

April 19, 1932.

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1,854,192

PROCESS AND APPARATUS FOR DRYING AND IMPREGNATING SHEET MATERIAL

Filed June 1, 1929

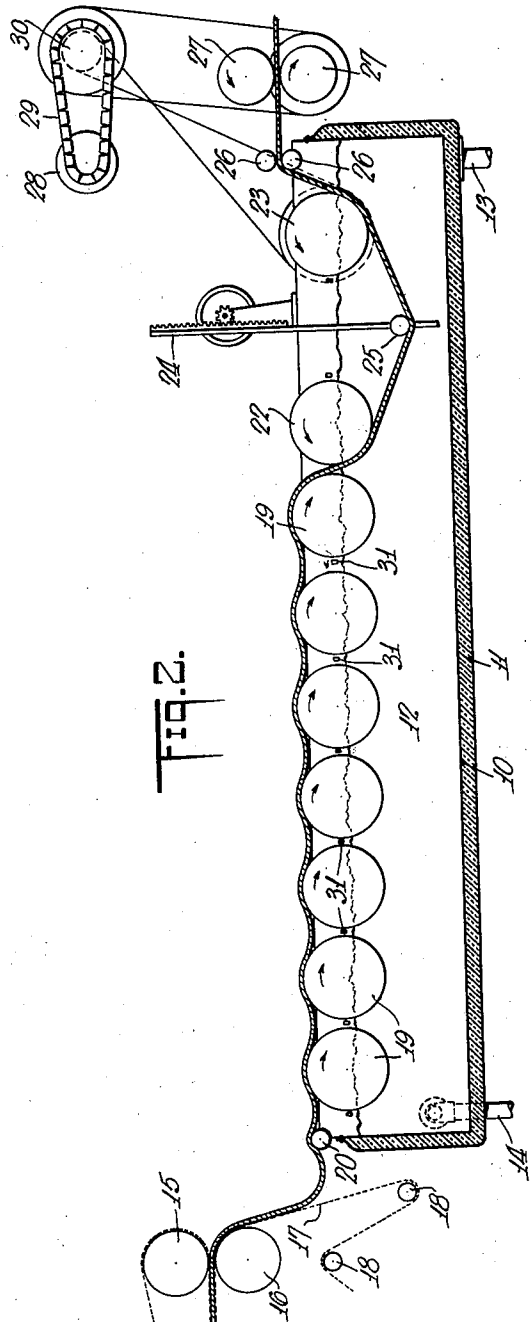
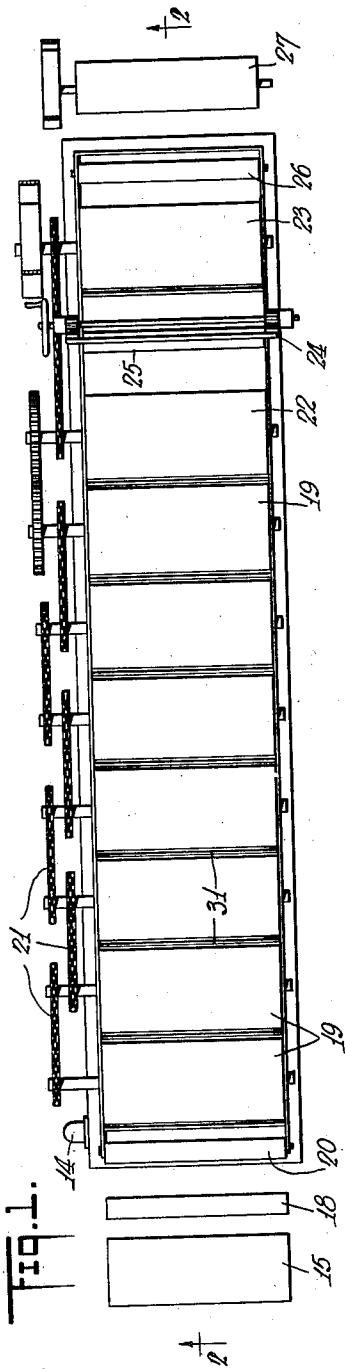


FIG. 2.

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PROCESS AND APPARATUS FOR DRYING AND IMPREGNATING SHEET MATERIAL

Application filed June 1, 1929. Serial No. 367,799.

In the usual process of impregnating sheet material, such as rag felt paper, with asphalt or similar impregnating material, it has heretofore been considered essential that the sheet material be quite thoroughly dried before it is subjected to the impregnating liquid. The impregnating is usually done by passing the sheet a plurality of times into and out of a bath of the impregnating liquid. In order to dry the sheet before it is impregnated it is common to employ a comparatively large and cumbersome apparatus involving cylinders and heating means.

The main object of the present invention is to reduce the labor and time required and reduce the labor cost by effecting the impregnating and drying substantially simultaneously.

By means of my invention continuous or semicontinuous sheets coming directly from the paper making machine may be dried and impregnated by a single operation and delivered from the apparatus as a completed product or ready for the application of crushed slate, depending upon the character of the final product.

As one important feature of my invention I first apply the impregnating liquid to only one side of the sheet and in such a manner that as it enters the sheet from this side it forces out the moisture from the opposite side. When this treatment has proceeded to a point where substantially all of the moisture has been driven out, the impregnating liquid is applied to both sides so as to thoroughly saturate the previously dried sheet.

While my invention is particularly applicable for the impregnating of rag felt paper in the manufacture of roofing, it will be understood that it may be applied to the treatment of various other wet fibrous materials in web or sheet form, and the impregnating liquid may be of any suitable kind which is not ordinarily applied in suspension or solution in water.

In the accompanying drawings I have illustrated merely one embodiment of the invention.

In these drawings:
Fig. 1 is a top plan view; and

Fig. 2 is a vertical longitudinal section on the line 2—2 of Fig. 1.

In carrying out my invention there is provided a tank 10 of a width at least equal to the width of the sheet to be treated and of suitable length depending upon the substance of the sheet and the character of the material with which it is to be impregnated. This tank preferably has a heavy insulation wall 11 to conserve the heat and it is adapted to contain a bath 12 of asphalt, tar, pitch, Mexican flux or other impregnating material which is liquid at high temperature and solid or substantially solid at normal temperature. The bath 12 may be kept heated in any suitable manner as for instance by steam coils or the like, or the material may be continuously drawn off through a pipe 13 at one end, conducted through a heating chamber, and returned to the bath through a pipe 14 at the opposite end.

The material to be treated may be delivered directly from a paper making machine, as for instance, from between a pair of feed rollers 15 and 16 and may be supported on its way to these rollers by a belt, web or carrier sheet 17 which may be continuous and which may return over rollers 18 back to the paper making machine.

Within the tank 10 there are mounted a plurality of rollers 19 closely adjacent to each other and at such an elevation that their lower parts are immersed in the bath while their upper parts are above the liquid level. These rollers serve to transfer heat from the bath to the sheet; to support the sheet in its movement; and to transfer to the sheet the liquid from the bath.

The wet sheet passes over a guide roller 20 onto the first roller 19 and then along over the several rollers in succession. The rollers are all rotated in the same direction, as for instance, by connecting sprockets and chains 21 and at a speed of travel such that when the sheet reaches the last of the rollers 19 substantially all of the moisture will have been driven out from the upper side of the sheet. Each roller in succession serves to heat the sheet above the temperature of the water in the sheet so as to insure rapid

vaporization of the water and at the same time it carries up from the bath a film of the asphalt or other impregnating liquid and rolls it onto the under side of the sheet. It will be noted that the sheet and the upper side of the rollers travel together in the same direction so that each roller has the effect of rolling along a sheet and pressing its coating into the sheet. Very little of the coating may enter the sheet at the first roller, but will force out the moisture from the upper surface of the sheet. As the sheet progresses more and more of the moisture will be driven out and more and more of the impregnating liquid will be forced into the sheet so that the impregnating liquid will substantially reach the upper surface of the sheet by the time the sheet reaches the last of the rollers 19.

In order to effect the thorough saturation of the sheet it is preferable to immerse it in the bath after substantially all of the moisture has been driven out. To effect this I provide a pair of rollers 22 and 23 which are similar to the rollers 19, but which are rotated in the opposite direction and are spaced farther apart. Between these rollers I provide a vertically movable frame 24, having a guide roller 25 at its lower end which may be moved down to near the bottom of the tank so that after the sheet passes over the last of the rollers 19 it may pass beneath the rollers 22, 25 and 23 before emerging from the bath. It may then pass between squeezing rollers 26 which aid in forcing the impregnating liquid into the sheet and removing the surplus liquid so that the sheet may be delivered between suitable delivery rollers 27.

The power for operating the various rollers may be obtained from a motor or other source of power 28 and the speed of the various rollers may be controlled by a Reeves drive connection 29 to a shaft 30 from which the power is transmitted by suitable chains, sprocket wheels and gearing.

By means of my invention rag felt paper suitable for making roofing material and containing possibly 75% by weight of moisture, may be brought into contact with the hot impregnating liquid and by maintaining a flux at a temperature of 210° C. it is possible to dry and impregnate the sheet in four minutes, which is no greater than the time ordinarily required for drying the sheet prior to the impregnating action. I thus accomplish the drying and the impregnating at the same time and in the time ordinarily required for only one of these operations.

The rollers may be driven at a materially higher speed above that of the sheet, for instance, with a peripheral speed approximately five times the speed of the sheet so that the rollers will bring a larger amount of heat and impregnating liquid to the sheet than would be the case when the peripheral speed was the same as that of the sheet. Due to the smooth

surface of the rollers and the sheet, the rollers may slip and have a rubbing action on the under surface of the sheet.

It will, of course, be understood that the temperature and speeds above given will vary with the size of the machine, the character of the stock treated, and the character of the impregnating liquid.

If it is desired to deliver a comparatively thin film of impregnating liquid to the sheet by each roller, the apparatus may be provided with a series of bars 31 adjacent to each roller and just above the surface of the liquid so that the thickness of the film will be determined by the distance between the bar and the roller surface.

A larger or smaller number of the rollers 19 may be employed depending upon the amount of moisture in the sheet and on other operating conditions, and after the sheet is treated by the rollers 19 it may be immersed a plurality of times rather than only once as illustrated.

My invention has a very great advantage over the large and cumbersome apparatus heretofore used which in addition to its large size is quite costly to operate due to condensation in the steam lines and the cylinders caused to a great extent by the cooling effect produced as the wet sheet itself comes in contact with the metal cylinders. In order to offset the slow drying action of the paper a large number of cylinders are needed and these all have to be steam heated at a very large cost in fuel.

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

1. An apparatus for heating and impregnating a wet sheet of fibrous material, including a bath of asphalt or the like maintained at a temperature above the boiling point of the liquid to be driven out of the sheet, a series of spaced rollers having their lower sides immersed in the bath and their upper sides above the bath, and means for passing the sheet over said rollers in succession, above the surface of the bath, whereby the sheet between successive rollers is exposed to the heating action of the bath, to evaporate liquid from the sheet.

2. An apparatus for impregnating a wet fibrous sheet with a tarry or asphaltic material, which includes a bath of said material, a series of spaced rollers partially immersed in the bath, means for passing the sheet over said rollers in succession while maintaining the sheet above the surface of the bath, and means beyond said rollers for immersing the sheet in said material.

3. An apparatus for drying and impregnating a wet sheet of fibrous material, including a bath of impregnating liquid maintained at a temperature above the boiling point of the liquid to be driven out of the

sheet, a plurality of heat transferring mem-
bers having their lower parts immersed in
said bath, and their upper parts above the
bath, and means for passing said sheet over
5 and in contact with said members in suc-
cession above the surface of the bath, said
members being spaced apart whereby the
under surface of the sheet is exposed to the
heating effect of the liquid between succes-
10 sive members and spaced from said liquid,
and said members being movable to carry
said impregnating liquid from the bath into
contact with one side of said sheet.

4. An apparatus for drying and impreg-
15 nating a wet sheet of fibrous material, in-
cluding a bath of impregnating liquid main-
tained at a temperature above the boiling
point of the liquid to be driven out of the
sheet, a plurality of rollers having their lower
20 sides immersed in said bath, and their upper
sides above the bath, means for passing sheet
over said rollers in succession above the sur-
face of the bath, and means for rotating said
rollers at a higher peripheral speed than the
25 linear speed of the sheet to carry said im-
pregnating liquid from the bath into con-
tact with the under side of said sheet, and
exert rubbing action on said side.

Signed at New York, in the county of New
30 York and State of New York, this 31st day
of May, A. D. 1929.

HARRY E. HOLCOMB.

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