

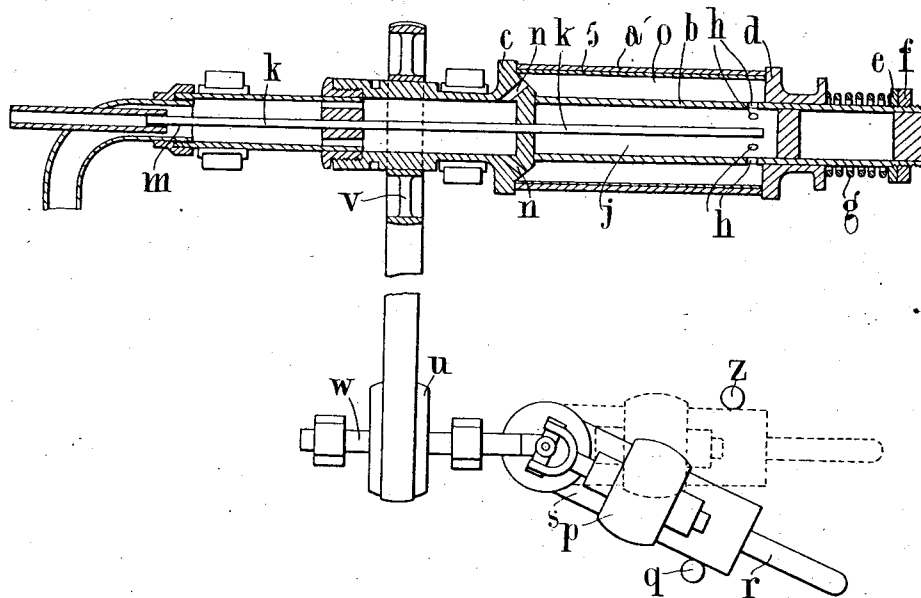
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COATING INTERNALLY OF HOLLOW ARTICLES WITH METAL

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UNITED STATES PATENT OFFICE

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COATING INTERNALLY OF HOLLOW ARTICLES WITH METAL

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This invention relates to the coating internally of hollow articles with metal and more particularly to the lining of the sleeves of sleeve valve engines with white metal.

5 The object of this invention is to improve the uniformity of the internal coating and the closeness of its association with the article treated.

Referring to the accompanying diagrammatic drawing:—

The accompanying figure illustrates partly in vertical section and partly in elevation a convenient arrangement in accordance with the present invention.

15 In carrying the invention into effect in one form illustrated by way of example as applied to the lining with white metal of sleeves for sleeve valve engines, we mount the sleeve *a* upon a mandrel and provide means for rotating the latter. The mandrel is formed as regards the greater part of its length of a portion *b* of diameter somewhat smaller than the internal diameter of the sleeve when coated, the portion *c* being slightly greater
25 in diameter than the external diameter of the sleeve. An abutment plug *g* is mounted slidably upon the portion *b* of the mandrel and is adapted to bear against and support concentrically one end of the sleeve. The other end
30 of the sleeve abuts a shoulder embodied in the mandrel portion *c* and nuts *e*, *f* fitted to a threaded portion of the first-mentioned part *b* of the mandrel, together with an interposed compression spring *g*, ensure sufficiently good
35 joints between the sleeve ends and their abutting surfaces.

The plug *d* is of such length as to prevent the heat employed in the process from drawing the temper of the compression spring and the spring accommodates any variation in expansion between the mandrel and the sleeve.

45 Near the end of the sleeve adjacent the plug a number of radial holes *h* are drilled in the mandrel, these communicating with a central conduit *j* longitudinally formed therein. An inlet pipe *k* communicates with this conduit and an outlet pipe *m* concentric with the inlet pipe *k* communicates with a number of holes
50 *n* drilled in the shoulder separating the two

portions of the mandrel. These holes last mentioned communicate with the space *o* contained between the internal surface of the sleeve and the external surface of the mandrel, i. e. the smaller diameter portion *b* of the mandrel. 55

In operation, a suitable flux having been applied to the inner surface of the sleeve and a lump or lumps of white metal having been placed within the sleeve, this is mounted in position upon the mandrel. A non-oxidizing gas is then conveyed through the mandrel by way of the inlet and outlet pipes and conduits described above. Conveniently coal gas may be employed for this purpose, in which case observation of the colour or nature of the flame produced from igniting the outlet gas provides a ready indication of the expulsion of air. Immediately all the air has been removed heat is applied externally to the sleeve, the gas being passed through the interior of the sleeve meanwhile. The mandrel is then erratically rotated or rotated at a slow speed so that relative motion occurs between the article to be coated and the coating metal thus producing effective tinning of the interior surface. Subsequently the mandrel is rotated at a steady speed or at a comparatively high speed so that no relative motion now occurs and when the whole of the metal has become melted it forms a uniform coating 5 closely associated with the inner surface of the sleeve, this action being aided by the centrifugal force. 75

The temperature of the sleeve is now reduced below that of the melting point of the coating metal, rotation of the sleeve being continued until the coating 5 sets. 85

Convenient means for producing erratic or uniform rotation at will comprise an electric motor *p* mounted upon a swivelable bed plate *s*, a universal joint *t*, a driving pulley *u* and a driven pulley *v*, the latter being embodied in the mandrel. The shaft *w* carrying the pulley *u* and universal joint *t* is mounted in fixed bearings but the hand lever *r* enables the bed plate *s* to be rocked either into a position such that the shaft *w* is in line with the motor shaft or into a position such that these two shafts are mutually inclined. 100

Stops *g, z*, are provided to limit the angularity of the motor shaft.

It is to be understood that although we have described a convenient example according to the present invention as applied to the coating of cylindrical sleeves for sleeve valve engines, the invention is also equally applicable to the treatment of other articles which when assembled embody an approximately cylindrical internal surface. For example, the invention may be applied to the treatment of split bearings, the two halves of the bearings conveniently being provided with separating plates to prevent the metal coating from joining the two halves together. These separating plates may either project inwardly to a sufficient extent to separate the metal lining into two portions or they may be sufficiently short to allow the lining to be formed as a continuous member.

A convenient speed at which to rotate a sleeve of about $2\frac{1}{2}$ " to 3" diameter is about 700 revolutions per minute in the arrangement where surface alloying is effected by erratic rotation but in the arrangement where a slow steady speed is utilized a speed of about 100 revolution per minute is suitable.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. A method of coating internally with metal to any desired thickness a hollow metal article which consists in introducing into the article a suitable flux and the desired quantity of metal for the coating, causing a direct alloying between the metal constituting the article and metal for the coating by erratically rotating the article relatively to the coating metal while under the influence of heat while subjecting the surface of the metal to be coated and the coating metal to an inert atmosphere and subsequently rotating the article at a uniform and comparatively fast rate while still subjected to heat so as to distribute uniformly the liquefied coating metal.

2. A method of coating internally with metal to any desired thickness a hollow metal article in accordance with claim 1, wherein the surface alloying is effected by slowly rotating the article, thus producing relative motion between the metal constituting the article and the coating metal, with a suitable flux while the article is subjected to heat sufficient to liquefy the coating metal.

In testimony whereof we have signed our names to this specification.

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