Dec. 15, 1931. J. A. HEANY 1,836,467

APPARATUS FOR MAKING PAPER

Original Filed Feb. 15, 1924 2 Sheets-Sheet 1

Fig. 1.

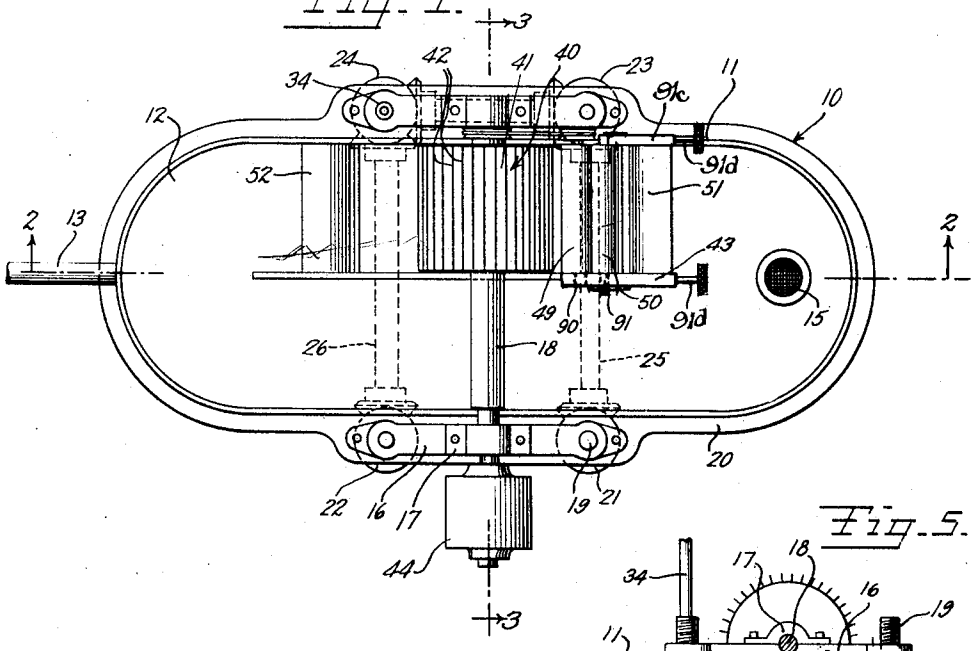


Fig. 5.

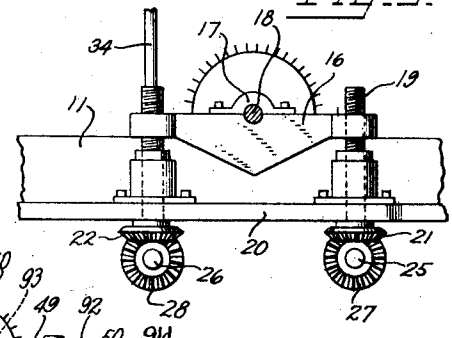


Fig. 2.

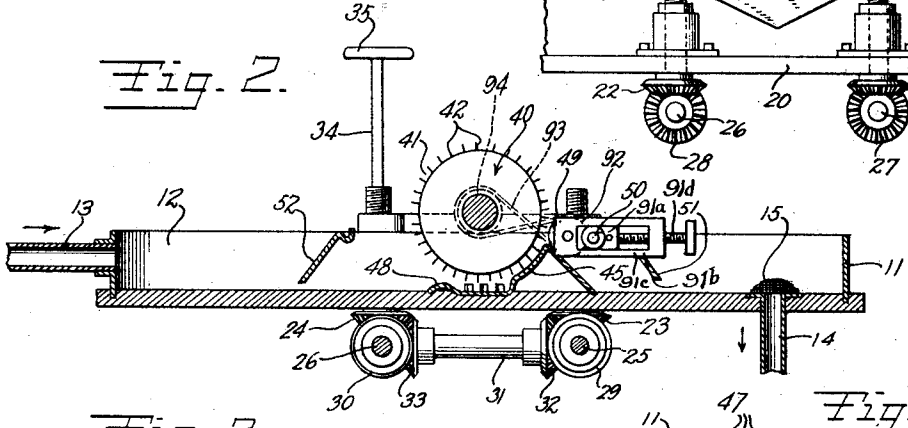


Fig. 3.

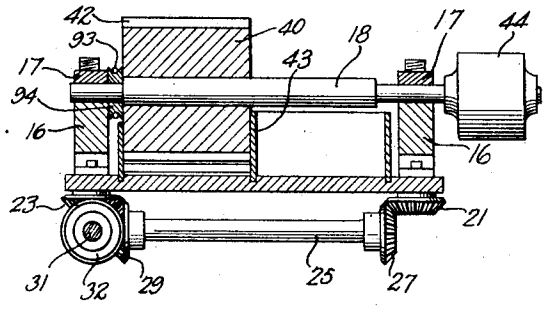
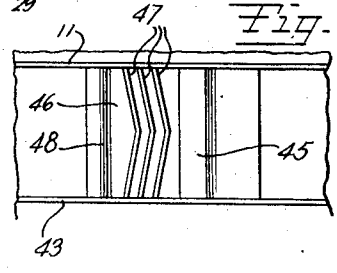


Fig. 4.



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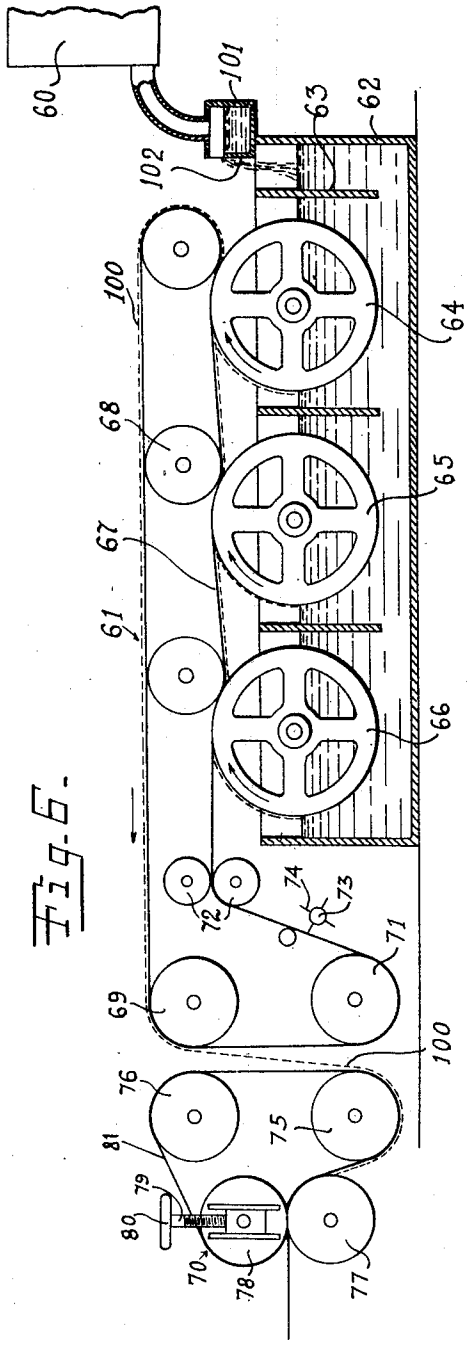


Fig. 6.

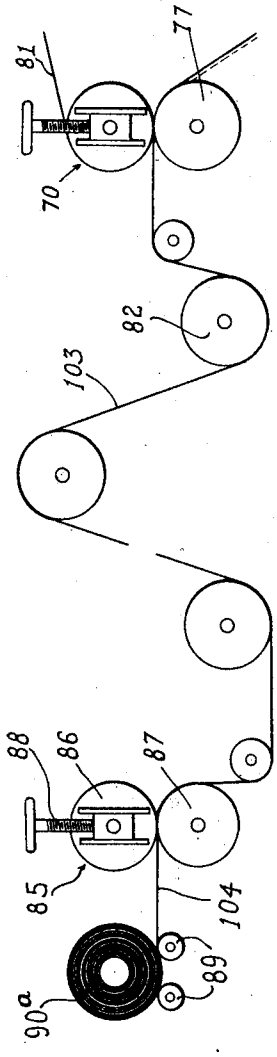


Fig. 7.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING PAPER

Original application filed February 15, 1924, Serial No. 692,947. Divided and this application filed September 12, 1927. Serial No. 218,891.

This invention relates to apparatus for making paper. The invention relates more particularly to mechanism for manufacturing paper out of asbestos fibre. The invention also relates to a preferred type of beater having utilization in loosening the fibrous structure of the paper stock.

In the manufacture of paper, especially where asbestos fibre is employed, it has been customary to work the basic pulp in the condition of paper fibre mixed with water in a beater machine, subsequently transferring the pulp to the paper machine in which the fibre is deposited on travelling belts to form a sheet and subsequently compressed under pressure rolls and thoroughly dried. One disadvantage of this process, as heretofore employed, has been that the fibre as present in the finished product has insufficient looseness, the paper being somewhat harsh and poor in absorptive properties. This defect has been noteworthy in connection with paper which has been subjected to impregnation, the close hard fibres tending to prevent proper absorption of the impregnating fluid. It has been proposed to accentuate the beating effect in the beating machine in order to loosen the fibres, but this action is undesirable inasmuch as the intensified beating, especially where employed with asbestos fibre, tends to break up the fibre instead of loosening it, and since it is desirable in paper structure to have the fibre as long as is possible, this modification of the process as heretofore employed has been unsatisfactory.

One of the important objects of my invention, therefore, is to provide means in a paper making machine by which the fibre stock entering into the composition of the paper is sufficiently loosened to permit easy impregnation or saturation without at the same time breaking the fibrous structure. Another important object is to provide means whereby a mineral fibre, such as asbestos, is worked so that the resultant paper product is smooth and flexible and absorbent. Specifically, it is an object of the invention to provide an improved beater machine in which the fibres entering into the pulp are loosened without maceration. Further objects, such as relate to details of the apparatus and specific features of the process involved will become apparent on consideration of the description and drawings containing an embodiment of the invention which may be preferred, hereinafter set forth.

Generally stated, my invention involves the use in addition to the beater of the beating machine, of a plurality of compressor rollers, or devices having similar functions, through which the pulp is passed and then passing the pulp to the paper machine, depositing the same on carrying belts and finally subjecting the sheet of matted material to a series of compressing and drying steps. A feature of the invention also is the employment of a beater drum which does not tear or break the pulp fibre as it passes beneath the same, this result being secured by mechanism for adjusting the elevation of the drum relative to the vat base.

Referring to the drawings:

Fig. 1 is a plan view of the beater machine;

Fig. 2 is a sectional elevation of the same taken on lines 2—2 of Fig. 1;

Fig. 3 is a view showing the drive mechanism and beater drum taken on lines 3—3 of Fig. 1;

Fig. 4 is a plan view of the base of the beater beneath the beater drum

Fig. 5 is a detail view of the beater drum and the mechanism connected thereto;

Fig. 6 is a diagrammatic view showing the paper machine in elevation; and

Fig. 7 is a diagrammatic view of parts of the paper machine in continuation of Fig. 6.

Referring to Fig. 1 of the drawings, there is shown in plan the beater machine 10 of a modified rectangular shape having the walls 11 curved at the ends of the vat 12, as shown. In one end of the vat, the end pipe 13 is positioned and the outlet pipe 14, shown in Fig. 2, and covered by a screen 15 is placed at the other end of the vat, said outlet 14 leading to the storage tank, hereinafter indicated.

In the side walls of the beater are placed bearings adapted to hold the beater drum, these bearings shown particularly in Figs. 1, 2, 3 and 5, include side support blocks 16, carrying retaining plates 17 in which the beater

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shaft 18 is rotatably mounted. The ends of the block 16 have screw-threaded engagement with upwardly projecting pins 19 mounted on the base plate 20 of the beater, the lower ends of said pins terminating in bevelled gears 21, 22, 23 and 24. The gears 21, 23 and gears 22 and 24 are connected by cross shafts 25 and 26, the same terminating in bevelled gears 27, 28, 29 and 30, cooperating with the corresponding horizontal bevellel gears 21, 22, 23 and 24, attached to the vertical pins 19. In addition, the stub shaft 31 is positioned on one side of the beater 10 having end bevelled gears 32 and 33 in connection with the vertical gears 29 and 30. One of the pins 19 is extended by an integral rod 34, terminating in a hand wheel 35 and it is apparent that rotation by the operator of the hand wheel 35 will cause a simultaneous rotation of the various bevelled gears and the movement of the screw-threaded pins 19, thus causing the vertical movement of the bearing blocks 16 upon which the beater drum shaft 18 is mounted.

The beater shaft 18 carries adjacent one end, the beater drum 40, this drum consisting of a cylindrical casting 41, upon which are mounted a plurality of axially extending plates 42. The plates 42 are relatively shallow in radial depth so that in operation upon the pulpy contents of the vat 12, the pulp is limited in its movement between the plates 42 of the drum. The drum 40 extends about halfway of the width of the vat 12 and terminates adjacent the dividing plate 43, extending axially in the vat and dividing the same into two compartments. One end of the shaft 18 of the beater drum terminates in a power pulley 44.

It is apparent from Fig. 1, that the partition 43 divides the vat in such a way that a channel is formed in which the pulpy stock may have movement, the material passing under the beater drum 40 and around on the other side of the vat and again under the beater drum, this movement being caused by the rotation of the drum which gives movement to the massed material in the vat. In connection with the beater drum, there are guide elements provided as indicated particularly in Fig. 2 in which the pulp is guided for a portion of the periphery of the drum. This guide is indicated by the curvilinear plate 45, the inner surface of which is positioned adjacent the outer ends of the beater drum blades 42. The lower end of the plate 45 is extended beneath the drum as at 46 and is formed with a plurality of corrugations 47, the same being in the shape of a shallow V, the apex of which is at the center of the channel and pointed in the direction of movement of the material, i. e., toward the curved portion of the plate 45. The end of the plate 46 is curved as at 48 to guide the material toward the beater drum 40. Beyond the curved plate 45 there are positioned rollers 49 and 50 extending across the channel containing the beater drum 40 and parallel with said drum. The rollers 49 and 50 are mounted on shafts 90 and 91. Shaft 90 may be mounted directly in the channel walls but shaft 91 at opposite ends of the roller 50 is mounted in blocks 91*a* slidable lengthwise of the channel in slots 91*b* in members 91*c* which are fixed with reference to the channel walls. The blocks 91*a* are adjustable by suitable means such as screws 91*d* to determine the distance between the rollers 49 and 50. The shaft 90 carries a pulley 92, and a power belt 93 forms a driving connection with a pulley 94 on the beater drum shaft 18. The plate 45 is extended partially over the roller 49 so that the pulp in its movement under the drum is forced onto the roller 49 and thence between the rollers 49 and 50, the pulp then entering the drum channel. Splash preventing aprons are provided as at 51 and 52 on either side of the beater drum to prevent escape of the liquid within the vat.

Considering the operation of the beater mechanism as described, the raw material such as asbestos fibre is placed in the vat 12 with a liquid as water to give the requisite plasticity to the pulp and permitting ease in working the same. In the case of asbestos pulp, it is ordinarily desirable to add in addition to water, substances such as lime, starch and caustic, the object of the lime being to combine with the slimy material of the pulp, thereby giving the same sufficient roughness and adherence to be handled easily with the various steps of the process, the object of the starch being to furnish the requisite cohesion with the paper fabric and the purpose of the caustic being to disorganize the material binder between the absestos fibres. Power is then applied to the pulley 44 and the drum 40 driven in such a direction as to cause movement of the pulp coincident with that of the arrow in Fig. 1, and as indicated by the arrow in Fig. 2. This rotation causes the pulp to travel in the beater drum over the corrugated base plate 45 up the curved wall thereof, intermediate said roll and the blades 42 of the drum and into the slot between the rollers 49 and 50 adjacent the edge of the plate 45. By means of the hand wheel, 35, the operator adjusts the drum 40 so that a sufficient distance is secured between the plate 45 and the drum as not to macerate the asbestos pulp while at the same time breaking down the various lumps of fibrous stock and moving the material up the inclined surface of the plate 45. The adjustment of the drum 40 is also such as to provide sufficient material to fill the opening between the rollers 49 and 50. The rollers 49 and 50 are, as already described, adjustable and power driven and act as squeeze rolls to force out the liquid in the pulp and at the same time by this pressure

loosen the bonds between the various fibrous elements making up the asbestos stock without at the same time breaking the fibres. The compressed stock is then passed into the vat and enters the current of material passing around the channel to be again operated upon by the drum 40 and rollers 49 and 50. This combined squeezing and beating operation is continued until the material is in condition to be passed into the paper machine.

From the beater the paper pulp is led by the pipe 14 to the storage vat 60 and thence to the paper machine 61 as needed. The paper machine consists in its essential elements of the vat 62 having a plurality of transverse partitions 63, extending from the top of the vat to the point displaced from the adjacent base of the vat. In the compartments formed by the partitions 63 are placed hollow drums 64, 65 and 66, each of which is rotatable on shafts mounted on the side wall of the vat 62. The various drums or "moulds" are preferably formed with screen walls and means are provided such for example as a force pump, not shown, by which the pulp bearing liquid is drawn toward the interior of the drum, thus causing the deposit of the pulp upon the exterior surface of the screen. The drums, in rotation, carry the fibrous material upwardly into contact with the travelling belt 67 made of felt or similar material to which the fibrous stock adheres, each drum adding this deposit of matted pulpy material, forming a matted sheet 100 of loose fibre. The sheet, thus formed, is then carried by the belt supported by the various rollers 68 and 69 into juxtaposition with the calendering apparatus 70.

As shown in Fig. 6, the belt 67 is extended from the rollers 69 about the roller 71 through guide rolls 72 back to the screened drum 64, 65 and 66. A cleaner roller 73 is also provided having blades 74 in order to remove any of the fibrous material remaining on the belt surface subsequent to movement over the roller 71. The use of an intermediary tank 101 is also indicated between the storage tank 60 and paper machine vat 62, said intermediary tank having an overflow strip 102 on one side over which the pulp flows into the tank 62.

The calendering apparatus 70 is shown as comprising two vertical rollers 75 and 76, displaced from each other and two pressure rolls 77 and 78 one above and in contact with the other, the pressure rolls being provided with appropriate pressure mechanism including a threaded rod 79 and wheel 80. A belt 81 is placed about the rollers 75 and 76 and the roll 78 and the sheet of matted fibre is guided from the roller 69 to the belt 81 as it winds about the rollers 75 being carried intermediate the pressure rolls 77 and 78. This operation squeezes the water out of the fabric and brings it approximately to size and at the same time compacts the fibrous structure to a strip indicated at 103 and thus permits greater ease in handling. From the calendering unit 70, the sheet of stock is carried into a drying oven in which may be positioned a plurality of rollers 82 over which the sheet of fibrous stock is wound, the number of rollers varying with the size of the oven.

After the movement of the material through the drying oven, the sheet is again subjected to a pressure operation by means of the calendering unit 85, having rollers 86 and 87 and pressure mechanism 88 similar in all respects to that of the calender 70. The function of the second pressure operation is to further size the sheet of fabric and compact and smooth out the material into final form as a sheet 104. On emergence from the calender 85, the paper stock is wound over supporting rollers 89 into the roll 90*a*, this completing the final step in the paper making process.

In the calendering operation, it is desirable to have considerable pressure approaching one thousand pounds in value so that a high degree of compactness is obtained and all possible moisture removed from the fabric. Also instead of utilizing an oven as suggested, the fabric may be passed over a series of rollers in which steam is passed at about a pressure of 20 pounds to dry out the material. Attention is directed also to the base corrugations 47 of the beater which are so designed as to guide the material toward the center of the channel under the beater drum and thus facilitate the passage of the paper pulp. It is further noted that the number of blades 42 on the beater drum is such that a continuous impact is imparted to the pulp and also a continuous movement thereof which carries the same into the squeeze rollers 49 and 50. In addition to the loosening action of the beater with the succession of impacts on the pulp passing under the drum and the successive squeezings of the pulp in its circuiting about the vat, attention is also directed to the effect of the calendering operation as tending to loosen the fibrous structure of the pulp. By means of these various steps as indicated, the paper obtained possesses fibre of high absorptive qualities which permit ready impregnation and which imparts high flexibility to the product. Paper made by the process described is readily usable in connection with the making of yarns to be woven into fabric such as brake lining or friction clutches or various other fabrics in which resistance to frictional wear and high temperature is desirable.

The invention has been described as a preferred embodiment of the mechanism and the preferred method of treating the material but it is understood that such variations may be made as come within the scope of the claims hereunto appended.

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Having thus described my invention, what I claim is:

1. A beater for the separation of fibres from fibrous masses in the making of paper which comprises a beater drum having a cylindrical casing, a plurality of axially extending blades thereon, said blades having a relatively shallow radial depth, a dividing plate in the said beater adjacent one end of the drum to form a channel and to permit circulation in the beater around said dividing plate, means for rotating the drum, a guide means associated with said drum for guiding the pulp for a portion of the periphery of the drum, a series of corrugations on said guide means, and pulp compressing means receiving the pulp directly from the drum.

2. A beater for the separation of fibres from fibrous masses in the making of paper which comprises a beater drum having a cylindrical casing, a plurality of axially extending blades thereon, said blades having a relatively shallow radial depth, a dividing plate in the said beater adjacent one end of the drum to form a channel and to permit circulation in the beater around said dividing plate, means for rotating the drum, a guide means associated with said drum for guiding the pulp for a portion of the periphery of the drum, a series of corrugations on said guide means, means for adjusting the relative position of said drum with respect to said guide means, compression rolls in proximity to said guide means for receiving the pulp delivered by said axially extending blades and compressing the said pulp, whereby when the said pulp is circulated, the material is progressively subjected to a series of impacts and compressions.

3. A beater for the separation of fibres from fibrous masses to form a pulp comprising a beater drum having blades thereon adapted to separate the said fibres without tearing or breaking the fibres to a substantial extent, means for dividing the said beater to form a circulatory channel therein, a guide means associated with the said drum for guiding the fibres in proximity to a portion of the periphery of the drum, means for adjusting the relative position of the drum to the said guide means, compression rolls mounted in proximity to the said drum to receive the fibres delivered thereby, and to subject them to compression, and means for adjusting the relative position of said rolls.

4. A beater for the separation of fibres from fibrous masses to form a pulp comprising a beater drum having blades thereon adapted to separate the said fibres without tearing or breaking the fibres to a substantial extent, a plate for dividing the said beater to form a circulatory channel therein, a guide means associated with the said drum for guiding the fibres in proximity to a portion of the periphery of the drum, means for adjusting the relative position of the drum to the said guide means, compression rolls mounted in proximity to the said drum to receive the fibres delivered thereby and to subject them to compression, means for adjusting the relative position of said rolls, said rolls being so positioned on the same side of said dividing plate as the said drum so as to attain a relatively long path around the said dividing plate for soaking action of the said fibres, and means for driving the said rollers in synchronism with said drum.

In testimony whereof, I affix my signature.

JOHN ALLEN HEANY.

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