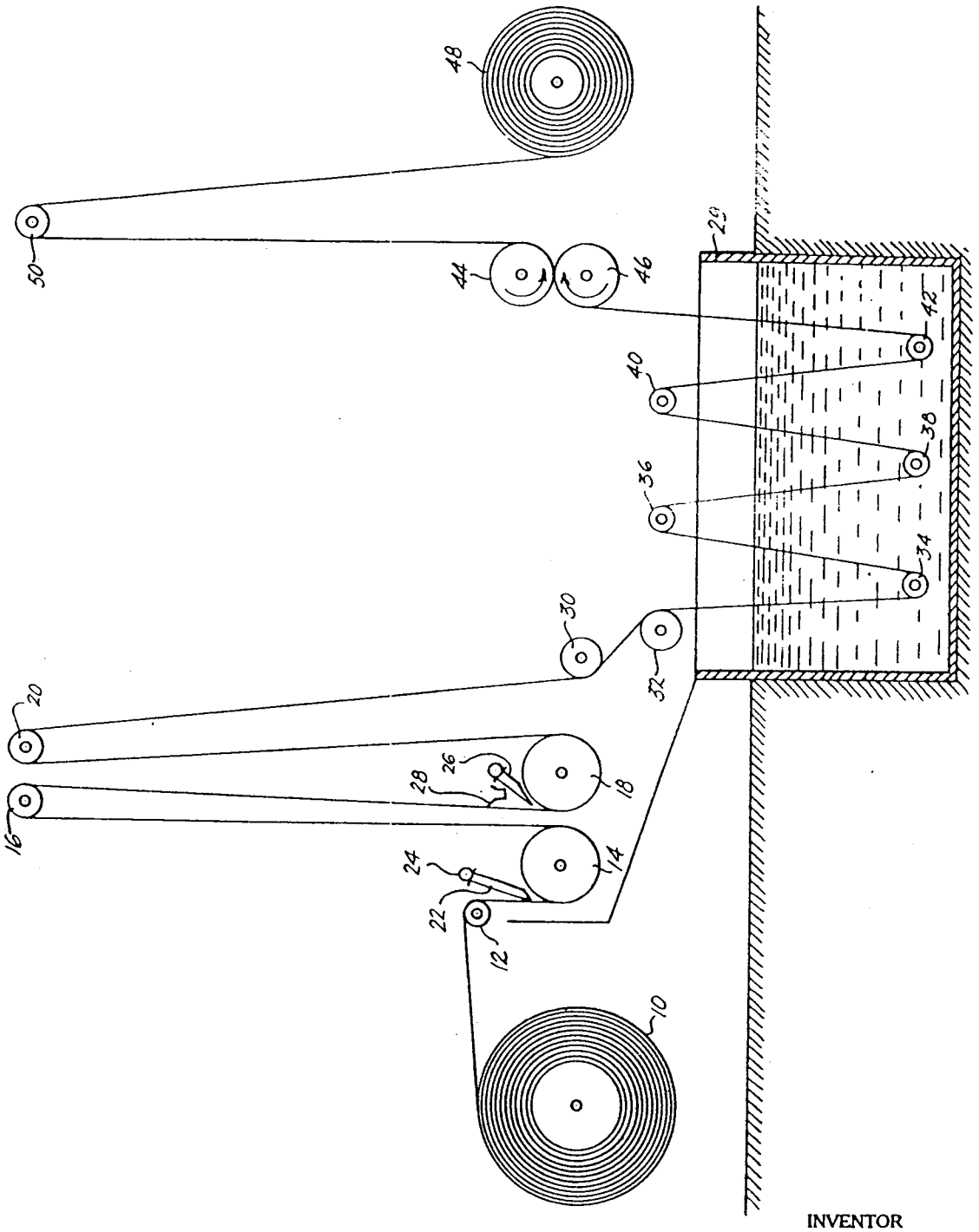
July 26, 1927. 1,636,750

J. E. MILLER

MANUFACTURE OF PREPARED ROOFINGS

Filed March 23, 1926



INVENTOR
JOHN E. MILLER
BY
ATTORNEYS

Patented July 26, 1927. 1,636,750

UNITED STATES PATENT OFFICE.

JOHN E. MILLER, OF MARSEILLES, ILLINOIS, ASSIGNOR TO CERTAIN-TEED PRODUCTS CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF MARYLAND.

MANUFACTURE OF PREPARED ROOFINGS.

Application filed March 23, 1926. Serial No. 96,681.

This invention relates to the impregnation or saturation of felt or paper, such as is used in the manufacture of prepared roofings and similar materials, with asphalt or other tarry or bituminous compound, and has for its general object to improve both the process and the apparatus for effecting such impregnation or saturation.

The durability or life of prepared roofings is dependent to a large extent upon the amount of saturation carried in the felt; that is, the proportion by weight of saturation to the weight of the felt, and it is therefore important, in the manufacture of the better grades of prepared roofings and similar materials, to obtain as high a percentage as possible of saturation. This is usually done by making as many successive applications of the asphalt or other tarry or bituminous compound in fluid condition as are necessary to obtain the percentage of saturation desired, these applications, in the case of the very best grades of material, usually stopping only when it has been determined that the felt or other vehicle for carrying the saturation will carry no more.

Various factors, besides the mere application of saturating material to the felt, enter into the problem of obtaining the maximum saturation, and the interference of these various factors with the saturating process also affects, to a considerable extent, the quality of the ultimate product. One of the difficulties most commonly encountered in the saturation of felt by the usual process of immersing it in the saturating bath is that, unless the felt has been thoroughly dried and heated before immersion, it usually contains a considerable amount of moisture and also air and possibly other gases, and that, therefore, the simultaneous application of saturating material to both faces of the felt frequently imprisons a portion of these gases and also of the moisture which does not escape in the form of bubbles in the saturating operation. When such roofing material is exposed on the roof to the sun's rays, the expansion of the moisture and other occluded gases frequently proceeds to the extent of breaking out through the surface of the asphalt or other saturant, thus leaving so-called "pock marks" in the roofing. These not only make it unsightly, particularly when the roofing is in the form of shingles on the better grades of buildings, but eruption of the weather-resisting surface affects materially the durability of the roofing, since it exposes the interior of the roofing to the direct action of the weather.

Of the various schemes heretofore devised for increasing the percentage of saturation in the felts employed to carry the various roofing materials such as asphalts, tarry and bituminous compounds, the majority slow up the saturating operation by increasing the number of saturating steps and, in addition, require a considerable enlargement both of the saturating machines themselves and of the spaces in which they are located. Moreover, most of the attempts to increase the saturation, while possibly effecting this to some extent, usually fail to overcome the other difficulties hereinabove referred to which stand in the way of obtaining uniformity of the resultant structure and absence of occluded moisture and gases in the finished product.

The present invention aims particularly both to increase the speed of saturation, to eliminate the defects in the final product resulting from processes heretofore employed, and, by the increase of speed and other modifications in the apparatus and process, also to reduce the amount of space required for equipment for a given capacity of production.

Not only does the invention aim to increase the speed of saturation and improve the quality of the final product so far as freedom from occluded gases and vapors is concerned, but the invention aims also to increase the percentage of saturation in the final product.

In the manufacture of prepared roofing, the fundamental purpose of the roofing felt is to act as a vehicle or carrier for the asphalt or other tarry or bituminous material with which it is to be saturated, the felt having, of course, in addition to this fundamental purpose, an incidental reinforcing action. In order to subserve its primary purpose most effectively, the felt must, of course, be porous, soft and dry. These qualities are determined to a large extent by the character of the rags employed in making the felt, but the cost of rags of different qualities determines, to a large extent, the quality of rags used and, therefore the absorbent qualities of the resultant felt. Roofing felts,

therefore, vary considerably in their absorbent properties and affect, therefore, to a considerable extent the character of the final product when saturated by processes heretofore employed. A further object of the present invention, therefore, is to make the final product less dependent upon the character of the felt employed.

As hereinabove pointed out, by the usual processes of saturation, in which the saturating material is applied simultaneously to both faces of the felt, not only is air or moisture frequently imprisoned within the felt, thus leaving small unsaturated pockets which frequently burst after the felt is placed on a roof and make the so-called "pock marks," but the action of the hot saturating solution in driving out a portion of the moisture and the gases causes a foaming in the tanks that not only is objectionable in itself but also interferes with the rapidity of the saturating operation and, to some extent, with the amount of the saturation finally obtained. Attempts to remedy this by applying saturation to one side only have been defective in that by none of these methods has it been possible to obtain a maximum of saturation.

One of the objects of the present invention is so as to apply the saturating material as to prevent any occlusion of gas or moisture while at the same time making possible the operation of the time factor so essential to obtaining maximum saturation. To this end the invention aims to utilize the heat of the saturating material and the capillary attraction of the felt for said material while in its hot fluid state to drive any moisture and gases contained within the felt out of the felt on the side remote from that to which the saturant is applied; to provide a sufficient time factor for this heating and capillary action, but preferably not so great a time factor as to permit substantial setting of the saturating material; to repeat this operation, if necessary, until air and moisture have been completely driven from the sheet and then preferably to immerse the sheet to effect application of the saturant to both faces thereof, thus insuring both a maximum saturation and a more uniform surface in the resultant product.

Other objects and important features of the invention will appear from the following description and claims when considered in connection with the accompanying drawing which illustrates the novel apparatus for practicing the process, which apparatus is also a part of the present invention.

The saturation of roofing felt and the manufacture of the felt must, for practical reasons, be separate operations since the speed of the felt manufacturing machine is essentially less than that of the saturating machine. Moreover, even if it were practicable to run the felt directly from the felt machine into the saturating machine, it would not be good manufacturing practice since a breakdown of one would interfere with the operation of the other. The manufacture of felt for roofing is therefore a separate operation and frequently the felt wound up in rolls is stored for a considerable time before being brought to the saturating machine.

At the time it is first manufactured, the felt is substantially bone dry, but when stored for any length of time it absorbs more or less moisture, the moisture content of felt that has been stored for a considerable time varying from 3% to 7%, with possibly an average of 5%. It is this moisture and the air that of course fills the interstices of the felt that it is the purpose of the present invention completely to eliminate from the final product.

The accompanying figure discloses an apparatus for practicing the method.

In the illustrative embodiment of novel apparatus for practicing the novel process of the present invention, the roll of felt 10 to be saturated is shown as arranged at one end of the saturating machine and as it is unwound it passes over a guide roll 12, then down around a drum 14, preferably heated, then up over a looper roll 16, which may or may not be heated, as hereinafter set forth, then preferably down over a second drum 18, similar to the drum 14 and preferably also heated, again up over a second looper roll 20, etc. In the illustrative embodiment of the invention, only two drums 14 and 18, and two looper rolls 16 and 20 are shown, but it will be understood, as hereinafter pointed out, that the invention is not restricted to the particular number of drums 14 and 18 nor to the particular number of looper rolls 16 and 20 herein illustrated and that with some felts and under some conditions of operation and to obtain maximum speed of saturation it may be advisable to increase the number. In fact, in practical operations of the present invention it has been found that as high as eight drums and a corresponding number of looper rolls are sometimes desirable.

As the felt from the roll 10 approaches the drum 14, saturating material, such as liquid asphalt, is applied to one face of the sheet, the illustrated means for applying the saturating material being a spout 22 connected to a feed pipe 24 through which the saturant is forced, either by gravity head or by a pump or other suitable means. In the practical operation of the invention, it has been found desirable to use two of the spouts 22, each located about 6 inches from an edge of a 36″ sheet, so that the spouts are about 2 feet apart, thus obtaining more uniform distribution of the saturating material over the sheet. As shown, these spouts

are preferably located adjacent to the drum 14 so that the drum helps to spread or distribute the saturating material laterally over the sheet as the spouts pour or flood it on the sheet.

As hereinabove suggested, the drum 14 is preferably heated and when asphalt is used as a saturant it is preferably applied at a temperature around 420° F., although the temperature may be varied between comparatively wide limits, one of the primary considerations, of course, being to have the saturant quite fluid, and another important consideration being to have it at such a temperature that it will rapidly convert any moisture in the sheet into vapor so that it can be quickly expelled from the sheet.

After the asphalt has been applied to one face of the felt adjacent to the drum 14, the felt passes about the drum, thereby effecting a spreading and distributing action upon the asphalt, and then preferably travels a sufficient distance through the air to allow the asphalt or other saturant thoroughly to penetrate the sheet and to drive out the moisture and air from the other face of the sheet. In the illustrative embodiment of the invention, the felt travels up through the air and over the looper roll 16 so that as it returns the same face to which the saturant was applied before the felt passed about the drum 14 will be adjacent to the drum 18 and thus permit a second application of saturating material to the same face in a similar manner. As shown in the drawing, spouts 26 are located adjacent to the drum 18 so as to project the saturant between the face of the felt and the surface of the drum, there being preferably two of these spouts 26 (one of which is not shown) located in the same manner as above suggested with respect to the spouts 22 (one of which is also not shown).

Where only two applications of the saturant are made in the manner above described, as shown in the illustrative embodiment of the invention, the first application will ordinarily be completely absorbed by the felt before reaching the point of the second application, and none of the asphalt or other saturant will appear upon the surface. Where, however, a much larger number of applications are made, so that the felt gradually becomes completely filled with the saturant before reaching the later points of application, it may be that a slight skin of the saturant will set upon the surface of the felt, in which case it may be desirable to provide a scraper 28 to remove this skin adjacent to the point at which the succeeding application takes place.

When a sufficient number of applications of saturant have been made to the one side of the sheet of felt to thoroughly drive the air and moisture out of the other side (which ordinarily means when substantially as much saturant has been applied in this manner as the felt will take up in this manner), and after the felt has passed up over the last looper roll 20 to permit the last application to penetrate the felt as much as possible, the felt, while still hot and while the saturant it contains is still in a substantially fluid condition, is then preferably passed directly into a saturating bath in which both faces of the felt are covered with saturant.

In the illustrative embodiment of the novel machine for carrying out the novel process of the present invention, the saturating tank 29 and the gate mechanism employed therein may be substantially that of the prior art, the felt as it comes from the looper roll 20 passing over guide rolls 30 and 32 and then about the successive rolls 34, 36, 38, 40, 42 in the tank, the tank shown being merely illustrative and it being understood that a tank with any desired number of gates may be employed. From the saturating tank the felt passes between the usual squeeze rolls 44 and 46 and from there to the roll 48 on which it is wound. It is usually preferable to pass the felt as it comes from the saturating tank over one or more looping racks 50 before winding it into a roll in order to permit the saturant thoroughly to set before subjection to the winding pressure and thus prevent bleeding in the roll.

As hereinabove suggested, it may be desirable in some cases, to heat the looper rolls 16 and 20. Ordinarily it is not necessary to heat the first looper rolls of a series of these, but where more than three are used it is usually found desirable to heat the additional upper rolls.

The distance of the looper rolls 16 and 20 from the drums 14 and 18 may, of course, vary under different conditions. In a machine in successful operation, a distance of approximately 10 feet has been found to give satisfactory results.

As above suggested, the temperature of the asphalt applied is preferably in the neighborhood of 420°, the preferable limits being between 350° and 450° F., and preferably the temperature is the same for each of the successive applications, although of course it is not essential that the successive applications be at the same temperature, and under certain conditions it might be advisable to vary them. However, for convenience in feeding the spouts, through which the applications are made, from a common source, the successive applications are usually made at the same temperature and this has been found to give satisfactory results.

Although I have described the application of the asphalt or other saturant as being effected by flooding it on through spouts, it will be understood that it may be

applied in any of the well-known ways of applying such material, such as spraying, or by means of a roller which takes it up from a tank, etc.

By the improved process and apparatus hereinabove described, I have succeeded not only in producing a final product which is substantially free from occluded moisture or gas, but have also succeeded in increasing the saturation from 10% to 20% over the results obtained by the usual methods and have done this in a considerably reduced space and with a considerable increase of speed.

It will further be noted that among the advantages obtained by the novel process of the present invention are the elimination of the necessity of preheating the felt, when it has been in storage and has accumulated considerable moisture; the possibility of using the less expensive felts without materially slowing up the saturating operation; the substantially complete elimination of bubbling in the saturating tank; the elimination of blisters and pock marks in the resultant product; and increased speed of operation with consequent reduction in the total equipment necessary for a given capacity.

What is claimed as new is:

1. The process of saturating felt for the manufacture of roofing material and the like, which consists in applying to one face only of the felt fluid saturant heated to a temperature sufficiently high rapidly to vaporize any moisture in the felt and to permit rapid absorption by the felt, carrying the felt a sufficient distance through the air to permit the saturant, by its heating and penetrating action, to drive the moisture and air from the other face of the felt, and then applying saturant to the other face of the felt.

2. The process of saturating felt for the manufacture of roofing material and the like, which consists in applying to one face only of the felt fluid saturant heated to a temperature at which it will rapidly vaporize any moisture content in the felt with which it comes into contact, carrying the felt, after application of the saturant thereto, a sufficient distance through the air to permit substantially complete absoption of the saturant and the driving out of the moisture and air content of the felt from the other face thereof, repeating the foregoing operations while the immediately preceding application is still hot and substantially fluid until substantially all air and moisture have been driven from the felt, and then applying saturant to the other face of the felt.

3. The process of saturating felt for the manufacture of roofing material and the like, which consists in applying to one face only of the felt fluid saturant heated to a temperature sufficiently high rapidly to vaporize any moisture in the felt and to permit rapid absorption by the felt, carrying the felt a sufficient distance through the air to permit the saturant, by its heating and penetrating action, to drive the moisture and air from the other face of the felt, and then immersing said felt in a bath of the same saturant.

4. The process of saturating felt for the manufacture of roofing material and the like, which consists in applying hot fluid saturant to one face only of the felt, carrying the felt a sufficient distance through the air to permit substantially complete absorption of this first application, and then making succeeding applications of the saturant to the same face of the felt and after each application, carrying the felt a sufficient distance through the air to permit substantial absorption until the air and any moisture in the felt are driven out through the other face of the felt, and then immersing the felt in a bath of the saturant.

5. The process of saturating felt for the manufacture of roofing material and the like, which consists in applying fluid saturant, heated to a temperature higher than the vaporizing point of water, to one face only of the felt, passing the felt a sufficient distance through the air to permit the saturant to become substantially completely absorbed and to permit air and moisture in the felt to be driven out by the saturant through the other face of the felt, repeating the foregoing operations a sufficient number of times to obtain substantially complete elimination of the air and moisture from the felt, and then immersing the felt in a bath of the same saturant.

6. A continuous process of saturating felt for the manufacture of roofing material and the like, which consists in continuously passing the sheet of felt past a point or points at which fluid saturant heated to a temperature sufficiently high rapidly to vaporize any moisture content in the felt is applied to one face only of the felt, carrying the felt a sufficient distance through the air to permit absorption of the saturant by the felt and the heating and driving out of air and moisture from the other face of the felt, and then, while the saturant thus applied is still hot and in substantially fluid condition, applying saturant to the other face of the felt.

7. A process according to claim 6 in which the saturant is applied to one face only on the felt adjacent to a heated roll which helps to distribute it over that face of the felt.

8. A process according to claim 6 in which successive applications of the saturants are made to the same face of the felt, at points so spaced as to permit substantially

complete absorption between the successive applications, with the concomitant driving out of the moisture and air from the other face of the felt, followed by successive immersions of the felt after the moisture and air have been driven therefrom by the preliminary saturation from one face thereof.

9. The process of saturating felt for the manufacture of roofing material and the like, which consists in applying to one face only of the felt saturant heated to a temperature at which it will quickly vaporize any moisture with which it comes in contact and at which it is sufficiently fluid rapidly to penetrate the felt, passing the felt substantially vertically through the air a sufficient distance to permit substantially complete absorption of the saturant and the driving out of the moisture from the other side of the felt, repeating the foregoing operations while the respective preceding applications are still hot and fluid until all air and moisture are substantially eliminated from the felt, and then applying saturant to both faces of the felt.

10. The process of saturating felt for the manufacture of roofing material and the like, which consists in passing the felt about a heated drum, applying hot fluid saturant only to the face of said felt adjacent to said drum, passing the sheet in a substantially vertical loop through the air a sufficient distance to permit substantially complete absorption of the saturant and the driving out of the moisture and air from the other face of said sheet, repeating these operations until the saturant has penetrated substantially to the opposite face of the sheet and then applying saturant to both faces of the sheet.

11. A method of saturating felt for the manufacture of roofing material, which comprises applying hot asphaltic material to one face only of the felt to be treated, whereby moisture and gases contained therein will be expelled from the other face thereof, and thereafter, when substantially all the moisture has been expelled from the felt material and while the felt is still hot, immersing the said felt in a body of hot asphaltic material, so as completely to saturate the said felt.

12. A method of saturating felt for the manufacture of asphalt roofing, which comprises passing a sheet of felt through a predetermined path, applying hot asphaltic material to one face only of the said sheet at a predetermined point or points in the said path, whereby moisture and gases contained in the felt will be expelled from the other face thereof during the passage of said sheet through the said path until substantially all the moisture has been expelled from the felt, and thereafter, while the said felt and its asphaltic contents are still hot, passing the said sheet into a bath of hot asphaltic material so that it may absorb asphaltic material from both faces.

13. A method of saturating felt to be employed for roofing material, which comprises continuously applying hot fluid asphaltic material to one face only of a long strip of the felt to be treated, said strip being moved continuously by the point of application, permitting penetration of the hot asphaltic material into the said felt to expel moisture and gases in the felt from the other face thereof by passing the said strip a sufficient distance through the air so that substantially all of the moisture is expelled from said felt, and thereafter, while the felt and its asphaltic content are still hot, bringing hot asphaltic material into contact with the other face of the felt.

Signed at Marseilles, Ill., this 19th day of March, 1926.

JOHN E. MILLER.