

March 22, 1932.

G. E. GIBBS

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PAPER REENFORCING MACHINE

Filed Nov. 8, 1928

2 Sheets-Sheet 1

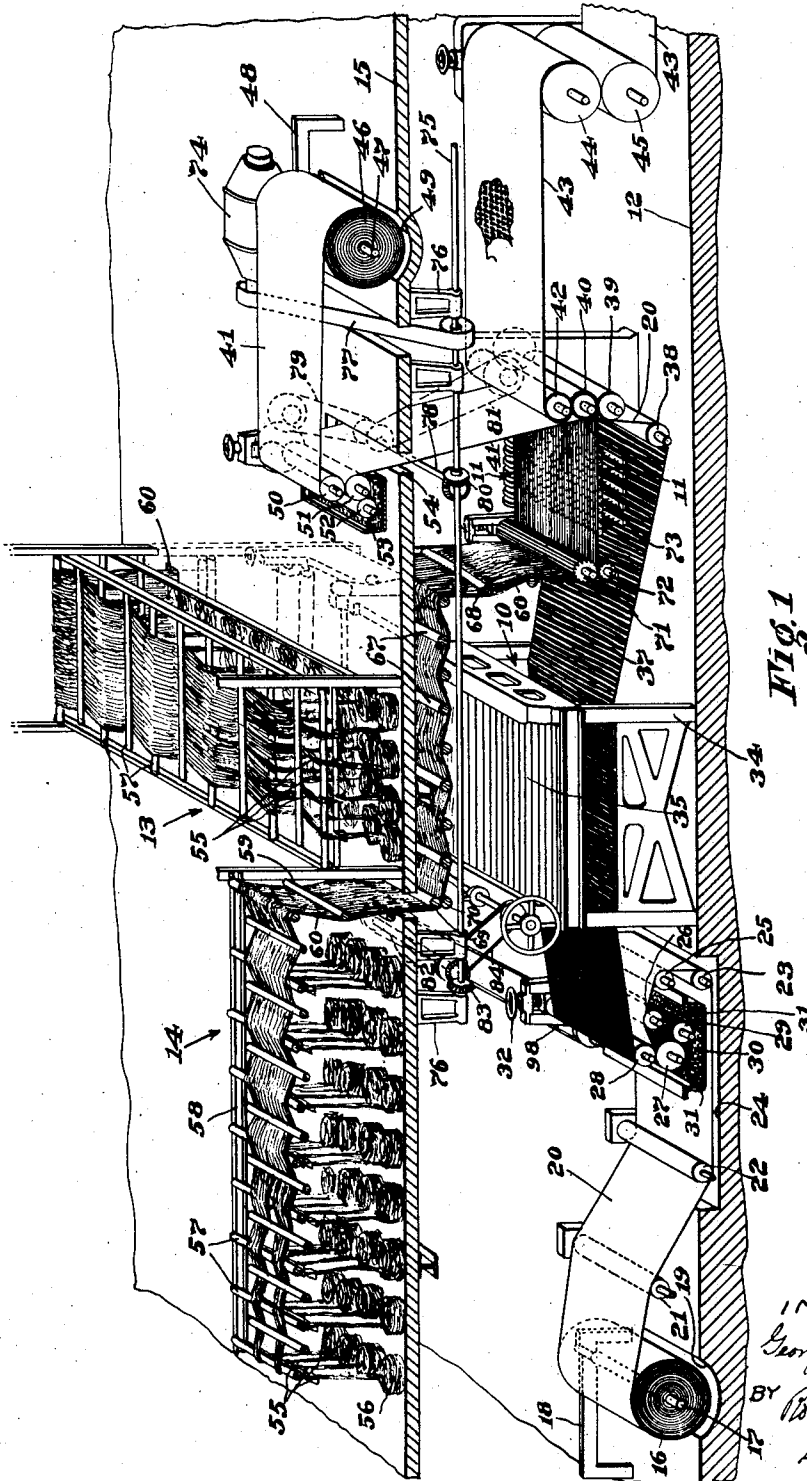


Fig. 1

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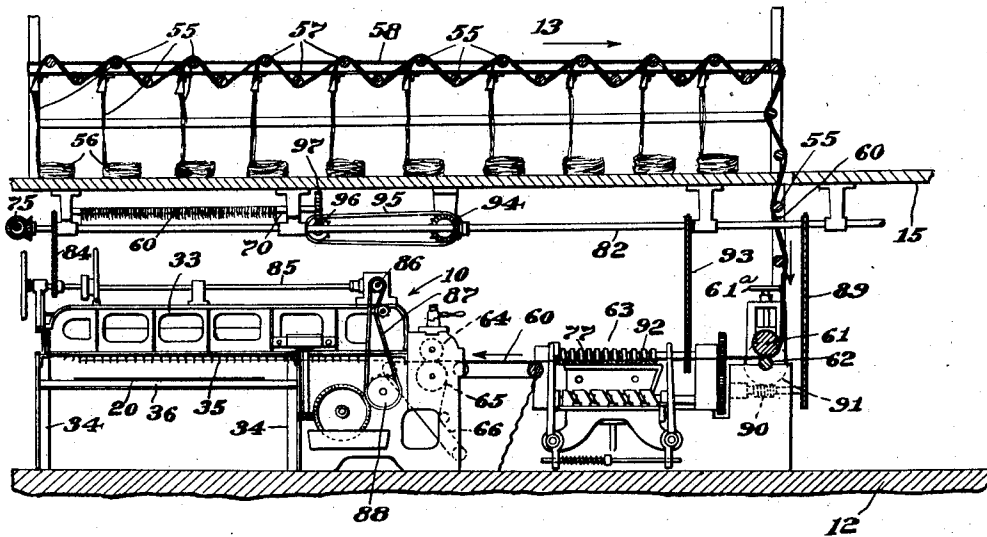
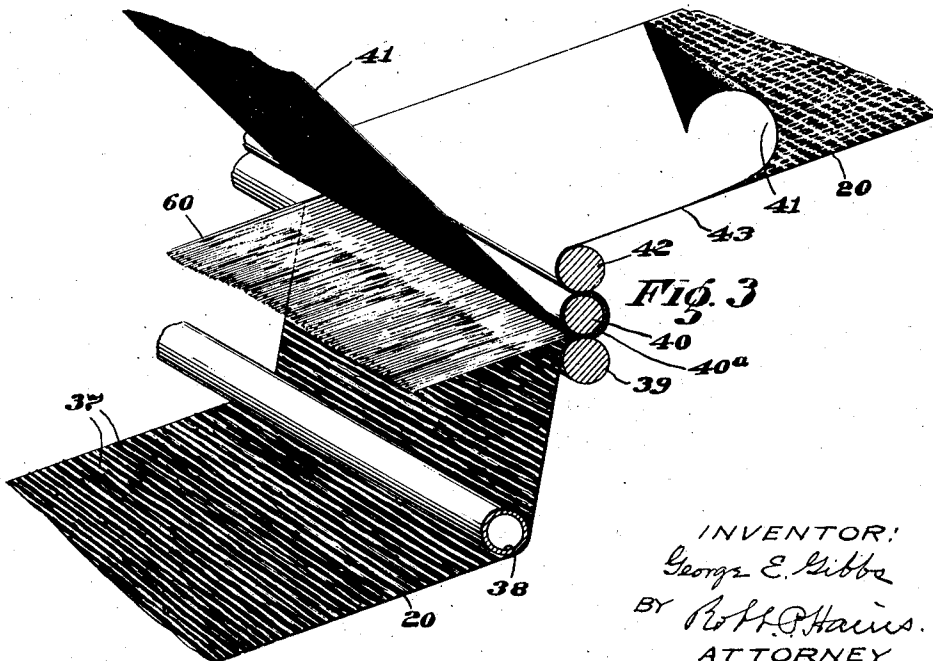


Fig. 2



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PAPER REENFORCING MACHINE

Application filed November 8, 1928. Serial No. 318,064.

This invention relates to improvements in machines for reenforcing paper both longitudinally and transversely.

It has been proposed heretofore to reenforce paper by applying straightened unspun fibres both longitudinally and transversely of the sheet of paper, and one good practical form of mechanism to this end is disclosed in the Charles H. Howard Patent No. 1,590,167, dated June 22, 1926.

In accordance with the disclosure of said patent, one machine is employed to apply a sheet of straightened, unspun fibres longitudinally of the sheet of paper to be reenforced, and a second machine is provided to apply successive, sheet-like groups of unspun fibres transversely of the traveling sheet of paper over the longitudinally extending fibres. The reenforcing fibres are conveniently supplied to each reenforcing machine in the form of rovings that are drawn from bales, but the bales from which the rovings are drawn occupy considerable floor space, and difficulty has been experienced heretofore in devising satisfactory means for supplying a sheet of rovings of the desired width from the bales to the reenforcing machines.

One of the features of the present invention therefore resides in a novel arrangement of parts for supplying the sheets of rovings to the transverse and longitudinal reenforcing machines.

Another feature of the present invention resides in the construction whereby the sheet of paper to be reenforced, is provided first with the transverse reenforcing fibres and then with the longitudinal reenforcing fibres, and as a result the transverse fibres can be more firmly embedded in the adhesive coating of the paper than in the constructions employed heretofore in which the longitudinal fibres were applied first and then the transverse fibres were laid over the longitudinally extending fibres.

A further advantage of the present arrangement in which the transversely extending fibres are applied first, results from the fact that these transversely extending fibres may be firmly ironed or pressed into the ad-

hesive coating of the paper sheet before the longitudinally extending fibres are applied.

Other features of the invention and novel arrangement of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate one good practical form of the invention.

In the drawings,—

Fig. 1 is a vertical sectional view through a building, and a perspective view of the paper reenforcing machines installed in the building for operation in accordance with the present invention;

Fig. 2 is a transverse sectional view through the building of Fig. 1 and shows the transverse reenforcing machine of Fig. 1 in side elevation; and

Fig. 3 is a perspective view showing the manner in which the two sheets of paper and the longitudinally extending fibres are united to form the two-ply reenforced sheet of paper.

This invention, as above pointed out, relates to the arrangement of the machines for applying one sheet of fibres longitudinally of the paper to be reenforced and a second sheet of fibres transversely of this paper, and is not concerned with the particular construction of either of these machines. It will therefore be apparent that various forms of machines adapted to apply straightened unspun fibres longitudinally and transversely of a sheet of paper may be employed in carrying out the present invention.

One type of machine which may be employed for applying the fibres longitudinally of the sheet of paper to be reenforced is shown, described and claimed in the C. H. Howard Patent No. 1,565,009, dated December 8, 1925. A form of machine which may be employed to apply the fibres transversely of the sheet of paper is shown, described and claimed in the C. H. Howard Patent No. 1,590,167, dated June 22, 1926, and a later type of machine which may be employed for applying the fibres transversely of the sheet of paper is disclosed and claimed in my co-pending application, Sr. No. 318,063, filed November 8, 1928.

In accordance with the disclosure of the present invention the machine 10 for applying the fibres transversely of the sheet of paper and the machine 11 for applying the fibres longitudinally of the sheet of paper are mounted upon the lower floor 12 of a building, while the roving supply mechanism 13 for supplying the sheet of rovings to the transversely extending machine 10 and the roving supply mechanism 14 for supplying a sheet of rovings to the longitudinally reinforcing machine 11 are mounted upon an upper floor 15 of the building.

The sheet of paper which is supplied to the transverse reinforcing machine 10 to have the reinforcing fibres applied transversely of this sheet, is drawn in the construction shown from a supply roll 16 which is rotatably supported by a shaft 17 the ends of which rest in bearings formed in the side frames 18. A clearance space 19 is conveniently formed in the floor of the building 12 below the paper roll 16, the construction being such that the roll of paper may be rolled along the floor without being elevated into the paper unwinding position in which it is shown. This is accomplished by making the supporting brackets 18 low enough to clear the ends of the shaft 17 until the roll of paper 16 is moved into a position above the clearance space.

The sheet of paper 20 is drawn from the supply roll 16 about the desired number of guide rollers, and as will be apparent from Fig. 1 passes downwardly from the first guide roller 21 under a pair of guide rollers 22 and 23 which are supported in a depression 24 formed in the floor of the building and this sheet of paper passes upwardly around the roller 23 over the rollers 25 and 26, and then between the pair of co-operating rollers 27 and 28 which serve to apply the adhesive such as asphaltum to the upper face of the sheet of paper that passes under the transverse reinforcing machine 10.

The asphaltum is supplied to the lower roller 27 by a roller 29 which dips into the hot asphaltum contained in the tank 30 and this asphaltum is preferably maintained at the desired temperature by heating coils 31. All three of the asphaltum applying rollers 27, 28 and 29 are preferably heated to promote the transfer of the asphaltum from the rollers 27 and 29 to the sheet of paper. This may be accomplished by making these rollers hollow so that hot oil may be forced through them to maintain them at the desired temperature. The thickness of the coating of asphaltum applied to the sheet of paper 20 may be controlled by raising and lowering the upper roller 28 slightly with respect to the lower roller 27 and this may be done by operating the adjusting screws 32.

The adhesive covered sheet of paper 20 passes from the upper roller 28 to the ma-

chine 10 for applying the fibres transversely of the sheet of paper, and this machine, as will be apparent from Fig. 2 of the drawings, has the portion 33 thereof which is supported by the uprights 34 in elevated relation to the floor of the building and is adapted to deposit successive groups or sections of fibres upon the sheet of paper 20. The sheet of paper as it passes under the machine 10 is supported in close proximity to the paper depositing combs 35 of this machine by the supporting bars or rollers 36, the arrangement being such that each time a predetermined length of the sheet of paper 20 passes beneath the machine 10 a sheet or batch of straightened unspun fibres will be deposited transversely upon the adhesive covered face of the sheet of paper by mechanism such as described in my copending application above referred to, or by the mechanism of the Howard Patent No. 1,590,167, above mentioned.

The sheet of paper 20 having the transverse reinforcing fibres 37 adhesively secured thereto, in accordance with the present invention, passes from the machine 10 to an ironing roller 38 which in the present case is shown as disposed below the longitudinal reinforcing machine 11. This ironing roller is preferably made hollow in order that it may be heated by passing a heating fluid such as hot oil therethrough, and this roller serves to iron or force the transversely extending fibres 37 firmly into the adhesive coating upon the sheet of paper.

The sheet of paper 20 passes upwardly from the roller 38 between the cooperating rollers 39 and 40 of the fibre reinforcing machine 11 and as the paper passes between the nip of these cooperating rollers it receives the sheet of longitudinally extending fibres, as will be more fully hereinafter explained. At the same time a second sheet of paper 41 is preferably applied over the reinforcing fibres to form a two-ply sheet of paper which is reinforced both longitudinally and transversely. This two-ply sheet of paper passes about the intermediate roller 40 in one direction and then upwardly and half-way around the upper roller 42, as will be apparent from Fig. 1 of the drawings. The roller 40 is preferably provided with a rubber jacket 40^a to give the same a yielding surface. The arrangement is such that the co-operating rollers 40 and 42 serve to firmly press the sheets of paper together to effect an intimate engagement of the reinforcing fibres and sheets of paper with the adhesive and thereby form the desired reinforced paper 43.

This reinforced sheet 43 may be at once wound in a roll ready for the market, but it is found in some cases that the reinforced paper may be improved by subjecting it to a heat treatment before it is wound into the final roll, and this may be accomplished by

passing the sheet of paper 43 between the cooperating hollow rollers 44 and 45 which may be maintained at any desired temperature by passing water or steam through these hollow rollers. These cooperating rollers 44 and 45 may serve either as heating rollers or cooling rollers depending upon the temperature at which they are maintained.

The sheet of paper 41 forming the upper sheet of the composite paper 43 is conveniently fed from a supply roll 46 which is supported upon the upper floor 15 of the building out of the way of the reinforcing machines, and the supporting shaft 47 of this roll is conveniently mounted upon the frames 48 which are adapted to support the roll over a depression 49 in the floor of the building, this arrangement being similar to that of the supporting means for the supply roll 16. A coating of adhesive is preferably applied to the fibre engaging face of the sheet of paper 41 and this is accomplished by passing the sheet of paper between the cooperating rollers 50 and 51, the adhesive such as asphaltum being supplied to the lower roller 51 by a roller 52 that rotates in the supply of asphaltum maintained within the tank 53. The asphaltum in this tank and the rollers 50, 51 and 52 are preferably heated in a manner similar to that of the adhesive applying means for the lower sheet of paper 20. The sheet of paper 41 with the adhesive applied thereto passes downwardly from the roller 51 through an opening 54 in the floor of the building to the nip of the cooperating rollers 39 and 40.

The reinforcing fibres are preferably supplied to the transverse and longitudinal reinforcing machines in the form of rovings 55 which are drawn from bales or other sources of supply 56, and these bales may rest upon the upper floor 15 of the building shown in the drawings. The rovings are drawn upwardly over the bars 57 which are supported in spaced relation to the floor by the side frames 58 and are pulled forward between the staggered bars, as shown, to the front of the roving supply machine, and then downwardly between the guide rollers 59 and through a hole in the floor 15 of the building.

The roving supply machine 13 for supplying a sheet of rovings to the transverse reinforcing machine 10 is in the present construction disposed directly over the machine 10, as will be apparent from Fig. 2 and the front end of the roving supply machine 13 is disposed directly above the attenuating mechanism which serves to feed the sheet of fibres to the transverse reinforcing machine 10 in a straightened condition. The sheet of rovings 60 may therefore be drawn downwardly through a hole in the floor 15 to the ribbed fibre advancing rollers 61 and 62 disposed at the forward end of the fibre attenuating machine 63. The upper roller 61

may be moved towards and from its cooperating roller 62 by adjusting the hand wheel 61^a.

The sheet of rovings 60 passes from the attenuating machine 63 to the feed rollers 64 and 65 of the transverse reinforcing machine 10 and is advanced by these rollers and the conveyor apron 66 to an endless carrier consisting of carrier bars having the combs 35 which are adapted to engage the sheet of fibres 60 and carry it to a position directly over the sheet of paper 20, whereupon this sheet or batch of straightened unspun fibres is ejected downwardly upon the traveling sheet of paper 20 to reinforce the paper transversely.

In the construction shown the roving feeding machine 14 for supplying the sheet of rovings to the longitudinal reinforcing machine 11 is located a substantial distance from the reinforcing machine 11, this arrangement being necessary in the present construction in order that the forward end of the roving feeding machine 14 may clear the roving supply machine 13. It is therefore necessary to advance this sheet of rovings 60 over the transverse reinforcing machine 10 just beneath the upper floor 15. This is accomplished by providing the fibre guiding rollers 67 which may be supported by brackets suspended from the upper floor 15 and the sheet of fibres preferably passes over and under these rollers as shown, and then downwardly about the guide rollers 68 to the machine 11. If a sufficient pulling force is exerted upon the sheet of fibres at the point at which it enters the machine 11 to draw the rovings from their source of supply over the various bars and rollers shown, the rovings may be unduly attenuated by this pull, and it is therefore desirable to provide the power driven feed rollers 69 and 70 which will help to advance this sheet of rovings to the machine 11.

The fibre reinforcing machine 11 is provided with the crimped feed rollers 71 and 72 which serve to advance the sheet of rovings 60 to the machine 11. As the fibres pass lengthwise of this machine they are combed and attenuated by the traveling combs 73. The construction of this fibre feeding and attenuating machine 11 and that of the machine 63 above referred to may be similar to the construction disclosed in the above mentioned Howard Patent No. 1,565,008.

The various machines described must obviously be operated in timed relation in order that they may properly cooperate in the production of the reinforced paper 43, and in the construction shown all the machines shown and described are driven from an electric motor 74 which is conveniently mounted on the upper floor 15 of the building. This motor drives a line shaft 75 which is supported beneath the upper floor 15 by the brackets

76, driving movement being imparted from the motor 74 to the shaft 75 by a flexible belt or chain 77 which extends downwardly through a hole in the floor 15 of the building.

5 The mechanism for applying asphaltum to the upper sheet of paper 41 is driven from a transversely extending shaft 78 by a chain 79 that extends upwardly from this shaft to driving gears for operating the rollers 50, 51.
10 The shaft 78 is driven from the main shaft 75 by bevel gears 80. The cooperating rollers 38, 40 and 42 of the machine 11 are driven from the transversely extending shaft 78 by a downwardly extending chain 81.

15 The transverse reenforcing machine 10 and means for feeding the fibres to this machine are driven from the transversely extending shaft 82 which is driven by bevel gears 83 from the main shaft 75. The machine 10 is
20 driven from the shaft 82 by a chain 84 adapted to rotate the longitudinally extending shaft 85 of the machine 10 and the shaft 85 serves to drive a transversely extending shaft 86 which in turn drives a chain 87 adapted to
25 rotate the gear 88 and various parts driven from this gear and the shaft to which it is secured.

The sheets of paper 20 and 41 are preferably driven at relatively high speed in order
30 to increase the production of reenforced paper. The sheets of rovings fed towards the paper reenforcing machines are much thicker than is required to reenforce the sheets of paper and it is therefore desirable
35 to draw these sheets of fibres out to a substantial degree before applying the fibres to the sheets of paper. This is accomplished by feeding the sheets of rovings at a relatively slow speed towards the fibre reenforcing
40 machines and then drawing the fibres out quickly before, or at the instant, they are brought in contact with the paper to be reenforced. The desired slow feed is imparted to the fluted rollers 61 and 62 in the construction shown
45 in Fig. 2 by a chain 89 extending downwardly from the shaft 82 and this chain serves to drive a worm 90 which meshes with a worm gear 91 adapted to rotate the fluted rollers 61 and 62. The feed screws 91, for advancing
50 the combs 73 along their upper and lower runs are driven from the shaft 82 by the chain 93. The fluted rollers 71 and 72 of the longitudinal reenforcing machine of Fig. 11 may be driven in a manner similar to the driving
55 mechanism just described for the fluted rollers 61 and 62.

The auxiliary feed rollers 69 and 70 which are provided to help advance the sheet of longitudinally reenforcing fibres to the machine 11 may be driven from the shaft 82,
60 which, through the bevel gears 94, drives the chain 95 adapted to drive the worm 96 which meshes with a worm 97 rigidly secured to the feed roller 70. The mechanism for applying asphaltum to the sheet of paper 20

may be driven from the power shaft 82 by the downwardly extending chain 98.

As a result of the mechanism described the sheet of rovings 60 for reenforcing the paper longitudinally is advanced slow along its
70 path of travel by the rollers 69, 70 and 71, 72 and the fibres are straightened by the action of the combs as the sheet passes over the machine 11. The fibres upon reaching the nip of the rollers 39 and 40 between which the
75 sheets of paper 20 and 41 are being rapidly fed are pulled forward by the paper through the combs and are applied between the two sheets of paper in the desired thin layer. In a similar manner the sheet of rovings 60 of
80 the transverse reenforcing fibres is advanced slowly to the attenuating mechanism shown in Fig. 2 of the drawings and is advanced by the combs to the nip of the rollers 64 and 65, whereupon the fibres are rapidly pulled forward
85 to produce a thin reenforcing sheet of fibres that is applied transversely of the sheet of paper 20.

It will be seen from the foregoing that as a result of the present invention the transverse
90 reenforcing fibres are applied to the sheet of paper 20 and through the action of the heated roller 38 are ironed or pressed firmly into engagement with the adhesive upon the sheet of paper. Then this transversely reenforced
95 sheet of paper is fed to the rollers 39 and 40 to receive the longitudinally reenforcing fibers as best shown in Fig. 3.

What is claimed is:—

1. A group of machines for reenforcing
100 paper both longitudinally and transversely, comprising in combination, cooperating feed rolls, means for delivering an adhesive covered sheet of paper to the nip of said rolls, a machine for depositing successive sheet-
105 like sections of unspun fibres transversely upon the adhesive covered face of a second sheet of paper, means for delivering the transversely reenforced sheet of paper between said rolls, a heated roll positioned between the transverse reenforcing machine and said cooperating rolls and adapted to iron the transversely extending fibres into the
110 adhesive of the second sheet, and a machine for delivering an attenuated sheet of unspun fibres between the two sheets of paper at the nip of said rolls to reenforce the paper longitudinally.

2. A group of machines for reenforcing
120 paper both longitudinally and transversely, comprising in combination, cooperating feed rolls, means for delivering an adhesive covered sheet of paper downwardly to the nip of said rolls, a machine for depositing successive sheet-like sections of unspun fibers
125 transversely upon the adhesive covered face of a second sheet of paper, means for delivering the transversely reenforced sheet of paper upwardly between said rolls, an ironing roll positioned between the transverse reenforc-

ing machine and said cooperating rolls and adapted to iron the transversely extending fibres into the adhesive of the second sheet, and a machine mounted in front of said rolls and adapted to deliver a sheet of unspun fibres between the two sheets of paper at the nip of said rolls and to attenuate the fibres as they are drawn forward by the rolls.

3. A group of machines for reenforcing paper both longitudinally and transversely, comprising in combination, cooperating feed rolls, a machine for depositing successive sheet-like sections of unspun fibres transversely upon the adhesive covered face of a sheet of paper and for delivering this transversely reenforced sheet to the nip of said rolls, an ironing roll positioned between the transverse reenforcing machine and said rolls and adapted to iron the transversely extending fibres into the adhesive of the second sheet, and mechanism for delivering a second adhesive covered sheet of paper and a sheet of longitudinally extending unspun fibres to the nip of said rolls.

4. A group of machines for reenforcing paper both longitudinally and transversely, comprising in combination, cooperating feed rolls, means for delivering an adhesive covered sheet of paper downwardly to the nip of said rolls, a machine for depositing successive sheet-like sections of unspun fibres transversely upon the adhesive covered face of a second sheet of paper, means for delivering the transversely reenforced sheet of paper upwardly between said rolls including an ironing roll positioned below said feed rolls to have the paper directed upwardly about its surface to the feed rolls and adapted to iron the transverse fibers into the adhesive, and a combing machine mounted between the feed rolls and the transverse reenforcing machine and adapted to deliver a sheet of unspun fibres in an attenuated condition between the two sheets of paper at the nip of said rolls.

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

GEORGE E. GIBBS.

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