

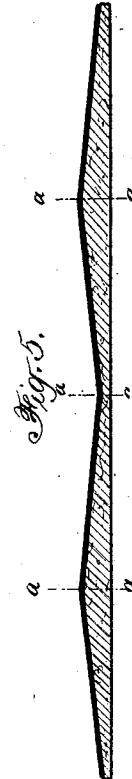
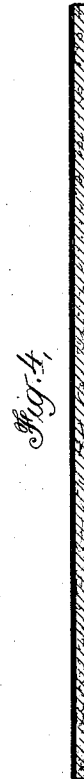
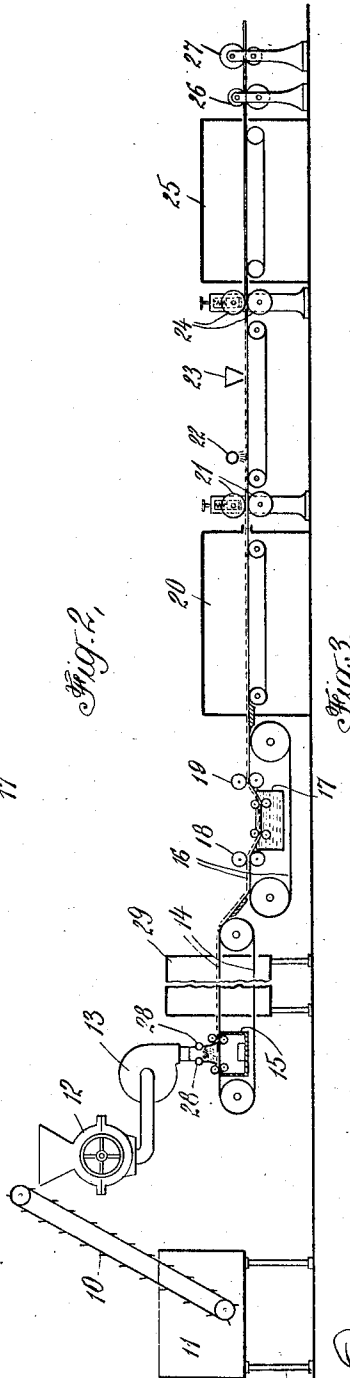
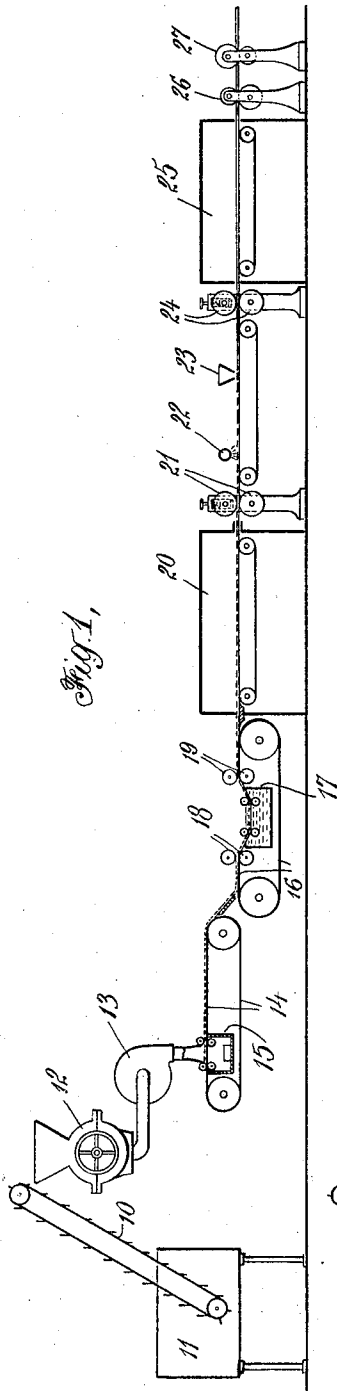
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H. F. WEISS

ROOFING MATERIAL

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UNITED STATES PATENT OFFICE.

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ROOFING MATERIAL.

Application filed January 24, 1920. Serial No. 353,760.

To all whom it may concern:

Be it known that I, HOWARD F. WEISS, a citizen of the United States, residing at Madison, in the county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Roofing Materials; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art in which it appertains to make and use the same.

This invention relates to improvements in the manufacture of composition roofing material, such, for example, as sheet roofing, shingles, and the like. The object of the invention is to provide an improved method of an apparatus for manufacturing composition roofing material.

The methods ordinarily practiced at the present time in manufacturing roll or sheet roofing, as well as the so-called asphalt shingles, consist generally in first manufacturing a felt, usually of rags, and then immersing this felt in a bath of a suitable saturant, after which the resulting article is coated with a suitable weather-resisting agent and then commonly sprinkled and rolled with crushed mineral matter. The sheet thus formed is then cut to the desired size when it is ready for use.

There are several objections to this present customary method of manufacturing composition roofing material and shingles. In the first place, unless a very good grade of rags is used and considerable care taken in beating them to form them into a felt, the felt will break when passing through the saturating machine, thus causing considerable delay and trouble. On the other hand, good grades of rags are expensive and cannot be economically used for this purpose. Moreover, the heretofore customary methods of operation are very expensive in that they require costly and cumbersome machinery for tearing the rags and beating them into a pulp in water and running the beaten rags over a felt or paper making machine. Furthermore, beating the rags in water tends to more or less hydrolyze the fibres, thereby rendering them less absorptive. Again, the rags commonly used in the manufacture of composition roofing are frequently so badly decayed that the felt formed from them often breaks in running through the saturating machine, thus causing delays and result-

ing in the production of a roofing material having weak spots. Finally, the roofing felt made in the heretofore customary manner is of unequal strength in that it is much stronger in one direction (lengthwise of the sheet) than at right angles to this direction (namely, crosswise to the sheet).

The present invention contemplates an improved method of manufacturing composition roofing material and shingles in which the present day procedure is greatly simplified and by which the cost of manufacture is materially lessened as compared with existing practice. In accordance with the method of the invention, fibrous material of suitable kind is subjected to appropriate treatment for more or less completely separating the material into individual fibres, whereupon these fibres are carried, preferably by blowing, to an appropriate support where they are deposited in a more or less heterogeneous arrangement and are felted or quilted together to a considerable extent, preferably by subjecting the deposited fibres to the action of suction. The resulting felted or quilted mat of fibres is then immersed in an appropriate liquid saturant and afterwards subjected to appropriate compression, and then coated with a weather-resisting agent and also, if desired, with crushed mineral matter.

In carrying out the invention in its preferred form, the fibrous material is introduced into a shredding engine and subjected to the disintegrating or shredding treatment characteristic of this type of machine. Any fibrous material which shreds so as to form a uniform mat upon leaving the shredding engine is satisfactory for the purpose of the invention, but I prefer to employ fibres which can be readily saturated. I have found wood fibres made from the so-called sulfite and kraft screenings very satisfactory for the purposes of the invention. The fibres from the bark of trees, as well as animal fibres, may also be used in carrying out the invention. In passing through the shredding engine the fibres are beaten in air in such a manner that they leave the shredding engine in the form of a cloud of individual fibres. The shredded fibres are then blown and sucked against a moving screen support in such a manner that the air passes through the screen leaving the fibres on the meshes of the screen. I have found that the greater

the velocity of the air and the greater the intensity of the suction, the more firmly and compactly the fibres felt themselves into a mat.

5 After being thus firmly felted and matted, the fibres are carried from the forming screen to a conveyor which passes them between pressure rolls into a bath of an appropriate liquid saturant. This bath may
10 be of any suitable composition, such as asphalt, coal tar pitch, or the like. In passing from the pressure rolls into the bath of saturant, the fibres tend to separate slightly, the saturant being absorbed very readily.
15 The conveyor then carries the mat of fibres out of the saturating bath between another pair of pressure rolls which press out the excess of the saturant and compact the now thoroughly saturated fibres into a firm
20 sheet. This sheet of saturated and pressed fibres is then cooled, by exposure to air of a lower temperature than that of the bath of saturant, after which the sheet is passed through another pair of rolls and subjected
25 to further pressure. This pressure may be applied in such a manner as to form a sheet having parallel surfaces or tapered surfaces. In both cases, the compressed saturated felt is next coated with a weather-resisting
30 agent, such as asphalt, pitch, or other suitable material. The coated surface is then cooled somewhat and is preferably sprinkled with powdered mineral matter, such as mica, slate, etc., which is firmly pressed on to the
35 weather-resisting coating. The resulting sheet is then further cooled, usually to room temperature, by simple exposure to the air, after which it is cut to any desired shape and size.

40 By the method just described, I have made excellent composition roofing, using wood fibres and I have found the roofing material made in accordance with this method extremely moisture-resisting, pliable and exceedingly strong.

While I have found the above described process very satisfactory in practice, I have also discovered that an excellent product may be produced by a slight modification of
50 this process. Thus, I have found that instead of felting the fibres together by suction, the fibres may be cemented together into a quilt by means of an appropriate adhesive. Thus, the fibres may be deposited
55 from the shredding engine directly upon a suitable support to form a more or less flocculent layer of the shredded fibres, and this layer of shredded fibres may be appropriately treated with an adhesive to cement
60 the fibres together. The resulting deposit of fibres is then dried, for example, by passing through a suitable drier, thereby forming a quilt of fibres cemented together in heterogeneous arrangement. This quilt of fibres
65 may then be passed into a bath of an ap-

propriate saturant in the manner hereinbefore described and subjected to the further treatment, as described, for the production of weather-resisting composition roofing. In accordance with this modification of the
70 invention, it will be noted that the fibres are cemented together and then dried before entering the saturating bath, while in the method first described these cementing and
75 drying operations are omitted. It is to be understood that it is not necessary to feed the dried quilt of cemented together fibres directly into the saturating machine, but this dried quilt may, if desired, be rolled on a
80 mandrel, and the rolls of quilt thus formed fed into the saturating machine at will.

The purpose of the aforementioned shredding operation is to separate the fibres into individual particles, and I have throughout this specification and the appended claims
85 employed the term "shredding", and its derivatives, in a generic sense to describe the operation of so treating the fibres that each fibre is substantially free from any other fibre. In practice, a shredding engine will
90 usually be most satisfactory for this purpose, but the desired result may be secured in other ways, as, for example, by brushing or combing, for example, a stiff wire brush revolving at a high rate of speed and coming
95 in contact with a piece of fibrous material will separate the material into individual particles or fibres.

The novel features of the invention which I consider patentable are definitely indicated in the appended claims. These features, together with the construction and mode of operation of apparatus embodying the same, will be more clearly understood from the following description taken in
100 conjunction with the accompanying drawings, in which:

Fig. 1 diagrammatically illustrates, in elevation, an apparatus for carrying out the method of the invention;

Fig. 2 diagrammatically illustrates, in elevation, a slightly modified form of apparatus for practicing the invention;

Fig. 3 is a sectional view of the felted mat or quilt of cemented together fibres before entering the bath of saturant;

Fig. 4 is a sectional view of a saturated, pressed and coated sheet of roofing material made in accordance with the invention and having parallel surfaces; and

Fig. 5 is a sectional view of a sheet of composition roofing material made in accordance with the invention and having tapered surfaces especially designed for the manufacture of tapered shingles.

Referring first to Fig. 1 of the drawings, the fibrous material is elevated by a conveyor 11 therefor into the hopper of a shredding engine 12. In the shredding engine, the fibres are beaten
130

in air in such a manner that they leave the engine in the form of a cloud of substantially individual fibres. These fibres are then blown by means of a blower 13 upon a belt conveyor 14, in the form of a screen conveyor. The fibrous material is thus shredded in the engine 12 and is blown onto the screen conveyor 14 to form a flocculent layer of the desired thickness.

A suction box 15 is arranged below the top surface of the screen conveyor 14 and directly beneath the discharge of the blower 13. The conveyor 14 may be in the form of a screen of suitable mesh or its supporting surface may be composed of suitably perforated or foraminated material, so that the fibres blown onto the conveyor are subjected to the action of the suction applied through the suction box 15. As the result of this blowing and suction treatment, the fibres deposited on the screen conveyor 14 are felted together into a mat which is carried along by the conveyor 14 to a second conveyor 16 running through a bath of saturant 17. Before entering the bath of saturant 17, the felted mat of fibres is compressed by the pressure rolls 18. In passing from the rolls 18 into the bath of saturant, the fibres tend to separate slightly, as the result of which action the saturant very readily impregnates the felted mat. Upon leaving the bath of saturant, the saturated mat passes through a pair of pressure rolls 19 which press out the excess of the saturant and compact the now thoroughly saturated fibres into a firm sheet.

The sheet of saturated and compacted fibres is then cooled by passage through an air drier 20, after which it is passed through a pair of rolls 21 and subjected to further pressure. The rolls 21 may be designed to produce a sheet of roofing material with parallel surfaces, as represented in Fig. 4 of the drawings, or the rolls 21 may be of such configuration as to produce a sheet of roofing material having a tapered upper surface as represented in Fig. 5. By cutting the sheet of material represented in Fig. 5 longitudinally along the lines *a-a* shingles of tapered section may be produced, as will be well understood by those skilled in the art.

After passing through the pressure rolls 21, the sheet of roofing material is coated with a weather resisting agent, such as asphalt or pitch, which may be sprayed on to the upper surface of the material from a spray pipe 22. A surface layer of powdered or crushed mineral matter is then deposited on the layer of the weather resisting agent from a hopper 23. This powdered mineral matter is firmly pressed on to the weather resisting coating by means of pressure rolls 24. The sheet of roofing material thus produced then passes through an air drier 25

in which it is cooled usually to room temperature, after which it is cut into appropriate sizes by means of a slitter 26 and a trimmer 27.

The arrangement of apparatus diagrammatically represented in Fig. 2 of the drawings is substantially the same as that represented in Fig. 1, and similar elements are indicated by the same reference characters in both figures. In the apparatus of Fig. 2, a quilted mat of cemented together fibres is passed through the saturating bath 17. This quilt is formed by depositing the shredded fibres upon the screen conveyor 14 in a heterogeneous layer with the fibres extending in all three cubical dimensions. This layer of fibres is appropriately treated, either during the deposition of the fibres or after they have been deposited upon the support, with an appropriate adhesive in order to cement the fibres together. The adhesive may, for example, consist of a solution of sodium silicate or of a solution of coal tar pitch or asphalt pitch in benzol. In the arrangement of Fig. 2, spray pipes 28 are shown for spraying the shredded fibres with the adhesive agent as the fibres are deposited on the conveyor 14. The sprayers 28 serve to discharge the adhesive either directly upon the fibres deposited upon the conveyor or outwardly in the form of a spray or mist through which the fibres fall. The sprayers 28 may be placed directly under the discharge of the blower 13 or to one side thereof, both arrangements having proved satisfactory. In either case, the adhesive serves to bind or cement the shredded fibres together, but I have found that when these fibres fall through a mist or spray of the adhesive, a somewhat firmer mat or felt containing fewer loose fibres is produced. In this modification of the invention, the blower 13 may, if desired, be dispensed with, and the shredding engine 12 may be arranged with its discharge directly above the conveyor 14, so that the shredded fibres fall directly from the shredding engine and are deposited on the conveyor 14 to form a flocculent layer of fibres of the desired thickness. However, I find it desirable to subject the shredded fibres to a slight suction during and directly after their deposition on the conveyor 14 and the suction chamber 15 advantageously serves this purpose.

After treatment with the adhesive, the flocculent layer of shredded fibres is passed through a drier 29. A suitable drying medium may, if desired, be passed through the drying chamber 29 for the purpose of more promptly hardening or drying the adhesive. When using an adhesive which dries or sets quickly, the drier can, if desired, be entirely omitted but its use is generally desirable. The quilt of cemented together fibres may be passed directly through the saturating

bath 17 and the other elements of the apparatus as indicated in Fig. 2, or this quilt may be wound into rolls and stored for subsequent treatment in the manner described.

The improved process of the invention, in addition to being simple and requiring a comparatively small initial outlay for machinery, is free of the objections hereinbefore mentioned as inherent in the present day customary methods of manufacturing prepared or composition roofing materials. Thus, the present invention makes use of a grade of fibres which are free from decayed or partially decayed matter. Moreover, the fibres are not beaten in water and hence hydrolysis takes place, if at all, to a minimum extent, thus securing maximum absorption in the felt. Furthermore, the saturated felts made in accordance with the invention are of uniform strength in both directions, that is lengthwise or crosswise of the sheet.

The felted or quilted mat of shredded fibres, before saturation, is more or less porous and provides an excellent medium for the ready absorption of the saturant. After passing through the saturating bath, this felted or quilted mat is thoroughly and completely impregnated with the liquid saturant, and after appropriate drying may be compressed into a sheet of excellent body for roofing materials. Fig. 3 of the drawings is intended to indicate diagrammatically the general character of the felted or quilted mat before passing through the saturated bath 17 and Fig. 4 of the drawings is intended to indicate diagrammatically the general character of the coated sheet of roofing material after passing through the pressure rolls 24. In making tapered shingles, the sheet of roofing material may be given a tapered section as indicated in Fig. 5 of the drawings, and the slitters 26 then cut this sheet longitudinally along the lines $a-a$, as will be well understood in the art. The tapered section may advantageously be of such dimensions that the thinnest part is less than one-half of the thickness of the thickest part. It will, of course, be understood that the tapered sections of the roofing material are cut transversely, preferably after the longitudinal slitting along the lines $a-a$, in suitable widths for shingles.

The felted or quilted mat produced as herein described is a monolithic fabric of felted or cemented together fibres. As a result of its porous character, this mat is very readily impregnated with the liquid saturant in passing through the bath 17. When applied to the mat the saturating or impregnating agent is in a liquid condition, but generally this condition of the saturant is brought about by heat or by appropriate

solvents, since at ordinary temperatures, or under normal conditions, the saturating agent itself is solid or dry, and of such a character that it will not objectionably soften under the conditions encountered in its use as a roofing material. The weather resistant coating is likewise of such composition as not to soften under these conditions.

The pressure rolls 19 serve to remove the excess of the saturant and to compact the saturated mat into a firm sheet. In the drier 20, the temperature of the saturated mat is somewhat reduced, although it is not the intention to reduce the temperature of the mat to room temperature in this drier. In fact, the mat should leave the drier at a sufficiently elevated temperature to permit the desired compression of the sheet by the pressure rolls 21.

The temperature of the saturating bath will depend upon the melting temperature of the particular saturant employed. In general, this bath will be maintained at such a temperature as to cause the saturant to be sufficiently fluid to effect the necessary penetration thereof within the layer of fibrous material to give complete saturation.

The rolls 19 are intended to remove the excess of the saturant after the treatment of the mat in the saturating bath, and the degree of compression is merely such as to compact the saturated mat into a firm sheet. After the sheet has passed through the drier 20, it is subjected to the action of the heavy pressure rolls 21 which compact it to the desired thickness to form a sheet having parallel surfaces or tapered surfaces, as desired.

A sheet of tapered section, such as illustrated in Fig. 5 of the drawing, is of especial advantage in the manufacture of shingles. This tapered configuration is preferably of such a character that the thinnest portions are less than half the thickness of the thickest portions, so that the thin end of the resulting shingle is less than one-half the thickness of the butt end. It will be observed that this tapered configuration is given to the body of the shingle itself, in contradistinction to prior suggestions of covering a sheet of felt or the like of uniform thickness with a tapered coating of weather-resisting material. The tapered shingle of the invention is remarkably strong and durable and in appearance and use is comparable to wooden shingles of tapered section.

While I have herein particularly described the method of the invention as employed in the manufacture of roofing materials, I have found that other products may be made by this method. Thus, I have found the method of the invention of advantage in the manufacture of floor coverings, water-proof linings for boxes and the like, as well as in the manufacture of other similar products. In

the appended claims, I, therefore, intend the expression roofing material to be taken in a broad generic sense to cover any and all products susceptible of manufacture by the methods therein set forth. It will moreover
 5 be understood that various modifications of the herein described procedures may be resorted to without departing from the spirit of the invention.

10 I claim:

1. The method of manufacturing roofing material, which comprises forming a loose, porous, highly absorbent mat of dry fibrous material with relatively slight cohesion, and
 15 saturating the mat so formed with a liquid high melt point saturant.

2. The method of manufacturing roofing material which comprises shredding fibrous material in air and blowing the shredded fibres by means of an air current upon an appropriate support to form a mat of heterogeneously arranged closely intermeshed fibres, impregnating the mat with an appropriate saturant, and coating one surface of the impregnated mat with a weather-resistant agent; substantially as described.

3. The method of manufacturing roofing material which comprises shredding fibrous material, depositing the shredded fibres in heterogeneous relation upon a support to form a layer of the desired thickness, subjecting the deposited layer of fibres to the action of an air current to mat the fibres together, immersing the fibrous mat thus produced in a bath of an appropriate liquid saturant, and applying a weather-resistant coating to a surface of the saturated mat; substantially as described.

4. The method of manufacturing roofing material which comprises shredding fibrous material, depositing the shredded fibres in heterogeneous relation upon a support to form a layer of the desired thickness, subjecting the deposited layer of fibres to the action of an air current to mat the fibres together, passing the fibrous mat thus produced through pressure rolls into a bath of an appropriate liquid saturant, and applying a weather-resistant coating to a surface of the saturated mat; substantially as described.

5. The method of manufacturing roofing material which comprises shredding fibrous material in air, depositing the shredded fibrous material upon a support in heterogeneous relation to form a layer of the desired thickness, subjecting the deposited layer of fibres to the action of an air current to mat the fibres together, immersing the fibrous mat thus produced in a bath of an appropriate liquid saturant, compressing the saturated mat, and applying a weather-resistant coating to a surface of the saturated and compressed mat, substantially as described.

6. The method of manufacturing roofing material which comprises shredding fibrous material in air, depositing the shredded fibrous material upon a support in heterogeneous relation to form a layer of the desired thickness, subjecting the deposited layer of fibres to the action of an air current to mat the fibres together, passing the fibrous mat thus produced through a pair of pressure rolls into a bath of an appropriate saturant, compressing the saturated fibrous mat, and applying a weather-resistant coating to a surface of the saturated and compressed mat; substantially as described.

7. The method of manufacturing roofing material which comprises shredding fibrous material, depositing the shredded fibres in a layer and compacting the layer to form a mat, immersing the fibrous mat in a bath of an appropriate liquid saturant, compressing the saturated mat, and applying a weather-resistant coating to a surface of the saturated and compressed mat; substantially as described.

8. The method of manufacturing roofing material which comprises shredding fibrous material, blowing the shredded fibrous material upon a support to form a layer of the desired thickness and subjecting the deposited layer of fibres to the action of suction to mat the fibres together, immersing the fibrous mat thus produced in a bath of an appropriate liquid saturant, compressing the saturated mat, and applying a weather-resistant coating to a surface of the saturated and compressed mat; substantially as described.

9. The method of manufacturing roofing material which comprises forming shredded fibrous material into a layer of loose heterogeneously arranged fibers and compacting the fibers to form a porous mat, impregnating the porous mat with an appropriate saturant, and compressing the resulting impregnated mat; substantially as described.

10. The method of manufacturing roofing material which comprises forming shredded fibrous material into a layer of loose heterogeneously arranged fibers and compacting the fibers to form a porous mat, drying the mat, impregnating the porous mat with an appropriate saturant, and compressing the resulting dried and impregnated mat; substantially as described.

11. The method of manufacturing roofing material which comprises shredding fibrous material in air, depositing the shredded fibrous material upon a support to form a layer of the desired thickness, subjecting the deposited layer of fibres to the action of an air current to mat the fibres together, passing the fibrous mat thus produced through a pair of pressure rolls into a bath of an appropriate saturant, and compressing the saturated mat; substantially as described.

urated fibrous mat; substantially as described.

12. The method of manufacturing roofing material which comprises shredding fibrous material, forming a layer of loose heterogeneous-
5 geneously arranged fibers and compacting the fibers to form a mat, immersing the

fibrous mat in a bath of an appropriate liquid saturant, and compressing the saturated mat to form a sheet of tapered section; 10 substantially as described.

In testimony whereof I affix my signature.

HOWARD F. WEISS.