July 9, 1935. C. B. JOHNSON 2,007,828

WARP SIZING MACHINE

Filed Dec. 7, 1934 5 Sheets-Sheet 1

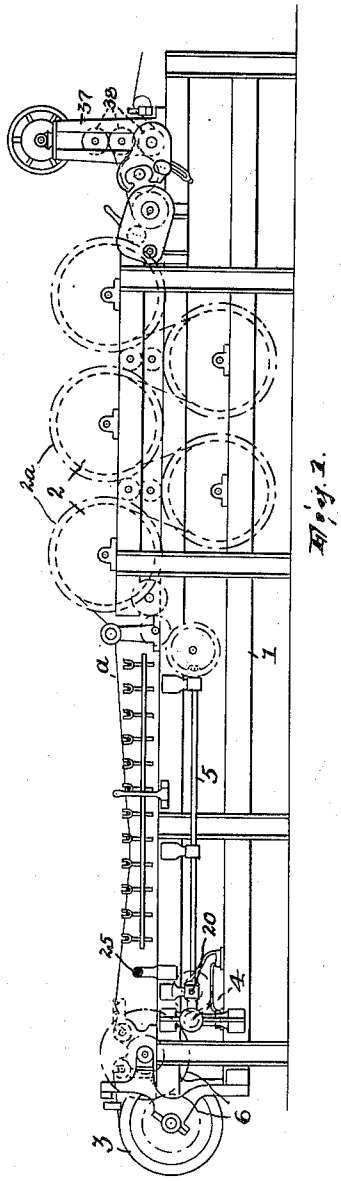


Fig. 1.

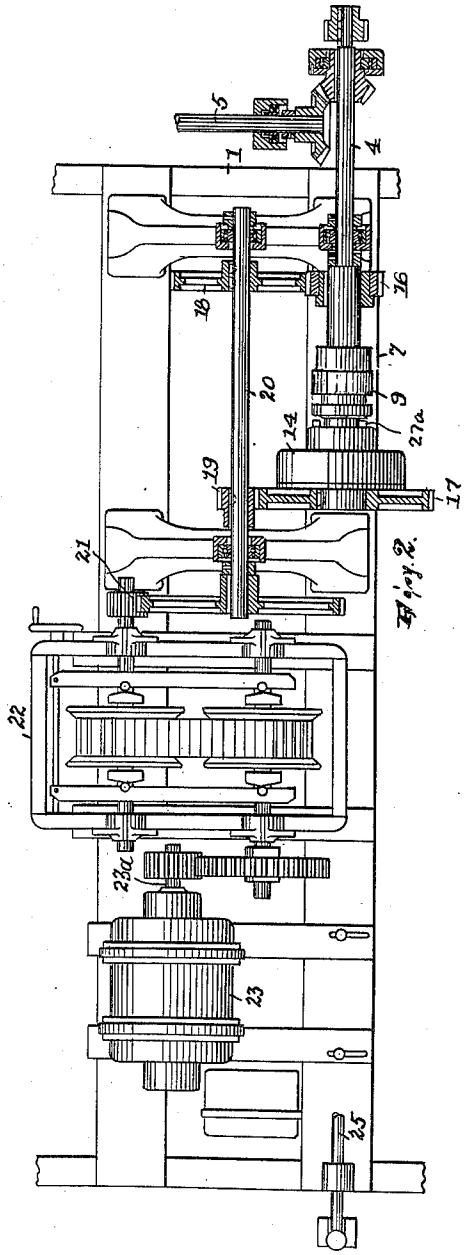


Fig. 2.

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WARP SIZING MACHINE

Filed Dec. 7, 1934 5 Sheets-Sheet 2

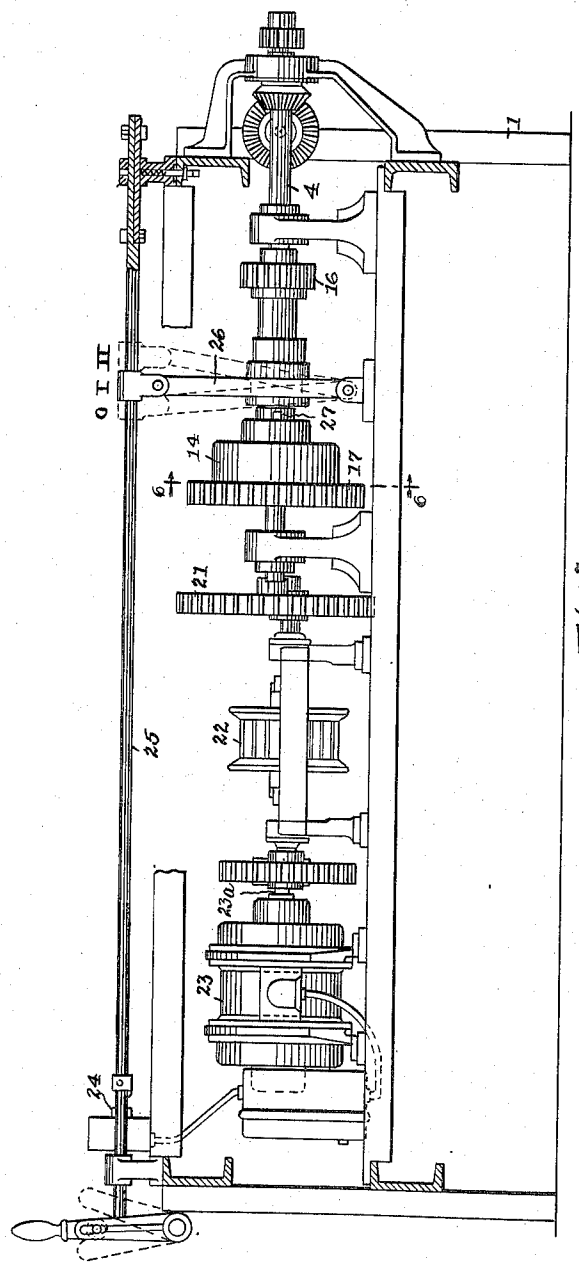


Fig. 3.

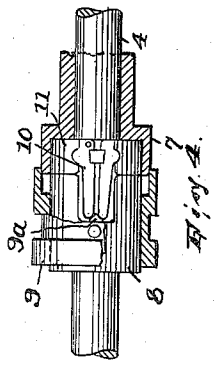


Fig. 4.

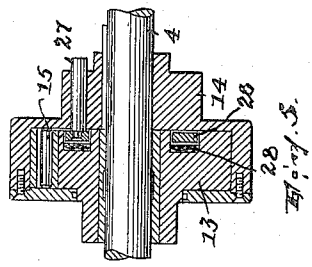


Fig. 5.

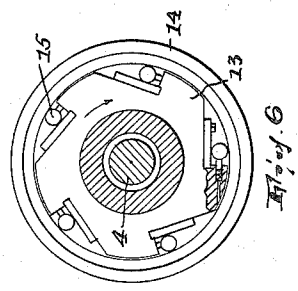


Fig. 6.

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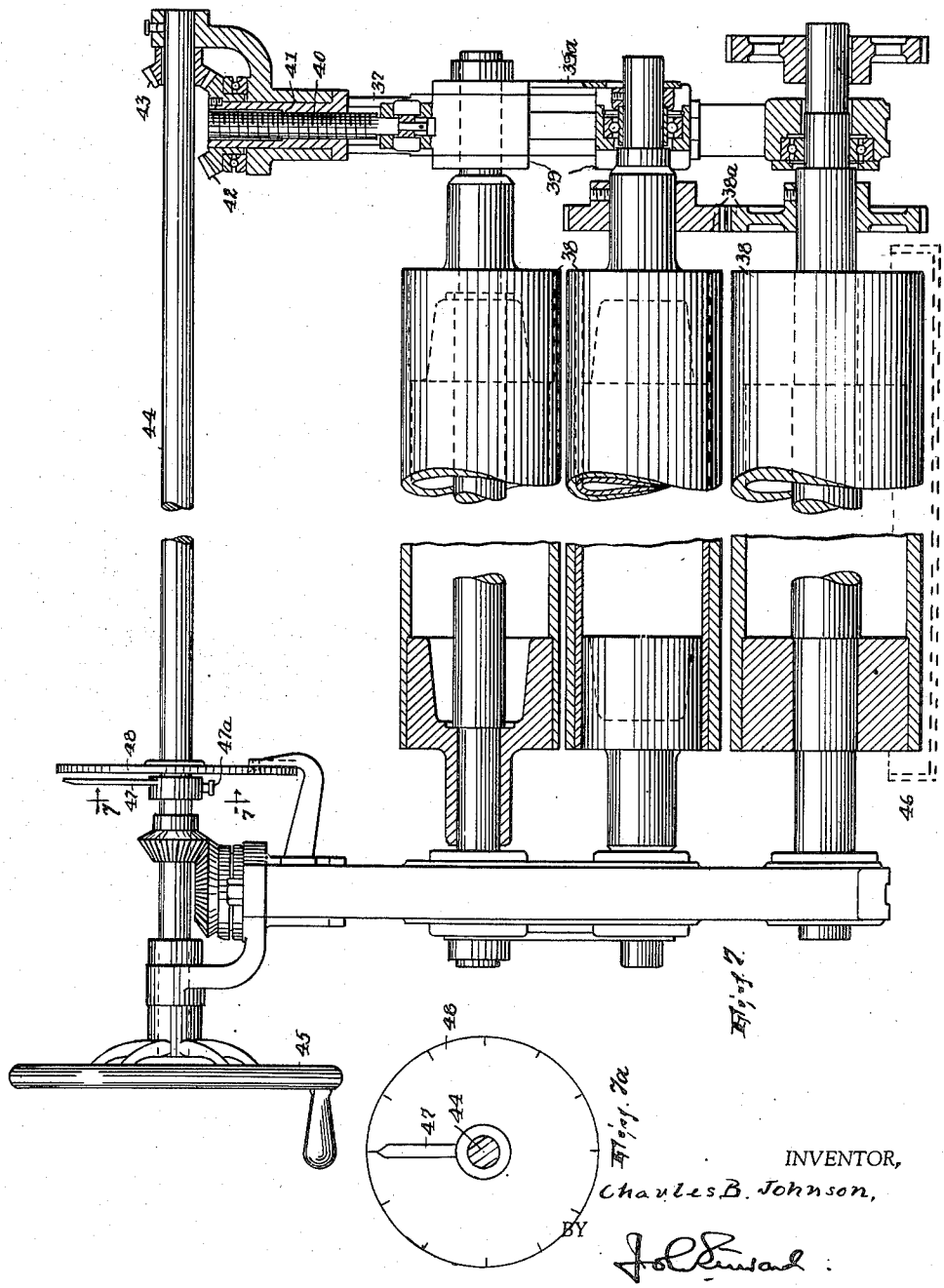
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July 9, 1935. C. B. JOHNSON 2,007,828

WARP SIZING MACHINE

Filed Dec. 7, 1934 5 Sheets-Sheet 3



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WARP SIZING MACHINE

Filed Dec. 7, 1934 5 Sheets-Sheet 4

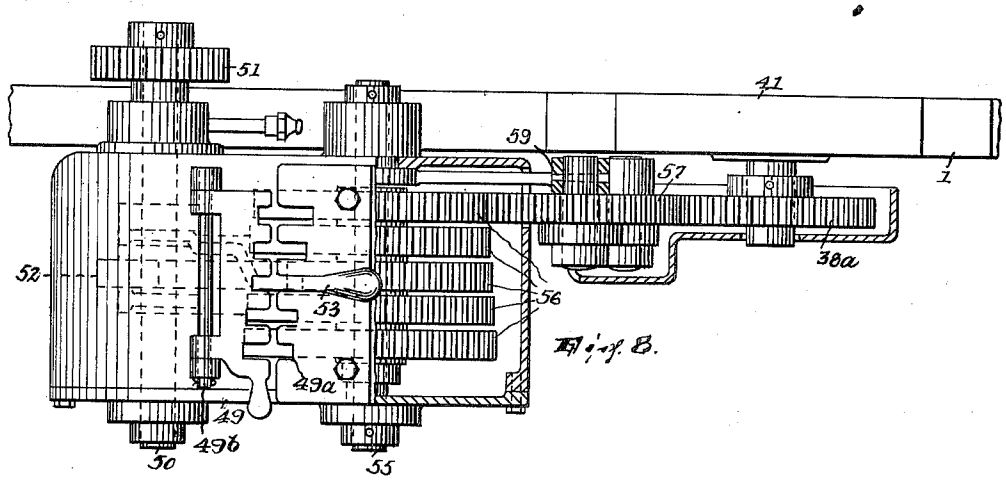


Fig. 8.

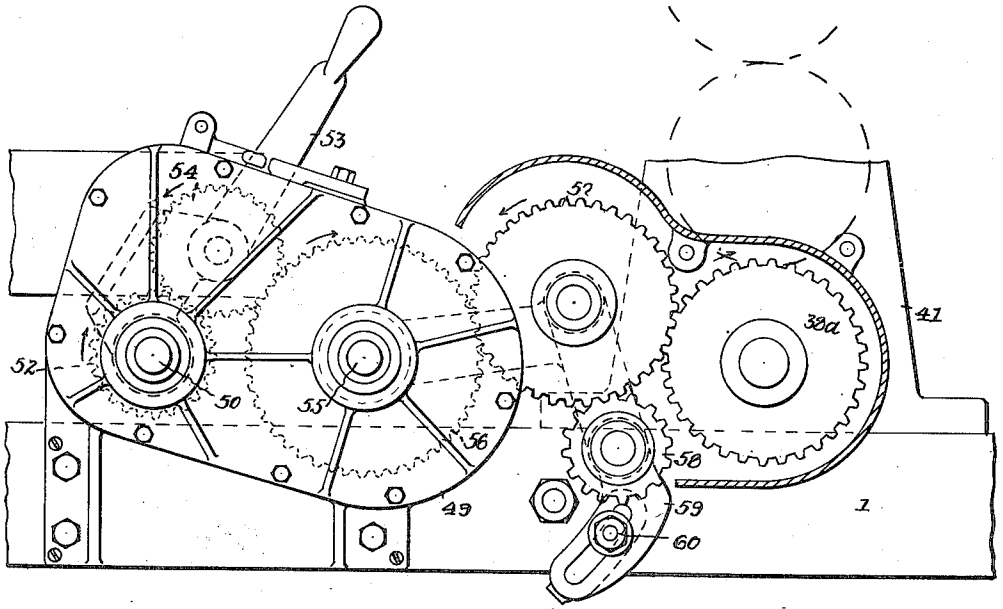


Fig. 9.

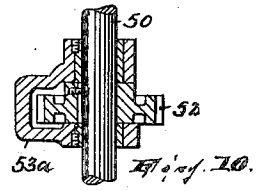


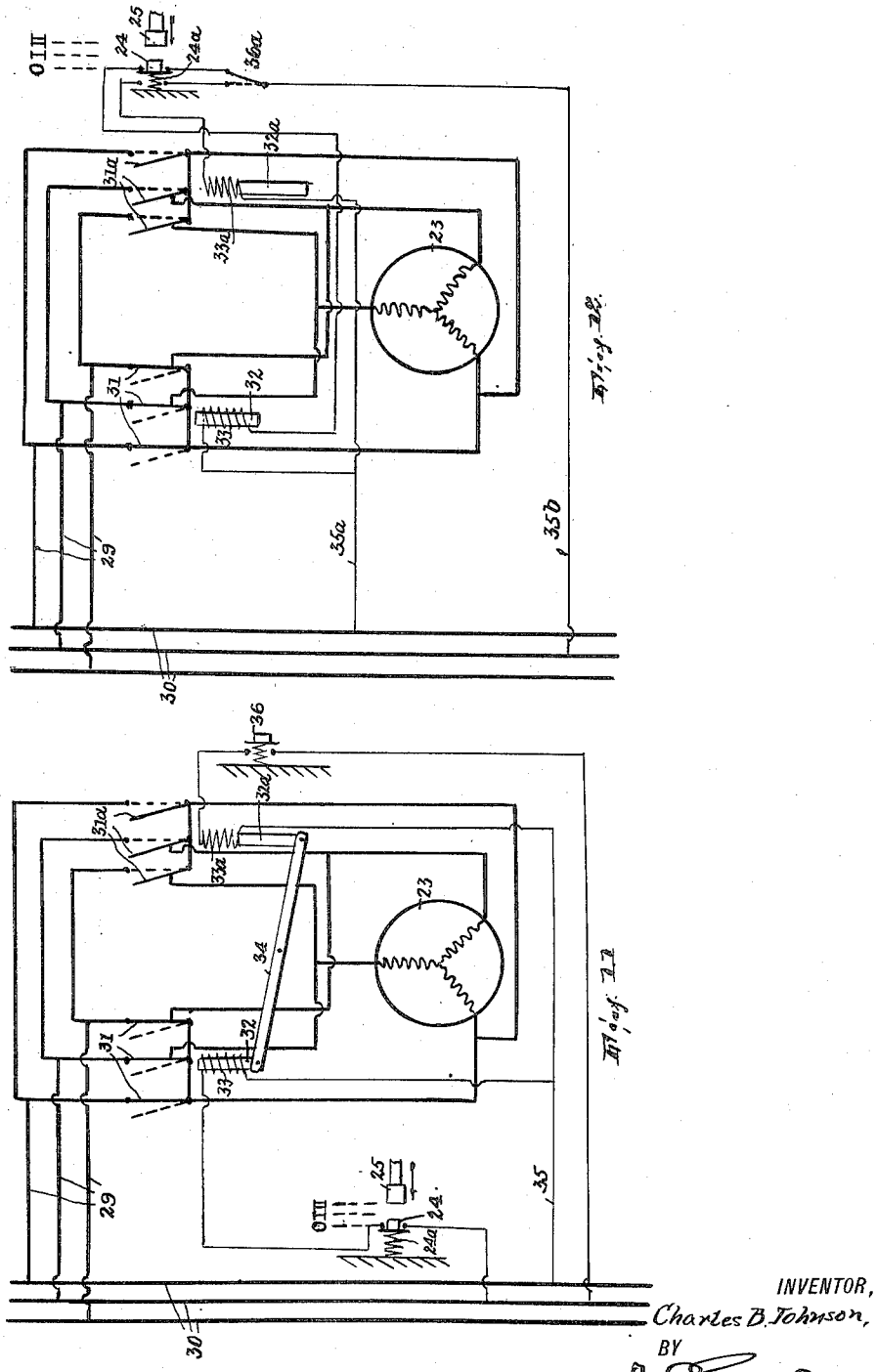
Fig. 10.

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WARP SIZING MACHINE

Filed Dec. 7, 1934 5 Sheets-Sheet 5



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Patented July 9, 1935 2,007,828

UNITED STATES PATENT OFFICE

2,007,828

WARP SIZING MACHINE

Charles B. Johnson, Paterson, N. J.

Application December 7, 1934, Serial No. 756,494
In Great Britain June 19, 1934

4 Claims. (Cl. 28—28)

This invention relates to machines in which a sheet of textile material is advanced while being treated, as with a sizing substance, and it consists in certain improvements in these machines whereby the sheet may be made to travel through the machine forward at high speed or low speed or reversely at low speed; whereby there may be positively maintained a predetermined and definite degree of tension on the sheet between the quetch (or equivalent means to apply the size) and the drying means; and whereby a predetermined degree of pressure on the sheet by the rolls of the quetch may be precisely realized.

In the drawings,

Fig. 1 is a side elevation of a warp-sizing machine including the present improvements;

Fig. 2 is a plan of the driving mechanism, partly in section;

Fig. 3 is a front elevation, as seen from the left in Fig. 1, of said mechanism, partly in section;

Fig. 4 is a view partly in section and partly in elevation of the means by which the output gear of the high-speed gearing may be clutched to the driven element;

Fig. 5 is a longitudinal section and Fig. 6 a section on line 6—6, Fig. 3, of the means by which the output gear of the low-speed gearing may be clutched to said driven element;

Fig. 7 is a front elevation of the quetch, with parts in section, and Fig. 7*a* a section on line 7—7, Fig. 7;

Fig. 8 is a plan and Fig. 9 a side elevation, partly in section, of the means whereby the quetch rolls are driven at a predetermined speed-ratio with respect to the drying drums or "cans", and Fig. 10 is a sectional view of a detail thereof; and

Figs. 11 and 12 are diagrams of different forms of the electrical part of the mechanism.

What will first be described has been heretofore been disclosed by me, to wit: In the frame 1 are journaled the drying drums 2, intergeared at 2*a* and suitably heated, and a suitable take-up 3. What I term the driven element, a shaft 4, is suitably connected with the nearest drum by a longitudinal shaft 5 (intergeared with such element and drum) and with the take-up by gearing 6, whereby said element drives the drums and take-up. The sheet of warp, being wound on the take-up and extending around the drums, is shown at *a*, Fig. 1. 7 is a clutch-member revoluble around element 4, 8 a fixed enlargement of element 4, and 9 a collar non-rotative but slidable on the enlargement so as by its wedge 9*a* to spread the dogs 10 to expand a split-ring 11 into clutching relation to member 7 and so cause the latter and said element to rotate as one. Also revoluble around said element is a clutch-member 13 coactive to form an overrunning clutch with the surrounding flange of a drum 14 (forming a fixed part of said element) by having peripheral notches containing rollers 15 which, when member 13 rotates as per the arrow in Fig. 6, become jammed between said member and flange in a known way so that said member and element will rotate as a unit when the former assumes to rotate the faster. Clutch-members 7 and 13 form fixed parts of a small gear 16 and a large gear 17, respectively, and meshing with these are a large gear 18 and a small gear 19, respectively, these latter being fast on a shaft 20 forming what I term the driving element. The gearings 16—18 and 17—19 may be respectively treated as high-speed and low-speed gearings of which the output gears 16 and 17 respectively have the clutch-members 7 and 13. Shaft 20 is geared at 21 to a Reeves variable-speed transmission 22, in turn geared to the rotor 23*a* of an electric motor 23 whose forward driving is determined as will appear, by a button 24 (forming a circuit-closer) normally urged to circuit-closing position by a spring 24*a* when a suitably guided manually operated rod 25, connected with a lever 26 engaged with collar 9, is moved from the position marked 0. When on such movement position I is reached the drive will be from element 20 through 19—17 to element 4, at slow speed, forward; and when position II is reached the drive will be from element 20 to element 4 through 18—16 at high speed, element 4 then rotating independently of output gear 17 and its clutch-member 13.

Now as to the improvements:

It is desired to run the machine reversely at times at slow speed. Hence there are in the drum-portion 14 of element 4 thrust-pins 27 which when moved to the left (as by collar 9 when acting to free clutch-member 7) and preferably against a friction-ring 28 in clutch-member 13 cause output gear 17 and element 4 to be clutched together to rotate as a unit. (Part 9—10—11, taken with part 27, combine to form in effect means movable in one direction to clutch the high-speed gearing output gear, and when moved in the other direction the low-speed gearing output gear, to element 4, although in the example actual separation of part 9—10—11 from part 27 occurs when the first-named clutching is effected.) When this clutching occurs, with simultaneous de-clutching as to output gear 16, reverse driving of element 20 causes reverse driving of element 4. It is incidentally noted that the reverse driving cannot be effected, without conflict of action or a jam, when the high-speed gearing output gear 16 is clutched to element 4 (or rod 25 in position II) because of the clutching action that would occur between drum 14 and clutch-member 13, both then positively subject to efforts to drive them reversely though at different speeds.

The circuit connections for the motor whereby the same may be driven forwardly when rod 25 is in position I or II, or reversely when the rod is in position 0, are as follows (referring first to Fig. 11):

The motor is of the alternating-current three-phase type and the leads 29 therefor (shown by heavy lines), connected to the service lines 30 in the conventional way, are controlled by what are well known in the electrical art as interlocking contactors, or circuit makers and breakers, 31—31*a*, assumed to be respectively moved to open or closed position by the cores 32—32*a* of electro-magnetic devices, as solenoids, 33—33*a*, said cores being connected as usual by a lever 34 which insures against either core being moved by the corresponding solenoid when the other solenoid is energized. In short, the part 31—32—33 determine the forward driving, and the part 31*a*—32*a*—33*a* the reverse driving of the motor. (It will be understood that the cores are mechanically connected with the contactors—as well known but not shown—so that a contactor will be in circuit-closing or opening position according, respectively, as the corresponding core is attracted or released by its solenoid.) A lead 35 extends from one service line and has branches leading to another such line, one branch, containing solenoid 33, being normally held closed by button 24 subject to spring 24*a*, whereas the other, containing solenoid 33*a*, is normally open and adapted to be closed by a manually actuated button or circuit-closer 36 normally held in open position by a spring 36*a*.

When rod 25 is in 0 position the motor is dead because then both buttons are in circuit-opening position. Movement of rod 25 from position 0 starts the motor forward, as described, element 4 and all it drives moving forward at slow or high speed according as rod 25 occupies position I or position II. If, with rod 25 in 0 position (button 24*a* being then in open position), button 36 be made to close its circuit the motor will be driven reversely.

According to the construction so far described it will be apparent that conflict of action might ensue (notwithstanding the presence of lever 34) if shaft 20 should be driven reversely when the high-speed gearing is clutched with shaft 4 (or rod 25 in position II) since the high-speed and low-speed gearings would then be tending to rotate shaft 4 at different speeds inasmuch as member 14, now reversely driven, would become clutched with member 13 through the rollers 15. This is a possibility when, with rod 25 at position II, button 36 is moved to close the reverse-driving branch of the circuit, or, with the button held closing such branch, the rod is moved from 0 position to position II. (There would, however, be no conflict of action under these conditions if rod 25 were in or moved to position I, because then member 13 rotated reversely, would merely idle with respect to member 14.) The condition indicated is possible because the circuit may be closed through either branch by operating only a single circuit-closer.

To avoid this the circuit connections may be as in Fig. 12.

Here the arrangement is the same as in Fig. 11 excepting that lead 35*a* (here shown divided within its length and affording the secondary circuits) has a break in each of its solenoid-containing divisions, the break of the division containing solenoid 32*a* being adapted to be closed by button 24 subject to the pressure of rod 25 when in the 0 position and the break of the division for solenoid 32 being adapted to be closed by button 24 under pressure of its spring 24*a* when the rod is moved from 0 position, and one or the other division being connectable with the continuing portion 35*b* of the lead by a switch or circuit-closer 36*a* connected to such portion. Here the mentioned conflict of action is not possible since the circuit can only be closed through either branch by both circuit-closers. In short, when the rod is in position I or II, the drive can be only forward, i. e., when, with 24 closing the forward-driving branch, 36*a* interrupts the reverse-driving and closes the forward-driving branch; if 24 is permitted to move to close the reverse-driving branch with 36*a* in open relation to such branch or if 36*a* is moved to close that branch with 24*a* in open relation thereto the motor remains un-energized.

According to either diagram, when the controlling means (25—26—9) is shifted to disestablish one clutching action (as at 7) and establish the other (as at 28) and to position 0 the impulse to the motor is interrupted and a fresh impulse may be imparted thereto, as by closing circuit-closer 36—36*a*.

The quetch (Figs. 1 and 7) comprises, as usual, two standards 37 mounted on frame 1 in which are journaled the trunnions of the quetch-rolls 38, those of the lower rolls being journaled directly in the standards and those of the other two in blocks 39 movable in vertical guideways in the standards, the blocks for the upper roll having depending extensions 39*a* slotted to receive the trunnions of the intermediate roller so that when the former blocks are raised the rolls will be separated for admitting the warp between them. The two lower rolls are intergeared at 38*a*. The upper blocks have screws 40 affixed thereto and engaging nuts 41 journaled in the standards and equipped with bevel pinions 42 meshing with bevel pinions 43 on a shaft 44 journaled in the standards and having a hand-wheel 45, whereby, during a pass of the warp through the machine, the rolls may be made to exert some predetermined pressure thereon. It will be understood that the lowest roll dips in the size solution, contained in a tank 46 shown by dotted lines in Fig. 7.

Heretofore, having by means of the hand-wheel determined the right degree of pressure for the particular warp, there was no expedient by which, in case the sizing operation had to be arrested for an appreciable time (as over night), the operator could re-set the rolls so as to re-establish that degree of pressure. Hence I provide, fixed on preferably the shaft 44 by a set screw 47*a*, a pointer 47 and, fixed to one standard 44, a disk 48 which on its face adjoining the pointer is provided with indices numbered to indicate pounds pressure and thus form a dial. When, after stopping the machine and relieving the pressure, the machine is to be re-started the operator turns the hand-wheel until the dial returns to the pointer that numbered index which adjoined the pointer previously to relaxing the pressure.

Assume the weight of the two upper rolls is 200 lbs. The first index on the dial will be 200, to indicate that weight, and with the pressure effected by turning the hand-wheel unapplied or off the pointer should register with that index, which can be effected by manipulating the set-screw 47*a* and setting the pointer around the shaft. The succeeding indices may be marked

250, 300, 350, etc., to indicate the applied pressure.

In the use of these machines it is frequently required that different warps should be subjected to stretch so as to issue from the treatment with a definite increase in length; incidentally, it is required that the stretch should be constant from one end to the other of the sheet. I have heretofore proposed a belt-and-pulley transmission connecting the quetch rolls, which coact to resist the advance of the sheet, with the nearest drum, which coacts with the other drums to effect such advance. This had these faults: that there might occur, during a treatment, slippage of the belt on the pulleys and hence a variation in the stretch applied to the particular warp, and that the operator had no recourse to determine the degree of stretch being effected but by pressing his hand against the warp between the drums and quetch. In short, both the constancy and the degree of stretch were entirely uncertain quantities. According to this invention the stretch obtained is not only constant during any given treatment but adjustment is possible to the end that the stretch will be precisely that degree for which the adjustment is effected, or so that with the adjustment effected for a certain degree of stretch the result will be that every warp (of substantially the same quality) passed through the machine will emerge having exactly the degree of stretch corresponding to such adjustment.

On frame **1** is a housing **49** in which is journaled a shaft **50** having a pinion **51**, meshing with the gear **2a** of the nearest drum, and having splined thereon a small gear **52** contained in the forked portion **53a** (Fig. 10) of a shifter **53** which is fulcrumed on said shaft and has journaled therein a small gear **54** meshing with gear **52**. On a shaft **55** journaled in the housing parallel with shaft **50** is fixed a system of gears **56** of graduated diameters. The shifter and its gears **52—54** may be shifted along shaft **50** to bring gear **54** into mesh with any one of said gears **56**, being held in the new position by any one of the notches **49a** shown in the top of the housing, which in part is hinged, as at **49b**. The smallest gear **56** meshes with a gear **57** in permanent mesh with a small gear **58**, such gears being journaled in a carrier **59** fulcrumed on shaft **55** and having a slotted extension which may be clamped to frame **1** by a bolt **60**. Carrier **59** may thus be shifted to engage either gear **57** or gear **58** with the gear **38a** of the lowest quetch roll. In the position shown, in which said gear is so engaged, the lowest roll will be driven anti-clockwise, or in the direction for advancing the warp when it is trained around the lowest roll.

Having thus fully described my invention what I claim is:

1. A machine for applying size to a textile sheet comprising, with supporting structure and means for advancing the sheet to be sized including a rotative driven element, a forwardly and reversely rotative driving element and high-speed and low-speed gearings driven by the driving element and each having its output gear revoluble relatively to the driven element and the output gear of the low-speed gearing being coactive as an overrunning clutch with the driven element and adapted to drive the same when said driving element is rotated forwardly, and controlling means movable in one direction to connect together for conjoint rotation the driven element and the first-named gear and movable in the opposite direction to connect together for conjoint rotation the driven element and second-named gear when the driving element is rotating reversely.

2. A machine for applying size to a textile sheet comprising, with supporting structure and means for advancing the sheet to be treated including a rotative driven element, a rotative driving system including an electric motor and a driving element and high-speed and low-speed gearings driven by the driving element and each having its output gear revoluble relatively to the driven element, an electric circuit having branches and means in each branch determining the driving of the motor, and controlling means movable in one direction to connect together for conjoint rotation the driven element and high-speed output gear and movable in the opposite direction to connect together for conjoint rotation the driven element and low-speed output gear, said circuit including in one branch a normally closed circuit-closer movable by the controlling means to open position when the latter is moved in said opposite direction and in the other branch a normally open circuit-closer movable to close the same.

3. A machine for applying size to a textile sheet comprising, with supporting structure and means for advancing the sheet to be treated including a rotative driven element, a rotative driving system including an electric motor and a driving element and high-speed and low-speed gearings driven by the driving element and each having its output gear revoluble relatively to the driven element, an electric circuit including a lead and branches thereof, each such branch having a break therein, means in one branch to determine the forward driving, and means in the other branch to determine the reverse driving, of the motor, controlling means movable in one direction to connect together for conjoint rotation the driven element and high-speed output gear and in the opposite direction to connect together for conjoint rotation the driven element and low speed output gear, a circuit-closer normally closing the break in the first-named branch and adapted to be moved to open position by the controlling means when the latter is moved in said opposite direction, and a circuit-closer for closing the break in the second-named branch.

4. A machine for applying size to a textile sheet comprising, with supporting structure and means for advancing the sheet to be treated including a rotative driven element, a rotative driving system including an electric motor and a driving element and high-speed and low-speed gearings driven by the driving element and each having its output gear revoluble relatively to the driven element, an electric circuit including a lead and branches thereof and a circuit closer to connect either branch with such lead, each such branch having a break therein, means in one branch to determine the forward driving, and means in the other branch to determine the reverse driving, of the motor, controlling means movable in one direction to connect together for conjoint rotation the driven element and high-speed output gear and in the opposite direction to connect together for conjoint rotation the driven element and low speed output gear, and a circuit-closer movable to close the break in one and open the break in the other branch, and vice versa, and having its movement controlled by the controlling means.

CHARLES B. JOHNSON.