May 6, 1930. R. T. JOHNSTON 1,756,947

COOLING METHOD AND MECHANISM

Filed March 31, 1923 2 Sheets-Sheet 1

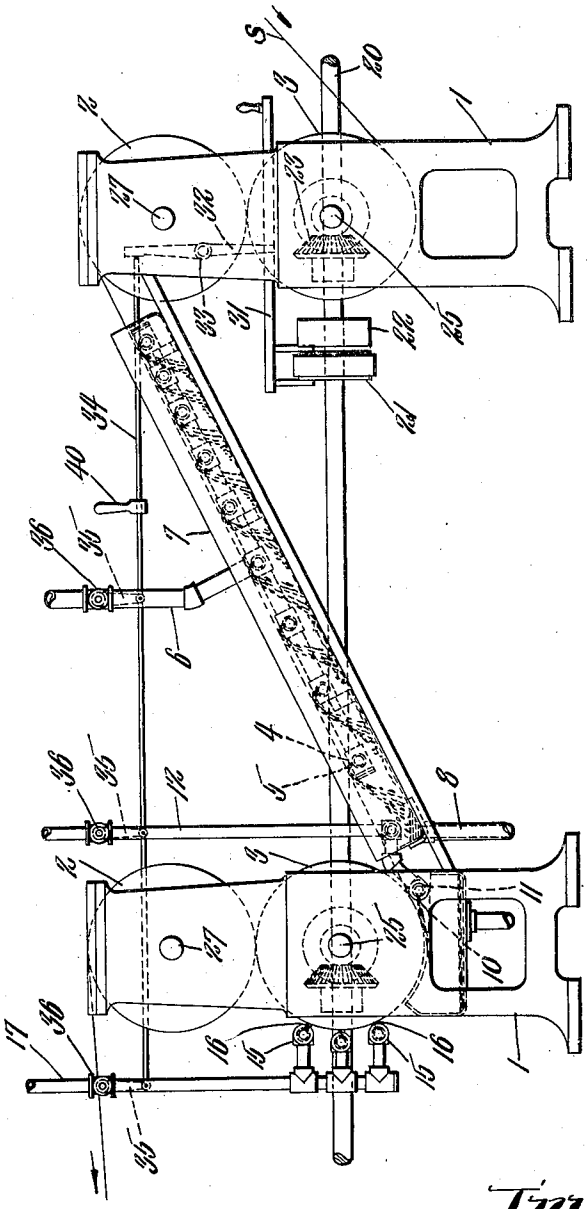


Fig. 1.

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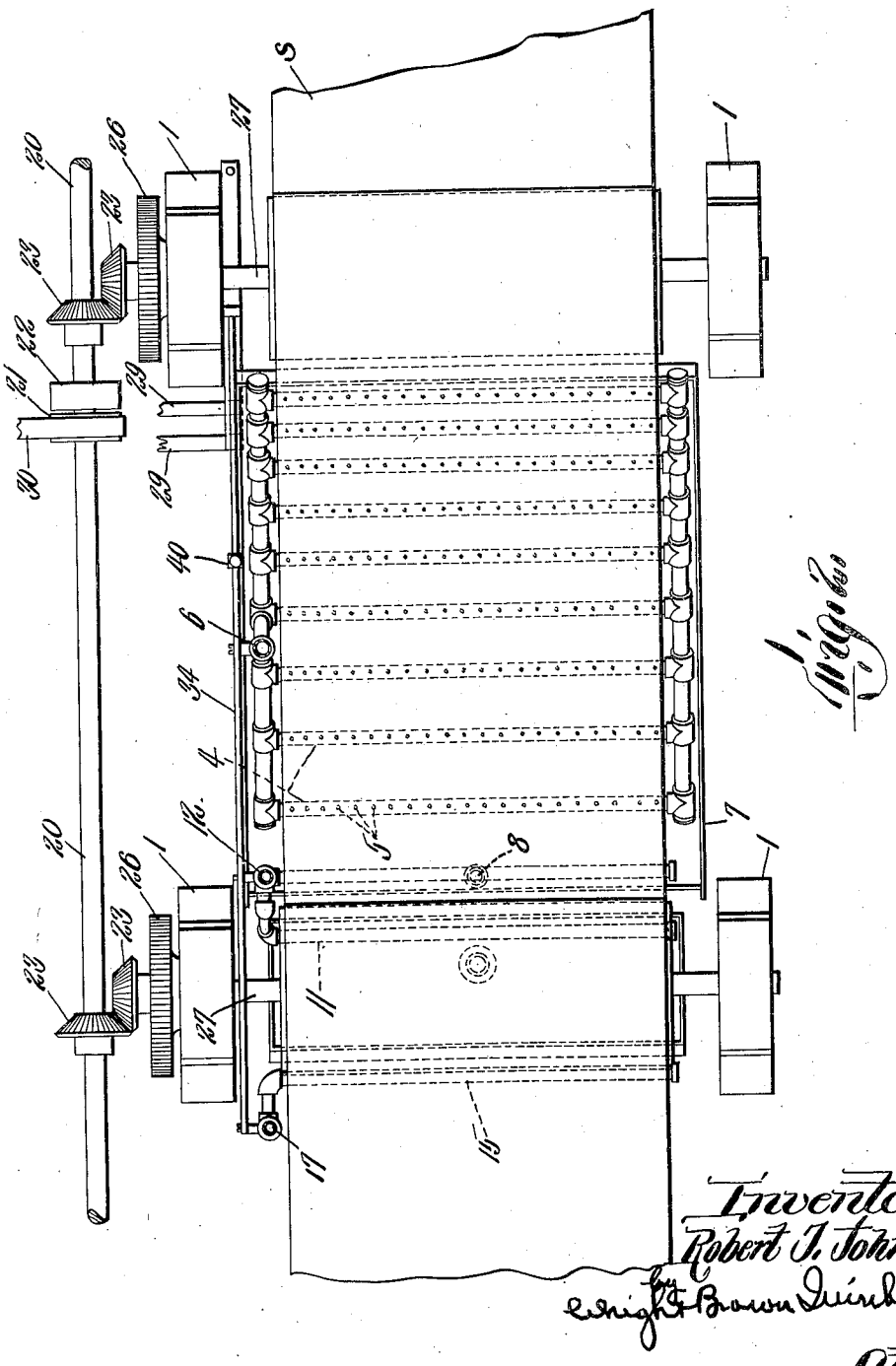


Fig. 2.

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UNITED STATES PATENT OFFICE

ROBERT T. JOHNSTON, OF NEW BRUNSWICK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PATENT AND LICENSING CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

COOLING METHOD AND MECHANISM

Application filed March 31, 1923. Serial No. 629,225.

This invention relates to a cooling method and mechanism for sheet material, having been more particularly designed for cooling asphalt roofing material as it leaves the saturating, coating and surfacing mechanisms preparatory to cutting it into the desired shapes to produce the finished product.

In the process of the manufacture of this material it is usual practice to saturate and coat fibrous sheet material with molten asphalt or similar compound and then if a slate or other granular surface is desired, to apply the surfacing material to one face of the sheet and roll it while hot and somewhat plastic to partially incorporate the surfacing therein. The material is then too soft and sticky to cut and pack for shipment and it has therefore been customary to receive the material as it comes from the surfacing mechanism and support it in a series of long festoons or loops often subjected to air currents so that it may have a chance to become cool enough for further handling before further operations are performed thereon. These festoons require considerable length and head room and a great length of material is present therein when the machine is in operation. The sheet is also unsupported over considerable lengths and is therefore quite liable to breakage. From this festooning mechanism the sheet is fed to the cutting mechanism by a manually controlled means.

The present invention provides a mechanism designed to take the place of the usual festooning mechanism and by which the cooling is rapidly effected, thus reducing the necessary size of the cooling mechanism and decreasing the length of material being treated therein. It also makes possible continuous feeding of the material to the cutting mechanism, eliminating the necessity of the manually controlled feed. The material is also properly supported during its entire travel through the cooling mechanism so that there is no danger of breakage of the sheet in transit. For this purpose a cooling liquid such as water is applied copiously to the face of the sheet and after sufficient cooling has been effected, the surplus water is blown off by an air jet and any remaining moisture evaporated by local surface impingement of superheated air or of a flame thereon, the heating of this air or flame being of such short duration that the surface heat is quickly absorbed by the body of the sheet material which is thus delivered from the mechanism in cool, dry condition.

Provision is also made by which when the machine is stopped, the supply of cooling liquid is cut off, and the blowing device and the flame device are shut off so that the material is undamaged and waste is prevented.

For a more complete understanding of this invention, together with further objects and advantageous details and combinations of parts, reference may be had to the accompanying drawings in which

Figure 1 is a side elevation of the mechanism showing the sheet material in place therein.

Figure 2 is a top plan of the same.

Referring to these figures, at 1 are shown a pair of spaced roller stands, each stand having journaled therein upper and lower feed rollers 2 and 3. Extending from adjacent the upper portion of one upper roller 2 in a downwardly inclined direction toward the lower portion of the opposite lower roller 3 is shown a series of pipes 4 which form in effect a platform over which the sheet material shown at *s* may pass, this material being passed around one of the lower feed rollers, herein shown in the right hand stand 1, then between this lower feed roller and the upper roller, and then down over the pipes 4, then beneath the left hand lower roller 3, between this roller and the corresponding upper roller 2, and then to the cutting mechanism, the direction of motion of the sheet being indicated by the arrows.

The pipes 4 are provided with upwardly directed openings or jets 5 through which cooling liquid such as water may be flowed, this liquid being supplied to the pipes 4 through a main supply pipe 6 communicating therewith. Beneath the pipes 4 is an inclined overflow tank 7 from which surplus cooling liquid may be drained through an overflow 8. By this means the lower face of the sheet material as it passes over the pipes 4 is provided with a copious supply of cooling liquid

which is flowed on to the lower face of the sheet material, the sheet being supported thereby during its traverse thereover. The parts are so designed that by the time the sheet reaches the left hand lower roller 3, as shown in Figure 1, the cooling shall have been effected to the desired extent. As the sheet then passes about the left hand lower roller 3, some of the cooling liquid will adhere thereto. For the purpose of removing said adherent liquid, a series of air jets, as shown at 10 may be employed, the air being supplied through a transverse pipe 11 adjacent the surface of the roller 3, this pipe being provided with orifices through which the air is directed against the sheet material away from the water pipes 4 and substantially tangentially to the surface of the material as it is deflected away from the air jets about the periphery of the roller. An air supply pipe 12 is connected to the pipe 11. The air blast from the jets 10 instantly removes most of the water bodily from the sheet, the water being caught in a receptacle placed beneath the roll 3 as shown in Figure 1. While the bulk of the moisture on the sheet is thus removed at once, the sheet will ordinarily retain a small residual amount of moisture adherent to or adsorbed by its surface. For the removal of this small quantity of residual moisture, the slower process of evaporation may not be sufficiently rapid, hence means may be provided for completing the drying of the sheet by rapid evaporation. As shown these comprise one or more pipes 15 arranged adjacent the periphery of the left hand roller 3 through which are a series of perforations forming jets for the passage of gas which when ignited forms flame jets 16 which impinge on the surface of the sheet material. These jets may be of any suitable form such as those commonly employed for drying ink on printing presses, and a pilot light of any suitable type may be employed for the purpose of igniting these jets when the fuel supply is turned on. A fuel supply pipe 17 connected to the jet pipes 16 is herein indicated. By means of these flame jets impinging on the material any moisture remaining thereon is quickly evaporated, and the material, somewhat tempered and made more brittle by the cold liquid restored to its rubbery consistency, the heating effect of the jets being so local as to affect only the surface of the material, the heat of which is quickly absorbed by the main body of the sheet so that as it leaves the upper roller 2 it is in cool and dry condition ready for any subsequent handling operations.

As shown the lower rollers 3 are driven to effect the feed of the sheet material through the mechanism and the upper rollers 2 may be driven therefrom if desired. For this purpose a horizontal actuating shaft 20 is herein shown having thereon tight and loose pulleys 21 and 22, respectively, by which the sheet may be connected or disconnected from any suitable main drive shaft. The shaft 20 is connected by systems of bevel gears 23 to the shafts 25 of the lower rollers 3 and these shafts may have fixed thereto gears 26 meshing with similar gears (not shown) fixed to the shafts 27 of the upper rollers 2. For controlling the rotation of the shaft 20 and consequently of the feed rollers, a belt shipper may be employed having shifter fingers 29 engaging opposite sides of the driving belt 30 and carried by a slide rod 31. This slide rod may have in engagement therewith the lower end of a lever 32 fulcrumed at 33, the upper end of this lever being adapted to impinge on a rod 34 to which are pivoted handles 35 of a series of valves 36 in the pipes 6, 12 and 17, these valves controlling the supply of cooling liquid to the pipe 4, the supply of air to the air jets 10 and the supply of fuel to the flame jets 16. When the shipper rod 31 is therefore moved to shift the belt to the loose pulley, the rod 34 is actuated to close all the valves 36. When the rod 31 is moved to shift the belt to the tight pulley the valves 36 may be opened by moving the rod 34, a handle 40 fixed thereto being shown for this purpose. Of course the pilot light for the flame jets should burn irrespective of the positions of these valves, but as this is a commonly used method of insuring the ignition of fuel when turned on, it has not been herein indicated.

Having thus described an embodiment of this invention it should be evident to those skilled in the art that many changes and modifications might be made therein without departing from its spirit or scope as defined by the appended claims.

I claim:

1. A mechanism of the class described comprising means for supporting and feeding sheet material, means for flowing a liquid against the surface of said material, means for driving said feed means, and means for simultaneously controlling said driving means and the supply of liquid to said flowing means.

2. A mechanism of the class described comprising spaced feed rollers for supporting and feeding sheet material, means intermediate said rollers for flowing a liquid against the surface of said material, means for driving said feed rollers, and means for simultaneously controlling said driving means and the supply of liquid to said flowing means.

3. A mechanism of the class described comprising a pair of spaced supporting and feeding means for sheet material, a series of pipes positioned between said feeding means and over which said material passes, said pipes having upwardly directed openings through which liquid may be flowed against the lower face of said material, and means beyond said pipes in the direction of feed for bodily removing liquid adhering to said material.

4. A mechanism of the class described comprising a pair of spaced supporting and feeding means for sheet material, a series of pipes positioned between said feeding means and over which said material passes, said pipes having upwardly directed openings through which liquid may be flowed against the lower face of said material, and a series of air jets positioned beyond said pipes in the direction of feed for bodily removing liquid adhering to said material.

5. A mechanism of the class described comprising a pair of spaced supporting and feeding means for sheet material, a series of pipes positioned between said feeding means and over which said material passes, said pipes having upwardly directed openings through which liquid may be flowed against the lower face of said material, a series of air jets positioned beyond said pipes in the direction of feed for removing liquid adhering to said material, and a flame jet positioned beyond said air jet for drying the surface of said material.

6. A mechanism of the class described comprising a pair of spaced supporting and feeding means for sheet material, a series of pipes positioned between said feeding means and over which said material passes, said pipes having upwardly directed openings through which liquid may be flowed against the lower face of said material, a series of air jets positioned beyond said pipes in the direction of feed for removing liquid adhering to said material, means for driving said supporting and feeding means, and means for simultaneously controlling said driving means, the liquid supply to said pipes and the air supply to said air jets.

7. A mechanism of the class described comprising a pair of spaced supporting and feeding means for sheet material, a series of pipes positioned between said feeding means and over which said material passes, said pipes having upwardly directed openings through which liquid may be flowed against the lower face of said material, a series of air jets positioned beyond said pipes in the direction of feed for removing liquid adhering to said material, and a flame jet positioned beyond said air jet for drying the surface of said material, means for driving said supporting and feeding means, and means for simultaneously controlling said driving means, the liquid supply to said pipes, the air supply to said air jets and the fuel supply to said flame jets.

8. A mechanism of the class described comprising means for supporting and feeding sheet material, means for flowing a liquid against one face of the material, said supporting and feeding means acting to deflect the path of said sheet material beyond said liquid flowing means away from said face, and an air jet impinging on said face substantially tangentially to said deflected path to blow adhering liquid off therefrom.

9. A mechanism of the class described comprising a pair of spaced roller stands, each having a pair of superposed rollers therein, a series of pipes forming a platform extending in an inclined direction from the upper roller of one stand to the lower roller of the other stand, said pipes having upwardly directed openings through which cooling liquid may be flowed into contact with the lower face of sheet material extending over said upper roller, over said pipes and under and partially around said lower roller, means to supply liquid to said pipes, means to receive liquid draining from said pipes and sheet material, a series of air jets directed against the lower face of said sheet material substantially tangentially of said lower roller acting to blow liquid adhering to said sheet material therefrom away from said pipes, and flame jets impinging on said face beyond said air jets.

10. A mechanism of the class described comprising a pair of spaced roller stands, each having a pair of superposed rollers therein, a series of pipes forming a platform extending in an inclined direction from the upper roller of one stand to the lower roller of the other stand, said pipes having upwardly directed openings through which cooling liquid may be flowed into contact with the lower face of sheet material extending over said upper roller, over said pipes and under and partially around said lower roller, means to supply liquid to said pipes, means to receive liquid draining from said pipes and sheet material, a series of air jets directed against the lower face of said sheet material substantially tangentially of said lower roller acting to blow liquid adhering to said sheet material therefrom away from said pipes, flame jets impinging on said face beyond said air jets, means for supplying liquid to said pipes, means for supplying compressed air to said air jets, means for supplying fuel to said flame jets, means for driving said rollers to feed the sheet material downwardly over said pipes, and means for simultaneously controlling said driving means and liquid, air and fuel supplying means to insure the discontinuing of the supply of liquid, air and fuel when the feeding of the sheet material is stopped.

11. Steps in the method of cooling a travelling sheet, which comprise applying cooling liquid to a face of the sheet, guiding the sheet so that the wetted face is the under face, and sweeping said under face with a substantially tangential air-blast.

12. Steps in the method of cooling a travelling sheet, which comprise applying cooling liquid to a face of said sheet, guiding the sheet so that the wetted face is the under face, causing said sheet in its travel to bend away

from said wetted face, and sweeping the wetted face with a substantially tangential air-blast at said bend.

13. A cooling mechanism comprising means for projecting a cooling liquid against one face only of said sheet, a guide roll, means for leading said sheet so that its unwetted face engages a substantial arc of said roll, and means for projecting an air-blast against the wetted face of said sheet substantially tangential to said roll.

In testimony whereof I have affixed my signature.

ROBERT T. JOHNSTON.