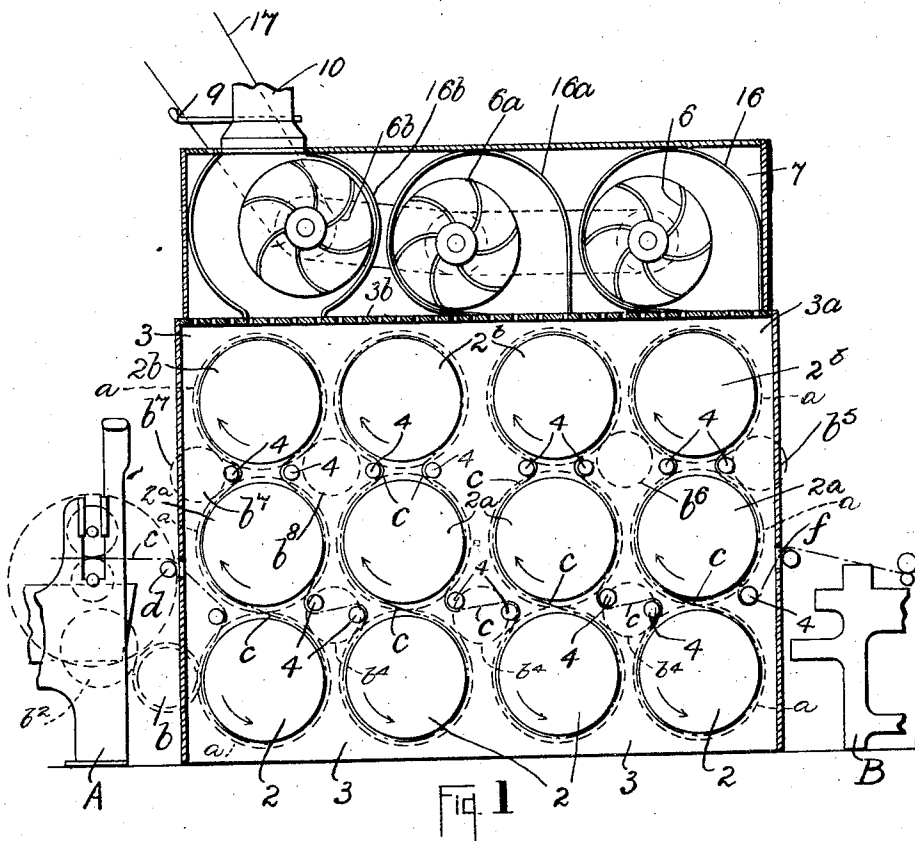


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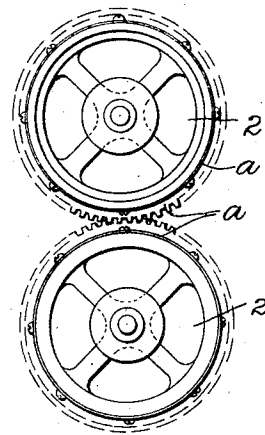
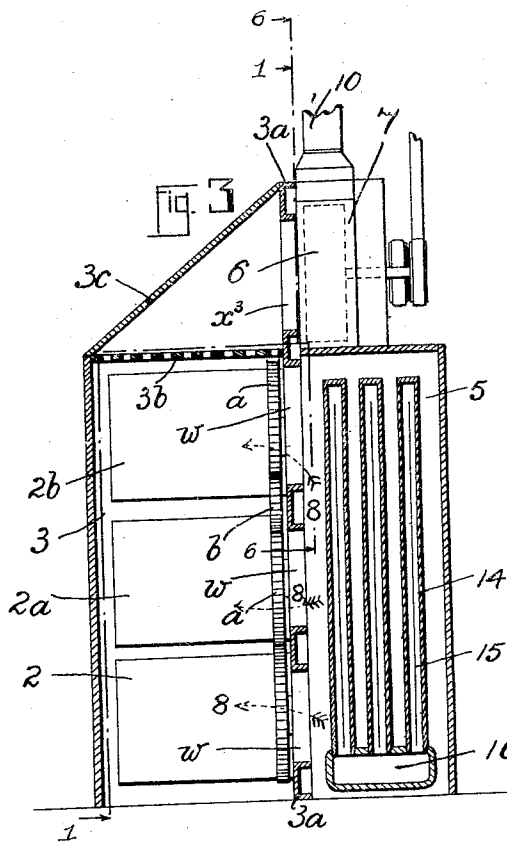
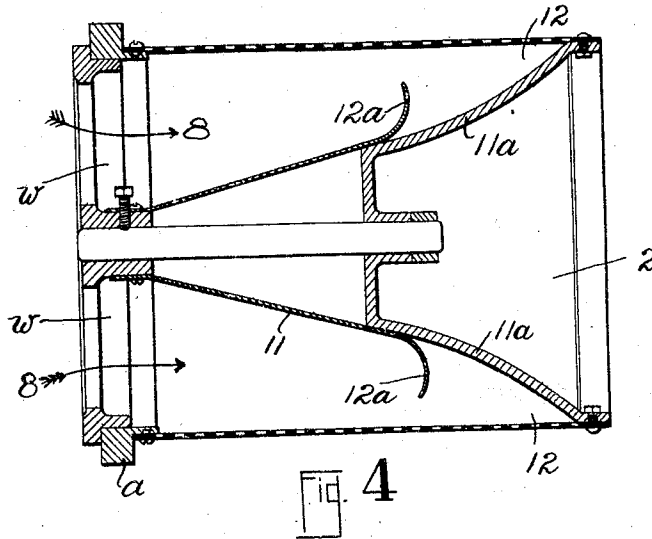
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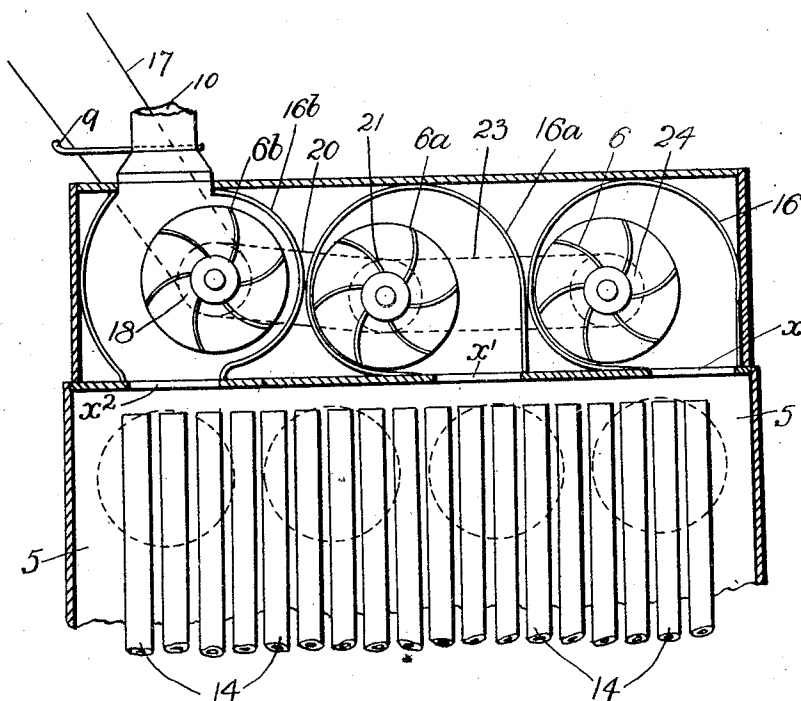


Fig. 6

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UNITED STATES PATENT OFFICE.

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DRYING APPARATUS FOR BACKWASHING MACHINES USED IN THE TREATMENT OF WOOL OR LIKE FIBROUS SUBSTANCES.

Application filed April 17, 1924, Serial No. 707,108, and in Great Britain December 18, 1923.

It relates to that part of the type or class of machines known as "back washing machines for treating wool or like fibrous substances" in which a series of drums or cylinders having perforated peripheries have hot air circulated through them to dry or act upon the wool or like fibrous substances which take in the form of a sliver around said perforated cylinders on leaving the washing part of the apparatus, and our present invention consists in an improved construction and arrangement of said cylinders and parts in connection therewith and in the arrangement of the air propelling or circulating apparatus made use of whereby we can have the heated air circulated so as to be more evenly distributed throughout the whole series of cylinders and over a larger area of the surfaces thereof than has heretofore been possible, by which means the fibrous substances are more evenly acted upon while the quantity or output of substances treated is greatly increased.

In order that our said invention may be readily understood we have hereunto appended sheets of drawings illustrative thereof, to which by letters and figures, reference is made in the following description.

Fig. 1 is a side elevation partly in section on the line 1—1 of Fig. 3 of the drying section of the machine to which our invention relates and shows same with the side walls removed so that the arrangement of cylinders and fans or propellers within may be clearly seen while the passages from the air supplying apparatus are also more clearly illustrated.

Fig. 2 is a plan of the apparatus shown by Fig. 1.

Fig. 3 is an end elevation of certain of the parts shown by Fig. 1 (as seen looking from right to left of said figure) with the walls removed so that the parts within may be more clearly illustrated.

Fig. 4 is a sectional elevation showing one of the cylinders constructed in accordance with our invention as is hereinafter described.

Fig. 5 is an end elevation of two cylinders (drawn to a reduced scale as compared with Fig. 4) and shows how same are geared together.

Fig. 6 is a view, similar to Fig. 1, partly in section on the line 6—6 of Fig. 3.

In Figs. 1 and 2 A indicates a portion of the well known washing part of the apparatus styled a "back washer" and B on the other side of the drying apparatus indicates a gill box or like machine to which the sliver of fibrous substances is delivered after passing through our improved apparatus.

In carrying our invention into effect we make use of the well known cylinders 2, 2^a, 2^b which have their peripheral walls perforated to allow air to pass through them. These cylinders are mounted within an enclosed cylinder chamber 3 which has air passages *w* formed through its inner wall 3^a leading to the interior of the cylinders. The upper horizontal partition 3^b is perforated to allow air circulation and forms the bottom of an intermediate chamber above the cylinder chamber while the slanting cover 3^c forms the top of said intermediate chamber.

Adjoining the cylinder chamber 3 is a heating chamber 5 within which heating apparatus, consisting of the steam (or hot air) heated pipes 14 is arranged as is hereinafter described, so that air may be circulated and caused to travel from the heating chamber 5 through the passages *w* to the interiors of the cylinders 2, 2^a, 2^b.

Situated above the heating chamber 5 is a fan chamber 7 within which are mounted the air propellers or fans 6, 6^a and 6^b. The fans 6 and 6^a are arranged to operate within their respective shields 16 and 16^a which are formed of the shape shown by Fig. 1 so that the spaces surrounding their peripheries gradually increase radially therefrom so as to finally end in comparatively large and free openings *x* and *x*¹ which lead into the heating chamber 5. The shield 16^b within which the fan 6^b operates, is arranged to have its outlet lead to an exhaust outlet passage 10 as well as to have another outlet at *x*² into the chamber 5.

Through the upper end of the wall 3^a are formed passages *x*³ (one opposite each fan 6, 6^a, 6^b) which lead into the intermediate chamber above the partition 3^b.

In the arrangement shown by the drawings we have made use of four tiers of these three series of cylinders 2, 2^a and 2^b, but it is obvious that the number of tiers and the number of series may be varied as well as may the number of fans 6, 6^a and 6^b as occasion requires.

I call the cylinder of each series or tier shown at the left in Figure 1, the first cylinder, the next the second cylinder, the next the third cylinder, and the next (at the right of the series) the fourth cylinder. The cylinders are rotated simultaneously in the directions indicated by the arrows in Figure 1, by the series of gear wheels next described. Each cylinder has a gear wheel *a* fixed to one of its ends. The first cylinder 2 derives its motion from a driving gear wheel *b*, meshing with the gear wheel *a* of this cylinder, and connected by a gear wheel *b'* with a gear wheel *b''*, on the shaft of the delivery roller of the washing-machine A. The gear wheels of the cylinders 2 mesh with those of the cylinders 2^a. The gear wheels of the cylinders 2 are connected by intermediate gear wheels *b*⁴. The gear wheels of the first cylinders 2^a and 2^b are connected by an intermediate gear *b*⁷. The gear wheels of the first and second cylinders 2^b are connected by an intermediate gear wheel *b*⁸. The gear wheels of the third and fourth cylinders 2^b are connected by an intermediate gear wheel *b*⁹. The gear wheel of the fourth cylinder 2^b is connected with the gear wheel of the fourth cylinder 2^a by an intermediate gear wheel *b*⁵.

In our arrangement we prefer the cylinders 2, 2^a, 2^b in each series to be in alignment with each other vertically, and not to occupy staggered or alternate positions as has heretofore been the arrangement in this type of machine.

The air propellers or fans 6^a, 6^b derive their motion through the medium of a driving belt 17 which is actuated by any prime motor, this belt 17 transmits motion to a pulley 18 fixed upon the shaft of the fan 6^b. On the same shaft is fixed another pulley 19 so that by a belt 20 motion is transmitted thereby to a pulley 21 fixed upon the shaft of the fan 6^a. Upon the shaft of the same fan 6^a is fixed another pulley 22 which by a belt 23 transmits motion to a pulley 24 fixed upon the shaft of the fan 6.

The sliver of wool or like fibrous substances *c* as it leaves the washing apparatus A passes over the guide roller *d* and is conducted therefrom to the interior of the chamber 3. It passes over the series of guide rollers 4 which are mounted adjoining the several series of cylinders 2, 2^a and 2^b in the positions shown by Fig. 1, so that said sliver first goes beneath the first cylinder 2 at the left of Fig. 1. It passes beneath said cylinder 2, comes in contact near the lower surface of the cylinder 2^a immediately above the cylinder 2 at the left of Fig. 1 forward over the guide roller 4 and over the top of the cylinder 2^b also at the left of Fig. 1. Passing over this cylinder 2^b it is then guided by another roller 4 back over a

portion of the middle cylinder 2^a in contact with which it was previously guided in its ascent. Passing beneath another guide roller 4 and over the top of a second guide roller adjoining, it then passes beneath the second of the cylinders 2 practically encircling the whole of the cylinder 2 until it rises into contact with the second cylinder 2^a immediately above. From this it is conducted upwards to the cylinder 2^b immediately above it and passes over the top of this cylinder back down to the cylinder 2^a beneath from which it is guided forward to the other series of cylinders by the respective guide rollers until it finally emerges at *f* from the chamber 3 to be conducted to the machine B or to any other apparatus as may be required.

On the apparatus being put into action the air circulated and heated within the chamber 5 travels into the cylinders 2, 2^a and 2^b as indicated by arrows 8 in Figs. 2, 3 and 4. This heated air then passes through the peripheral walls of said cylinders through the sliver of fibrous material encircling said walls and enters the chamber 3 from which it is partly withdrawn and circulated back again through the openings at the upper end of the walls 3^a down back to the chamber 5 this said circulation continues as long as may be found desirable. When the air becomes sufficiently saturated with water by taking up the moisture from the fibrous substances treated, a damper 9 leading to the exhaust outlet 10 is opened and the fan or propeller 6^b then, in addition to propelling any air through the opening *a*² into the chamber 5, will cause said air which is now saturated, to escape vertically by the exhaust 10, as it withdraws said air from the chamber 7, and the regulating of the damper 9 is carried out as the attendant may desire.

When the damper 9 is open so that the heated saturated air begins to leave the enclosures, fresh air enters the opening into the chamber 3 through the open space *f* where the sliver leaves said chamber 3. It will be observed that the progress of the sliver through the chamber 3 subjects said sliver firstly to the treatment of the air which is about to be exhausted or discharged from the apparatus so that both the sliver and the escaping air at these parts contain more moisture than they will as the sliver progresses through the chamber 3 to meet the other fresher air travelling in the opposite direction from the other side of the machine as propelled by the fans 6 and 6^a.

By constructing and arranging the means or apparatus as hereinbefore described we have found that while preventing the escape of air before such air has taken up its proper quantity of moisture we are enabled to carry out the process of drying under such conditions as to economize steam air or other heat

transmitting medium and yet secure greater advantages and better results than has been possible by the employment of any previous arrangement of devices.

5 In order further to distribute the heated air which enters the cylinders 2, 2^a, 2^b more evenly throughout the whole peripheral surfaces of said cylinders, we form the interior of said cylinders of the conical shape shown
10 by Fig. 4 in which the conical surfaces 11 and 11^a will cause the air to travel towards the periphery from where it enters at *w* to fill the interior of the cylinders and escape as described.

15 As further means for preventing the rush of heated air propelled into the cylinders 2, 2^a, 2^b to the extreme ends of the cavities at 12 we make use of a deflector 12^a which causes the heated air to be more evenly distributed throughout the whole width or area
20 of the internal surfaces of said cylinders and although we have shown such deflectors 12^a to extend from the conical shield 11 we are aware other deflectors may be made use of
25 to distribute the heated air in the manner described.

The deflector 12^a is in the form of a curved annular flange which radiates from the periphery of the shield 11 within the cylinder.

30 The circulation of steam (or hot air) within the heating chamber 5 is carried out through vertical tubes 14 which have sheet metal dividing plates or diaphragms 15 as we find this simple formation of radiating
35 apparatus to act sufficiently well by reason that the diaphragms 15 act in such manner as to enable steam to circulate through all the tubes 14 as supplied from the base cavity 16 and under such conditions that without
40 elaborate fittings and many joints (which have to be kept in repair) the apparatus answers the purpose for which it is used, although we may make use of other forms of radiating or heating apparatus as we
45 may find advantageous.

By the employment of our improved apparatus we have found that we are enabled to increase the speed at which the slivers of fibrous substances may be carried through
50 the machine, and yet have same evenly acted upon by the heated air so that the moisture left therein is evenly distributed throughout the whole length and breadth of the sliver when discharged from the apparatus while
55 the quantity of said fibrous substances thus treated is greatly increased as compared with the quantity it has been possible to treat in the same given time by apparatus heretofore employed.

60 Such being the nature and object of our said invention, what we claim is:—

1. In drying apparatus for "back washing machines", an enclosed cylinder chamber,
65 perforated peripheries, mounted to rotate

within said chamber, means for transmitting motion to said cylinders, an enclosed heating chamber adjacent the cylinder chamber, heating apparatus mounted within said heating chamber, an enclosed fan chamber above
70 the heating chamber, fans or air propellers mounted to rotate within said fan chamber, means for transmitting motion to said fans, shields partly encircling said fans, an enclosed intermediate chamber adjacent the
75 fan chamber and above the cylinder chamber, and an outlet or exhaust passage leading from the fan chamber substantially as set forth.

2. In drying apparatus for "back washing machines", an enclosed cylinder chamber, a
80 plurality of series of cylinders, having perforated peripheries, mounted to rotate within said chamber, means for transmitting motion to said cylinders, an enclosed heating
85 chamber adjacent the cylinder chamber, a wall between the cylinder chamber, and the heating chamber having openings to afford free access for air to the interiors of the cylinders, heating apparatus mounted with-
90 in said heating chamber, an enclosed fan chamber above the heating chamber, fans or air propellers mounted to rotate within said fan chamber, means for transmitting motion to said fans, shields partly encircling said
95 fans, an enclosed intermediate chamber adjacent the fan chamber and above the cylinder chamber, and an outlet or exhaust passage leading from the fan chamber substantially as set forth.
100

3. In drying apparatus for "back washing machines", an enclosed cylinder chamber, a
105 plurality of series of cylinders, having perforated peripheries mounted to rotate within said chamber, means for transmitting motion to said cylinders, an enclosed heating chamber adjacent the cylinder chamber, a wall between the cylinder chamber and the heating chamber having openings to
110 afford free access for air to the interiors of the cylinders, heating apparatus mounted within said heating chamber, an enclosed fan chamber above the heating chamber, fans or air propellers mounted to rotate within said fan chamber, means for trans-
115 mitting motion to said fans, shields partly encircling said fans, and communicating with the interior of the heating chamber, an enclosed intermediate chamber adjacent the fan chamber and above the cylinder
120 chamber and an exhaust outlet leading from the fan chamber substantially as set forth.

4. In drying apparatus for "back washing machines", an enclosed cylinder chamber, a
125 plurality of series of cylinders, having perforated peripheries mounted to rotate within said chamber, means for transmitting motion to said cylinders, an enclosed heating chamber adjacent the cylinder chamber, a wall between the cylinder chamber and the
130

- heating chamber having openings to afford free access for air to the interiors of the cylinders, heating apparatus mounted within said heating chamber, an enclosed fan chamber above the heating chamber, fans or air propellers mounted to rotate within said fan chamber, means for transmitting motion to said fans, shields partly encircling said fans, and communicating with the interior of the heating chamber, an enclosed intermediate chamber adjacent the fan chamber and above the cylinder chamber, a perforated partition between said chamber and the cylinder intermediate chamber beneath the same, and an exhaust outlet leading from the fan chamber substantially as set forth.
5. In drying apparatus for "back washing machines", an enclosed cylinder chamber, a plurality of series of cylinders, having perforated peripheries mounted to rotate within said chamber, means for transmitting motion to said cylinders, an enclosed heat-

ing chamber adjacent the cylinder chamber, a wall between the cylinder chamber and the heating chamber having openings to afford free access for air to the interior of the cylinders, heating apparatus mounted within said heating chamber, an enclosed fan chamber above the heating chamber, fans or air propellers mounted to rotate within said fan chamber, means for transmitting motion to said fans, shields partly encircling said fans, and communicating with the interior of the heating chamber, an enclosed intermediate chamber adjacent the fan chamber and above the cylinder chamber, a perforated partition between said chamber and the cylinder intermediate chamber beneath the same, an exhaust passage leading from the fan chamber, and passages leading through the side wall of the intermediate chamber to the fans or air propellers, substantially as set forth.

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