No. 612,189. Patented Oct. 11, 1898.

A. BIRCH.

MACHINE FOR MERCERIZING.

(Application filed Nov. 15, 1897.)

(No Model.)

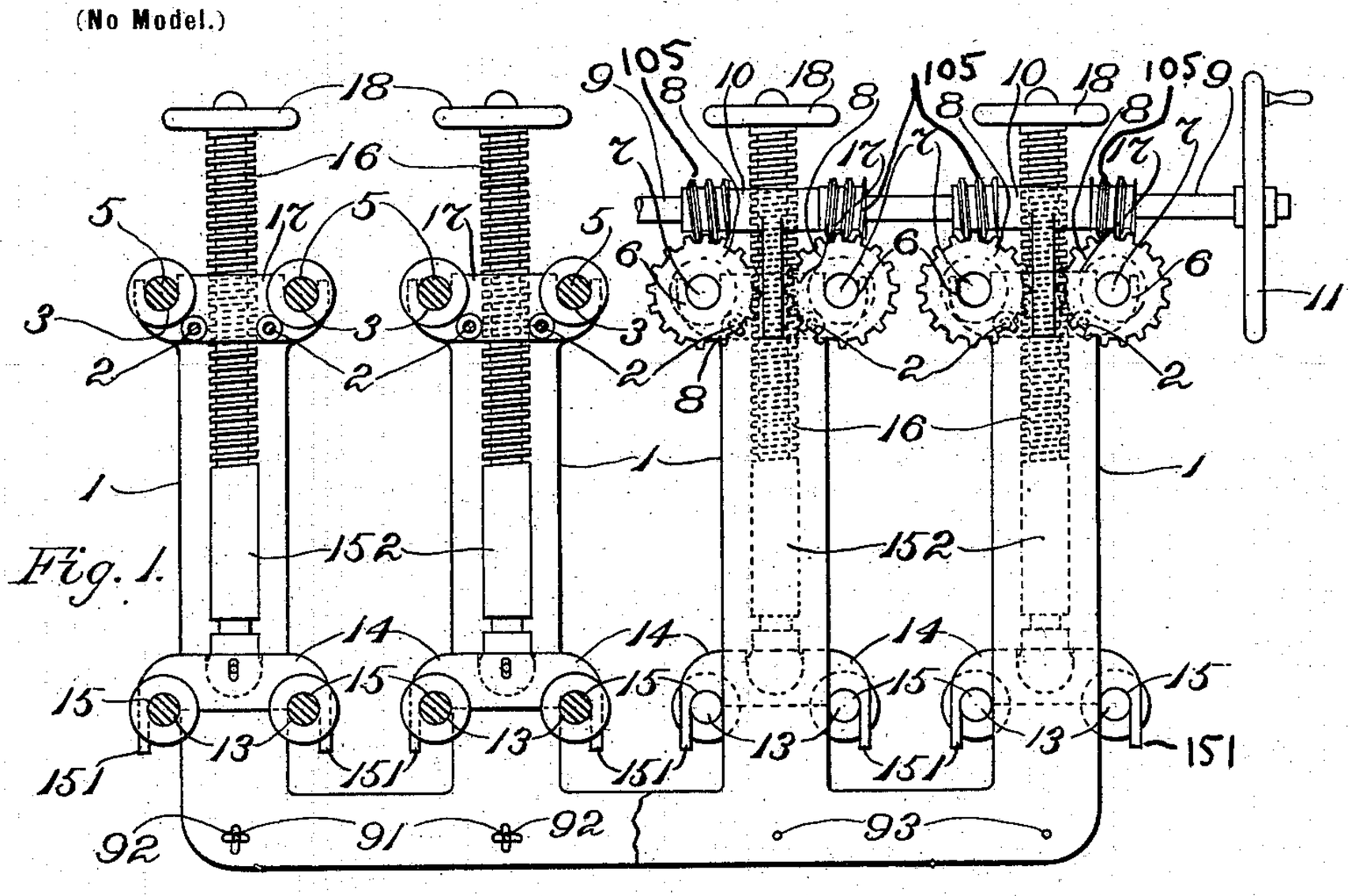

Fig. 1.

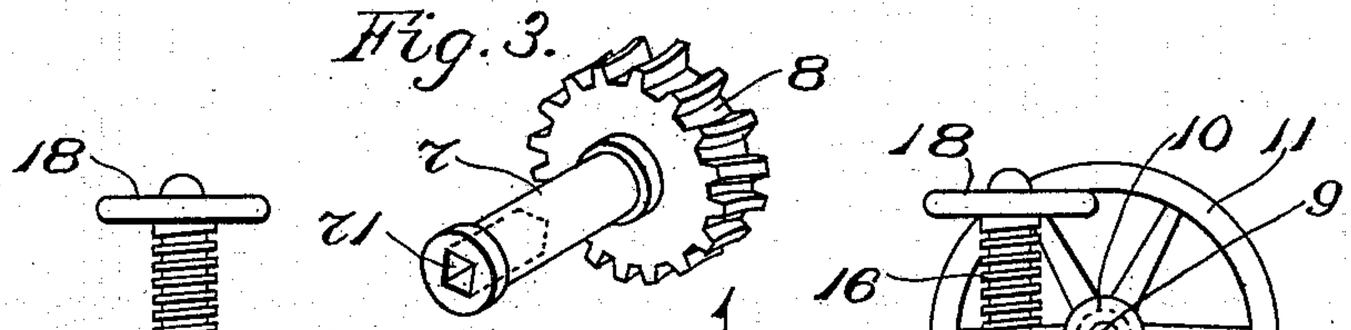

Fig. 2.

Fig. 3.

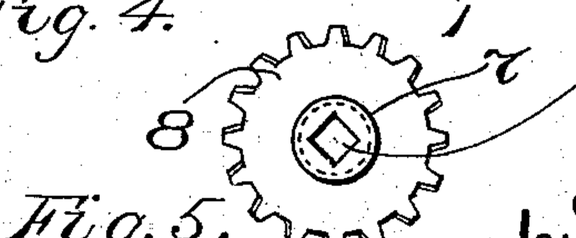

Fig. 4.

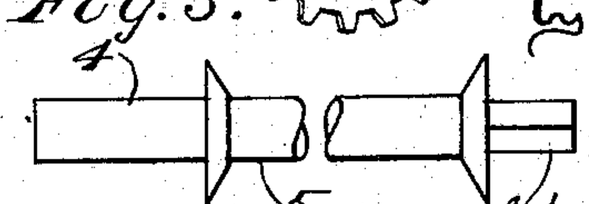

Fig. 5.

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UNITED STATES PATENT OFFICE.

ARTHUR BIRCH, OF ARLINGTON, MASSACHUSETTS.

MACHINE FOR MERCERIZING.

SPECIFICATION forming part of Letters Patent No. 612,189, dated October 11, 1898.

Application filed November 15, 1897. Serial No. 658,561. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR BIRCH, a subject of the Queen of Great Britain, residing at Arlington Heights, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Treating Yarns in the Hank, of which the following is a specification, reference being had therein to the accompanying drawings.

My improved apparatus has been designed more especially for use in treating yarns in skein or hank form by the steps of the so-called "mercerizing" process, and I will herein treat of it more especially with reference to its employment in connection with such process, although it should be understood that it is not necessarily restricted to use in this precise connection, but is adapted and contemplated for use in carrying out other processes for the preparation and finishing of yarns in the form of skeins or hanks and in which the yarns are subjected to treatment by solutions and the like, in which they are immersed.

The invention will be described first with reference to the accompanying drawings, in which latter I have illustrated the best embodiment of the invention which I have yet contrived, after which the essential and distinguishing characteristics of the invention will be particularly pointed out, and distinctly defined in the claims at the close of this specification.

Figure 1 of the drawings illustrates, partly in side elevation looking from the right in Fig. 2 and partly in vertical section on line 1 1 of Fig. 2, apparatus containing the said embodiment of my said invention. Fig. 2 is a view of the said apparatus in end elevation. Figs. 3, 4, and 5 show details.

The so-called "mercerizing" process, to which reference has been made hereinabove, has been practiced heretofore in connection with both woven cloth and yarns, and chiefly in connection with those composed of cotton. This process, in brief, consists in first subjecting the cloth or yarn to the action of a caustic solution, then washing out with water the excess of such solution from the cloth or yarn, then treating the cloth or yarn with a weak acid solution for the purpose of neutralizing the free caustic still remaining in the cloth or yarn, and, finally, washing again to remove the acid. The treatment usually is carried on in successive vats or tanks, the first of these containing the caustic solution, the second water, the third the acid solution, and the fourth water.

A peculiarity of the treatment by the foregoing process is the fact that it occasions a shrinking of the material which is subjected thereto. Cloth loses in both width and length, while yarn loses in length. This is regarded as a drawback or disadvantage and has operated to some extent to prevent the mercerizing process from coming into extended or general use. The object of my invention primarily is to obviate this drawback or disadvantage, more especially in the case of the treatment of yarn—that is to say, my aim is to prevent this shrinking of yarn when mercerized. This I accomplish by providing means whereby to hold the yarn under strong tension or strain while undergoing the action of the mercerizing solution.

A second object of my invention is to provide a practical and convenient form of apparatus which shall be fitted especially to attain the first object just mentioned and which also shall be equally serviceable and useful in other or similar processes for the treatment of yarns.

1 1 in the drawings designate opposite side frames or side plates, and 2 2 designate tie-rods by means of which the said side frames or side plates are connected with each other and also are held in the proper relative position at the desired distance apart. I have found it thus far to be convenient to employ the said tie-rods in connection with the side frames; but it will be obvious that in practice the two side frames or side plates may be connected by other means—such, for instance, as bridges or the like—either cast integral with the side frames or formed separately and bolted or otherwise connected or attached thereto. The tie-rods or other connections intermediate the side frames or side plates aforesaid may be connected with the said side frames or side plates at such places or points as may be found or deemed advisable or desirable. Preferably, however, and in accordance with one portion of my invention I apply the said tie-rods or equivalent con-

nections extending intermediate the two side frames or side plates entirely to the upper portions of the latter, substantially as is indicated in the drawings. This leaves the space between the two side frames or side plates entirely free of any permanently-fixed obstructions except at practically the very top of the apparatus. Thus after the removal from the apparatus of the rolls around which the hanks of yarn are stretched and by which the said hanks are supported during their treatment in the apparatus there is left an open passage-way between the side frames or side plates extending from end to end of the latter. After the apparatus has been elevated or upraised above the level of the tanks or vats aforesaid by means of the hoisting and transporting devices commonly in use in establishments for treating yarns the workman is free to enter and move along the said passage-way from one end thereof to the other. Thereby is afforded full facility for effecting the removal of material already in the apparatus and which has been sufficiently treated and the application of fresh material. Usually in effecting the loading and unloading of the apparatus the set of rolls at first employed in the latter and carrying the material which has been subjected to the treatment will be removed and replaced by a second set of rolls, on which is mounted the material about to be treated.

3 3, &c., designate a series of bearings which is located at the top of one of the side frames or side plates 1 1, the said bearings being designed for the reception of journals 4 4, &c., on the rolls 5 5, &c., from which the hanks of yarn are suspended. In practice the said rolls 5 5 are introduced into the upper ends of the bights of the hanks of yarn which are to be treated. Any suitable form of bearing permitting of the ready application and removal of the said journals may be employed. In the drawings I have shown a simple and well-known form of open-topped bearing. The journals, which fit in the said bearings, are cylindrical, as will be apparent. It is contemplated that the said rolls 5 5, &c., shall be rotated on their axes during the use of the apparatus in order to occasion a movement of the yarn within the liquid in which the latter is submerged. This movement is designed to expose all portions of the hanks alike to the action of the solution and to secure uniformity throughout the hanks in the action of the solution thereon. In order to occasion the rotation of the said rolls, I mount in bearings 6 6, &c., in the other of the side frames or side plates 1 1 a series of short shafts, as 7 7, &c., each of which is provided with means of giving motion to the same. In the present case I show each shaft 7 as furnished with a worm-gear, as 8, and also provided at its inner end with a socket 71 to receive a projecting portion, as 41, at the corresponding end of the roll. Any convenient provision may be made for compelling the roll to rotate in unison with the shaft 7 when the latter is actuated. I find it satisfactory in practice to make square the said projecting portion 41 of the roll and to give a corresponding shape in cross-section to the socket 71 in the said shaft. For the purpose of rotating the respective shafts 7 7, &c., I provide a longitudinally-extending shaft, as 9, which is mounted in bearings, as at 10, which are provided on the side frame, to which the shafts 7 7, &c., are applied, the said shaft 9 being furnished with worms, as 105 105, &c., in engagement with the worm-gears 8 8. The said shaft 9 may be rotated in any convenient manner and by any approved means. In the drawings, for the purposes of illustration, I have represented a hand-wheel 11 as fixed upon the said shaft. The hanks of yarn which are suspended from the rolls 5 5 are kept stretched so tightly during the time of their treatment that great resistance is offered to the rotation of the said rolls. This resistance makes itself felt clear back to the shaft 9 and tends to occasion end thrust of the same in its bearings. With the object in view of neutralizing this end thrust I make one-half of the worms 105 105 right-handed and the other half left-handed, whereby the end thrust resulting from the action of one portion of the said worms is offset by the oppositely-directed end thrust resulting from the action of the other portion of said worms. The worm-gears 8 8 are of course shaped to suit the worms by which they are engaged and actuated. The hanks which are suspended from the respective rolls 5 5 depend vertically therefrom, with the portions of one hank in close parallelism with those of the next adjacent hank or hanks. A loosely-projecting portion of yarn extending out from one hank would be likely at times to become engaged by the adjacent portion of the next hank if the proximate portions of two hanks were moving in opposite directions relatively to each other, in which case entanglement and injury to the hanks, such as snarling, would be the result. In order to obviate all tendency to this occurrence, I arrange, by preference, the worms 105 105 on the shaft 9 so that those worms which are right-handed shall alternate with worms which are left-handed. By this means I cause the proximate portions of adjoining hanks to move in the same direction.

13 13 are the rolls or rods which are placed within the lower portions of the bights of the hanks of yarn. For the purpose of forcing these rolls or rods 13 13 downwardly between the side frames 1 1 and away from the upper set of rolls I employ blocks 14 14, each furnished with bearings 15 15 for the journals at the corresponding ends of two adjacent rolls or rods 13 13, and in connection with each block I employ a rod 152, which is screw-threaded, as at 16, the screw-threaded portion of the said rod fitting a tapped hole in a lug, as 17, or other suitable part formed on or ap-

plied to the side frame. Each rod is provided with means whereby it may be turned in adjusting the position of the corresponding block 14. In the present case I have shown a hand-wheel 18 mounted thereon. In order to compensate for slight variations in the lengths of the hanks as they hang suspended on the upper rolls 5 5, I connect the blocks 14 14 with the lower ends of their adjusting-rods loosely, as by swiveling connection, as indicated in the drawings, so that the said blocks may tip or swing somewhat, according as the lengths of the hanks may vary. This prevents undue straining of a hank which may be shorter than the next adjoining one and secures equal straining or stretching of the two hanks. For the same reason I leave the screw-threaded rods independent of one another, as in the drawings, in order that they may be adjusted to independent extents, although if it should be desired in practice the said rods may be coupled in pairs or otherwise, as may be deemed advisable. An advantage which results of having the screws at opposite ends of a pair of the rods or rolls 13 independent of each other is that it enables either end of a roll to be depressed sufficiently to tighten up the hank properly at that end of the roll. It happens sometimes in practice that the different portions of the hank as distributed along the length of the rolls vary somewhat in length. In making application of a fresh lot of hanks to the apparatus they are prepared therefor by introducing a pair of rolls 5 and 13 within each hank. The journals of the lower roll 13 of the pair first are passed into the bearings of the block 14, and then the upper roll 5 is raised into position to have its end portions applied to the socket of the corresponding shaft 7 and to the oppositely-located bearing 13. In order that while this is taking place the journals of the lower roll 13 may not swing or drop forward again out of the bearings of the said block 14, I form the said bearings with an elongated outer or front wall, as 151, of sufficient vertical extent to guard effectually against the said swinging or dropping forward. The latter is an undesirable happening, which would occasion considerable inconvenience to the workman and would hamper and delay him in his work.

In order to prevent springing of the lower sides of the side frames 1 1 toward each other in consequence of the absence of tie-rods, I prefer to employ a movable or removable brace interposed between the two. In the present case I have illustrated a rod, as 91, which is movably connected, as by a pivot or hinge at 92, with one of the said side frames, near the lower edge thereof, and extends across to and engages with a corresponding portion of the other side frame. I have shown the said rod as having the free extremity bent to form a hook, which enters an eye 93, applied to the latter side frame.

I claim as my invention—

1. The improved apparatus for treating yarns in hank form by the mercerizing and other processes employing solutions and the like, comprising a supporting-frame, an upper set of rolls which respectively are received within the upper ends of the bights of the respective hanks and from which the hanks are suspended, a lower set of rolls to be introduced into the lower ends of the bights of the respective hanks, devices for straining the said lower set of rolls away from the upper set to hold the yarns under stretch during their treatment in the solution, and means to rotate the upper set of rolls in opposite directions alternately with relation to one another, whereby to produce movement of the hanks within the said solution around the rolls over which they are placed, and to cause proximate portions of adjacent hanks to move in the same direction with each other, substantially as described.

2. The improved apparatus for treating yarns in hank form by the mercerizing and other processes employing solutions and the like, comprising the supporting-frame, the upper set of rolls from which the hanks are suspended, the shafts with which the said upper set of rolls are connected detachably, means to rotate the said shafts, the lower set of rolls suspended in the bights of the said hanks, the bearing-blocks at the opposite ends of the said lower set of rolls and engaging with the latter in pairs, and the adjusting-screws for the respective bearing-blocks, in swiveling connection therewith, to permit of independent adjustment of the opposite ends of the rolls, and also of independent tightening of the rolls of a given pair at either end thereof, substantially as described.

3. The improved apparatus for treating yarns in hank form by the mercerizing and other processes employing solutions and the like, comprising the supporting-frame, the upper set of rolls from which the hanks are suspended, the shafts with which the said upper set of rolls are connected detachably, means to rotate the said shafts alternately in opposite directions relatively to each other, the lower set of rolls suspended in the bights of the said hanks, the bearing-blocks at the opposite ends of the said lower set of rolls and engaging with the latter in pairs, and the adjusting-screws for the respective bearing-blocks, in swiveling connection therewith, to permit of independent adjustment of the opposite ends of the rolls, and also of independent tightening of the rolls of a given pair at either end thereof, substantially as described.

4. The improved apparatus for treating yarns in hank form by the mercerizing and other processes employing solutions and the like, comprising a supporting-frame, an upper set of rolls which respectively are received within the upper ends of the bights of the respective hanks and from which the hanks are suspended, a lower set of rolls to be introduced into the lower ends of the bights of the respective hanks, bearing-blocks in engage-

ment with the opposite ends of the lower rolls, independent adjusting devices for the opposite bearing-blocks, and means to rotate the upper set of rolls to cause the hanks to travel within the said solution around the rolls over which they are placed, substantially as described.

5. The improved apparatus for treating yarns in hank form by the mercerizing and other processes employing solutions and the like, comprising a supporting-frame, an upper set of removable rolls which respectively are received within the upper ends of the bights of the respective hanks and from which the hanks are suspended, a lower set of rolls to be introduced into the lower ends of the bights of the respective hanks, blocks having bearings beneath which fit the journals of the rolls of the said lower set and furnished with downwardly-extended outer walls for said bearings to provide against accidental disengagement of said journals from said bearings, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR BIRCH.

Witnesses:
CHAS. F. RANDALL,
WILLIAM A. COPELAND.