W. CLARK.

PROCESS AND APPARATUS FOR DYEING THREAD AND YARN.

No. 185,625. Patented Dec. 26, 1876.

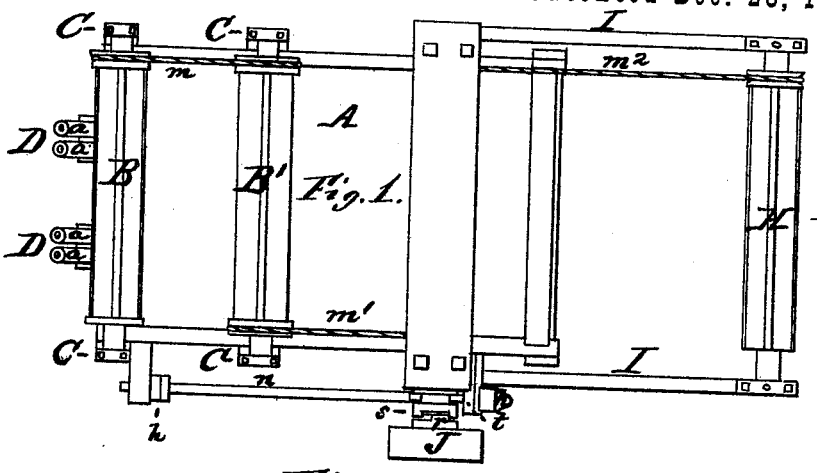


Fig. 2.

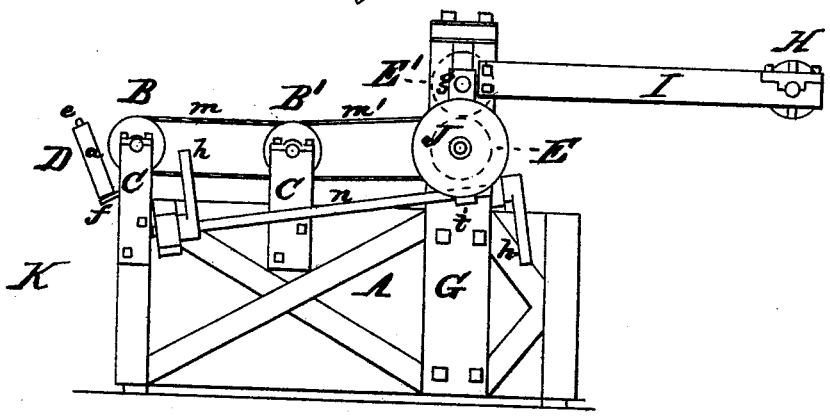
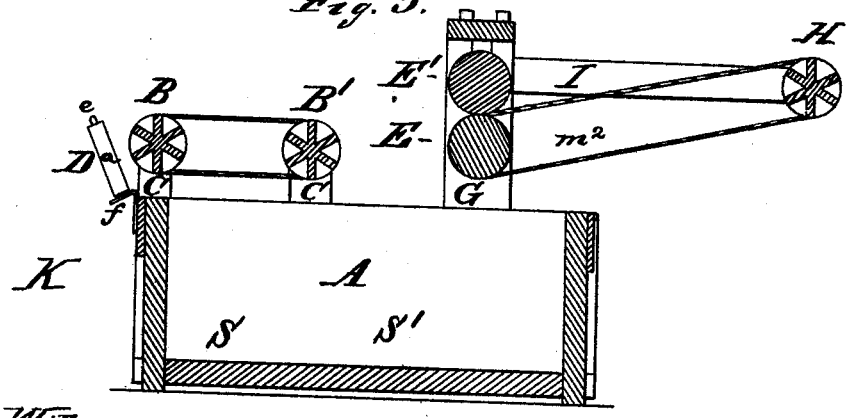


Fig. 3.



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WILLIAM CLARK, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR DYEING THREAD AND YARN.

Specification forming part of Letters Patent No. **185,625**, dated December 26, 1876; application filed November 18, 1875.

To all whom it may concern:

Be it known that I, WILLIAM CLARK, of Newark, in the county of Essex and State of New Jersey, have made an invention of certain new and useful Improvements in the Art of Dyeing Thread and Yarn, and in the machinery used in practicing the same; and that the following is a full, clear, and exact description and specification of the said improvements.

The object of this invention is to dye thread and yarn in the skein by the expenditure of a comparatively small amount of hand-labor.

It has been customary to perform this operation by dipping the skeins separately into the dye-vat by hand, or by lowering a number of disconnected skeins simultaneously into the dye-vat by means of a frame, which is first charged with a mass of skeins, is then lowered into the dye-vat, and is finally withdrawn therefrom and suspended over the dye-vat to permit the dye-liquor to drain from the skeins by gravitation. Either of these modes of conducting the operation requires much hand-labor, and the latter plan has been applied, so far as I know, only to skeins which are to be parti-colored.

My improvement in the art of dyeing thread or yarn in the skein consists of the process of passing a continuous, but loose, chain of connected, but not overlapping, skeins progressively through the dye-liquor, so that each skein is subjected in succession to the action of that liquor without being hampered or confined by frames or other means that would prevent the dye-liquor from penetrating every portion of the skein.

My improvements in the machinery for practicing the said improvement in the art consist of certain combinations of a dye-vat with other appliances, which are set forth in detail at the close of this specification.

In order that the invention may be fully understood, I have represented in the accompanying drawings, and will proceed to describe, the best form of machine that I have devised for embodying my improvements in dye machinery; and I will then describe the manner in which my process may be practiced by the use of that machine.

Figure 1 of the said drawings represents a plan of my said dyeing-machine. Fig. 2 represents a side view of the same. Fig. 3 represents a vertical longitudinal section of the same.

The dye-vat A forms the base of the machine, and acts as a frame to sustain and combine the moving members thereof. This dye-vat is surmounted by two rollers, B B′, each fitted with gudgeons, which are supported by standards C C, secured to the sides of the dye-vat. The barrels of these rollers are constructed, by preference, so as to present a cleated or barred periphery; but this form of periphery is not essential to my invention.

At the front end of the machine there are two guides, D D, each consisting, by preference, of a pair of guide-rolls, *a a*, each roll being tubular, and each being supported upon a spindle, *e*, on which it can revolve freely. The two spindles of each pair of guide-rolls are secured to a bracket, *f*, which is made fast to the vat. At the rear end of the vat there are a pair of squeezing rollers, E E′, each of which has gudgeons or journals, which turn in boxes that are held by the standards G. These standards are slotted to receive the boxes of the squeezing-rollers, and the boxes *g* of the upper squeezing-roller E′ are permitted to slide in the slots, so that the roller may rise and fall. Beyond the squeezing-rollers there is a delivery-roller, H, which is supported by arms I I, in the outer ends of which its gudgeons revolve. The barrel of this delivery-roller is constructed, by preference, with bars or cleats.

In order that the rollers B B′ E E′ H may be caused to revolve simultaneously, the peripheries of their heads are each grooved, so as to form pulleys for round belts. The first roller B, which, for distinction, I call the "first dipping-roller," is connected by a belt, *m*, with the second dipping-roller B′, and the second dipping-roller B′ is connected by a belt, m^1, with the lower squeezing-roller E. The delivery-roller H is also connected by a belt, m^2, with the lower squeezing-roller; hence, when the lower squeezing-roller is turned, all the others turn in concert with it, and the diameters of the several pulley-grooves are such that all the peripheries of all the rollers move with substantially the same progressive speed.

The upper squeezing-roller is caused to revolve by the frictional contact of its barrel with that of the lower roller, or with the material between the two. Motion is conveniently imparted to the lower squeezing-roller E, and thence to the other rollers, by means of a belt applied to a belt-pulley, J, which is mounted so as to turn freely upon the prolonged extremity of one of the gudgeons, or the shaft of the lower squeezing-roller. This pulley may be connected with the roller-shaft and disconnected from it, as required, by means of a clutch, one of whose members, *r*, is formed by teeth projecting from the hub of the pulley J, while the other member, *s*, is fitted to slide upon the roller-shaft, and is connected therewith by a longitudinal spline and groove, in the customary manner. The connection and disconnection of the pulley J with the roller-shaft is effected readily by means of the clutch-fork *t*, whose forked end engages in a groove of the movable member *s* of the clutch. The shank of the clutch-fork is secured to a rock-shaft, *n*, which extends at one side the dye-vat, is supported in suitable bearings, and has each of its extremities fitted with a lever-handle, *h*, by means of which it can be rocked to shift the clutch. Hence the machine can be readily stopped or started by an operator at either end of the dye-vat.

In the dyeing of thread or of yarn according to my invention, with the machine above described, the skeins or hanks are formed into a continuous chain by connecting their ends by means of soft twisted yarns or threads, in the manner represented at Fig. 4, so that the successive skeins or hanks, which constitute links of the chain, are not interlocked. One of these chains of hanks is conveniently held in a large barrow, and two barrow-loads of chains are placed at the front end K of the machine. A leading-string, several feet in length, is introduced through the end of the first hank of each chain.

The machine being set in motion, the string is passed between the rollers *a a* of the guide D, and is pulled over the barrel of the first dipping-roller B. The operator pulls along the chain by the leading-string, and permits the end of the chain to drop into the dye-vat. He then holds the end of the leading-string, until, by the operation of the first dipping-roller, about a dozen hanks, more or less, of the chain have been delivered into the dye-vat at S, Fig. 3. Then the operator draws the end of the leading-string over the second dipping-roller B′, and, pulling the chain along by the leading-string, permits the end of the chain to drop into the dye-vat.

The operator holds the end of the leading-string until about a dozen hanks, more or less, of the chain have been dropped into the dye-vat at S′ by the operation of the second dipping-roller. When this last operation has taken place, the operator introduces the leading-string between the squeezing-rollers E E′, and when it is delivered at the rear side thereof he seizes it and conducts it over the delivery-roll H, and thus leads the end of the chain over that roll and permits it to descend into an empty barrow, which is placed beneath to receive it. The operation of the machine then proceeds automatically, and every hank of the chain of hanks or skeins is successively dipped into the vat by the first dipping-roller, is permitted to remain therein long enough to be saturated with dye-liquor, is drawn from the vat and dipped a second time by the second dipping-roller, is permitted to remain in the dye-liquor long enough to become a second time saturated therewith, and is then withdrawn therefrom by the squeezing-rollers E E′, which express the superfluous dye-liquor. Finally, the chain is delivered by the delivery-roller H into the barrow beneath it.

The length of time during which the hanks remain in the dye-liquor depends upon the peripheral speed of the rollers and the quantity of slack chain permitted to descend into the vat between the two dipping-rollers B B′, and between the second dipping-roller B′ and the squeezing-rollers E E′.

The clutch-handles *h h* permit the machine to be stopped at any moment in case of a kink in the chain, or for any other reason.

The machine is provided with two sets of guide-rollers, and is broad enough to operate simultaneously upon two chains of hanks, whose ends are presented simultaneously to the machine by two operators—one at each side of the vat. As soon as the machine commences to deliver the ends of these chains into the delivery-barrows, one of the operators stations himself at the front end of the machine, so as to watch the entrance of the chains and stop the machine in case of a kink, while the other operator attends to the distribution of the chains in the receiving-barrows.

In the dyeing of thread, I find that good results are obtained by running the rollers with a peripheral speed of about two hundred and fifty feet per minute.

By the above-described operations, the threads or yarns are dyed in a chain of hanks, the links of which are successively dipped into the dye-liquor, saturated therewith, and squeezed by a continuous movement of the chain. The process is continuous until the entire chain is dyed.

In practicing this process, it is important that the successive members of the chain should be connected by threads or yarns, and should not be interlocked in loops, because the effect of interlocking the hanks by looping them into each other is to impede the penetration of the thread by the dye-liquor at the interlooped portions of the chain, which overlap and protect each other wholly or partially from the action of the dye-liquor.

Having thus described a practical application of my improvements in the art and in dye machinery, I would have it understood that the invention is not restricted to the ex-

act details above given, as variations may be made without ceasing to embody the invention in substance. Thus, for example, I have described the various rollers as supported directly by the dye-vat; but it is obvious that a separate frame may be used for the purpose, the only essential feature as respects the support of the rollers being that they should be maintained in their proper positions relatively to the dye-vat and to each other; and the essential feature as respects their movement being that they are driven positively by means of belts or other mechanical devices, so that they move the chain of skeins forward, instead of depending for their movement upon the frictional contact of their surfaces with the material to be dyed. I have also described the employment of two dipping-rollers; but this number may be increased, if found expedient, or may be diminished to one. So, also, a second roller may be mounted above each dipping-roller, so as to exert a pressure upon the chain. Moreover, if the friction of fixed guides is not considered detrimental, guide-pins or other fixed guides may be substituted for the guide-rollers.

I do not claim the formation of skeins of yarn or thread into chains by interlooping the skeins, so that a portion of each skein overlaps the one to which it is linked, as I am aware that skeins of yarn have been formed into chains in that manner for the purpose of bleaching them.

As the belts and pulleys represented in the drawings simply convey motion to the several parts of the machine, so as to cause them to move with the proper relative speeds, such belts and pulleys may be replaced by other combining mechanism producing the same effect.

I claim as my invention—

1. The improvement in the art of dyeing thread in the skein, consisting in the connecting of the skeins in a chain by threads or interposed links so slender as to enable the skeins to take the dye equally throughout, the dipping of said chain of skeins progressively into the dye-liquor, and the expression of the superfluous liquor therefrom, all substantially as before set forth.

2. The combination, substantially as before set forth, of the dye-vat, the guide, the dipping-roller, the squeezing-roller, and the belts by which the dipping-roller and the squeezing-roller are caused to revolve positively.

3. The combination, substantially as before set forth, of the dye-vat, the dipping-roller, the squeezing-rollers, the delivery-roller, and the belts by means of which the several rollers are caused to revolve positively.

4. The combination, substantially as before set forth, of the dye-vat, the guide, the dipping-roller, the squeezing-rollers, the delivery-roller, and the belts by means of which the several rollers are caused to revolve positively.

Witness my hand this 19th day of Novem ber, A. D. 1875.

WM. CLARK.

Witnesses:
C. S. HAWES,
WM. WOODRUFF.