

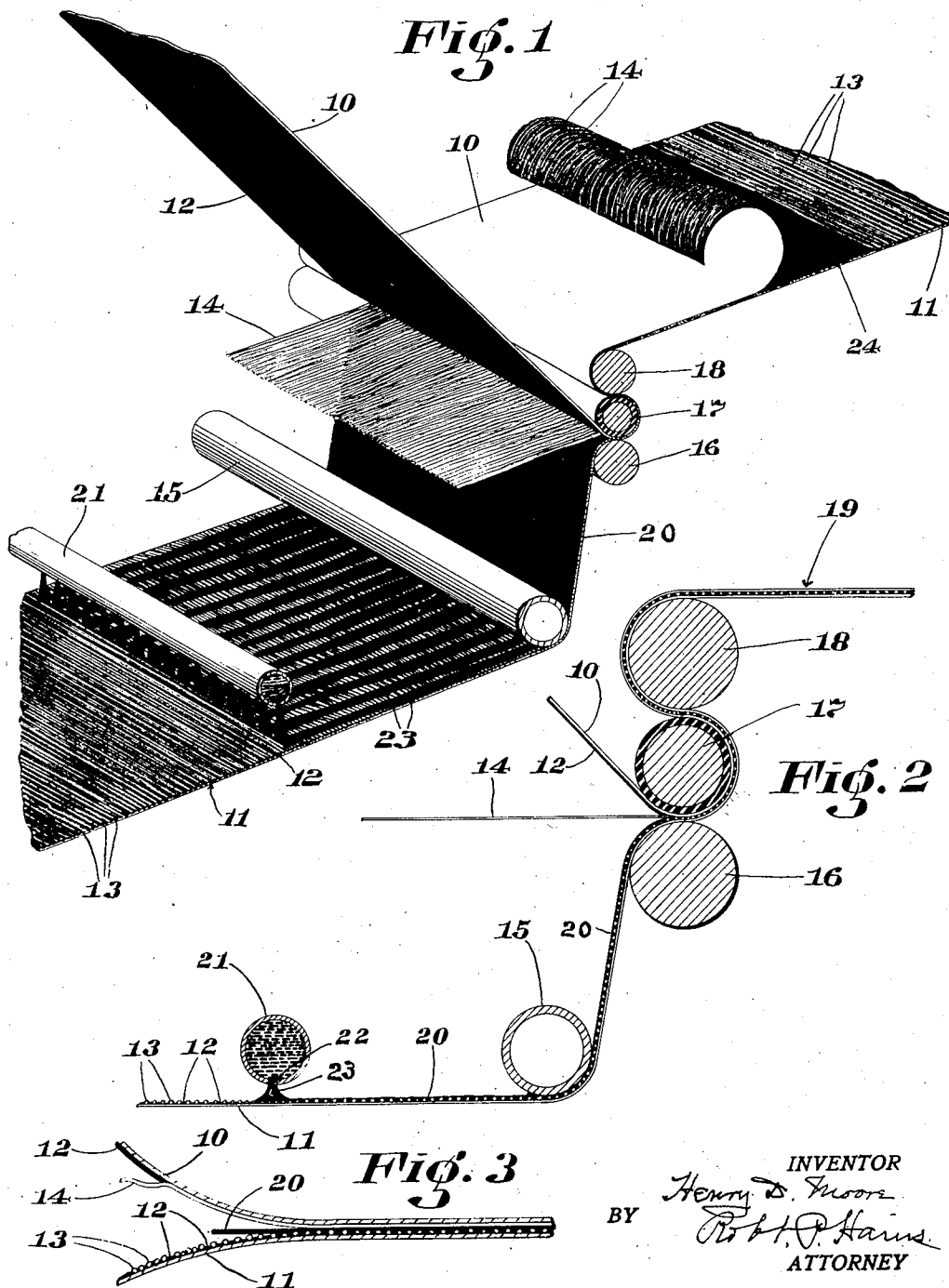
Nov. 1, 1932.

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1,885,280

REINFORCED PAPER AND METHOD OF MAKING THE SAME

Filed Jan. 31, 1931



UNITED STATES PATENT OFFICE

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REINFORCED PAPER AND METHOD OF MAKING THE SAME

Application filed January 31, 1931. Serial No. 512,531.

This invention relates to reenforced waterproof paper and method of making the same.

Reenforced waterproof paper consisting of two sheets of paper adhesively secured together with asphaltum and reenforced with straightened unspun fibres embedded in the asphaltum is now extensively used as a building and wrapping paper and for other purposes where its strength and waterproof properties are desired.

Such paper may be reenforced longitudinally, or both longitudinally and transversely as found desirable, and a machine for producing reenforced waterproof paper is shown described and claimed in the Charles H. Howard Patent No. 1,590,167, June 22, 1926.

In accordance with the disclosure of this patent a coating of black asphaltum is applied to one sheet of paper and straightened unspun fibers are laid longitudinally of this sheet and secured thereto by the asphaltum.

Straightened unspun fibres are then applied transversely of the sheet of paper over the longitudinally extending fibres, and a second sheet of paper having a coating of black asphaltum applied thereto is secured to the first sheet over the reenforced paper to provide a multiply waterproof sheet that is reenforced both longitudinally and transversely.

While the reenforced waterproof paper constructed in the manner just described is strong, tough and durable and is admirably adapted for various uses, the present invention relates to further improvements in this type of paper whereby its strength, durability and moisture resisting properties may be further increased.

One important feature of the present invention therefore resides in a reenforced waterproof paper having a layer of reinforcing fibres adhesively secured to one sheet of paper and another layer of reinforcing fibres adhesively secured to a second sheet of paper, and having the two reenforced sheets of paper thus produced firmly secured together by a third coating of adhesive applied between the two layers of reinforcing fibres. As a result of this construction the reenforced

sheets of paper are united much more firmly than in the prior construction in which the asphaltum that passes between the reinforcing fibres is relied upon to unite the reenforced sheets of paper.

Furthermore as a result of the present invention a much stronger paper can be produced than heretofore, since in the prior construction, when it was attempted to increase the strength of the paper beyond a certain point by increasing the reinforcing fibres, it was found that the two reenforced sheets of paper would not adhere together firmly. That is the additional reinforcing fibres reduced the binding action between the two reenforced sheets of paper and caused a tendency of the two layers of fibres to separate.

This difficulty is entirely overcome by the present invention since by providing a third coating of asphaltum between the two layers of reinforcing fibres the reenforced sheets of paper are firmly united irrespective of whether the reinforcing fibres of a layer are placed close together or spaced some distance apart.

Another important feature of the present invention resides in a reenforced paper that is moisture-proof to a greater degree than that produced heretofore, for while the prior paper above described is water-proof in the sense that water or moisture will not pass through it under most conditions, it is found nevertheless that when the paper above described is employed to protect and cure freshly laid concrete by laying sheets of the paper upon the concrete and allowing it to remain there for a number of weeks, the water that falls upon the paper tends to gradually penetrate through the waterproof coatings and stain or discolor the underlying concrete.

This gradual penetration of moisture through the reenforced paper appears to be due to minute apertures or pin holes produced in the asphalt coating by air bubbles formed at the time the hot asphaltum is applied to the paper. It is only occasionally that these apertures or pin holes occur sufficiently close together in reenforced paper as constructed heretofore, to permit moisture to penetrate entirely through the paper, and by providing a third coating of asphaltum be-

tween the two layers of reinforcing fibres, and ironing or smoothing out the third coating as hereinafter described, the present reinforced paper is both waterproof and moisture-proof, and will resist the penetration of moisture under practically all conditions.

Still a further feature of the invention resides in a method of producing the new reinforced moisture-proof paper.

The construction of the present paper and method of producing the same will be clearly understood from the following description when read in connection with the accompanying drawing, wherein:—

Fig. 1 is a perspective view of mechanism for producing the reinforced waterproof paper of the present invention.

Fig. 2 is a vertical sectional view through the mechanism of Fig. 1, looking at the edge of the paper; and

Fig. 3 on an enlarged scale is a longitudinal sectional view through the paper of Fig. 1.

The multiply reinforced, waterproof, paper illustrated in the drawing comprises an upper sheet of paper 10 and a lower sheet of paper 11. To the inner face of each of these sheets of paper is applied a coating 12 of adhesive. The lower sheet of paper 11 in the construction shown is reinforced transversely by applying to its inner face the transversely extending fibres 13, so that these fibres are firmly secured to the paper by the adhesive 12, and the inner face of the upper sheet of paper 10 is reinforced longitudinally by securing thereto, by the adhesive 12, the longitudinally extending fibres 14.

The adhesive 12 used to secure the reinforcing fibres to the sheets of paper is preferably a waterproof adhesive such as asphaltum, and while either spun or unspun fibres may be employed as the reinforcing elements, excellent results are secured by reinforcing the paper with straightened unspun fibres of long staple such as sisal, since unspun fibres will yield less under tension than most spun fibres and therefore will not stretch sufficiently to permit the rupturing strain to fall upon the papers.

In accordance with the disclosure of the above mentioned Howard patent the longitudinally extending fibres are applied first to the lower sheet of paper and then the transversely extending fibres are deposited upon this sheet across the longitudinally extending fibres, and while the improvement of the present invention may be employed in connection with the reinforced paper of said patents, or in connection with other forms of reinforced paper having the two layers of reinforcing fibres variously arranged, the invention is herein illustrated and described in connection with a multiply reinforced paper in which the transversely extending fibres are applied to one sheet of paper, and the longitudinally extending fibres are applied to

the other sheet of paper as the two sheets are united.

In accordance with the construction disclosed in the drawing the transversely reinforced sheet of paper 11 is advanced, it is assumed, from a transverse reinforcing machine such as shown in Fig. 2 of the patent above mentioned, below a heated roll 15 and upwardly between the nip of the cooperating rollers 16 and 17. This roll 15 is preferably heated internally by superheated steam or hot oil. The sheet of paper 10 with the coating of hot asphaltum 12 applied to its inner face is also passed between the nip of the roll 16 and 17, and the reinforcing fibres 14 are applied to the inner face of the sheet of paper 10 at this point, as will be apparent from the drawing, these fibres being delivered to the nip of the rolls 16 and 17 by attenuating means such as the combs 28 shown in Fig. 1 of the patent above mentioned.

The multiply paper preferably passes from the nip of the rolls 16 and 17 upwardly around the roll 17 and between the roll 17 and an upper roll 18 and then around this roll as shown whereupon the reinforced waterproof paper 19 may be wound upon a roll (not shown) and trimmed or cut into sheets of the desired width ready for the market. The rolls 17 and 18 are preferably forced downwardly by weights or springs (not shown) to exert a substantial pressure upon the multiply paper in order to force the two reinforced sheets of paper firmly together. The intermediate roll 17 is preferably provided with a rubber jacket, or other material that will yield slightly to the crossing fibres. The mechanism so far described will produce a reinforced paper similar to that produced by the Howard patent above mentioned, but as above pointed out difficulty has been experienced heretofore in attempting to increase the amount of reinforcing fibres applied to each sheet of paper, beyond a predetermined point due to the tendency of the two reinforced sheets of paper to separate if too many fibres are used.

This difficulty is entirely overcome through the present invention by providing a third coating 20 of adhesive such as asphaltum between the two reinforced sheets of paper, and while various means might be employed for applying the adhesive coating 20 between the two layers 13 and 14 of reinforcing fibres the means illustrated in the drawings to this end comprises a pipe 21 which may be closed at one end and is connected at its opposite end to suitable means adapted to supply asphaltum in a hot condition to this pipe under pressure, and the pipe 21 is provided along its lower face with the discharge apertures 22 through which jets or streams of hot asphaltum are deposited upon the transversely extending fibres 13 as indicated by 23. It is desirable to iron or spread out the asphaltum

23 into a smooth substantially uniform coating and this is readily accomplished by providing the roll 15 which is preferably heated and is held in firm contact with the adhesive 23 upon the sheet of paper 11 to iron or spread out the asphaltum 23 into a smooth coating as indicated by 20.

It will be seen from the construction just described that as the reenforced sheets of paper 10 and 11 pass between the rollers 16, 17 and 18 they will be forced together and firmly united by the coating of adhesive 20 lying between the transversely and longitudinally extending fibres.

As a result of this construction the two reenforcing sheets of paper will be firmly united by the coating 20 irrespective of whether the reenforcing fibres are crowded closely together or spaced some distance from each other, and by providing the reenforced paper 19 with three layers of asphaltum instead of two layers as heretofore, the composite paper is more firmly united and the moisture-proof properties of the paper are increased to such an extent that it will be practically impossible for moisture to penetrate through the multiply paper even when water is allowed to remain on the paper over a long period of time.

It will be seen from the foregoing that through the employment of the present invention reenforced paper much stronger than that provided heretofore can be produced and that the moisture-proof properties of the paper are greatly increased.

What is claimed is:—

1. As an article of manufacture, reenforced waterproof paper, comprising in its construction a paper fabric formed of two sheets of paper each having a coating of adhesive applied to its inner face and a reenforcing sheet of fibrous material secured to each sheet of paper by the adhesive and having a third coating of adhesive between the two sheets of fibrous material and in engagement with both of said fibrous sheets to firmly unite the two reenforced sheets of paper with the fibrous material of one fibrous sheet contacting with the other fibrous sheet, and at least one of said coatings being formed of waterproof adhesive.

2. As an article of manufacture, reenforced paper, comprising in its construction a paper fabric formed of two sheets of paper each having a coating of adhesive applied to its inner face and a layer of reenforcing fibres secured to each sheet by the adhesive, and having a third coating of adhesive between the two layers of fibres and in adhesive engagement with both layers of fibres to firmly unite the two reenforced sheets of paper with the fibres of one layer contacting with those of the other layer.

3. As an article of manufacture, reenforced waterproof paper, comprising in its construction a paper fabric formed of two

sheets of paper each having a coating of waterproof adhesive applied to its inner face and a layer of reenforcing fibres secured to each sheet by the adhesive, and having a coating of adhesive between the two layers of fibres and in engagement with both layers of fibres to firmly unite the two reenforced sheets of paper with the fibres of one layer secured directly to the fibres of the other layer.

4. As an article of manufacture, reenforced waterproof paper, comprising in its construction a paper fabric formed of two sheets of paper each having a coating of waterproof adhesive applied to its inner face and a reenforcing layer of straightened unspun fibres secured to each sheet by the adhesive, and having a third coating of waterproof adhesive between the two layers of fibres and in engagement with both layers to firmly unite the two reenforced sheets of paper with the fibres of one layer secured directly to the fibres of the other layer and increase the moisture-proof properties of the reenforced paper.

5. As an article of manufacture, reenforced paper, comprising in its construction, a paper fabric formed of two sheets of paper each having a coating of adhesive applied to its inner face and one sheet having a layer of straightened unspun fibres secured longitudinally of its inner face by the adhesive and the other sheet having a layer of straightened unspun fibres secured transversely of its inner face by the adhesive, and having a third coating of adhesive between the two layers of fibres and in engagement with both layers to firmly unite the two reenforced sheets of paper with the fibres of one layer secured directly to those of the other layer.

6. As an article of manufacture, reenforced waterproof paper, comprising in its construction, a paper fabric formed of two sheets of paper each having a coating of asphaltum applied to its inner face and one sheet having a layer of straightened unspun fibres secured longitudinally thereof by the asphaltum and the other sheet having a layer of straightened unspun fibres secured transversely thereof by the asphaltum, and having a third coating of asphaltum, between the two layers of fibres and in engagement with both layers to firmly unite the two reenforced sheets of paper with the fibres of one layer secured directly to those of the other layer.

7. As an article of manufacture, reenforced waterproof paper, comprising in its construction, a paper fabric formed of two sheets of paper each having a coating of adhesive applied to its inner face and one sheet having a layer of straightened unspun fibres secured longitudinally of its inner face by the adhesive and the other sheet hav-

ing a layer of straightened unspun fibres secured transversely of its inner face by the adhesive, the two sheets of reenforced paper being firmly united by a third coating of adhesive applied between the two layers of fibres and in engagement with both layers and at least one of said coatings being formed of waterproof adhesive.

8. The method of forming reenforced paper, which consists in coating two sheets of paper with an adhesive and securing a layer of reinforcing fibres to each sheet of paper by the adhesive, then applying a third coating of adhesive upon one of said reenforced sheets of paper over the reenforced fibres, and forcing the sheets together to cause them to be firmly united by the third coating with the fibres of one layer secured directly to the fibres of the other layer.

9. The method of forming reenforced paper, which consists in coating two sheets of paper with a waterproof adhesive and securing a layer of reinforcing fibres to each sheet of paper by the adhesive, applying a third coating of waterproof adhesive over the fibres upon one of said reenforced sheets of paper and spreading it out into substantially a uniform layer, and then forcing the reenforced sheets of paper together to cause them to be firmly united by the third coating with the fibres of one layer secured directly to the fibres of the other layer.

10. The method of forming reenforced paper which consists in coating a face of a sheet of paper with adhesive and securing a layer of straightened unspun fibres longitudinally of the sheet by the adhesive, coating a face of a second sheet of paper with adhesive and securing a layer of straightened unspun fibres transversely of the sheet by the adhesive, applying a third coating of adhesive over the fibres upon one of said sheets, and forcing the reenforced sheets together to cause them to be firmly united by the third coating with the fibres of one layer secured directly to the fibres of the other layer.

11. The method of forming reenforced waterproof paper, which consists in coating a face of a sheet of paper with waterproof adhesive and securing a layer of straightened unspun fibres longitudinally of the sheet by the adhesive, coating a face of a second sheet of paper with waterproof adhesive and securing a layer of straightened unspun fibres transversely of the sheet by the adhesive, and applying a third coating of waterproof adhesive between the fibres of said reenforced sheets and forcing the sheets together to cause them to be firmly united by the third coating with the fibres of one layer secured directly to the fibres of the other layer.

12. The method of forming reenforced waterproof paper which consists in coating a face of a sheet of paper with waterproof adhesive and securing a layer of straightened

unspun fibres longitudinally of the sheet by the adhesive, coating a face of a second sheet of paper with waterproof adhesive and securing a layer of straightened unspun fibres transversely of the sheet by the adhesive, applying a waterproof adhesive to the fibres upon one of said sheets and ironing it out into a substantially uniform coating, and forcing the reenforced sheets of paper together to cause them to be firmly united by the last mentioned coating with the fibres of one layer secured directly to the fibres of the other layer.

13. The method of forming reenforced waterproof paper which consists in coating a face of a sheet of paper with asphaltum and securing a layer of straightened unspun fibres longitudinally of the sheet by the asphaltum, coating a face of a second sheet of paper with asphaltum and securing a layer of straightened unspun fibres transversely of the sheet by the asphaltum, depositing asphaltum over the layer of fibres upon one of said sheets and spreading or ironing the asphaltum out into a substantially uniform coating, and forcing the reenforced sheets of paper together to cause them to be firmly united by the last mentioned coating with the fibres of one layer secured directly to the fibres of the other layer.

14. The method of forming reenforced waterproof paper which consists in coating a face of a sheet of paper with hot asphaltum and securing a layer of straightened unspun fibres longitudinally of the sheet by the asphaltum, coating a face of a second sheet of paper with hot asphaltum and securing a layer of straightened unspun fibres transversely of the sheet by the asphaltum, spraying hot asphaltum upon the layer of fibres upon one of said sheets and ironing the asphaltum out to form a smooth coating, and forcing the reenforced sheets of paper together to cause them to be firmly united by the last mentioned coating with the fibres of one layer secured directly to the fibres of the other layer.

In testimony whereof, I have signed my name to this specification.

HENRY D. MOORE.