, winding the outer cylindrical surface of said tube with coils of iron wire, then placing and supporting said wound compound piece vertically in a furnace or oven and giving to said wound compound piece a rotary movement in said furnace or oven, and during said movement subjecting said wound compound piece to the action of heat until said metals are so expanded thereby that an annular space is formed between said tube and bar, then pouring into said annular space so formed a sufficient quantity of melted solder introduced into said furnace or oven at the time when such annular space has been developed by the action of heat as aforesaid to fill said annular space thereby uniting the tube and bar together, then removing said wound compound piece from the furnace or oven and cooling the same whereby the tube is shrunk or contracted and evenly distributes and compresses the solder upon the bar, and then removing said wire from the tube, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

HERBERT M. WILLIAMS.

Witnesses:
WARREN R. PERCE,
HOWARD A. LAMPREY.