Oct. 18, 1932. M. R. WARE 1,883,144

ART OF MAKING PAPER AND FELTED SHEET MATERIALS

Filed Oct. 14, 1929 2 Sheets-Sheet 1

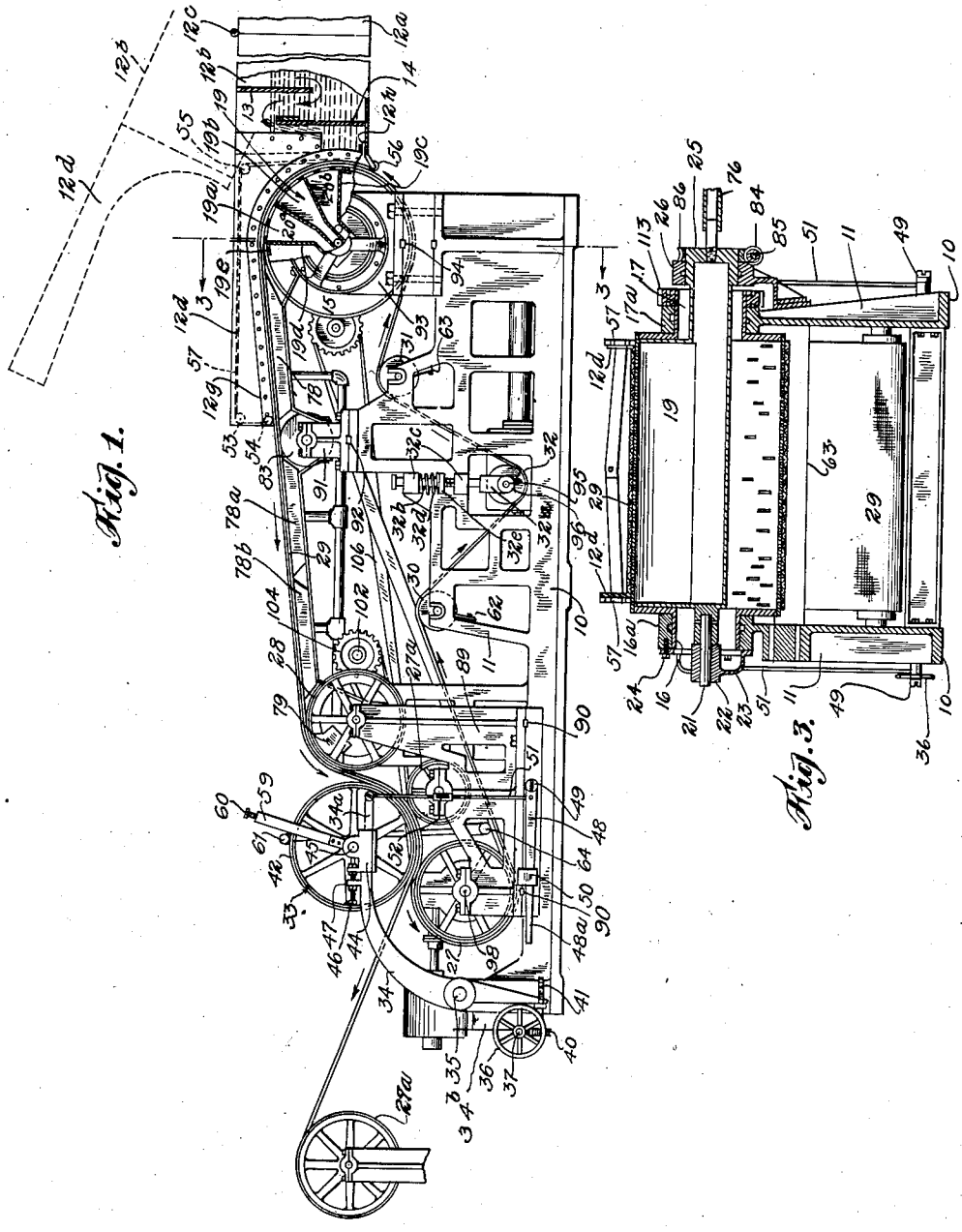


Fig. 1.

Fig. 3.

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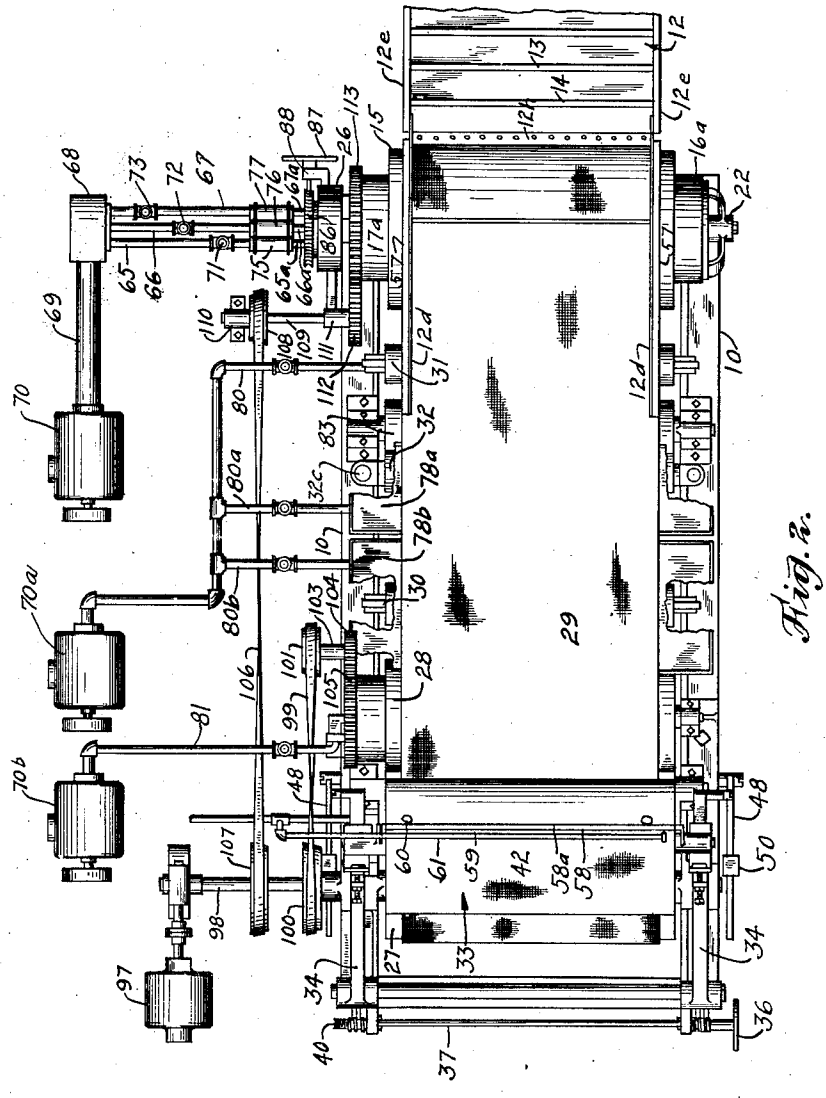


Fig. 2.

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UNITED STATES PATENT OFFICE

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ART OF MAKING PAPER AND FELTED SHEET MATERIALS

Application filed October 14, 1929. Serial No. 399,656.

This invention relates to the art of making paper and felted sheet materials of a porous nature which may be readily dried and are adapted to be easily impregnated with saturating materials. This application is a continuation in part and improvement on Patent No. 1,732,176, granted October 15, 1929. The important value of this method of manufacture lies in the fact that with any given grade of paper stock that may be used, a sheet can be formed which is much less compacted than sheets formed by machines or methods now and heretofore employed.

Heretofore, generally speaking, paper and sheet materials made from pulp or water stock fibrous materials have been manufactured by forming a web upon a carrier by either gravity flow or gravity and suction means and then transferring or couching to a felt carrier and drawing the water therefrom by mechanical pressure means used alone or in combination with suitable suction means, thereby necessitating a more or less complex arrangement and structure for producing a web suitably drained for transferring to the usual drying machine. It has been noted that with machines of the above type and others of different types now being used the webs, due to numerous mechanical operations, are compacted while being drained, thereby producing a more or less dense sheet which not only retards the drying thereof but also retards the saturating thereof with any treating solution or impregnating compound.

In its general aspects this invention involves the depositing of a fibrous watered stock upon a travelling perforated or reticulated, endless carrier to form a web, from which the water is drained by means of suitably arranged suction means without subjecting the web to any mechanical operating or pressure means until it is sufficiently drained and dried, so that the web will not be compacted by any mechanical operations peculiar to present type machines commonly used having a woolen felt belt in combination with a series of presses which have a tendency to roll the fibres down on the surface and cause a stretching action of the sheet, thereby causing shrinkage crosswise and compacting the sheet.

In the preferred form, the watered stock is drawn on to the traveling carrier by means of a controllable variable suction means in a web-forming cylinder over which the endless carrier passes.

This method of manufacture is particularly adapted to form matted webs of a loose textured nature, for the reason that the webs while being formed and drained are not only subjected to fewer mechanical operations than heretofore used, but also special care has been taken to eliminate the application of all mechanical pressures and operations which have a tendency to compact, until the web or sheet is sufficiently drained so that the application of any mechanical pressure thereon will not materially change the physical character thereof. The sheets produced by this method are sufficiently drained and dried to go directly to the usual dryers without necessity of going over long draws to presses and the like.

By this invention, not only is the loose texture of the sheet or web as formed upon the web-forming carrier maintained, but it has been found that by drawing the watered stock by suitable suction means upon the web-forming carrier at a speed greater than the travel of the carrier, the fibres are not only drawn upon themselves, but are also crisscrossed in all directions, thereby producing a wet web which, when drained and treated as hereinabove stated, produces a more loosely textured sheet having an unusual fluffy and matted nature which is tear-resisting in all directions and easily dried and saturated with impregnating compounds.

This invention may be best understood by reference to the accompanying drawings, in which:

Figure 1 is a side elevation of the machine constituting the invention with parts broken away, showing the arrangement of vacuum boxes in the fabricating drum and also showing the internal arrangement of the stock vat and the relation of endless belt deckels to the endless conveyor belt.

Fig. 2 is a plan view of the machine.

Fig. 3 is a section on the line 3—3 of Fig. 1, looking in the direction of the arrows and

illustrating the arrangement of the vacuum boxes in the fabricating drum.

This invention is described with reference to the accompanying drawings in order to facilitate an understanding thereof.

Referring to the drawings in detail, the same reference characters designating the various parts throughout all figures of the drawings, 10 designates a base, preferably of cast iron or such usual materials as are employed for this purpose, upon which the framework 11 of the machine is mounted, which framework may be cast integral therewith as shown in the drawings. At one end of the machine, as shown in Figure 1, is a vat 12 made in two parts 12*a* and 12*b* hinged together at 12*c*, the latter part lying adjacent the fabricating drum and having extensions or side boards 12*d* extending over the drum and extending a certain distance beyond the drum along the carrying endless belt to be described. The purpose of the hinged construction is to permit the portion of the vat 12*b* and the side boards 12*d* to be lifted off of the drum and folded back on the portion 12*a* or suspended from a suitable support in case it is desired to remove the belt or for any other purpose. The vat or tank 12 is provided with the usual tortuous passageway around a plurality of baffles, two of which are illustrated at 13 and 14, extending from the top and the bottom of the vat respectively so that the stock may be delivered to the portion of the vat 12*b*, thoroughly agitated and of uniform mixture. The vat may be arranged with an open forward end so that the stock will flow onto a fabricating drum, to be described, from the side, as shown in Figure 1. The fabricating drum or roll 15 is suitably mounted for rotation by means of hollow trunnions 16 and 17 in journal boxes 16*a* and 17*a* respectively secured to the frame 11. The drum is of openwork construction preferably having slats extending longitudinally of the drum and spaced apart about its periphery.

Mounted on the opposite end of the frame is a plurality of rolls 27, 27*a* and 28 which cooperate with the drum 15 to support an endless carrying belt or apron 29 of reticulate material and preferably consisting of a strip of closely woven wire cloth, either woven endless or spliced as may be desired, which endless belt is trained about the drum and is of sufficient length to pass around rolls 27 and 28 over rolls 30 and 31 and under the tensioning roll 32 lying between rolls 30 and 31. The roll 32 is journaled in brackets 32*a* at the ends of screws 32*b* which are provided one on each side of the machine mounted in ears 32*c* extending from the sides of the frame. Encircling these screws are compression springs 32*d* having their ends respectively abutting against ears 32*c* and nuts 32*e*. Adjacent the rolls 27, 27*a* and 28 is provided a roll 33 mounted upon arms 34*a* of the levers 34. The levers 34 are pivoted to the frame 11 intermediate of their ends at 35 and may be adjusted to position roll 33 relative to rolls 27 and 27*a* so that the desired pressure may be exerted on the fibrous web between said rolls, by means of shafts 41 journaled to the frame 11 and having threaded connection with the ends of arms 34*b* of the levers 34; shafts 41 being operated by means of hand wheel 36 and worms 38 on shaft 37 meshing with worm wheels 40 on shafts 41. The roll 33 may be covered with a woolen jacket 42 to prevent slipping of the fibre web, which jacket is preferably shrunk thereon and made fast at the ends. The roll 33 is of larger diameter than the rolls 27 and 28 and is designed to rest on the upper surface of the belt between said rolls. Roll 33 is provided with trunnions 45 which are rotatably mounted in journal boxes 44 slidably mounted on the lever arms 34*a*, the journal boxes 44 being adjustably held on the said arms by means of screw bolts 46 rotatably connected with the journal boxes and having threaded connection with lugs 47 projecting from the lever arms. The purpose of this roll 33 is to cooperate with the rolls 27, 27*a* and 28 in order to exert pressure on the web of felt fibres resting on the upper surface of the belt 29, and to couch the sheet or web to a drying carrier 29*a*; and in order that the pressure exerted may be varied the outer ends of the lever arms 34*a* are connected, by rods 51 having turn buckles 52 thereon, with levers 48 pivoted to the frame at 49 and having weights 50 slidably adjusted along their arms 48*a*. By the above arrangement, all mechanical pressures are remote to the place of formation of the wet web, and as they are applied to the web on a non-stretchable carrier, the original formation of the web or sheet is substantially maintained without drawing of the fibres into a parallel relation.

The side walls 12*e* of the portion 12*b* of the vat 12 adjacent the drum 15 are spaced apart a distance equal to the width of the endless belt 29 and the side boards 12*d* are attached thereto. Secured to the lower edge of the side boards are aprons in the form of strips of cloth or flexible material 12*g*, the lower edges of which are slightly spaced from the endless belt. The purpose of these aprons is to break the joint between the side board and the deckel. The rolls 56 lie below the bottom of the tank in order to cause the rubber deckel to contact with the endless belt 29 ahead of the point where the stock is fed thereto and in order to prevent stock and water from spilling out of the vat under the drum an apron 12*h* is secured along the edge thereof adjacent the drum and extends a sufficient distance therefrom to make a firm contact with said belt 29 on said drum.

Mounted upon the side boards and on the

outside surface thereof are rolls 53, 54, 55 and 56 about which are trained rubber belts or aprons 57 which act as deckels, the lower surfaces of which are adapted to conform at the sides thereof with the belt 29 as it passes around the upper surface of the drum 15 and to press against the edge of the fibre deposited on said belt 29. These rubber deckels are extended forwardly of the drum 15 to the forward edge of the side boards, as will be seen by reference to Fig. 1, for their movement about the rolls 53, 54, 55 and 56 upon frictional contact with the wire cloth belt 29. The purpose of these rubber deckels is to give a uniform edge to the web of fibre.

By means of the above structure, a head box arrangement is formed having the same width as the sheet being formed, thereby eliminating dead pockets which tend to slow up the flow of the stock, and cause whirls or eddies in which slimes and fibres collect and finally break away, and flow over the sheet producing slime spots, lumps and uneven formations. Also, the stock will require less water for suspension when handled in the above type of head box or vat, as the vacuum formation causes a more rapid flow, thereby doing away with the deadened flows as commonly used in gravity formation in the Fourdrinier or cylinder type of machines.

Doctors for cleaning the various rolls which contact with the surface of the fibrous web or with the side of the belt with which said web has contacted are provided in connection with said rolls. A doctor 58 having a wooden doctor blade 58*a* contacting with the surface of the roll 33 is provided, which is supported by a suitable frame 59 and connected therewith by adjustment screws 60, the frame 59 being supported by journal boxes 44. This blade may be supplemented in its cleaning action by a shower pipe 61 extending transversely of the machine adjacent the roll 33 and adapted to sprinkle water thereupon. In connection with rolls 30 and 31 are provided doctors 62 and 63 which carry rubber doctor blades for scraping any fibre from said rolls which may have been deposited thereon by the belt 29. For assisting in cleaning the belt 29 and salvaging the fibre adhering thereto after the web has been taken off, a shower pipe 64 is extended transversely of the machine above the lower reach of the belt adjacent the roll 27, which shower pipe is adapted to sprinkle water on the belt as it passes that point, washing any adhering fibre off into collecting receptacles of well-known character, not shown.

Mounted within the drum 15 and arranged for angular adjustment relative thereto is a vacuum box 19 having walls 19*d* and a plurality of compartments 19*a*, 19*b* and 19*c* separated by partitions 20*a* and 20*b*, said vacuum box being supported at one end by means of the trunnion 21 rotatably mounted in a journal box 22 formed integral with the supporting structure 23 which may be attached to the journal box 16*a* in which the trunnion 16 is mounted by any suitable means, as by screw bolts 24. At the opposite end of the vacuum box is provided a hollow shaft 25 which is journaled in the bracket 26 secured to the frame 11. The partitions 20*a* and 20*b* extend into and partition this hollow shaft 25 whereby each compartment of the vacuum box may be connected separately with a vacuum pump as hereinafter described. The walls 19*d* are provided at the edges with flanges 19*e* of sufficient width to connect with slats adjacent the said walls 19*d* when the said walls happen to fall between said slats and to prevent suction being exerted except through the cylindrical surface of said drum.

Connected with the compartments 19*a*, 19*b* and 19*c* through the extensions thereof in the hollow shaft 25, are a plurality of suction pipes 65, 66 and 67 which connect through a manifold 68 and pipe 69 with a suction device, as a vacuum pump 70, of any desired construction, the suction through the pipes 65, 66 and 67 being controlled by valves 71, 72 and 73. The respective compartment extensions have short lengths of pipe 65*a*, 66*a* and 67*a* extending therefrom which connect with pipes 65, 66 and 67 by means of a length of flexible hose 75, 76, and 77, which construction permits of the angular adjustment of the vacuum box described above. The purpose of the vacuum box 19 is to suck the water in the vat 12 through a mesh of the endless belt 29 leaving the fibre contained therein deposited upon the endless belt 29. The suction exerted through the vacuum box also partially dries the fibrous web. The adjustment of the vacuum boxes 19*a*, 19*c* and 19*b* may be accomplished through a worm 84 mounted on the shaft 85 meshing with the worm wheel 86 on the end of the hollow shaft 25 and the hand wheel 87 on the other end of the shaft 85, said shaft 85 being mounted in a bracket 88 secured to the frame 11.

By using the vacuum formation in combination with the stock vat it is unnecessary to use any mechanism for the purpose of crossing fibres in the manufacture of a sheet of paper on this type machine, as the natural suspension of the fibres in the watered stock as ordinarily used is just about the desired formation, provided they can be drawn onto the sheet in the same condition as they are when suspended in water, which is made possible by vacuum formation. With this arrangement, the stock on flowing to the vat will become attached and bound together by the action of the vacuum, and, due to the vacuum action being quicker than the action of the cylinder turning against the stock, will cause the fibres to be formed into a sheet in a criss-cross relation before the revolving action of

the roll has any disturbing effect on the natural form of suspension, whereas with the gravity flow in the present type cylinder machines, the current is so dead that the action of the cylinder without the vacuum means has a tendency to drag the fibers, causing them to lie longitudinal with the sheet, forming a denser sheet which does not permit of rapid saturation. Other vacuum boxes along the course of travel of the forming belt are provided for further drying the web, as, for example, at 78, 78*a*, 78*b* and 79, the boxes 78, 78*a* and 78*b* being connected by pipes 80, 80*a* and 80*b* to a suction device 70*a*, and the box 79 to a suction device 70*b* by pipe 81. All the above pipes have valves therein for the purpose of regulating the suction pressures in the respective boxes. In the preferred method of operation, the valves are regulated so that the suction increases from the web-forming cylinder to the couching roll, so that the web is gradually drained without subjecting the forming or carrier belt to undue binding stress against the faces of the boxes, particularly where there is a considerable amount of water therein, as at the head end of the machine. By use of the above suction arrangement, the web may be drained to any degree desired before it reaches the couching roll, thereby effecting a substantial or any desired drying before being contacted by any mechanical pressure means.

A supporting or guide roll 83 may be provided on the frame at any suitable point for supporting the weight of the upper strand of the belt 29 and guiding it as it passes from the drum 15 laden with the fibre web to the rolls 27 and 28.

Inasmuch as belts of wire cloth, such as belt 29, are very heavy and difficult to place upon the drum and rolls, provision is made for removing the rolls 27, 27*a* and 28 with their integral supporting structure 89 which is so connected with the base of the frame 10 that it may be detached therefrom by sliding it sidewise on tracks 90. The supports 91 and 93 of roll 83 and drum 15, respectively, on one side of the machine are removable, leaving the drum and roll suspended in place, said supports 91 and 93 being slidable transversely of the machine on tracks 92 and 94, respectively. The tension roll 32 is likewise detachable by removing the shaft 95 on which it is mounted from its bearings 96.

The various rotatable parts of the machine are power-driven through a motor 97 or any other suitable means connected with the shaft 98 on which the roll 27 is secured for rotation therewith, the roll 28 being driven from said shaft 98 through cross belt 99 trained over cone pulleys 100 and 101, the latter being secured to a stub shaft 102 journaled in a suitable bearing 103 on the frame of the machine, the opposite end of said stub shaft being provided with a gear 104 meshing with a gear 105 on the end of the roll 28. The drum is similarly driven through cross belt 106 trained about cone pulleys 107 and 108 respectively on shafts 98 and 109, the shaft 109 being mounted in bearings 110 and 111 and having a gear 112 secured thereon and meshing with a similar gear 113 on the end of the cylinder 15.

The operation of the machine is as follows:

The fibrous pulp after being screened in the usual manner travels through suitable pipes, not shown and not part of this invention, to the vat 12 being agitated and brought to a uniform mixture by passing around baffles 13 and 14, arriving finally in the compartment adjacent the drum 15. The pulp will deposit on the belt 29 partially by gravity, the water passing through the mesh thereof, and partially by suction exerted thereon through the vacuum compartments 19*a*, 19*b*, 19*c* suitably adjusted to the inner surface of the drum. The vacuum pressure in said compartments is regulated individually by their respective valves 71, 72 and 73. As the belt 29 passes upwardly over the drum 15, the rubber deckel belts 57 will eliminate the rough edges, giving the desired deckeled edge to the web of pulp fibre.

As the pulp is carried rearwardly by the belt 29, it passes over vacuum boxes 78, 78*a* and 78*b*, which extract additional water therefrom, thence over the roll 28, which may be called the vacuum roll having a vacuum box 79, thereby draining and driving the web. The belt then passes between rolls 28, 27*a* and 27 on the under surface thereof and the jacketed roll 33 on the upper surface, the latter being adjusted to the pressure and location relative to said rolls 27, 27*a* and 28 necessary to produce any desired pressure on the web of fibre pulp. After passing between these rolls, the web may be guided off of the roll 27, which may be known as the drive roll, and may go direct to dryers or be passed between a series of presses or the like. In the preferred form the draining suction devices are disposed below the web, however, the same may be disposed above the web. Also the blowing or forcing of heated air against the web towards the suction means greatly expedites the draining and drying of the web.

The endless belt 29 of course continues around the driving roll 27 and under the shower at 64, where the belt is almost completely cleaned of any fibre adhering thereto. From thence the belt passes over and under the guide rolls 30, 32 and 31. The cleaning of the belt is further effected by means of the rubber doctor blades 62 and 63 adjacent the respective rolls 30 and 31. The white water containing the fibre scraped or washed from the belt 29 is caught in the usual manner and directed to a salvaging plant.

In passing off of the vacuum roll 28 it will

be noted that the web of fibre contacts with the jacketed roll 33 several inches ahead of the point where the pressure roll 27*a* contacts with the under side of the belt 29, which arrangement prevents crushing or slipping of the web. Likewise, the contact of the jacketed roll with the web will prevent slipping of the web between the pressure roll 27*a* and the driving roll 27 and will prevent slipping of the web or crushing thereof when the pressure of the jacketed roll 33 is applied to the driving roll 27.

With the above combination, it is possible, by suitable adjustment of the web forming vacuum box and proper manipulation of the suction valves related thereto, along with the controllable suction boxes and the jacketed roll, to readily manufacture various grades and textures of papers and sheet materials. Because of the more rapid drying due to the vacuum suction boxes it is possible to carry out the process with a shorter carrying belt for the fibre web and at a greater speed than in machines now in use, and the pressing which may be applied with controllable variation to the web between rolls 33 and 27, 27*a* and 28 eliminates the necessity of any further pressing before the usual final drying of the web. Further, the sheets made by this method are more uniformly matted in all directions and retain their original formation and elasticity better than sheets heretofore made, for the reason that the webs are formed by vacuum means on a non-stretchable carrier which, with its associated draining and treating means, renders the webs in suitable condition to pass directly to the usual dryers, omitting numerous draws and felt drying or draining belts with their usual pressure rollers, which have a tendency to stretch the carrier belts and draw the fibres into a parallel compact relation. The sheets by this method of manufacture are delivered substantially in the condition they are formed, not being subjected to any stretching and cross wise shrinkage, thereby producing sheets having a high degree of elasticity and which are much stronger cross-wise than those heretofore produced.

The above described method has been found to be particularly advantageous in connection with the manufacture of asbestos webs or sheets which may be readily impregnated or saturated with asphalt for roofing purposes. Heretofore, in view of the slow shedding characteristic of asbestos, sheets or webs of asbestos have been built up by multiple cylinder machines in plies or laminations, which do not thoroughly mat together to produce a homogeneous sheet. Asbestos sheets made by the latter method and others now and heretofore used compact the fibres, making a dense sheet which not only retards the drying thereof, but also retards the saturation or impregnation thereof.

By the method used in this invention, the asbestos stock is drawn onto the web-forming carrier in one homogeneous layer with the fibres arranged in a criss-cross loosely matted relation, which is readily drained by the suction means and substantially maintained in the original formation for the reason that there are no mechanical pressure applications until the web is more or less dried. The web made by the above method is more or less loosely textured and porous, depending upon the water content of the web, which is readily controllable by regulating the series of suction means before the web reaches the pressure rollers at the tail end of the machine. This loose textured web is thoroughly matted together, and has a somewhat fluffy nature, and is readily saturated and treated with asphalt to produce a sheet suitable for roofing purposes.

It has also been found that with this vacuum formation and the combination used in connection therewith, longer fibres may be used, thereby enabling the use of asbestos fibres as they are produced at the mines with substantially no treating or refining.

Proper regulation of the vacuum box in the web-forming cylinder also eliminates the necessity of manufacturing certain grades of paper and paper board in plies, which does away with flaws, splitting, ragged edges, crushing, checking, deckel troubles, overloading of the cylinders, stopping up of stuff gates, variation of weight and waste. The rapidity of production possible with this machine prevents the water in the vat from becoming frothy and slimy, and consequently avoids production of slime spots on the paper and avoids thin and thick streaks.

What I claim is:

1. In a paper machine of the class described, characterized by an endless belt running over a web-forming suction cylinder, the combination with said belt and cylinder of a couch roll operating on the formed web at a point in the belt path of movement remote from the cylinder, said couch roll constituting the first factor of mechanical pressure-application to be encountered by the paper web, and means, operating between the cylinder and couch roll, for draining water from the web.

2. In a paper machine of the class described, characterized by an endless wire belt running over a web-forming suction cylinder, the combination with said belt and cylinder of a couch roll operating on the formed web at a point in the belt path of movement remote from the cylinder, said couch roll constituting the first factor of mechanical pressure-application to be encountered by the paper web, and suction means, operating between the cylinder and couch roll, for draining water from the web.

3. In a paper machine of the class de-

scribed, characterized by an endless perforated belt running over a web-forming suction cylinder, the combination with said belt and cylinder of a couch roll operating on the formed web at a point in the belt path of movement remote from the cylinder, said couch roll constituting the first factor of mechanical pressure-application to be encountered by the paper web, and a series of suction boxes, operating between the cylinder and couch roll, for draining water from the web, and means for drying the web.

4. In a paper machine of the class described, characterized by an endless wire belt running over a web-forming suction cylinder, the combination with said belt and cylinder of a couch roll operating on the formed web at a point in the belt path of movement remote from the cylinder, said couch roll constituting the first factor of mechanical pressure-application to be encountered by the paper web, and suction means, operating between the cylinder and couch roll, for draining water from the web, said suction means being variable and controllable.

5. In a paper machine of the class described, characterized by an endless wire belt running over a web-forming suction cylinder, the combination with said belt and cylinder of a couch roll operating on the formed web at a point in the belt path of movement remote from the cylinder, said couch roll constituting the first factor of mechanical pressure-application to be encountered by the paper web, and suction means, operating between the cylinder and couch roll, for draining water from the web, said suction increasing from the head to the tail end of the machine.

6. In a paper machine of the class described, characterized by an endless belt running over a web-forming cylinder, the combination with said belt and cylinder of a couch roll operating on the formed web at a point in the belt path of movement remote from the cylinder, said couch roll constituting the first factor of mechanical pressure-application to be encountered by the paper web, and means, operating between the cylinder and couch roll, for draining water from the web, said cylinder having a controllable variable vacuum suction box for drawing the fibres thereon.

7. A method of making paper, which comprises forming a wet web of fibrous material upon a conveyor by suction means, and drawing water from the web without subjecting it to compacting pressure until the water content is so far reduced as to render any subsequently applied mechanical pressure ineffective to compact the web, and then drying the web, thereby producing a loose-textured bibulous sheet.

8. A method of making a loose textured asbestos sheet material, which comprises forming a wet web of fibrous asbestos material upon a conveyor by vacuum suction means, and draining water from the web without subjecting it to compacting pressure until the water content is so far reduced as to render the mechanical pressure to which it is subjected on the forming conveyor ineffective to compact the web thereby producing a porous, bibulous sheet.

9. A method of making porous asbestos sheet material, which comprises drawing a wet web of fibrous asbestos material upon a conveyor at a speed faster than the travel of the conveyor to form a criss-cross loose textured mat, and then draining the water from the web without subjecting it to compacting pressure until the water content is so far reduced as to render the subsequently applied mechanical pressure ineffective to compact the web.

10. A method of making a loose textured sheet material and the like, which comprises drawing a wet web of fibrous material upon a carrier, draining the water from the web without stretching and crosswise shrinkage of the web and then subjecting it to rolling pressure on the same carrier, the water content of the web being sufficiently reduced so that the rolling pressure is ineffective to produce any substantial compacting of the web.

11. A method of making a bibulous sheet material and the like, which comprises drawing a wet web of fibrous material upon a carrier at a speed greater than the travel of the carrier thereby causing the fibers to be arranged in a criss-cross loosely matted relation, draining the water from the web and then subjecting it to rolling pressure on the forming carrier, the water content of the web being sufficiently reduced so that the pressure is ineffective to produce any substantial compacting of the web.

12. A method of making a fluffy asbestos sheet material and the like, which comprises drawing a wet web of fibrous asbestos material upon a carrier at a speed greater than the travel of the carrier, draining the water from the web by suction means, and then subjecting it to rolling pressure on the forming carrier and then drying the web, the water content of the web being sufficiently reduced so that the rolling pressure is ineffective to produce any substantial compacting of the web.

Signed at New York, in the county of New York and State of New York, this 11th day of October, A. D. 1929.

MELVIN R. WARE.