

(No Model.)

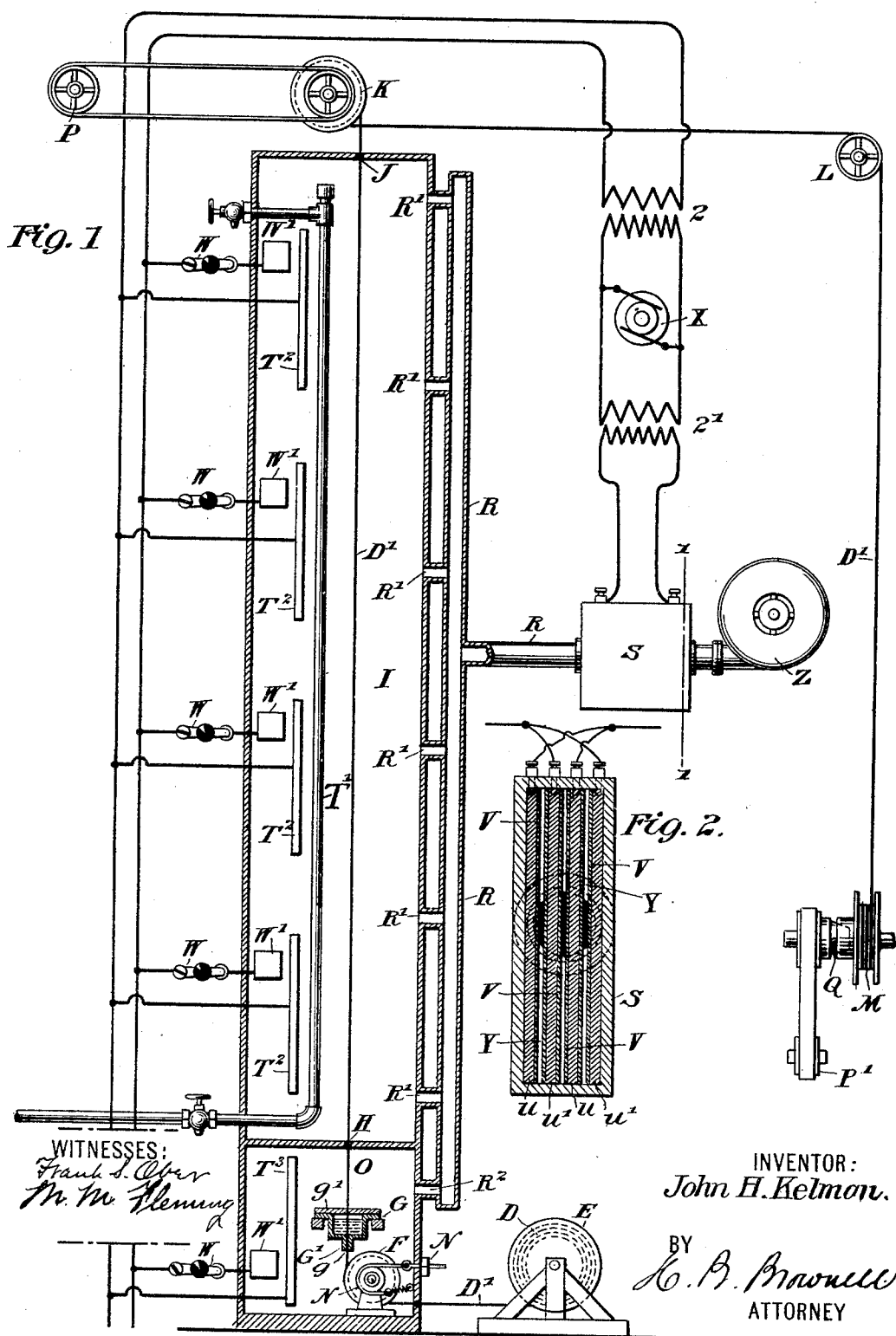
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METHOD OF AND APPARATUS FOR APPLYING JAPAN.

No. 586,555.

Patented July 20, 1897.



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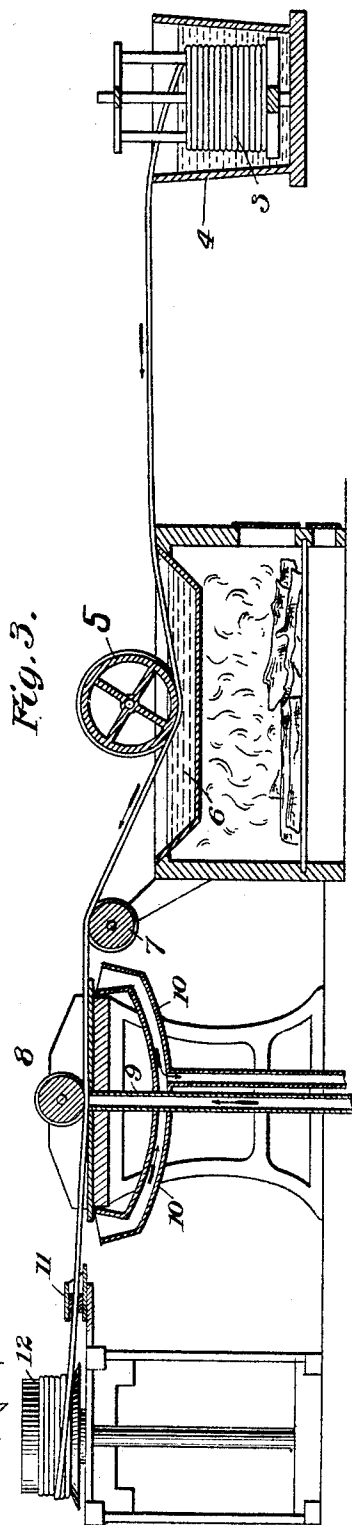
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Patented July 20, 1897.



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METHOD OF AND APPARATUS FOR APPLYING JAPAN.

SPECIFICATION forming part of Letters Patent No. 586,555, dated July 20, 1897.

Application filed March 29, 1897. Serial No. 629,795. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. KELMAN, a citizen of the United States, residing in the city of Pittsfield, in the county of Berkshire and State of Massachusetts, have invented a certain new and useful Method of and Apparatus for Applying and Hardening Coatings of Baking-Japan and other Materials Having Like Drying Qualities to Continuous Lengths of Material, of which the following is a specification.

My process and apparatus relate to the making of extended continuous lengths of copper or similar electrical conductor insulated with japan or other similar insulating material, also to the making of extended continuous lengths of oiled cloth or oiled tape or to coating other extended continuous lengths to which it may be desired to apply similar coatings.

The object of my invention is to provide a new and useful method of and means for applying baking-japan and other coatings having similar drying qualities to extended continuous lengths—as, for instance, to an extended length of copper or other similar electrical conductors—whatever the length may be, so that they may be formed into flexibly-insulated coils, the helices being separated and having smooth and uniform coatings, or for making extended continuous lengths of oiled tape or oiled cloth, so that they may have the oil applied and hardened uniformly and be made of any length.

My method and apparatus are of particularly great importance in the making of electrical conductors insulated with what is known as “baking-japan,” as I have discovered that by it a thin coating of such japan can be applied to an electrical conductor, such as copper, so flexible that the conductor can be made into coils for generators and transformers and similar apparatus without further insulation, and that the insulation afforded by this flexible coating under the strains to which insulation in such relations is subject is almost ideal in that it is very uniform, is of little bulk, is of very high ohmic resistance and dielectric strength, and has practically no “faults” and can easily be applied to conductors of any shape. Moreover, it does not contain substances which attack

the metal of the conductor or tend to make the insulation break down under such action.

My apparatus and method afford a means and a way of making such flexibly-insulated conductors, so that they may be of any length whatever and so that the coating will be uniform and perfect throughout.

In the drawings, Figure 1 represents a partly-sectional and partly-diagrammatic view of an apparatus embodying my invention, and Fig. 2 a section of an ozone-generator S on the line 1 1. Fig. 3 shows, diagrammatically, a suitable tinning apparatus.

The following description taken therewith sets forth my new apparatus and method.

In the drawings, Fig. 1, D represents a continuous length of material to be coated and for the present description may be considered to be a coil of copper wire, preferably tinned, mounted upon a reel E. The wire D' from this coil is passed around a pulley F in a closed chamber O and up through an orifice g in a plug or projection G' at the bottom of the vessel G, containing a bath of the material for the insulating-covering and preferably having a cover g'. It then passes through the orifice H into a hardening-chamber I. This chamber I is built to retain heat and to keep out as much light, either natural or artificial, as possible, since by my process the best insulation is made when all light is absent from both the hardening-chamber I and the chamber O. In this chamber I, which is a heated hardening-chamber, the wire D', after being coated by passing through the bath in the vessel G, is subjected to the action of ozone or heat, or both, which hardens the material adhering to the wire after its passage through the bath. It then passes out through the orifice J and over the pulley K, after which it passes over the idle-pulley L to the reel M. The pulley F is encircled part way by the wire and has a friction-brake N, which makes the pulley F act as a tension upon as well as a guide for the wire D'. The pulley K is made to revolve at a slow rate of speed by power from some convenient source, as P, and draws the wire D' upward through the chamber I. The reel M is made to revolve sufficiently fast to take up the wire as it comes to it, being driven from some convenient source of power, as P', by a friction

connection Q, which permits it to adjust its rotation to the speed of the wire.

Directly below the chamber I is the closed chamber O, which preferably should be of size large enough to permit a man to enter. Within this chamber is the vessel G, containing the bath, a suitable composition for which when it is desired to make the flexibly-insulated conductor above referred to the following is a suitable formula, to wit: one hundred pounds asphaltum-gum, ten gallons boiled linseed-oil, five pounds gum-animo, fifteen gallons turpentine, and turpentine sufficient to keep it at the necessary thickness for the desired coat. Any commercial baking-japan will, however, answer the purpose, the more flexible and tough when hardened the better. A bath of linseed-oil makes a very satisfactory insulation. By the addition of turpentine or other similar fluid it should be kept at the proper degree of fluidity to result in a smooth coat of the desired thickness. (In case oiled cloth or oiled tape are being made the bath should consist of linseed-oil or such composition as it may be desired to apply.) The orifice *g* through the small plug or projection *G'* is of a size to just permit the free passage of the wire *D'*. In making conductors insulated with japan in order to maintain the bath in proper condition the temperature of the contents of the vessel is maintained at about 200° Fahrenheit, preferably by an electric heating device *T*³, which also heats the conductor *D'* from the coil somewhat before it reaches the bath.

The chamber I, when ozone is used, is kept saturated with ozone supplied by ducts *R'* *R'* from the ozone-generator *S*. This chamber I is kept heated, so that at the bottom the temperature is about 250° Fahrenheit and at the top 375°. The chamber O is also preferably supplied with ozone by the duct *R*², so that the coating is acted on somewhat before it reaches the highest temperature of the chamber I. The heating I prefer to accomplish by the joint action of a steam-pipe *T'* and electrical heaters *T*² *T*² *T*³, which are controlled by switches, preferably by manual switches *W* and also by automatic thermostatic switches *W'*, so as to automatically regulate the temperature. By this means if the difference in temperature between the top and the bottom of the chamber due to the tendency of heated air to ascend is not that desired the heaters at the top can be adjusted so as to make the upper part of the chamber still hotter, or vice versa. The length of the chamber I is governed by the length of the conductor to be coated that can be drawn by the pulley *K* from the reel *E* without stretching, a greater length of chamber permitting greater speed of the conductor without shortening the time during which it is subjected to the action in the hardening-chamber.

The ozone-generator I have used generates a sufficient quantity of ozone, and consists of a chamber *Y*, containing two sets of oppos-

ing conducting-plates *U' U'*, separated by thin coatings of a dielectric *V*, such as a coating of enamel or japan, on their opposing surfaces. The alternate plates are connected, respectively, to the terminals of a circuit of high alternating potential. A fan *Z* or other similar means is provided for drawing or forcing a current of air between the plates *U' U'* and into the ozone-chamber *I*. The air as it passes between the plates *U' U'* is acted upon by the electric discharge and part of it converted into ozone. This ozonized air then passes into the chambers *I* and *O*, escaping at the orifices through which the wire passes and at other points, if necessary. As shown, the generator *X*, through the transformers *Z* *Z*, supplies electricity to the ozone-generator *S* and the heaters *T*², *T*², and *T*³.

The action upon the covering on the wire in the heated ozone-chamber is as follows: The heat soon volatilizes any volatile parts of the coating, while at the same time the ozone, rendered more active by the heat, oxidizes the linseed-oil contained therein in the absence of any light. This process of oxidation being of a different nature from evaporation leaves no pores in the covering, but, on the contrary, makes a covering without pores and of a tough, flexible, and semielastic character. As any portion of the now covered wire reaches the upper portion of the hardening-chamber *I* it is subjected to an increased temperature, which tends to still further harden the covering. The higher degrees of heat at the upper part of the chamber tend to decompose the ozone, but the circulation in the chamber being upward keeps the upper part supplied with ozone. If it is desired that the covering be subjected to the action of heat and ozone for a longer period, the conductor may be made to traverse the hardening-chamber for a second time. The flexibly-insulated conductor after the coating is sufficiently hardened is reeled, making the completed coil. Should it be desired to make the insulation thicker than can be done by passing the conductor through the bath and chamber but a single time, the first operation can be repeated upon the flexibly-insulated conductor until the several coats make the desired thickness. In case the substance to be coated is such that it will not be injured by a higher degree of heat than that above named I may subject it to as much as 450° Fahrenheit. In such a case, since the ozone would be at once decomposed, I omit the ozone and rely only on the heat for hardening. I may omit the ozone at lower temperatures.

When a copper conductor is used, it should preferably be tinned before it is coated. This assists very materially in obtaining a smooth and even coat, as the insulating material adheres more readily to the tinned surface than it does to the copper surface. The tinning is done in the ordinary way by any of the ordinary apparatus for tinning wire now in use.

The apparatus above described to obtain the best results should be run continuously twenty-four hours a day, new reels being supplied and joints soldered while in operation. The speed at which the wire moves should be such that the coating will be well hardened before it leaves the ozone-chamber.

The drawings show but one wire passing through the chamber I. In practice, however, as large a number of wires are run through as can be without interference, to do which the number of reels, pulleys, baths, &c., is increased accordingly.

The metallic portions of the conductor may be of almost any shape. In case the apparatus is to be used for making oiled cloth or oiled tape or applying any composition to other continuous lengths it is only necessary that the bath be made with the proper material and kept at the proper thickness for the desired coating, and that the orifice in the projection G' and to permit passage into and out of the chamber I be made to correspond in shape to a section of the substance to which the material is to be applied, and that continuous lengths of fabric or other material suitable for the base of the desired product be passed through the apparatus, coated with the material from the bath, and exposed with its coating in the ozone-chamber. The process in such cases is the same as that above described, with the exception of the tinning, which is an auxiliary and preliminary step which may be and preferably is used in the case of coating with japan or oil a continuous length of copper conductor for electrical purposes.

A suitable tinning apparatus is shown in Fig. 3. Any other tinning apparatus for tinning continuous lengths may be used. In that shown 3 is a reel of wire to be tinned. 4 is a containing vessel containing muriate of zinc or other suitable preparation. 5 is a pulley under which the wire is drawn and by which it is kept for a time submerged in the heated metal bath 6. 7 is a guide-roller over which it passes to the washing-table, where it is kept by the roller 8 underneath flowing water supplied by pipe 9 and carried off by pipes 10 10. It then passes through the die 11 and around the drawing-cylinder 12, which may be rotated by any suitable means.

The vertical chamber I and the passing of the lengths through it in a vertical position have an advantage and are preferred, since the coating under such circumstances distributes itself more evenly and smoothly while being acted upon by the ozone.

The flexibly-insulated conductor referred to as being coated by the process described above forms the subject-matter of another application executed by me, Serial No. 613,483, filed November 27, 1896.

Having thus described my invention, what I claim is—

1. The process of applying and hardening coatings of japan or other materials having

similar drying qualities to articles of extensive lengths consisting in continuously passing a continuous length of the article to be coated through a bath of the material to be applied, and then through a hardening-chamber, and subjecting succeeding portions of the coated article while in said hardening-chamber to the action of heat of continuously-increasing temperature, substantially as described.

2. The process of applying and hardening coatings of japan or other materials having similar drying qualities to articles of extensive lengths consisting in continuously passing a continuous length of the article to be coated through a bath of the material to be applied, and then through a vertical hardening-chamber and subjecting succeeding portions of the coated article while in a vertical position to the action of heat of continuously-increasing temperature, substantially as described.

3. The process of applying and hardening coatings of japan or other materials having similar drying qualities to articles of extensive lengths consisting in continuously passing a continuous length of the article to be coated through a bath of the material to be applied, and then through a vertical hardening-chamber and subjecting succeeding portions of the coated article while in a vertical position to the action of heat of continuously-increasing temperature with ozone, substantially as described.

4. The process of applying and hardening coatings of japan or other materials having similar drying qualities to extensive lengths of copper or other similar electrical conductor which consists in first tinning said conductor, then passing it through a bath of the material to be applied and then through a hardening-chamber and subjecting succeeding portions of the coated conductor while within said hardening-chamber to the action of heat of continuously-increasing temperature, substantially as described.

5. An apparatus for applying and hardening coatings of japan or other materials having similar drying qualities, consisting of a vertical hardening-chamber, and means for supplying heat of continuously-increasing temperature to the same, a bath of the material to be applied, and means for continuously passing extended lengths of the article to be coated through said bath and vertically through said hardening-chamber, whereby successive portions of the article are coated and the coating hardened while subjected to the action of heat of continuously-increasing temperature, substantially as described.

6. An apparatus for applying and hardening coatings of japan or other materials having similar drying qualities, consisting of a vertical light-proof ozone-chamber, and means for supplying heat of continuously-increasing temperature to the same, an ozone-generator supplying ozone to said chamber,

a bath of the material to be applied and means
for continuously passing extended lengths of
the article to be coated through said bath and
vertically through said ozone-chamber, where-
5 by successive portions of the article are coated
and the coating hardened while subjected to
the action of ozone and heat of continuously-

increasing temperature, substantially as de-
scribed.

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Witnesses:

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