

W. A. FAIRBURN.

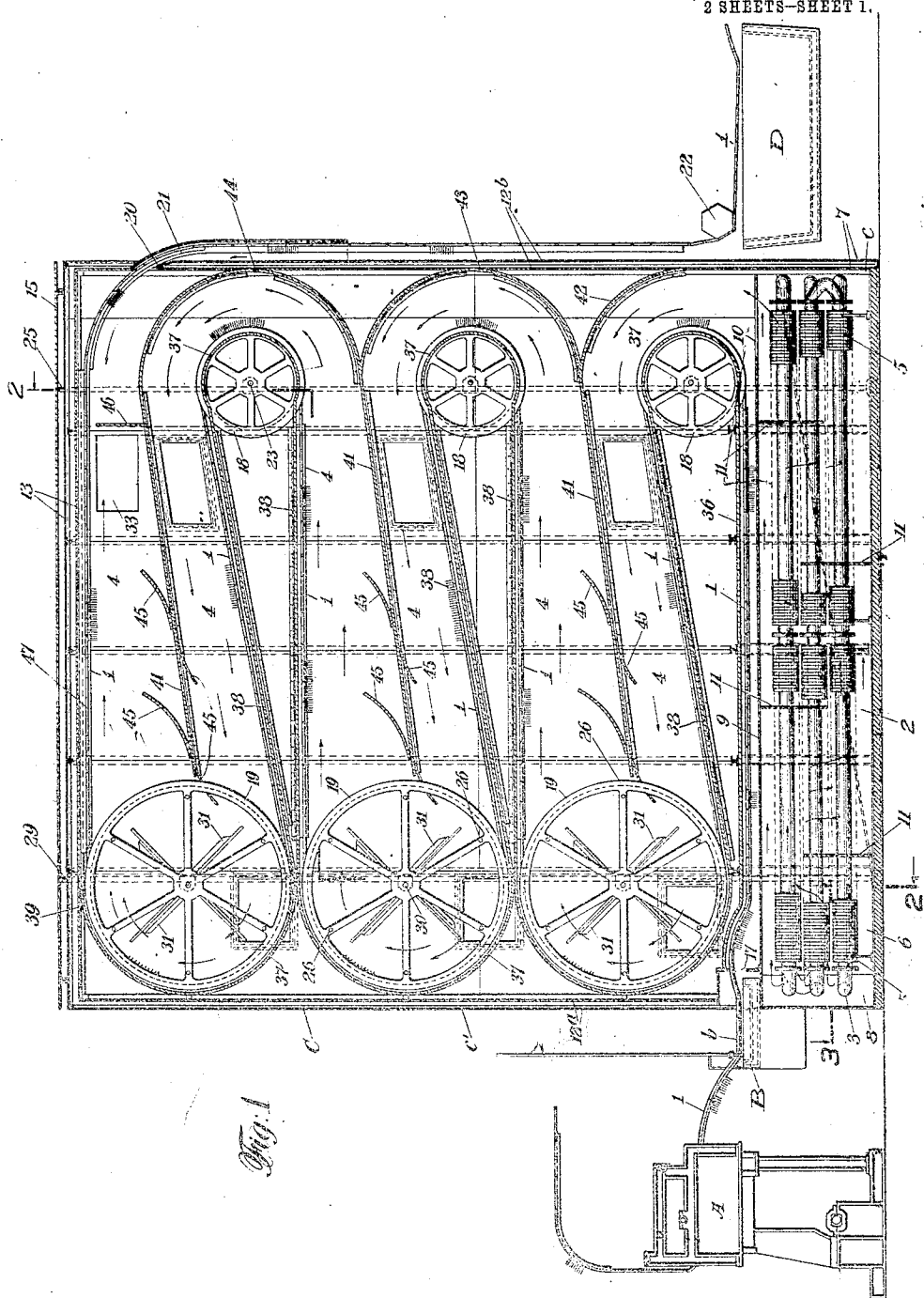
SPLINT DRYING MEANS FOR MATCH MACHINES.

APPLICATION FILED APR. 11, 1912.

Patented Nov. 12, 1912.

1,044,155.

2 SHEETS-SHEET 1.



Witnesses:
M. B. Goeney
Charles A. Mead

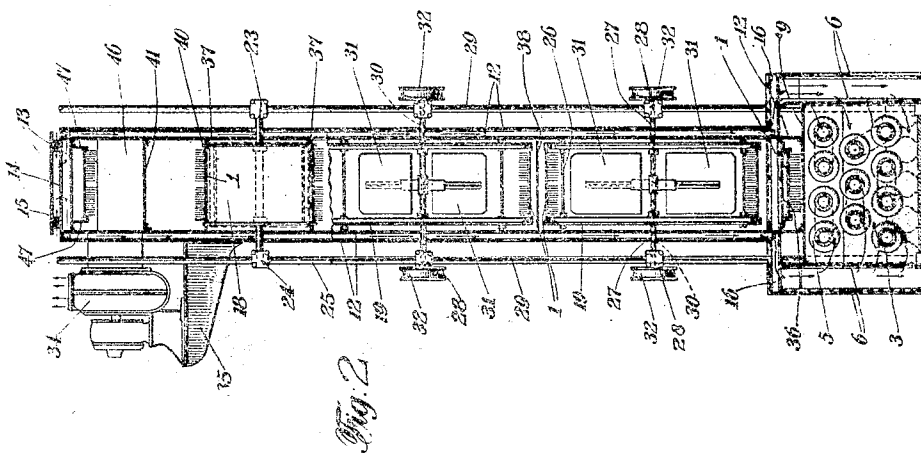
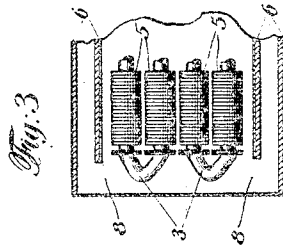
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2 SHEETS—SHEET 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. FAIRBURN, OF SHORT HILLS, NEW JERSEY, ASSIGNOR TO THE DIAMOND MATCH COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SPLINT-DRYING MEANS FOR MATCH-MACHINES.

1,044,155.

Specification of Letters Patent.

Patented Nov. 12, 1912.

Application filed April 11, 1912. Serial No. 696,145.

To all whom it may concern:

Be it known that I, WILLIAM A. FAIRBURN, a citizen of the United States, and resident of Short Hills, in the county of Essex and State of New Jersey, have invented certain new and useful Splint-Drying Means for Match-Machines, of which the following is a specification.

This invention relates to splint-drying means for match machines, and more especially for that class known as continuous machines wherein is employed an endless carrier chain into which the splints are progressively set in parallel rows and thereby transported through the match making path, including the paraffin and head-composition stations. In one type of such machines the splints are cut row by row from blocks of wood, and as rapidly as they are cut the splints are inserted into the carrier chain, and in another type, previously-cut splints are transferred row by row from a hopper or magazine to the said chain.

The principal object of my invention is to provide, in a continuous match machine, a novel construction and organization of mechanism whereby the splints, when the carrier leaves the inserting station and before they are subjected to the paraffin treatment, can be impregnated with a chemical solution of a nature to preclude the glowing of the splints after they, as finished matches, have been lighted and blown out, and whereby the wet impregnated splints shall be rapidly and efficiently dried in order to prepare them to take the paraffin.

In the particular form of embodiment of my invention which I have herein selected for illustration I arrange between the splint inserting station and the paraffin reservoir of a match machine, an impregnating tank and a drying structure, which latter is constructed to receive the traveling chain and its wet impregnated splints and therein subject the splints progressively to the influence of radiated heat, hot air, and air containing a low percentage of humidity, in such a manner that the splints are rapidly and efficiently dried preparatory to the paraffining operation, as will be hereinafter particularly described and claimed.

While I shall herein point out in detail the structural features of the form of apparatus which I have shown in the annexed

drawings, it is to be understood that my invention is not restricted to the precise details of construction to which reference may be made, as the mechanism may be variously modified without departure from the fair spirit of the invention. It is to be understood also that the term "paraffin" is used herein in a descriptive sense merely, and that in lieu of paraffin any vehicle for the efficient transmission of the flame from the igniting material, comprising the head, to the body of the splints, may be employed.

In the drawings—Figure 1 is a sectional elevation of a portion of a match machine equipped with a drying structure embodying my invention, said structure being shown in longitudinal vertical section. Fig. 2 is a transverse vertical section, as on the line 2—2 of Fig. 1. Fig. 3 is a transverse horizontal section through the front end of the heating chamber, as on the line 3—3 of Fig. 1.

1 indicates a portion of an endless carrier chain into which the splints are inserted in consecutive rows at the station A, and are thus transported in spaced relation to each other through the match making path. The chain herein illustrated is of the perforated plate variety, but of course any suitable carrier by means of which the splints are spaced and held, row by row, may be employed.

B indicates a tank arranged in rear of the inserting station and adapted to contain a chemical solution into which the depending splints on the chain are submerged or dipped to a depth and for a period sufficient to accomplish the efficient impregnation of the splints; the chemicals being of such a nature as to impart the nonglowing property to the splints. The tank is supported in any suitable manner below the route of the chain, and the track for the latter is appropriately constructed (as at b) to effect the depression of the traveling plates toward the tank so as to dip the splints to a sufficient depth in the impregnating solution, then guide the plates above the top of the tank to maintain the splints for a sufficient period in the solution, and then raise the plates to withdraw the splints from the solution and permit the progress of the chain with its impregnated splints.

C is a splint drying structure immediately succeeding the impregnating tank, which

structure is so constructed and organized that the traveling chain carrying the impregnated splints is efficiently directed there-through preparatory to the passage of such splints to and over the usual paraffin-containing reservoir D.

The drying structure, which I shall now proceed to describe in detail, is of such character, and the chain is so supported and guided therein, that the impregnated splints are exposed for a prolonged period to the influence of radiated heat, and a continuous current of heated air and air of low humidity, which not only progressively and efficiently evaporate the solvent from the splints but rapidly carry off the vapor to a point of discharge. In the present instance this structure comprises a basal casing (c) of appropriate shape and size which affords an extended horizontal heating chamber 2 within which, longitudinally thereof, is supported a circulating pipe system 3 adapted to be supplied with steam or other heating agent from a suitable source; and a superposed casing (c') communicating with said chamber and providing a sinuous conduit 4 through which the carrier chain is impelled concurrently with highly heated air flowing from the chamber. The coils of the pipe system are preferably provided throughout their length with solid metal rings 5 in order to increase the heat radiation.

The basal casing includes the spaced side walls 6 and spaced rear end wall 7, the latter being extended upward to constitute the rear end wall of the upper casing. The inner side walls are foreshortened at their forward ends to afford communication, as at 8, between the chamber 2 and the spaces (which constitute air ducts) between the adjacent walls of the structure. The roof of the heating chamber comprises a plate 9 which is supported directly above the system of pipes 3 so as to present an extended heat radiating surface throughout the length of the chamber; the rearward end of the plate being foreshortened, or otherwise provided with an opening, as 10, to permit the escape of the heated air from that end of the chamber, the fresh air being introduced at the front of the latter. At intervals throughout the length of the chamber are preferably arranged vertical baffle plates 11 which direct the air in an undulating path through the chamber and in efficient contact with the pipes in order to insure the heating of the air to a high degree in its passage from the front to the rear of the chamber. In the present instance there are four alternating baffle plates 11, of which two rise from the bottom of the chamber and two depend from the top plate 9; but, of course, the number and arrangement of these plates may be varied as occasion may require.

The upper casing (c') includes the spaced side walls 12; the spaced front wall 12^a; the spaced rear wall 12^b comprised by the upward extensions of the end walls 7 above referred to, and the spaced top 13, the spaces between the respective parts being in open communication with each other. The outer top portion 13 is provided with a longitudinal slot 14 to permit the free ingress of the external air to the wall spaces, and a plate or shield 15 is preferably arranged above and throughout the length of the slot in order to prevent the entrance therein of foreign bodies.

The upper casing in the form herein illustrated is of less width than the basal structure, and the inner side walls 12 of the former are extended down upon and secured to the heating plate 9; the outer side walls terminating upon the top of the basal structure. The top of the latter, at the sides of such outer walls, comprises spaced or jacketed portions 16 which communicate with the wall spaces of the upper and lower casings, and thus establish complete intercommunication of the respective air ducts or passages.

The forward end of the structure, directly above the plane of the heating plate 9, is illustrated as recessed to receive and support the rearward end of the impregnating tank, but, if desired, this tank may be located at some distance from such structure. The forward end of the structure is provided with an entrance, as at 17, for the carrier chain and its trackway. This trackway is extended into the structure adjacent to and substantially parallel with the heating plate, whereby the depending splints, immediately after their removal from the impregnating tank, are carried into the structure in a longitudinal path directly above the heating plate and are thus subjected to the direct drying action of the radiant heat from said plate. Thence the chain passes partially around a small guide wheel 18 within the lower portion of the rearward end of the upper casing; thence to and partially around a larger wheel 19 within the forward part of such casing; thence to and around a smaller wheel 18 within the rearward portion of the casing, and so forward and back to and about alternate large and small wheels until a sufficient length of travel of the chain within the upper casing has been had. The chain finally passes outwardly through an opening, as 20, in the upper portion of the rear end of the structure, and is at that point supported and guided preferably by a suitable trackway 21 which deflects the chain downward toward the reservoir D containing the liquid paraffin. At or adjacent the forward end of this reservoir is preferably arranged a roller 22 about which the chain is turned and thereby directed in a horizontal path above the par-

affin reservoir in order that during the travel of the chain the rows of depending splints thereon can be properly dipped in the contents of the reservoir preparatory to their passage to the usual head-composition applying station or stations in the route of the chain.

As herein illustrated the smaller guide wheels 18 are arranged at the rear and the larger guide wheels at the front of the structure, the smaller wheels receiving and supporting the back of the chain so as to cause the splints to radiate outwardly, and the larger wheels receiving and supporting the front of the chain to cause the splints to project inwardly. The smaller wheels are ordinary flanged wheels mounted on shafts 23 which extend transversely of the structure, through the side walls thereof, and are supported by bearing blocks 24 on vertical posts 25 exteriorly of the structure. The larger wheels each comprise a pair of peripherally flanged side members which are connected by cross bolt-rods 26, such members being adequately spaced to receive and support the edges of the carrier chain while permitting the unobstructed passage of the inwardly-projecting splints. Each of the wheels 19 is loosely mounted on tubular stubs 27 which extend through the side walls of the structure and are supported by bearing blocks 28 on exterior vertical posts 29. Extending through the stubs is a shaft 30 from which radiate within the wheel a series of arms carrying blades or vanes 31 which are adapted to be rotated similarly to the vanes of a fan, the outer end or ends of the shaft 30 being provided with a pulley or pulleys 32 which are driven from a suitable source of power. Each of the larger wheels is provided with one of these fan devices, and all the fans are simultaneously driven in the same direction, that is, in the direction of travel of the chain about the respective wheels 19, for a purpose which will presently appear.

Within the structure is provided the sinuous conduit 4 above referred to through which the chain passes during its travel from the inlet 17 to the exit 20, such conduit including the space directly above the heating plate and communicating by way of the opening 10 in the latter with the heating chamber 2. The top or terminal branch of this conduit is provided with an outlet 33 leading to an exhaust fan 34 which is supported exteriorly of the structure, as on the bracket 35, whereby during the operation of the fan a current of air is drawn into and through the heating chamber 2 and therefrom progressively into and throughout the entire length of conduit until finally discharged at the fan.

The conduit is so constructed and arranged that the air in its passage there-

through is concentrated and deflected upon the splints in a manner to avail of its maximum drying efficiency, which result is contributed to by the rotating fans, whereof the blades 31 sweep the advancing air outwardly and upwardly to insure a wide diffusion thereof in the region of the larger guide wheels.

In the present instance the conduit comprises, in connection with the inner side walls of the upper casing, a plate structure which is arranged directly above and parallel, or substantially so, with the heating plate as indicated at 36; and then curved and extended correspondingly with the forward and backward path of the carrier, as at 37 and 38 respectively, and finally terminated at the top of the upper casing, as at 39, adjacent the uppermost large guide wheel 19. The sinuous partition thus constituted by the plate structure is so arranged that the back of the traveling chain lies adjacent thereto in order that the splints carried by the chain shall always project away from the proximate top or bottom wall, as the case may be, of the conduit. The curved portions of the plate structure adjacent the small wheels are cut away, as at 40, to permit the peripheral portions of the wheels to pass therethrough and support the chain.

The spaces between the successive longitudinal sections of the plate structure are divided into two passages by longitudinally disposed partition plates 41 which extend from a point adjacent the peripheries of the larger wheels 19 to a point midway, or substantially so, between the succeeding smaller wheels 18. The rearward portion of the lowermost partition, is provided with a downwardly curved wall 42 which terminates at the rear end wall of the structure so as to produce a passage through which the heated air is directed from the heating chamber; such portion of the lowermost partition is connected with the next succeeding portion by a curved wall 43, and such latter partition is connected with the next upper portion by a similar wall 44; the whole affording a series of intercommunicating passages corresponding with the sinuous course of the carrier, and properly proportioned as regards area and air velocity. It is to be noted that the < shaped passages formed between the adjacent longitudinal sections 38 of the conduit, constitute dead-air chambers which, so to say, insulate the outer walls of the successive passages of the conduit and insure therein the maximum drying efficiency of the current.

The partitions 41 are preferably provided on their upper and lower sides with inclined baffle plates 45 which are so constructed and located as to deflect the air toward and into intimate contact with the opposing splints

as they are carried through the succeeding branches of the conduit; and the uppermost partition is also provided, immediately in rear of the air exhaust opening 32, with a wall plate 46 which partially closes the discharge branch of the conduit and insures the proper flow of the air to the fan. The inner top wall of the upper casing is also preferably provided with suitably-arranged angle-bars 47 which constitute tracks upon which the carrier is supported and guided during its travel to the exit 20.

The operation of the apparatus may be briefly described as follows: Assuming the exhaust fan to be in operation, the wheel fan devices to be rotating, and the heater pipes to be supplied with steam or other agent at a high degree of heat, the external air enters the opening 14 in the top of the casing, passes along the wall ducts or passages, enters the front end of the heating chamber 2 and flows therethrough in a devious course so as to be highly heated by contact with the opposing pipes and heated surfaces. Thence the heated air enters and passes along and through the sinuous conduit, and is finally discharged at the exhaust fan. The traveling carrier chain receives the splints row by row at the inserting station and transports them to and through the impregnating solution contained in the tank B, the period and depth of immersion to insure efficient impregnation being influenced by the length and temperature of the bath, the nature of the solution used, and the speed of the chain. Thereupon the chain carries the wet splints into the front end of the drier structure and through the longitudinal chamber directly above the heating surface 9. As the latter is located over and close to the heated coils the wet splints are subjected in their travel throughout the length of the plate to the direct action of the radiant heat from the latter, thus effecting a rapid vaporization of a substantial quantity of the solvent in the splints. The splints are then impelled through the prolonged course of the conduit and therein subjected to the influence of the ascending current of hot air from the heating chamber 2, which air progressively dries the splints during their travel and rapidly expels the vapors arising therefrom; the moisture-laden air being continuously discharged by and through the exhaust fan. When the splints complete their journey through the structure they are effectually dried and are thus in proper condition for treatment with the contents of the paraffin tank. The walls of the drying structure are provided with suitably located openings and doors whereby access may be readily had thereto at various points.

Reclaim—

45 1. In splint drying means for a match

machine having a splint carrier chain; a casing, a heat radiating member therein, means for guiding the carrier chain through said casing with the splint bearing face of the chain adjacent said member, and means for establishing a current of air in said casing.

2. In splint drying means for a match machine having a splint carrier chain, a structure comprising an air-heating chamber, means for supplying air to said chamber, a conduit communicating with said chamber and receiving the heated air therefrom, means for guiding the carrier chain through said conduit, and propellers arranged at intervals within the conduit for agitating and diffusing the heated air during its passage through the conduit.

3. In splint drying means for a match machine having a splint carrier chain, a casing, an air-heating chamber therein, a sinuous conduit communicating with said chamber, means for guiding the carrier chain through said conduit, and means whereby air is caused to flow through said chamber and conduit, said last-named means including propellers arranged at intervals within the conduit.

4. In splint drying means for a match machine having a splint carrier chain, a casing, an air-heating chamber therein, a sinuous conduit communicating with said chamber, a series of wheels arranged at the bends of said conduit and adapted to support and guide the chain throughout the conduit, and means whereby air is caused to flow through said chamber and conduit, said last-named means including propellers arranged at intervals within the conduit.

5. In splint drying means for a match machine having a splint carrier chain, a conduit for the said chain, guide wheels for the chain within the conduit, and air propelling fans within said wheels.

6. In splint drying means for a match machine having a splint carrier chain, a conduit for the said chain, guide wheels for the chain within the conduit, plates arranged in said conduit to deflect the air against the splint bearing face of the carrier, and means whereby a current of air is caused to flow through said conduit.

7. In splint drying means for a match machine having a splint carrier chain, a casing, a heater chamber therein, a longitudinal superposed chamber, a heat radiating plate between said chambers, and means for guiding the carrier chain through said latter chamber so that the splint-bearing face thereof will travel adjacent the heat radiating plate.

8. In splint drying means for a match machine having a splint carrier chain, a casing, a heater chamber therein, a longitudinal superposed chamber, a heat radiating plate between said chambers, a conduit con-

stituting a continuation of said superposed chamber and having communication with the heating chamber, and means for guiding the carrier chain through the superposed chamber and the conduit.

9. In splint drying means for a match machine having a splint carrier chain, a casing, a longitudinal air-heating chamber therein, a system of heater coils in said chamber, a longitudinal superposed chamber, a heat radiating plate between said chambers, and means for guiding the carrier chain through said latter chamber so that the splint bearing face thereof will travel adjacent to the heat radiating plate.

10. In splint drying means for a match machine having a splint carrier chain, a casing, a longitudinal air-heating chamber therein, a system of heater coils in said chamber, a longitudinal superposed chamber, a heat radiating plate between said chambers, a sinuous conduit constituting a continuation of said superposed chamber and having communication with the heating chamber, and means for guiding the carrier chain through the superposed chamber and the conduit.

11. In splint drying means for a match machine having a splint carrier chain, a casing, a longitudinal air-heating chamber therein, a system of heater coils in said chamber, a longitudinal superposed chamber, a heat radiating plate between said chambers, a sinuous conduit constituting a continuation of said superposed chamber and having communication with the heating chamber, means for guiding the carrier chain through the superposed chamber, and a series of alternating small and large

wheels arranged to support and guide the chain through the conduit.

12. In splint drying means for a match machine having a splint carrier chain, a casing having air ducts between the walls thereof and an air inlet at the top thereof, a basal longitudinal heating chamber with which said ducts communicate, a sinuous conduit communicating with said chamber, means for guiding the carrier chain through said conduit, and means for exhausting air from said conduit.

13. In a splint drying means for a match machine having a splint carrier chain, a casing, wheels arranged therein to support and guide the chain to a sinuous course of travel, partitions arranged within the casing to afford, in conjunction with the wheels, a series of intercommunicating passages through which the chain is directed, and also closed or dead-air spaces exteriorly of said passages, and means for establishing a current of air through said passages.

14. In splint-drying means for a match machine having a splint carrier chain, a structure comprising a conduit, means for supplying air thereto, means for supporting and guiding the carrier chain within the conduit, and means for deflecting the air against the splint-bearing face of the carrier during its travel within the conduit.

Signed at New York in the county and State of New York this 10th day of April A. D. 1912.

WILLIAM A. FAIRBURN.

Witnesses:

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B. CHANDLER SNEAD.