

May 2, 1944.

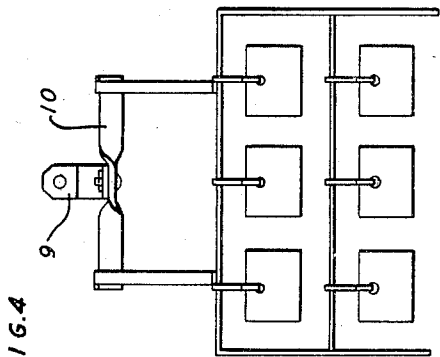
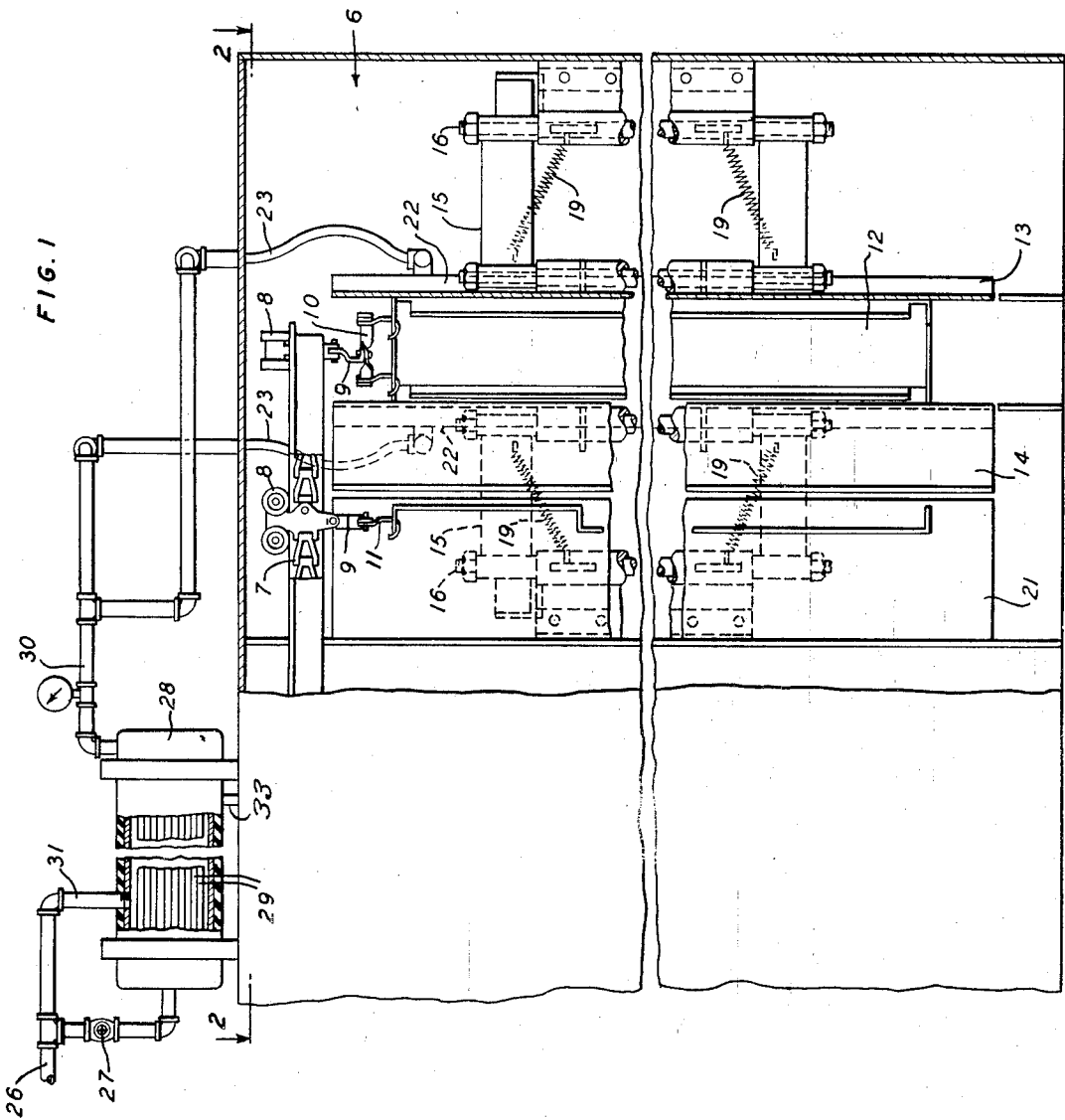
F. D. JOHNSTON ET AL

2,347,781

DRYING APPARATUS

Filed Aug. 23, 1941

2 Sheets-Sheet 1



INVENTORS
F. D. JOHNSTON
S. S. SHERRILL

BY *E. H. Lang*
ATTORNEY

May 2, 1944.

F. D. JOHNSTON ET AL

2,347,781

DRYING APPARATUS

Filed Aug. 23, 1941

2 Sheets-Sheet 2

FIG. 2

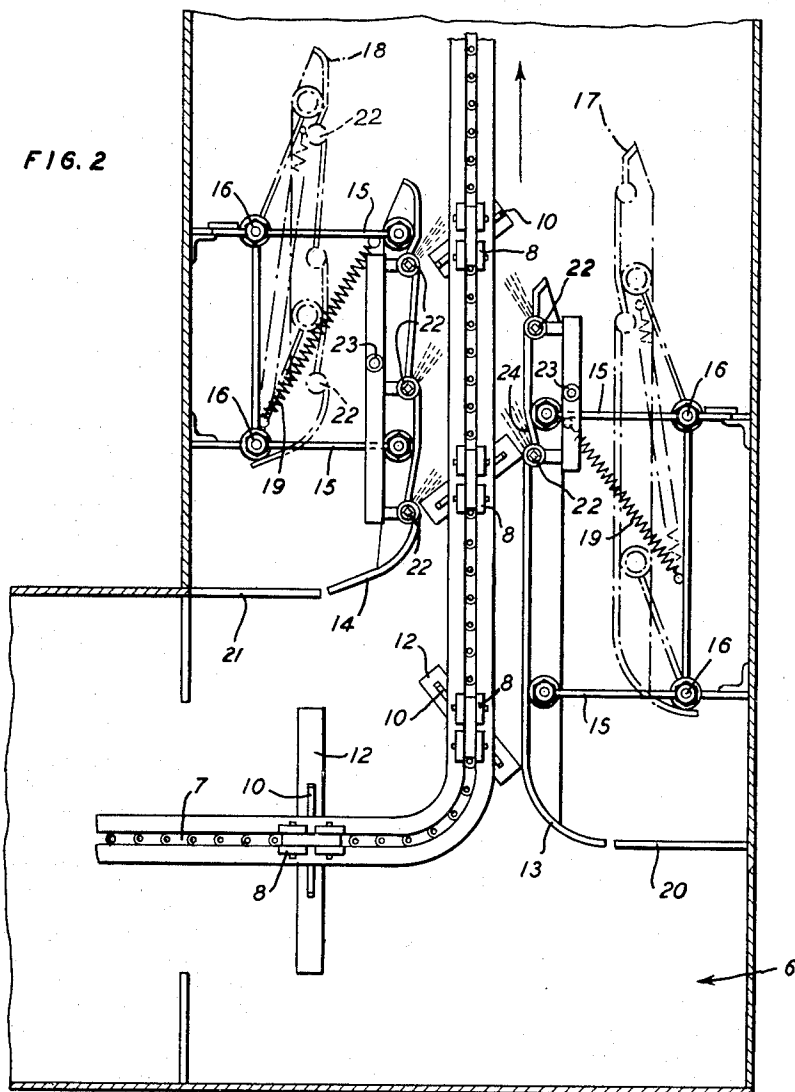
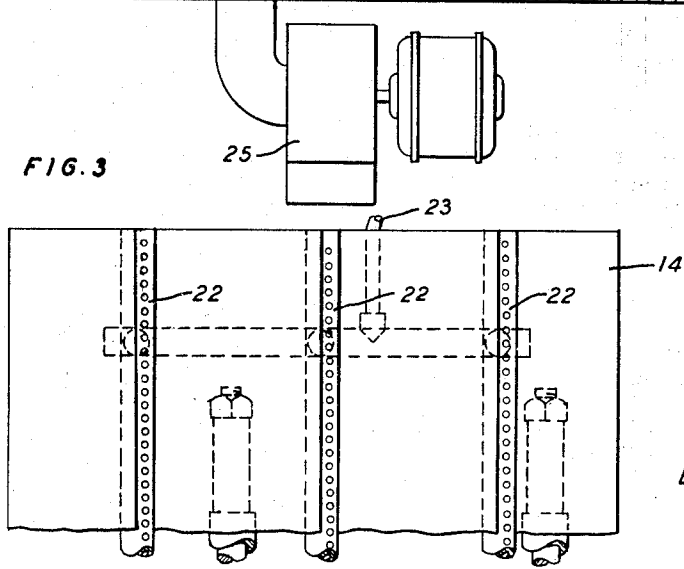


FIG. 3



INVENTORS

F. D. JOHNSTON

S. S. SHERRILL

BY

E. H. Nantz

ATTORNEY

UNITED STATES PATENT OFFICE

2,347,781

DRYING APPARATUS

Fred D. Johnston, Towson, and Sloan S. Sherrill,
Baltimore, Md., assignors to Western Electric
Company, Incorporated, New York, N. Y., a
corporation of New York

Application August 23, 1941, Serial No. 408,014

11 Claims. (Cl. 34—232)

This invention relates to a drying apparatus and more particularly to an apparatus for drying articles preparatory to paint spraying them.

In order for paint applied by spraying to effectively adhere to metallic articles, it is essential that the articles be thoroughly cleaned and dried before the paint is applied.

Many metallic articles are cleaned with a water spray before they are painted, and the removal of the film and drops of water that cling to the articles after they have been sprayed has been a difficult problem. Frequently, even after prolonged drying by the usual methods, the crevices, corners and angular surfaces of the articles had drops of water retained therein. As a result, the subsequently applied coating of paint was often defective.

An object of the invention is to provide an apparatus for effectively drying articles.

In accordance with one embodiment of the invention, an apparatus is provided having means for generating and applying super-heated steam to articles with a sweeping action and at close range, the articles being moved through a narrow path formed by two walls which may move apart to prevent jamming of the articles.

A complete understanding of the invention may be had by reference to the following description, taken in conjunction with the accompanying drawings, in which

Fig. 1 is a vertical sectional view of an apparatus embodying the invention;

Fig. 2 is a fragmentary sectional view of the apparatus taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary view of a movable wall used in the apparatus; and

Fig. 4 is a detailed view of an article supporting rack which may be employed in the apparatus.

Referring now more in detail to the drawings, a drying chamber 6 is shown through which articles that have been washed and are to be dried are carried on a conveyor 7, which moves in the direction of the arrow in Fig. 2. The conveyor comprises a plurality of rollers 8—8 carrying links 9—9 which have pivotal connections with a plurality of crossbars 10—10, from which hooks 11—11 are suspended for carrying articles 12—12 through the drying chamber. The articles to be dried are carried through a narrow path defined by walls 13 and 14. Each of these walls is supported on arms 15—15, which are pivotally connected at the ends thereof to the walls 13 and 14 and at the opposite ends thereof to fixed pivotal points 16—16 so that the walls 13 and 14 may be moved to the positions shown at 17 and 18, re-

spectively, when an article tends to jam between the walls. The walls are returned to their normal positions by means of springs 19—19. In the normal position of the walls, the rear curved ends of the walls 13 and 14 are closely adjacent to partitions 20 and 21, respectively. Each of the walls has a plurality of vertical tubes 22—22 mounted therein, each of which is connected by means of one of a plurality of flexible hoses 23—23 to a source of super-heated steam.

Adjacent to each of the tubes 22—22 the walls 13 and 14 are inclined or set in, as shown at 24, and a vertical series of apertures is provided in each tube, forming jets from which super-heated steam is projected onto the articles to be dried. The apertures in tubes 22—22 preferably are formed therein on lines normal to the conveyor 7. The super-heated steam will strike the forward end of an article being advanced through the apparatus and cause the article to be rotated away from the jets. As a result, the steam will have a component of movement along the line of movement of an article. This positioning of the apertures permits the super-heated steam to strike the article with considerable force and also aids in imparting a sweeping action over an article being cleaned. If desired, the jets may be so positioned that the steam strikes the articles at an angle to this path of motion, but in that event some of the force of the steam is lost before it strikes the articles.

As pointed out above, the articles are supported on a conveyor in such a manner that they may rotate due to the impact of the drying medium on the article. The tubes 22—22 in the opposite walls 13 and 14 are offset or staggered so that when an article moves into the drying zone, it will first be impinged upon by a plurality of steam jets from the first tube on the left, as viewed in Fig. 2. This will cause the front end of the article to swing to the right, as seen in the figure, and the super-heated steam will sweep along the side of the article.

As the article is further advanced, it will next be impinged upon by steam from the first tube on the right, viewed in Fig. 2, which will cause the article to swing in the opposite direction. Thus, an article will be caused to oscillate to and fro as it passes the steam jets, causing all parts of the article to be exposed to the super-heated steam and the steam to pass over the article with a sweeping action.

In the event that an article is so positioned that it would jam between the walls if the walls were unyielding, the walls will move outwardly momen-

tarily to expand the path and allow the article to continue in its course. In this manner, the steam jets may be made to operate in close proximity to the articles by confining the articles to a narrow path and, at the same time, jamming of the articles is prevented.

There is, however, an additional advantage in providing a narrow path for the articles to traverse. The outlet end of the chamber 6 may communicate with a paint spraying booth or the atmosphere. In either event, it is desirable to have as little of the steam as possible escape from the outlet end of the apparatus. For this reason, an exhaust fan 25 is provided to draw just enough of the atmosphere out of the chamber 6 to prevent steam from escaping from the outlet end of the chamber. The provision of a narrow path for the articles to pass through requires a smaller volume of air to be drawn out by the fan 25 to prevent the escape of steam.

Fig. 4 illustrates a modified form of rack which may be used for suspending a plurality of articles from a single link 9.

It has been found that super-heated steam has a decidedly better drying property than saturated steam. In order to avoid the necessity for a separately fired super-heater, a source of high pressure steam (not shown) is used to supply a steam inlet 26. This high pressure steam may have a pressure of approximately 225 pounds per square inch, and it will consequently have a temperature of about 397° F. This pressure is higher than is necessary or desirable for the drier, and the steam is therefore passed through a reducing valve 27 and thence through a heat exchanger 28 in which the reduced pressure steam passes through a plurality of tubes 29—29 to an outlet pipe 30.

A certain amount of steam may be passed without reduction in pressure through a pipe 31 into the space surrounding the tubes 29—29 of the heat exchanger 28 to impart a certain amount of super-heat to the steam under reduced pressure in the heat exchanger tubes. An outlet 33 formed in the bottom of the heat exchanger 28 drains off the water formed by the condensation of the high pressure steam. If, for instance, the pressure of the steam introduced into the tubes 29—29 is reduced to 115 pounds per square inch, the steam at this pressure would have a temperature of 347° F. and the steam used in the cleaning and drying apparatus would be super-heated.

By employing super-heated steam, there is no tendency for the steam to condense upon the articles being dried. By causing the jets of steam to travel along the surfaces of the articles, drops of water which may be thereon are swept off by the force of the steam. In consequence, articles of intricate shapes may be thoroughly dried without having drops of water retained in the corners or crevices, or on horizontal surfaces thereof.

It will be understood that the nature and embodiment of the invention herein disclosed is merely illustrative and that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a drying apparatus, a pair of walls forming a narrow path for articles to be dried, a conveyor for carrying articles through the path, means for movably supporting one of the walls so that said wall may be moved by an incorrectly positioned article carried by the conveyor to lat-

erally expand the path and thereby prevent damage to the article or the wall, resilient means for returning the wall to its original position, and means for projecting a drying medium upon the articles.

2. A drying apparatus comprising means for conveying articles to be dried including swivel supports for the articles, a pair of movable walls defining a narrow path for the articles, said walls being movable to expand said path to prevent jamming of the articles between the walls, and means for projecting a drying medium onto said articles.

3. A drying apparatus comprising means for conveying articles to be dried including swivel supports for the articles, a pair of movable walls defining a narrow path for the articles, said walls being movable to expand said path to prevent jamming of the articles between the walls, and means mounted in said walls and movable therewith for projecting a drying medium onto said articles.

4. In a drying apparatus, a conveyor for carrying articles horizontally along a path including means to pivotally support the articles, and a plurality of vertical series of drying jets spaced a predetermined distance along each side of said path so that the series of jets on one side of the path are staggered with respect to the other series of jets on the opposite side of the path to cause the articles passing along the path to pivot to and fro about a vertical axis and thereby to provide a sweeping action of the drying medium over the articles.

5. A drying apparatus comprising a chamber, resiliently movable walls defining a normally narrow path in said chamber, a conveyor for carrying articles along said path, means for projecting steam on the articles to dry the articles, and exhaust means for withdrawing air from said chamber to prevent the escape of steam from the outlet end of said path, the normally narrow path reducing the amount of air required to be exhausted.

6. A drying apparatus comprising a drying chamber, means for projecting superheated steam on articles to be dried, and means to supply superheated steam to the steam projecting means, which latter means includes a high pressure steam supply pipe, a series of superheating tubes, a pipe leading from the high pressure steam supply pipe and connected to said tubes to convey a portion of the high pressure steam directly into the tubes, means for reducing the pressure of that portion of the high pressure steam which is introduced into the tubes, a chamber surrounding the tubes, and a second pipe connected to the supply pipe to convey the balance of the high pressure steam to the last mentioned chamber whereby the reduced pressure steam passing through the superheating tubes is superheated.

7. In a drying apparatus, a pair of movable walls forming a path for articles to be dried, a conveyor for carrying articles along the path, and a plurality of pivotally mounted arms supporting the walls at spaced intervals to permit the walls to move along with and away from incorrectly positioned articles carried by the conveyor.

8. In a drying apparatus, a pair of walls defining a narrow drying zone, a conveyor provided with means for pivotally supporting and carrying articles to be dried through the drying zone, means for movably supporting one of the walls whereby that wall may be moved by an incor-

rectly positioned article carried by the conveyor to expand the drying zone and thereby prevent damage to the article or the wall, resilient means for urging the wall toward a normal operative position, and means mounted on and movable 5 with the movable wall for projecting a drying medium upon the articles carried through the drying zone by the conveyor.

9. In a drying apparatus, a conveyor for carrying articles to be dried including means to pivotally support the articles to be dried, a pair of walls which in their normal positions define a drying zone of predetermined dimensions through which the articles are carried by the conveyor, a plurality of pivotally mounted arms supporting 10 the walls at spaced intervals to permit movement of the walls from their normal positions, and a plurality of vertical series of jets formed in and movable with the walls for projecting a drying medium upon the articles, each of which series 15 of jets is staggered along the longitudinal axis of the conveyor with respect to the series of jets in the opposite wall to cause the articles to oscillate while passing through the zone defined by the walls. 20

25

10. In a drying apparatus, a plurality of walls defining a narrow drying zone, a conveyor to carry articles to be dried through the drying zone, means for movably supporting one of the walls whereby said wall may be moved by an incorrectly positioned article carried by the conveyor without damage to the article, and resilient means for urging said wall toward a normal operative position adjacent to the path of travel of the conveyor.

11. In a drying apparatus, a plurality of vertical walls defining a narrow drying zone, a conveyor to carry articles to be dried through the drying zone, means for movably supporting the walls so that the walls will yield when engaged by an incorrectly positioned article carried by the conveyor and thereby prevent damage to the article or the wall, resilient means urging the walls toward a normal operative position adjacent to the path of travel of the conveyor, and means 20 mounted on the movable walls and movable therewith to project a drying medium on the articles carried by the conveyor.

FRED D. JOHNSTON.
SLOAN S. SHERRILL.