M. F. DAVORAN.

DRYING MECHANISM FOR ELECTROPLATING APPARATUS.

APPLICATION FILED AUG. 3, 1917.

1,279,086.

Patented Sept. 17, 1918.

3 SHEETS—SHEET 1.

Fig. 1

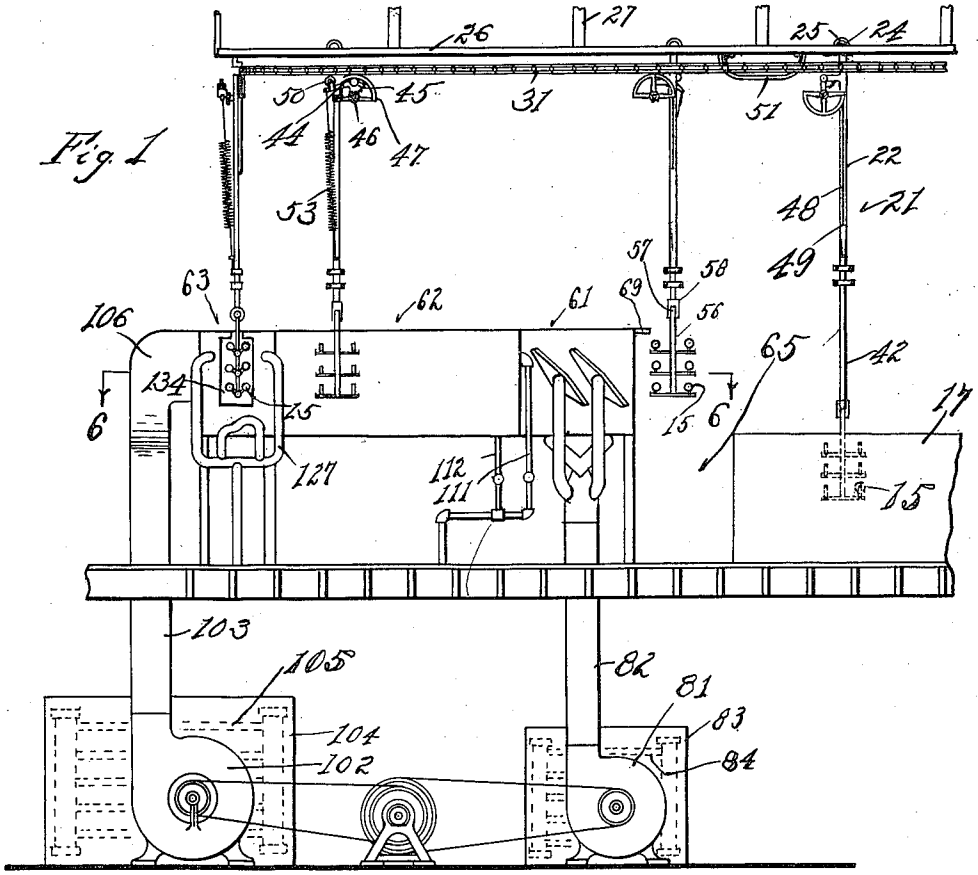
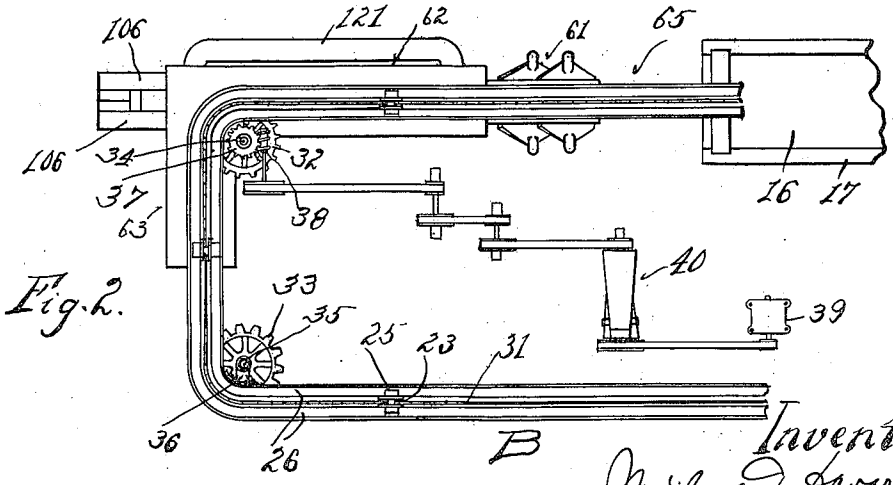


Fig. 2.



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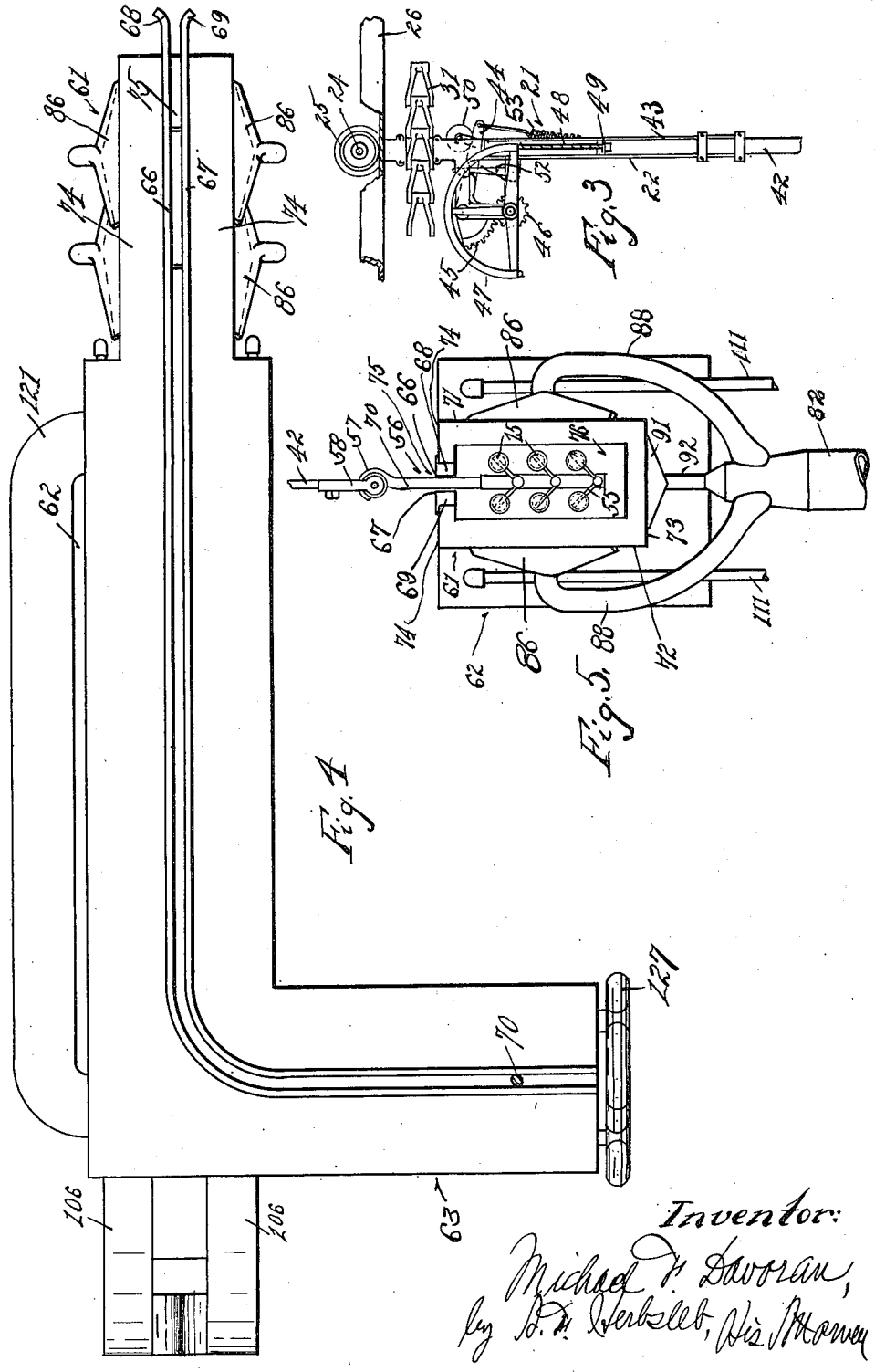


Fig. 4

Fig. 3

Fig. 5

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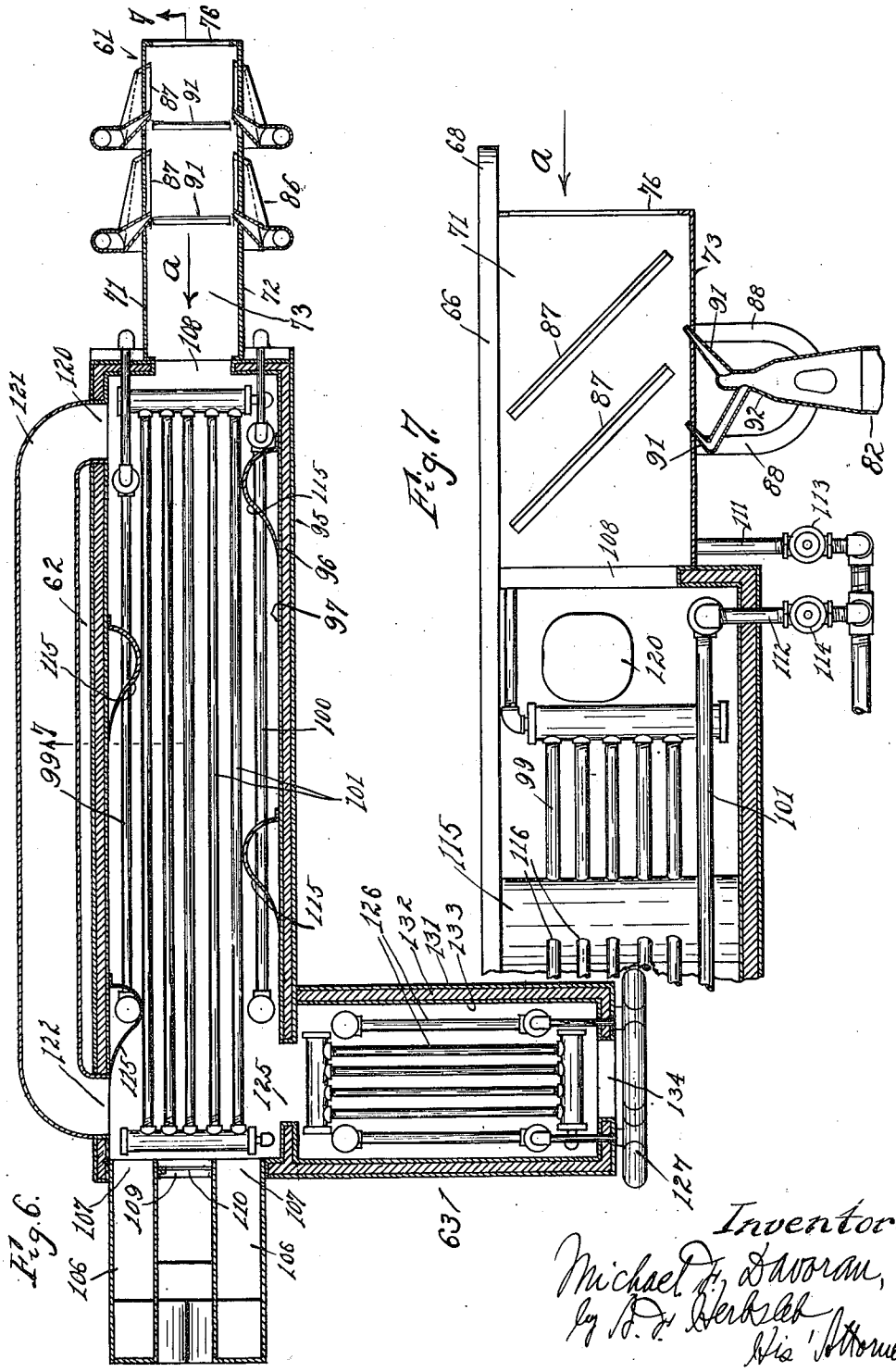


Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

MICHAEL F. DAVORAN, OF CINCINNATI, OHIO, ASSIGNOR TO THE CRANE & BREED MANUFACTURING COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

DRYING MECHANISM FOR ELECTROPLATING APPARATUS.

1,279,086. Specification of Letters Patent. Patented Sept. 17, 1918.

Application filed August 3, 1917. Serial No. 184,267.

To all whom it may concern:

Be it known that I, MICHAEL F. DAVORAN, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Drying Mechanism for Electroplating Apparatus, of which the following is a specification.

It is the object of my invention to provide a new and improved drying mechanism applicable for electro-plating apparatus, for instance, of the character of that shown, described and claimed in my copending application for patent on improvement in method of an apparatus for electro-plating, filed in the United States Patent Office August 3, 1917, as Serial No. 184,265.

I do not herein claim the method or apparatus for electro-plating herein shown or described, having shown, described and claimed the same in my aforesaid application, nor do I herein claim the dipping mechanism herein shown and described, having shown, described and claimed the same in my application for patent on dipping mechanism, filed in the United States Patent Office August 3, 1917, as Serial No. 184,266.

It is the object of my invention to provide a drying mechanism for electro-plating apparatus constructed and arranged to subject the electro-plated and rinsed articles to various kinds of drying agencies in sequence, in novel manner, within the terms of the appended claims; further, to provide novel means for subjecting electro-plated and rinsed articles to blasts projected crosswise of and counter to the movement of the articles passing the blast agencies; further, to provide a series of compartments or chambers through which the articles are arranged to pass and in which the articles are subjected, first, to blasts of greater intensity, second, to currents of heated air of less intensity, and third, to a substantially quiet heat, for drying the articles.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a side elevation of so much of an electro-plating apparatus as is necessary to illustrate the present invention.

Fig. 2 is a plan view of the same.

Fig. 3 is a side view of one of the article-carriers, partly broken away.

Fig. 4 is a plan view of the heating chambers.

Fig. 5 is an end elevation of the same, shown in connection with an article-carrier, partly broken away, arranged for supporting and moving the articles being dried.

Fig. 6 is a horizontal section of my improved device, taken on the line 6—6 of Fig. 1; and,

Fig. 7 is a central vertical section of a portion of the same, taken in the plane of the line 7—7 of Fig. 6.

The articles being dried are exemplified as small pieces of hardware 15, for instance, casket hardware, which have been provided with an electro-plated coating, for instance, by employment of the method and apparatus disclosed in my aforesaid application Serial No. 184,265. In the course of the electro-plating of the article, the same has been immersed in a series of baths, including a rinsing bath, a series of plating baths, and a final rinsing bath, the latter being exemplified at 16 in a tank 17. This final rinsing bath is a bath of clear water of very high temperature, preferably of substantially as high a temperature as the water will contain under atmospheric pressure. The tank and bath are sufficiently long to thoroughly cleanse and rinse the electro-plated articles during passage thereof through said bath.

The articles are exemplified as supported and moved lengthwise of the bath and along the drying mechanism, the supporting and conveying means being exemplified the same as the supporting and conveying means disclosed in my aforesaid applications.

These means are exemplified as article-carriers 21, of which a suitable number is employed to insure continuity of operation. The article-carrier comprises a suspended frame 22, suspended by a bearing 23 from an axle 24, journaled in said bearing, and having fixed thereon suitable flanged wheels

25, riding on a pair of tracks 26 suitably supported, as from the ceiling of the room in which the apparatus is located, by means of hangers 27. The flanges of the wheels coact with the inner edges of the tracks, which are preferably formed of angle-irons.

The article-carriers are moved lengthwise of the tracks and of the heating apparatus by being articulated with an endless sprocket-chain 31 received about sprocket-wheels 32, 33, of which a suitable number are employed, dependent on the course of the tracks, the tracks being arranged in suitable directions and along suitable curves, forming closed paths or endless tracks, so that the wheels 25 may pass therealong in endless closed paths throughout the apparatus, as is more particularly disclosed in my aforesaid applications. The sprocket-wheels are suitably supported, as on shafts 34, 35, journaled in brackets 36, secured to and extending from the tracks.

The sprocket-wheel 32 is exemplified as a driving sprocket-wheel, its shaft having fixed thereon a worm-wheel 37 with which a worm 38 meshes, the worm being suitably supported and driven, preferably at selective speeds, as by means of an electric motor 39, the driving means having a speed-varying device 40 interposed between the electric motor and the worm.

The article-carrier comprises the main frame 22 suspended from the flanged wheels and a supplemental frame 42, having slide connection 43 with the main frame for being raised and lowered on the main frame, as by means of a lever 44 having thereon a gear 45 meshing with a pinion 46 for rotating a sheave 47, to which a flexible connection 48 is secured at one of its ends, the other end of said flexible connection being secured to the supplemental frame at 49, so that when the lever is caused to descend, as by the riding of the roller 50 on said lever on a supplemental track 51, the supplemental frame is caused to rise for raising the articles out of the tank and into correlation with the drying mechanism. A latch 52 is arranged to coact with the lever for maintaining the supplemental frame in raised relation, suitable means being provided for tripping the latch at desirable points. A spring 53 cushions the descent of the supplemental frame.

The articles are supported on pins 55 of an article-support 56 which has releasable connection with the supplemental frame by being hooked by means of a hook 57 in a fork 58 of the supplemental frame. The pins make electric connection with the articles for subjecting the articles to the electrolytic action of the electrolyte of the plating baths when passing through the latter.

The parts of the article-conveyer above referred to are more particularly disclosed in my aforesaid applications.

The drying mechanism comprises a series of chambers exemplified as a blast chamber 61, a heated-current chamber 62, and a quiet-heat chamber 63.

Previous to entrance of the articles into said blast chamber, the articles have traveled lengthwise through the heated rinsing tank 17 and been raised out of said rinsing tank by the dipping mechanism and means coacting therewith, so as to pass through a dripping space 65 between said rinsing tank and the point of action thereon by the blast mechanism.

After the passage of the articles through the heated rinsing bath, and preferably through said dripping space, the articles are subjected in their further movement to blasts of air of relatively high temperature directed toward the articles from different directions and preferably counter to the direction of the passage of the articles. This is for the purpose of blowing the drops and tears which may adhere to the articles or be contained in crevices and recesses in the articles after the same have been allowed to drip while passing through said dripping space.

The temperature of the articles has been raised while being subjected to the heated rinsing bath in order that the same may have as little cooling effect as possible upon the blasts and subsequent drying agencies to which they are subjected.

These blasts are heated blasts, heated to a high temperature. They remove the fluid globules from the articles and aid in expediting the drying of the articles and prevent spotting of the articles. This spotting of the articles, present in methods and apparatuses for electro-plating heretofore employed, has been caused by the drying on the articles of drops or tears or globules of moisture which are, however, physically removed by the heated blasts of my improved device.

The article is then subjected to currents of heated air, which are preferably of less intensity or velocity than the heated air blasts, and then to preferably quiet-heat of high temperature, in order to evaporate from the articles any moisture or latent steam which may still be adherent thereto.

While passing through the chambers, the article-supports are preferably steadied laterally for preventing swaying thereof, as by guide-bars 66, 67, the ends of which are relatively separated as shown at 68, 69, for ready reception of the stem 70 of the article-supports between said guide-bars. This steadying of the article-supports is especially useful while the articles are subjected to the heated blasts.

The heated-blast chamber 61 shown, com-

prises side walls 71, 72, a bottom wall 73, and a top wall 74, in which latter there is a slot 75 for accommodating the shanks of the article-carriers, the walls of the slot being formed by the guide-bars 66, 67. The chamber 61 has an entrance opening 76. The walls are preferably of sheet metal.

Blasts of air are directed upon the articles, instanced as created by a blower 81 communicating with a blow-pipe 82, and receiving a supply of heated air from a heating chest 83, wherein the air passes over steam pipes 84 for raising the temperature of the air to a substantially high degree.

Blast nozzles 86 are exemplified at the sides of the chamber 61, and are shown as elongated nozzles having elongated blast openings 87. A plurality of these nozzles is shown projecting through each side wall of the blast-chamber, the openings in the nozzles extending in oblique directions to the vertical and formed to project the blasts crosswise of the articles in directions counter to the direction of travel of the articles, the latter being indicated by the arrows *a*, the blasts being directed slantingly toward the entrance opening 76 of the blast-chamber, and slantingly in upward direction. The nozzles 86 are fed through the branches 88 connecting with the blow-pipe 82.

Nozzles 91 extend slantingly upward and counter to the direction of travel of the articles, for directing blasts slantingly upward against the articles and slantingly counter to the direction of movement of the articles. The nozzles 91 are shown as elongated nozzles extending through the bottom wall 73 of the blast-chamber and as being fed by a branch 92 extending from the blow-pipe 82.

The blast-chamber is preferably just sufficiently large and of such shape in cross-section as to provide a passage for the article-supports and articles supported thereby, in order to bring the openings of the nozzles close to the articles and to avoid diffusion of the blasts. The blast-nozzles project the drops and sprays of moisture toward the entrance opening and the upper slot of the blast-chamber, for projecting said drops and spray as much as possible out of said chamber.

The heated-current chamber 62 comprises an outer surrounding sheet-metal body 95, a heat insulating filling 96, and an inner lining 97, this inner lining preferably having a bright reflecting inner surface for reflecting the heat rays. Heating pipes 99, 100, 101, are arranged along the respective sides and the bottom of the heating chamber for imparting heat to the chamber and to the currents of air passing therethrough, these currents of air preferably being created by a blower 102 having a blow-pipe 103 extending therefrom. The blower is fed from a heating chest 104 having steam-pipes 105 therein for raising the temperature of the air passing through the blower to a high degree. The blow-pipe has branches 106 connecting with openings 107 in the end of the chamber 62 opposite the connection thereof with the blast-chamber 61 and the passage 108 between the blast-chamber and the heated-current chamber. The passage 108 is preferably only sufficiently large to admit the article-support and the articles carried thereby into the heated-current chamber. The chamber 62 may also have an inspection opening 109 in its rear wall, which however, is normally closed by a hinged door 110. Supply steam pipes 111, 112, having valves 113, 114, therein feed the pipes 99, 100, 101.

The interior of the chamber 62 is provided with baffle-plates or deflectors 115 at the respective sides thereof, extending preferably throughout the heights of said sides, these deflectors slanting toward the path of the article-supports and counter to the direction of travel of said article-supports, for directing the currents of air across said articles and into contact with the heating pipes. They are alternately placed at opposite sides of the heated-current chamber. The heating pipes preferably pass through openings 116 in said deflectors. The deflectors are secured in suitable manner to the side walls of the heated-current chamber, the air-contacted walls of the deflectors preferably having close connection with the side walls of the chamber.

There is an opening 120 in the side of the heated-current chamber at the entrance end of said chamber. A heated-air pipe 121 connects with said opening and extends alongside the heated-current chamber, the other end of said heated-air pipe connecting with said heated-current chamber adjacent the exit end of said chamber, as through an opening 122 in the side wall of said chamber. This heated-air pipe is provided for re-use of the air heated in said chamber. The deflector 115 diagonally opposite the opening 120 directs air currents in the chamber across the articles into said opening.

The heated air passing through this heated-air pipe or by-pass pipe is received in the heated-current chamber between the openings 107, through which the currents of air pass from the blower, and the first of the deflectors 115, with the result that the supply currents of air through the openings 107, acting in conjunction with said deflector, aid in drawing the air through said by-pass pipe, the deflector causing a cross-current of air across the heated current chamber toward the diagonally opposite deflector, which causes rebound of the air currents crosswise of the heating pipes toward the diagonally opposite deflector, which again

causes rebound of the air currents, these rebounds and cross passages of heated air being continued until a portion of the currents are caused to pass into the by-pass pipe, other portions of the currents passing through the heated-blast chamber, this latter passage being aided by the draft caught by the blast nozzles.

The articles pass from the heated-current chamber 62 through a passage 125 into the quiet-heat chamber 63, wherein the articles are subjected to an intense heat created, for instance, by means of heating pipes 126 in said chamber, fed by steam-pipes 127. This quiet-heat chamber may, like the heated-current chamber, be formed of an outer casing 131, for instance, of sheet metal, a heat-insulating filling 132, and an inner lining 133, this inner lining having preferably a bright reflecting inner surface for reflecting the heat rays.

After treatment in said quiet-heat chamber, the articles pass through an exit opening 134, after which they travel for a distance through the atmosphere and are delivered at the delivery station B.

My improved drying mechanism provides convenient and compact means whereby, during a comparatively short length of travel of the articles, the articles are thoroughly dried without danger of detrimentally affecting the finish of the articles, accomplished by subjecting the articles to a plurality of drying operations of different kinds successively performed upon the articles and comprising, first, blasts of high velocities or intensities applied preferably hot directly upon the articles and projected in directions crosswise of the articles and counter to the path of travel of the articles, to blow from the articles any drops, tears, globules or deposits of moisture there may be thereon, or in crevices or openings in the same, in order that the moisture may be blown off of the articles as drops or spray for physically separating the moisture from the articles, and thereby reducing the necessary amount of evaporation of moisture from the articles, in order to dry the same, and preventing the formation of spots upon the electro-plated articles during the operation; second, the passing of the articles through a heated chamber in which they are subjected to currents of heated air, preferably of less intensities or velocities than the blasts, and projected through the chamber in directions counter to the direction of travel of the articles and crosswise of said articles; and, third, the passing of the articles through a chamber in which there is a high degree of quiet-heat, this heat being sufficiently high to convert any moisture there may still be on the articles into vapor, for separating all moisture from the articles, the vapor rising through the top slot in the chamber.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a drying mechanism for electroplating apparatus, the combination of a drying chamber, forced blast means projecting forced blasts slantingly away from said chamber at the entrance of said chamber, heating means in said chamber, means causing currents lengthwise of said chamber into contact with said heating means and toward said blasts, and means for conveying the articles past said first-named blasts and through said chamber.

2. In a drying mechanism for electroplating apparatus, the combination of a drying chamber, forced blast means projecting forced blasts slantingly away from said chamber at the entrance of said chamber, heating means in said chamber, means causing currents lengthwise of said chamber toward said blasts, said chamber provided with deflectors for deflecting said currents into contact with said heating means at a plurality of points in said chamber, and means for conveying the articles past said first-named blasts and through said chamber.

3. In a drying mechanism for electroplating apparatus, the combination of a drying chamber, forced blast means projecting forced blasts slantingly away from said chamber, heating means in said chamber, means causing currents of less intensity than said forced blasts lengthwise of said chamber into contact with said heating means and toward said blasts, a heated current return pipe connecting the respective ends of said chamber, and means for conveying the articles past said first-named blasts and through said chamber.

4. In a drying mechanism for electroplating apparatus, the combination of a drying chamber, forced blast means projecting forced blasts slantingly away from said chamber, heating means in said chamber, means causing currents of less intensity than said forced blasts lengthwise of said chamber into contact with said heating means and toward said blasts, a quiet-heat chamber, and means for conveying the articles past said first-named blasts and through said chambers.

5. In a drying mechanism for electroplating apparatus, the combination of a drying chamber, heating pipes in said chamber, a blow-pipe having connection with said chamber adjacent one end thereof, a return pipe for heated air one end whereof connects with said chamber adjacent the other end of said chamber, the other end of said blow-pipe having an opening adjacent said first-named end of said chamber, a deflector in said chamber slanting toward said first-named end of said return pipe, an article-conveyer conveying the plated articles

through said chamber, and forced blast means projecting forced blasts of greater intensity than the currents from said blow-pipe across the path of the articles in advance of their entrance into said chamber.

6. In a drying mechanism for electro-plating apparatus, the combination of a drying chamber, means for conveying the plated articles through said chamber, forced blast means at the entrance of said chamber projecting forced blasts slantingly counter to the direction of movement of said articles, heating means in said chamber, means causing heated currents lengthwise in said chamber toward said blasts, said chamber provided with deflectors for deflecting said heated currents into contact with said heating means at a plurality of points in said chamber, and a quiet-heat chamber.

7. In a drying mechanism for electro-plating apparatus, the combination of a heated rinsing bath for rinsing and preliminarily heating the electro-plated articles, a drying chamber, a conveyer for moving the articles out of said bath and through said drying chamber, means for projecting blasts of heated air upon said articles counter to the movement thereof between said rinsing bath and said drying chamber, means causing currents of heated air of less intensity than said blasts through said chamber toward said blasts, heater pipes in said chamber, deflectors in said chamber for deflecting the currents of air against said pipes, a supplemental drying chamber, and means whereby substantially quiet-heat is in said last-named chamber.

8. In a drying mechanism for electro-plating apparatus, the combination of a heated rinsing bath for rinsing and preliminarily heating the electro-plated articles, a drying chamber, a conveyer for moving the articles out of said bath and through said chamber, means for slantingly projecting blasts of heated air upon said articles counter to the movement thereof, means for causing currents of heated air through said chamber toward said blasts, a supplemental drying chamber, and means whereby substantially quiet-heat is in said last-named chamber.

9. In a drying mechanism for electro-plating apparatus, the combination of a heated rinsing bath for preliminarily heating articles to be dried, a heating chamber, heating pipes therein at the sides and bottom thereof, a conveyer for the rinsed articles, means projecting heated blasts against the articles from both sides of the articles in opposite directions and from the bottom of the articles, said heated blasts slanting upwardly and counter to the direction of movement of said articles, said conveyer moving said articles between said blasts and between said heating pipes at the sides of said chamber and above said heating pipes at the bottom of said chamber, means for causing currents of heated air of less intensity than said blasts in said chamber counter to the direction of travel of said articles, deflectors at the sides of said heating chamber deflecting said currents across said articles into contact with the heating pipes at the opposite side of said chamber, and a supplemental quiet-heat drying chamber through which the articles are conveyed by said conveyer.

10. In a drying mechanism for electro-plating apparatus, the combination of article-supports arranged for supporting the plated articles, means for suspending and causing travel of said article-supports, a blast chamber, a heated-current chamber, guiding means for laterally steadying said article-supports, means causing blasts in said blast chamber against the articles from a plurality of directions, and means causing heated currents in said heated-current chamber counter to the direction of movement of said articles, said last-named currents being of less intensity than said blasts.

11. In a drying mechanism for electro-plating apparatus, the combination of a heated rinsing bath for rinsing and preliminarily heating the plated articles, a conveyer for conveying said plated articles, article-carriers suspended therefrom comprising suspension-shanks, a heating chamber having an upper slot through which said shanks move, means in said chamber causing heated blasts against said articles from a plurality of directions and toward said slot for blowing the drops and tears from said articles, and means causing currents of heated air counter to the direction of movement of the articles, said last-named currents being of less intensity than said blasts.

12. In a drying mechanism for electro-plating apparatus, the combination of a blast chamber, a heated-current chamber, and a quiet-heat drying chamber, an article conveyer comprising suspension shanks, the tops of said chambers having slots through which said suspension-shanks move, means for directing heated blasts against a plurality of sides of said articles in said blast chamber toward the slot therein and in directions slantingly counter to the movement of said articles, means for causing heated currents in said heated-current chamber in directions counter to the direction of movement of the articles, said heated blasts and heated currents being of different intensities, and heating means for said quiet-heat drying chamber.

13. In a drying mechanism for electro-plating apparatus, the combination of a blast chamber, a heated-current chamber, and a quiet-heat drying chamber, an article conveyer comprising suspension-shanks, the tops of said chambers provided with slots

through which said suspension-shanks move, means for directing heated blasts against a plurality of sides of said articles in said blast chamber toward the slot therein in directions slantingly counter to the movement of said articles, means for causing heated currents in said heated-current chamber in directions counter to the direction of movement of the articles, and deflectors in said heated-current chamber for directing said heated currents crosswise of said articles from side to side of said heated-current chamber, said heated blasts and heated currents being of different intensities, and heating means for said quiet-heat drying chamber.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

MICHAEL F. DAVORAN.

Witnesses:
MAURICE STEINBERG,
THERESA M. SILBER.