

(No Model.)

4 Sheets—Sheet 1.

G. L. P. EYRE & T. J. HOPKINS.
WOOL WASHING MACHINE.

No. 517,566.

Patented Apr. 3, 1894.

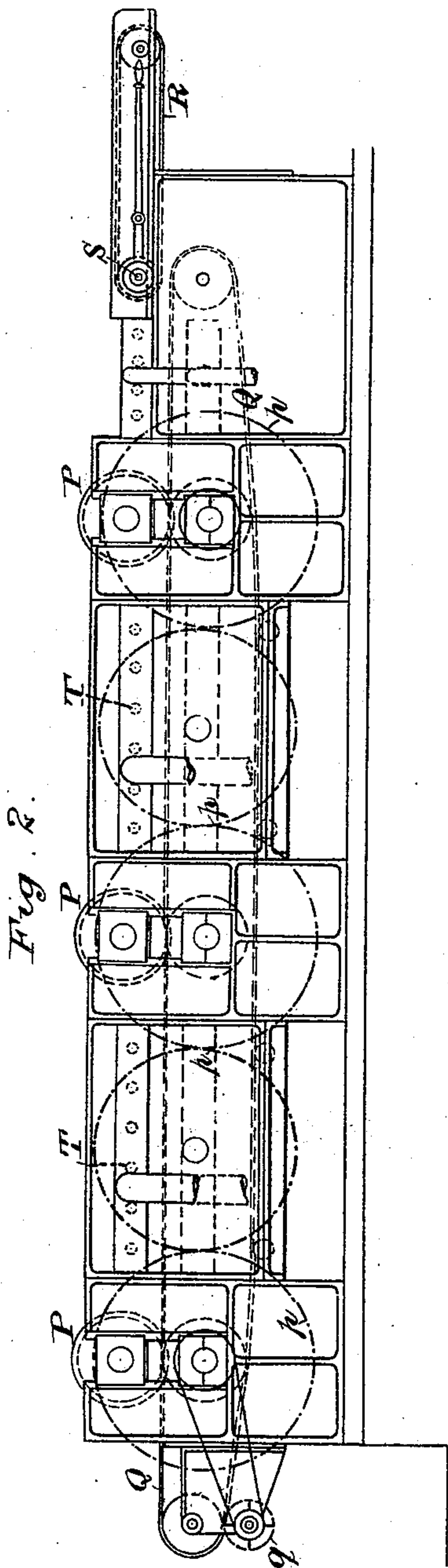


Fig. 2.

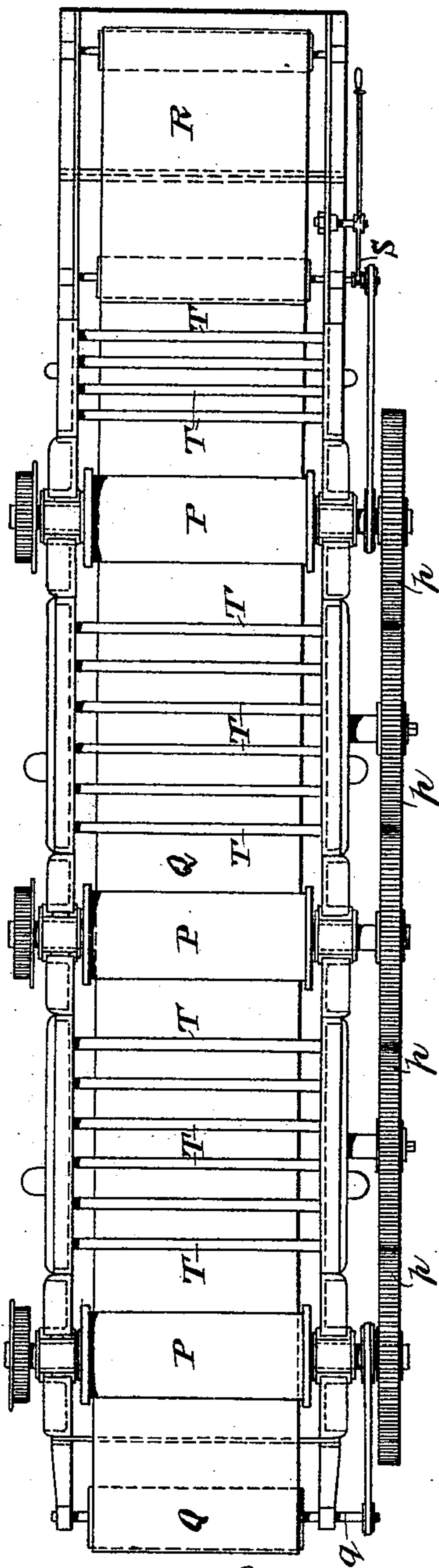


Fig. 1.

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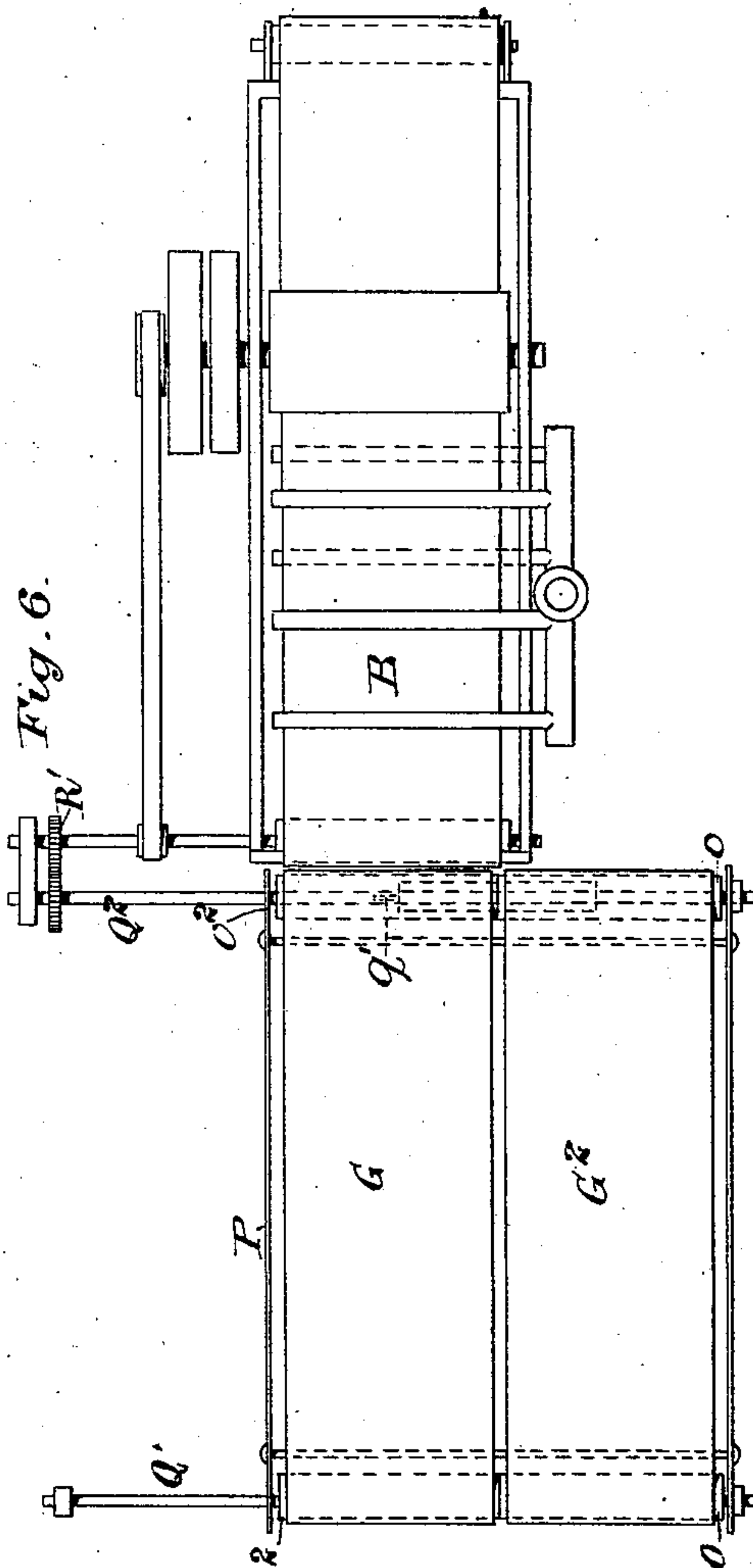
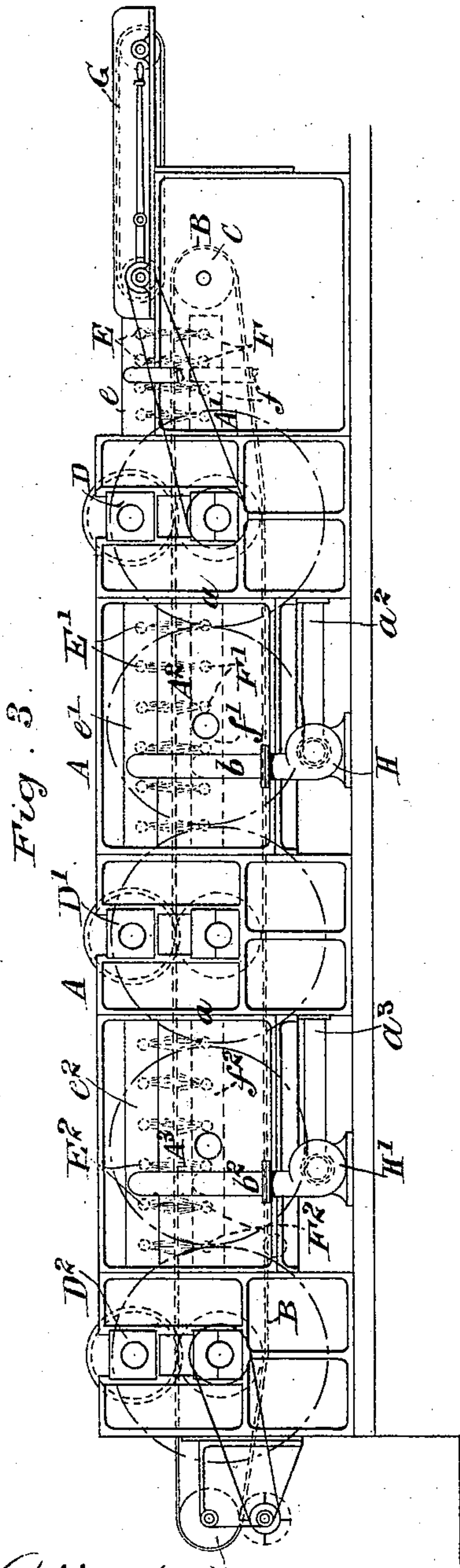
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No. 517,566.

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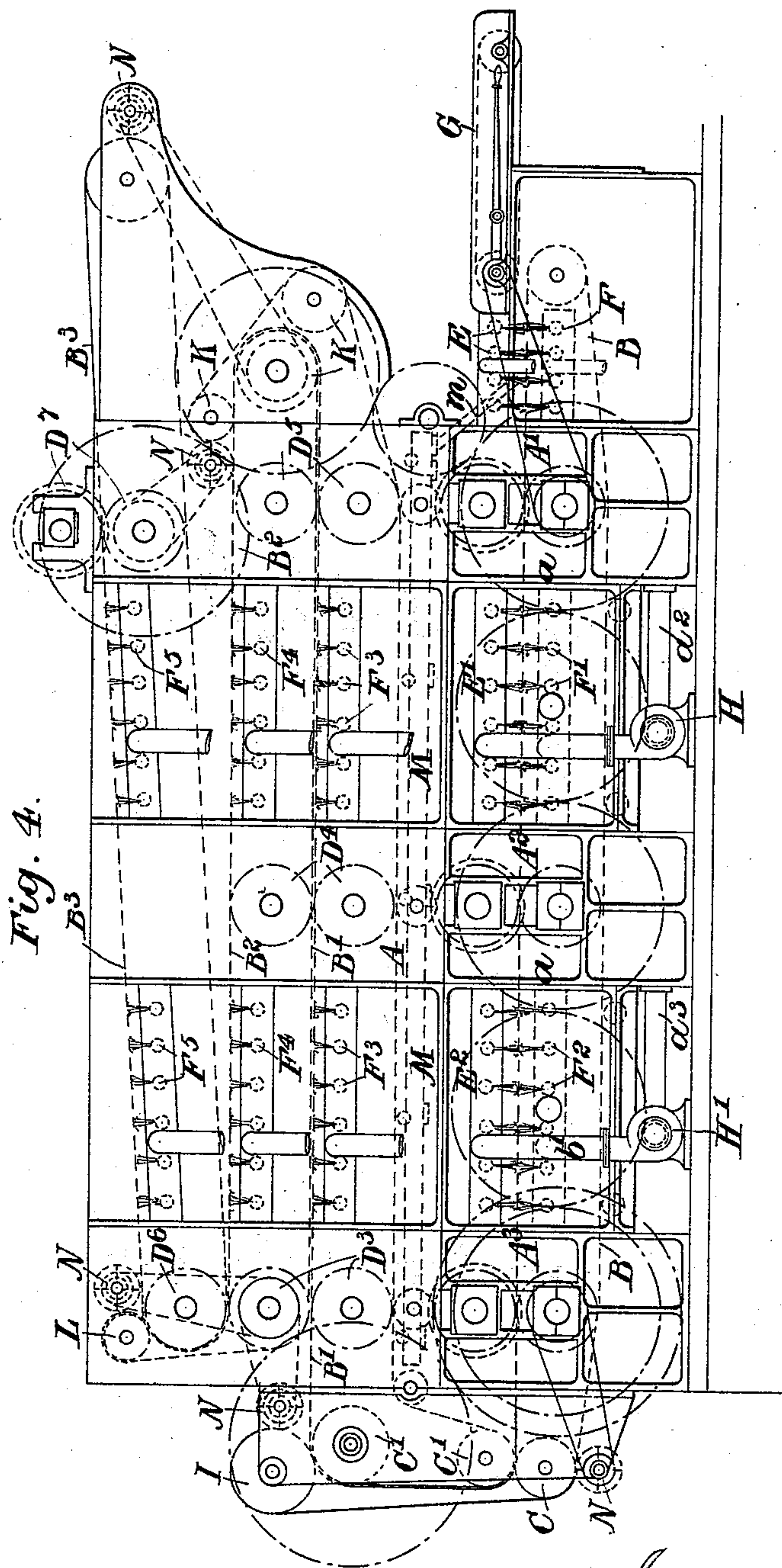
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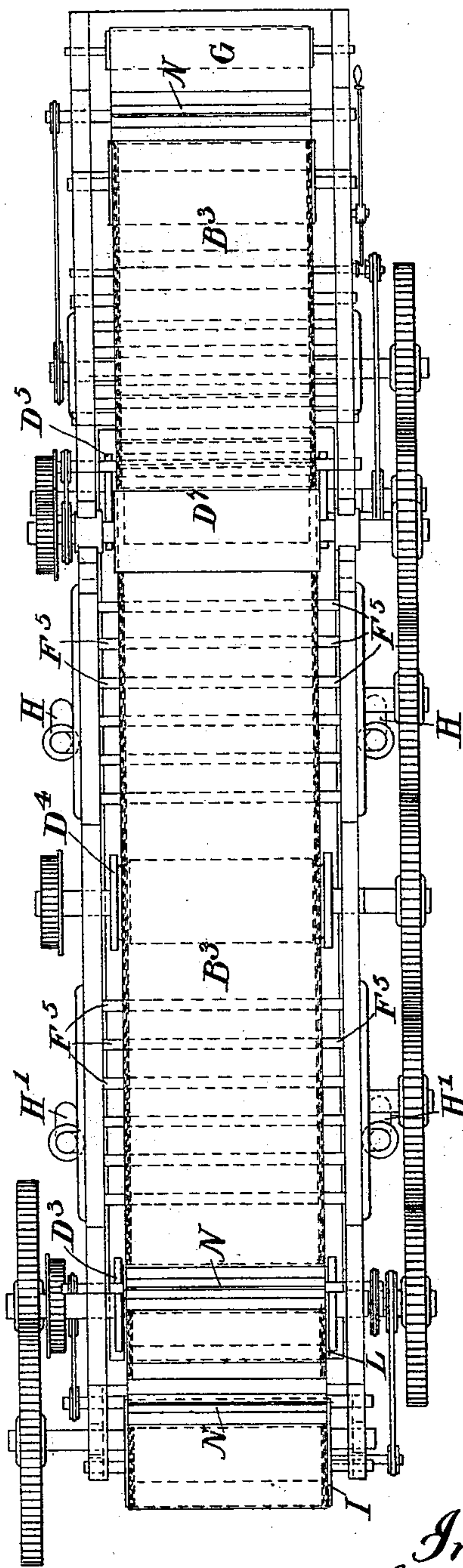
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Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE L. P. EYRE, OF LONDON, AND THOMAS J. HOPKINS, OF TROWBRIDGE, ENGLAND; SAID HOPKINS ASSIGNOR TO SAID EYRE.

WOOL-WASHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 517,566, dated April 3, 1894.

Application filed December 6, 1892. Serial No. 454,242. (No model.) Patented in England September 29, 1892, No. 17,405.

To all whom it may concern:

Be it known that we, GEORGE LEWIS PHIPPS EYRE, solicitor, residing at 1 John Street, Bedford Row, London, and THOMAS JOHN HOPKINS, engineer, residing at Cradle Bridge Works, Trowbridge, in the county of Wilts, England, subjects of the Queen of Great Britain and Ireland, have invented certain Improvements in Apparatus for Washing or
5 Cleansing Wool or other Materials, (for which we have obtained Letters Patent of Great Britain, No. 17,405, dated September 29, 1892,) of which the following is a specification.

The object of our invention is to provide
15 apparatus or means whereby wool or other materials (we will presume for the sake of description that it is wool that is to be treated) can be washed or cleansed in a much more efficient manner than hitherto and our invention consists mainly in providing in such apparatus rollers and means for projecting water, or other washing or cleansing medium or agent (which we will refer to as the cleansing agent) onto, into and through the wool from
25 one or from both sides or surfaces thereof. We prefer to project the said cleansing agent from both sides as thereby the side which is, or would otherwise be, in contact with the perforated or reticulated apron band or device by which the wool is conveyed forward
30 during the washing or cleansing operation, is more efficiently washed or cleansed than it would otherwise be if the cleansing agent were applied to one side only.

Figure 1, is a top plan view of the simplest form of our improved washing apparatus in which the cleansing agent is discharged against one side only of the conveyer apron. Fig. 2, is a side elevation of Fig. 1. Fig. 3, is
40 a side elevation of another form showing the sprayers arranged to discharge against both sides of the conveyer apron. Fig. 4, is a similar view showing a series of conveyer aprons with sprayers and mechanism for transferring the wool under treatment from one apron to the next. Fig. 5, is a top plan view of Fig. 4, and Fig. 6, is a plan view showing an arrangement of feeding aprons for the conveyer apron.

50 A simple form of the apparatus by which

the washing and cleansing are effected is illustrated in plan in Fig. 1 and in elevation in Fig. 2. It consists of rollers P set in pairs at a suitable distance apart between which passes an endless band or apron Q (which is preferably of wire-work) onto which the material to be washed is fed preferably by another endless band or apron as at R. The material on the band or apron Q is squeezed by the said rollers P as the said band or apron Q passes between them. The rollers are driven by any suitable motor and are geared together by the wheels *p* so that they all rotate in the proper relative direction. The band or apron R by which the material is fed onto the other band or apron derives its motion from the same motor and may be driven by a clutch S which can be operated to give movement to the said band to feed the material as required. Between the pairs of rollers and situated above the material carried by the endless band or apron are perforated pipes T by which the washing water or cleansing liquid is sprayed over, and passes through the material which is squeezed between the rollers. A cleaner or "stripper" *q* may rotate in proximity to the delivery end of the endless band or apron Q to clear the same effectually.

The special object of this machine is to wash and cleanse the material under treatment (say wool) in such a manner as to keep the fibers unentangled and to wash the fleece so as to remain as nearly whole and unbroken as possible.

The action in washing wool for instance is as follows:—The wool is carefully spread in a thin layer on the feed band or apron R and when the said band or apron is covered with wool, the machine is set in motion and the water or cleansing liquid is turned on and the wool will pass from the feed apron R to the washing apron Q, and as it passes under the sprays of cleansing liquid from the spray pipes and between the squeezing rollers P, it is subjected to a very efficient washing action, the rollers squeezing out the water or cleansing liquid and loosened dirt. Any number of sets of spray pipes and pairs of rollers can be used according to the dirtiness of the material to be

washed and any desired kind of gearing can be used to give motion to the parts.

An extension or conveyer apron may be added to the delivery end of the machine to
5 save labor and carry the washed material to any desired place such as to a hydro-extractor, where it is treated to remove remaining water or cleansing liquid.

When we project the cleansing agent from
10 both sides we arrange under the perforated or reticulated apron, band or device, on which the wool is placed and carried between squeezing rollers and beneath sprays of the cleansing agent, a perforated pipe, passage or cham-
15 ber, or perforated pipes, passages or chambers through which the cleansing agent is forced under such pressure that it passes through the perforations or interstices of the carrying apron, band or device with sufficient
20 force to practically lift the wool therefrom so as to thoroughly wash or cleanse the under side of the wool under treatment; at the same time clearing the interstices of the carrying apron, band, or device, of fibers or dirt which would
25 otherwise under the action of the upper spray tend to choke up the said interstices. The effect of the two oppositely directed sprays is that at the first moment of impact, the resultant of the two forces slightly lifts the
30 wool from the surface of the carrying apron. The wool begins at once to fall by the action of gravity, and the result is an undulatory motion of the wool over the apron in its course from one set of rollers to the next. The con-
35 joint action of the sprays from above and from below, and of the squeezing rollers thus gives a very efficient washing and cleansing action on the wool.

If desired duplicate and intermittently act-
40 ing feed aprons may be provided to which a lateral and forward traveling and delivery action is given for the purpose of saving the loss of time in the operation of washing or cleansing thus making the action of the ma-
45 chine as nearly continuous as possible but the same feed apron may be used continuously if desired. The cleansing agent may be so supplied and the wool be so traversed in relation thereto that during its passage
50 through the machine the said wool will meet a cleaner and cleaner supply of cleansing agent it being acted upon by the cleanest water or liquid as it is about to leave the machine so that the cleansing agent which
55 has acted upon comparatively clean wool afterward acts upon dirtier wool whereby the said cleansing agent will remove from the wool under treatment as much dirt and soluble matter as possible during the passage of the
60 said wool through the machine or apparatus.

In place of using combined upper and under sprays of cleansing agent the machine may be so constructed that the wool is turned
65 upside down during its passage through the machine and in this arrangement an upper

spray or sprays or an under spray or sprays of cleansing agent only may be used for the washing or cleansing of both sides of the wool under treatment or both upper and lower
70 sprays may be employed with this method of reversing.

Fig. 3 represents in side elevation a machine constructed according to our invention for washing wool (or other materials but we will presume it to be wool) in which the wool
75 is acted on by a combination of upwardly and downwardly projected sprays of cleansing agent whereby the wool is acted upon from both the upper and the lower sides so that the dirt or impurities are more effectually
80 removed from the wool than is the case when the cleansing agent operates from one side only the arrangement being such also that the cleansing agent is very economically utilized. Any soluble products extracted from
85 the wool may be readily recovered.

Figs. 4 and 5 are respectively a side elevation and a plan of a modification in which in place of employing upwardly and downwardly projecting sprays of the cleansing agent, only
90 upwardly or downwardly projected sprays may be employed and the same result be obtained by reversing or turning the wool upside down as it passes through the machine so as to present both sides alternately to the
95 action of the sprays of cleansing agent.

Fig. 6 shows diagrammatically in plan an arrangement for feeding a continuous supply of wool into the apparatus.

Referring to Fig. 3 A is a tank or chamber
100 separated by partitions α into compartments A^1 , A^2 , A^3 , and provided with a reticulated or perforated endless band, apron or traversing device B by which the wool is traversed through the tank. The apron B is carried on
105 rollers C at the opposite ends of the tank A and may be provided at its edges with suitable means—such as sprocket chains engaging sprocket wheels at the opposite ends of the drums—so as to provide for the uniform
110 travel and preventing unequal sagging thereof and consequently insuring the wool being conveyed in the proper course through the machine. The apron B may consist of any
115 suitable reticulated or perforated material (preferably wire work) that will admit of the cleansing agent passing freely therethrough. This apron passes between the several pairs of squeezing rollers $D D^1 D^2$ situated respectively, in or over the compartments $A^1 A^2 A^3$
120 of the tank A. In each of these compartments are arranged two sets of jet or spray pipes $E F E^1 F^1 E^2 F^2$ extending transversely across the trough A and connected to boxes or chambers $e e^1 e^2$ and $f f^1 f^2$ situated re-
125 spectively on opposite sides of the tank A. The upper sets of pipes $E E^1 E^2$ are perforated beneath so as to direct sprays of the cleansing agent onto, into and through the wool from above, and the lower sets of pipes $F F^1 F^2$
130

F² are perforated on the upper side so as to direct sprays of the cleansing agent onto into and through the wool from beneath the said cleansing agent being forced with sufficient pressure through these pipes to cause the wool to be saturated therewith and preferably such that the said wool is raised slightly from the apron, band or device by the pressure of the said cleansing agent passing through the interstices of the said apron from beneath whereby the wool is more effectually cleansed and the interstices of the apron, band or device are kept clearer than is the case when the cleansing agent is supplied from spray pipes at the upper side only. The wool may be fed onto the apron B by any convenient means for example (as shown in the drawings) by means of a creeper or endless apron G. The wool when fed onto the apron B is first saturated with the cleansing agent forced through the pipes E and F in the compartment A' of the tank A and is carried thence by the apron B between the pair of squeezing rollers D by which the liquid and impurities are expressed from the wool and descend into the compartment A'. The lower part of the compartment A' is in communication by a pipe a² with the suction ends of pumps H on opposite sides of the machine the delivery end of one of which pumps is in communication by a pipe b with the box or chamber e' communicating with the jet pipes E' in the compartment A² the corresponding pump on the opposite side of the machine being similarly connected to the box or chamber f communicating with the jet pipes F' in the said compartment A². These pumps may be driven by gearing or otherwise from any suitable source of power so as to force the cleansing agent from the compartment A' through the pipes E' F' with sufficient force to saturate the wool passing from between the squeezing rollers D. The wool is then conducted by the apron B between the second pair of squeezing rollers D' by which the cleansing agent and further impurities are expressed from the wool and descend into the compartment A² of the tank A. This compartment is in communication, by pipes a³ with two pumps arranged on opposite sides of the machine, the pump H' serving to pump the cleansing agent from the compartment A² through the pipe b² into the box e² and through the jet pipes E² above the wool as it passes through the compartment A³ the corresponding pump at the other side of the machine forcing the said cleansing agent from the compartment A² into the box f² and through the pipes F² onto the under side of the wool as before. The wool is thus again saturated with the cleansing agent in passing from the rollers D' to another pair of squeezing rollers D² situated in the compartment A³ by which latter rollers the liquid or cleansing agent and still further impurities are expressed from the wool and enter the said compartment A³ the wool pass-

ing thence from the machine freed from dirt and impurities and it may be conducted by any convenient means to any desired place for further treatment if required.

The machine may be provided with any desired number of compartments fitted with spraying pipes and squeezing rollers, as described; and the wool be passed through any desired number of the compartments according to the dirtiness of the said wool. By thus employing the cleansing agent economy of such agent is obtained while the soluble by-products extracted from the wool may be more readily recovered.

In the arrangement illustrated by Figs. 4 and 5 the wool is traversed to and fro through the machine and is turned upside down or reversed at each return motion so as to present alternately the opposite sides or surfaces of the layers of wool to the direct action of the sprays of cleansing agent. We have shown this arrangement in combination with the arrangement hereinbefore described and shown in Fig. 3 but it may be used independently thereof. When employed in combination as shown the endless band or apron B by which the wool is carried through the trough A is passed round a roller I so as to convey the wool in a reversed position onto another endless band or apron B' carried at one end of the machine on rollers C' and between a pair of squeezing rollers D³ situated over the compartment A³ of the tank A the said apron passing also between two other pairs of squeezing rollers D⁴ and D⁵ situated respectively over the compartments A² A' of the said tank A. This apron is carried at the opposite end of the machine round rollers K situated so as to cause the wool to turn over and pass onto another apron B² above, by which the said wool is traversed back toward the end of the machine from which it had traveled. This band or apron B² is at this end of the machine carried upward round a squeezing roller D⁶ and guide roller L so as to cause the wool to be again reversed or turned upside down onto another endless band or apron B³ by which it is again conducted through and from the machine. Between the upper and lower portions of the endless band or apron B' are arranged perforated pipes F³ through which the cleansing agent is forced through the interstices of the said band or apron onto, into and through the wool from the under side thereof, similar perforated pipes F⁴ and F⁵ being arranged respectively between the upper and lower portions of the endless apron B² and the apron B³ through which pipes the cleansing agent is forced in upwardly directed sprays through the bands or aprons onto, into and through the wool so that while the wool is passing through the machine it is alternately acted upon from first one side or surface of the layers and then from the other side or surface of layers by the sprays of cleansing agent the

wool after each saturation passing between squeezing rollers so that it is very efficiently cleansed.

As the inlet for cleansing agent is at the upper part of the machine and the wool passes in an upward direction through the machine, the cleanest water acts on the wool as it is about to leave the machine with the advantages mentioned with regard to the previous arrangement Fig. 3. The final pressure is given to the wool by a pair of squeezing rollers D^7 to express the cleansing agent and last impurities from the wool before it leaves the machine. The cleansing agent and impurities expressed from the wool by the squeezing rollers D^3 D^4 D^5 D^6 and D^7 are caught in a tray or trough M and conducted therefrom by a spout m into the compartment A' of the tank A from which it may be pumped into and through the pipes F^3 and F^4 to act again on the wool and thus economize the use of cleansing agent as hereinbefore described.

Although we have shown in Fig. 4 the sprays of the cleansing agent as being directed onto, into, and through the wool from the under side thereof as it is traversed through the machine the said sprays may in this arrangement be passed onto, into and through the wool from the upper side thereof or the said sprays may be directed simultaneously onto, into and through the wool from both the upper and under sides thereof as hereinbefore described with reference to Fig. 3. The sprays or jets of the cleansing agent may be so arranged as to act intermittently, continuously or simultaneously in any desired manner. They may for example be made to act intermittently by providing the several pipes with cocks which are opened and closed as required by means of a rod connected to a striker acting on their levers or handles which rod or striker can receive motion from a crank driven from or by any convenient moving part of the machine.

N are rotating beaters or strippers to insure the wool passing from one apron onto another. These beaters or strippers and also the endless aprons, squeezing rollers and pumps may be driven by means of gearing as shown or in any other suitable manner.

The machine may be made with the aprons in line instead of with the aprons one above the other as shown.

The wool to be washed or cleansed may be fed into the apparatus in a continuous manner by providing duplicate feeding aprons or creepers as shown in Fig. 4 the said feeding aprons or creepers being capable of being moved in a lateral direction or at right angles to the direction of feed so that when the wool has been delivered from one of the aprons onto the washing apron, band or device the apron from which the wool has been so delivered will be moved away and the other feed apron which has meantime been supplied with a charge of dirty wool will be brought

into position to continue the feed to the washing apron, band or device. In the arrangement shown for this purpose two feeding aprons G G^2 are carried on rollers o o^2 mounted in a frame P fitted to slide on rods or shafts Q' Q^2 . The shaft Q^2 is driven by gearing R' from any suitable rotating part of the washing apparatus and is provided at about the center of its length or opposite the apron B by which the wool is traversed through the apparatus with a wedge or projection q' (or any other suitable engaging device, which when either forward roller o or o^2 is brought into position opposite the said apron B engages in a notch or recess or corresponding engaging device in the said roller so as to impart rotation thereto and consequently give a forward motion to the apron carried thereby. While one of the feed aprons (say for example the apron G) is in position for feeding wool onto the apron B the other apron (say that G^2) remains stationary its forward carrying roller o being out of engagement with the engaging device on the shaft Q^2 and then the said apron may be supplied with a charge of dirty wool in readiness to fill the place of the feed apron in action. When the wool from the apron G has been fed into the apparatus the frame P with the rollers carrying the aprons G G^2 may be traversed along the shaft Q^2 so as to move the apron G from opposite the apron B and bring the apron G^2 with its charge of dirty wool opposite the said apron B . The forward roller carrying the apron G^2 when in this position, is engaged by the engaging device q on the shaft Q^2 and receives motion therefrom so as to feed the dirty wool onto the washing apron band or device B and while this is taking place the apron G is stationary so that it can be supplied with dirty wool to be ready to take the place of the feed apron G^2 when that is emptied. A constant feed of dirty wool onto the washing apron, band or device may thus be maintained as long as required and the apparatus thus be made to work continuously or practically so. Duplicate delivery aprons may be similarly arranged at the delivery end of the apparatus so as to conduct the wool as it passes from the apparatus into centrifugal machines or other receivers. Or receivers may be alternately brought into position to receive the wool from a single delivery apron or the like.

As before stated although we have used the term "wool" in describing the apparatus the said apparatus may be employed to wash or cleanse any other material for which it is suitable.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In an apparatus for washing or cleansing wool or other material, the combination with an endless reticulated conveyer apron for the

same, of sets of spraying tubes arranged along the path of said apron at suitable intervals, for projecting a liquid cleansing agent against or through the wool or other material on the apron, from both sides thereof, and presser-rollers interposed between the sets of spraying tubes, substantially as described.

2. The combination with an endless reticulated conveyer-apron upon which the wool or other material is placed, of alternately arranged spraying tubes, for projecting the cleansing agent against the apron, and presser-rollers, disposed in pairs for squeezing the polluted agent out of the wool or other material on the apron, the latter not being submerged in the cleansing agent, troughs or tanks beneath said spraying tubes and apron for catching the polluted agent, and means for again forcing said polluted agent against the apron, substantially as described.

3. The combination with a series of conveyer aprons and presser-rollers for each apron, of spraying devices for the cleansing agent arranged in proximity to each apron,

and means for transferring the wool or other material successively from apron to apron in a reversed or turned-over position, so as to alternately subject the opposite sides thereof to the action of said cleansing agent, substantially as described.

4. The combination with an endless conveyer apron of a pair of feed-aprons projecting over one end of the former and means whereby said feed-aprons may be alternately thrown into and out of operation for the purpose of receiving a fresh supply of the material under-treatment, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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