

No. 673,067.

Patented Apr. 30, 1901.

F. SHUMAN.  
MERCERIZING MACHINE.

(Application filed Sept. 20, 1900.)

(No Model.)

2 Sheets—Sheet 1.

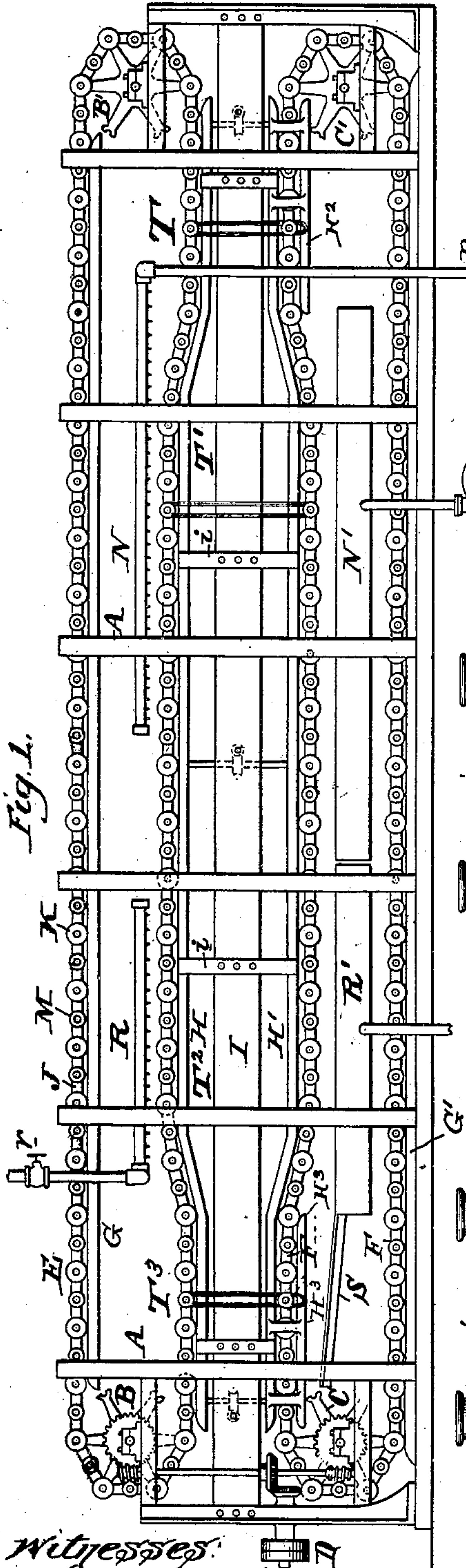


Fig. 1.

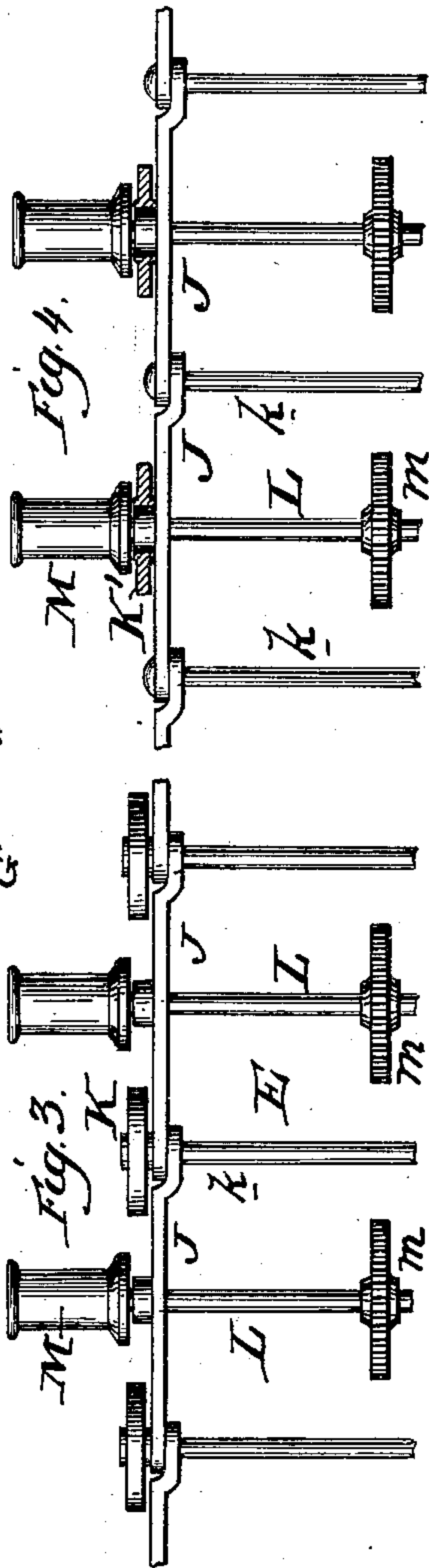


Fig. 3.

Fig. 4.

Fig. 5.

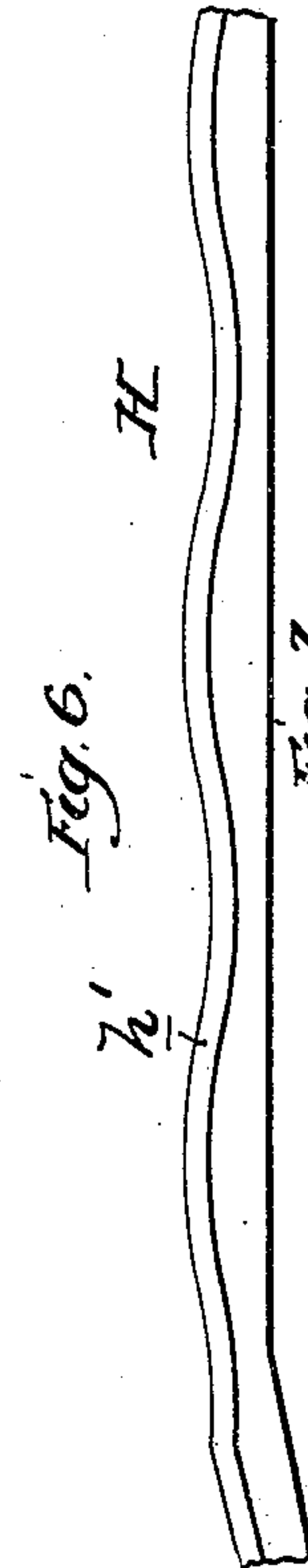


Fig. 6.



Fig. 7.

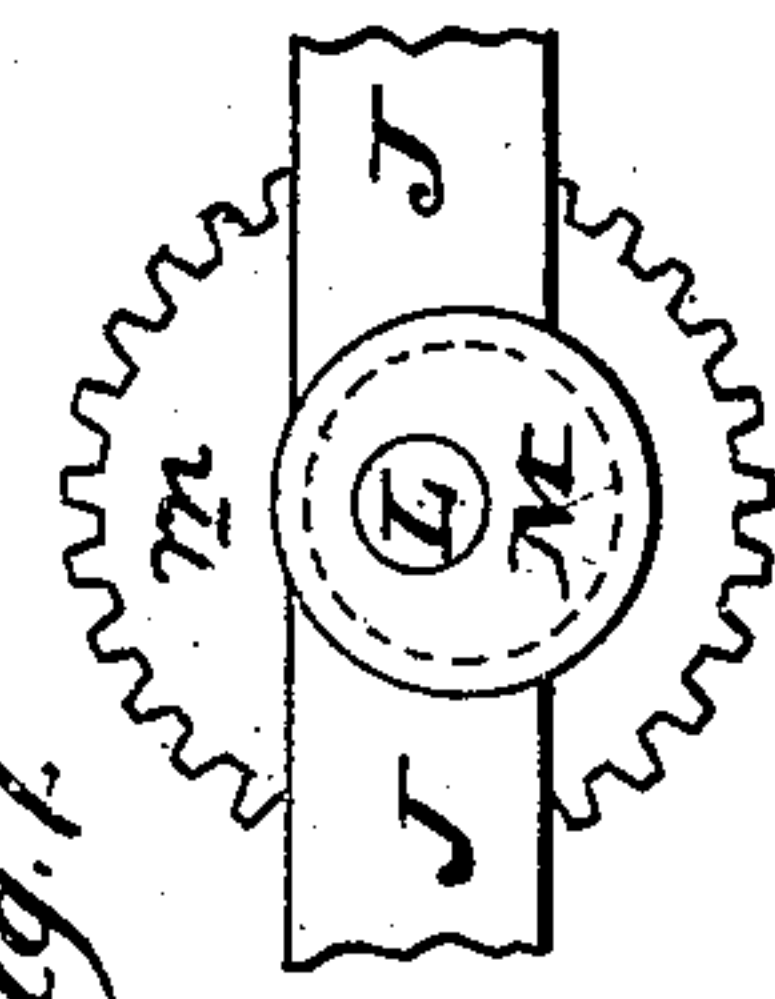


Fig. 8.

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No. 673,067.

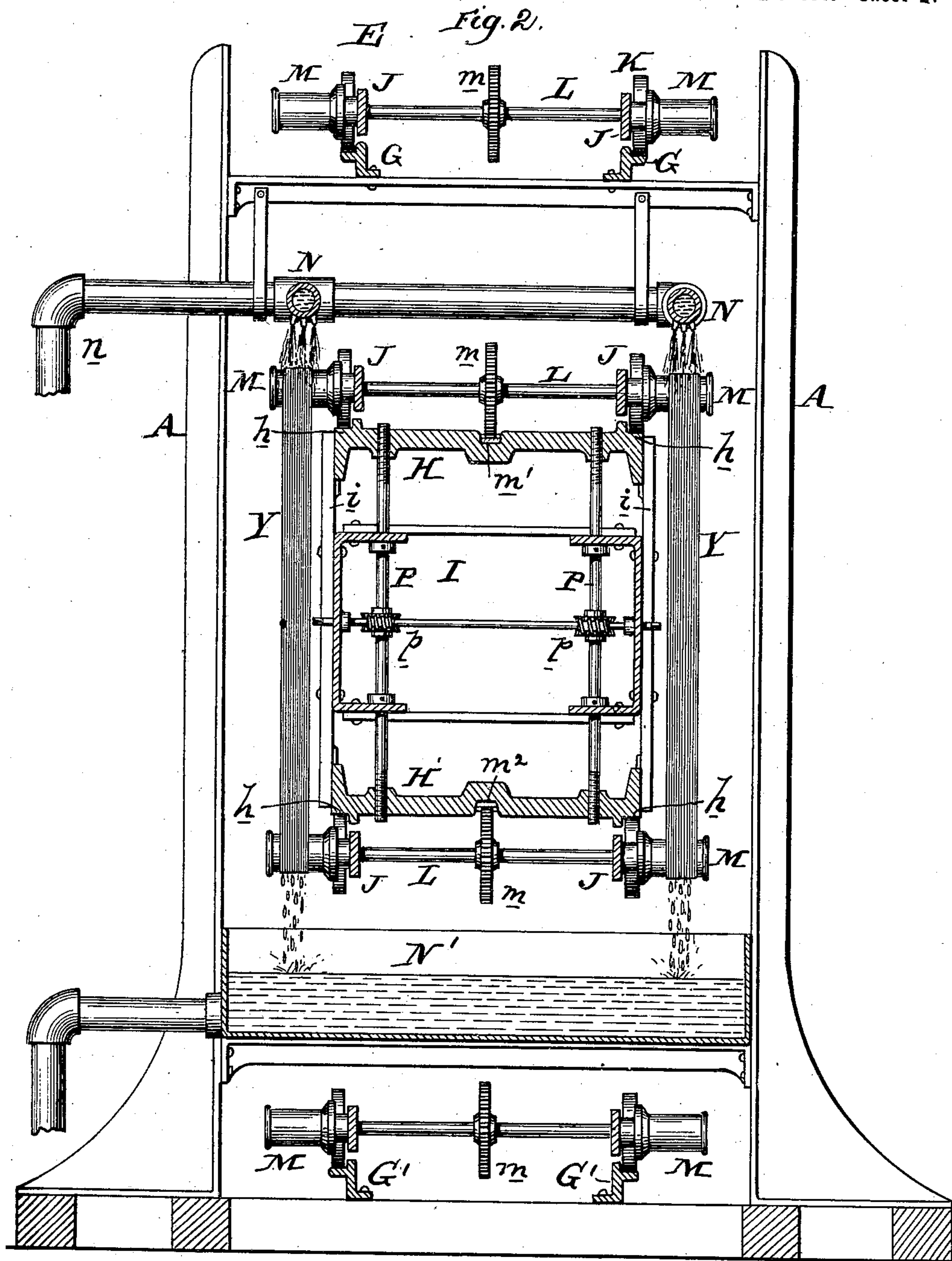
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2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

FRANK SHUMAN, OF PHILADELPHIA, PENNSYLVANIA.

## MERCERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 673,067, dated April 30, 1901.

Application filed September 20, 1900. Serial No. 30,605. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK SHUMAN, of the city and county of Philadelphia, in the State of Pennsylvania, have invented an Improvement in Mercerizing-Machines, of which the following is a specification.

My invention has reference to mercerizing-machines; and it consists of certain improvements fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide a suitable construction of mercerizing-machine adapted to carry on a continuous process whereby there is no loss of time due to the stoppage of the machine or handling of the yarn. The process which my improved machine is designed to perform may be briefly stated as one in which the yarn is placed on the machine in skeins in loose condition. It is then automatically conveyed along the machine and mechanically stretched and while in this condition subjected to the action of the caustic alkali. While so stretched it is next subjected to a washing action, and subsequently it is relieved of this stretched condition and is removed from the machine, said process taking place continuously with each skein of yarn in rapid succession and without stoppage or interference to the normal running of the machine. If desired, the stretching operation may be uniform or variable, as desired, in the latter case the tension being increased and decreased during the mercerizing operation.

In carrying out my invention I provide mechanism for accomplishing the above results, and, more specifically stated, the said mechanism comprises two endless chains of carriers combined with suitable means for moving and guiding the said carriers in the same direction and at a reasonable distance apart. Each skein of yarn is placed over a carrier on each one of the endless chains, and the said carriers are caused by suitable cam-guides to move apart, so as to put the yarn under tension and convey it into or through the mercerizing solution while thus maintained in a stretched condition. After the mercerizing operation the yarn in the custody of the two carriers is conveyed through the washing apparatus while still in the

stretched condition, and subsequently the said carriers are automatically moved toward each other for the purpose of relieving the tension on the yarn, at which place the said yarn may be removed from the carriers. The yarn while in the custody of the carriers may be moved over the carriers in one or both directions to more thoroughly present it to the mercerizing and washing fluids.

My invention also comprehends numerous details, all of which will be more fully understood by reference to the drawings, in which—

Figure 1 is a side elevation of a mercerizing-machine embodying my improvements. Fig. 2 is a transverse sectional elevation of same. Fig. 3 is a plan view of a portion of the endless chains and carriers. Fig. 4 is a similar view of a modification. Fig. 5 is a diagram illustrating the arrangement of the racks for rotating the carriers. Fig. 6 is a side elevation of a modified construction of the cam-guide, and Fig. 7 is a side elevation of a modification of the manner of attaching the carrier.

A is the main frame of the machine and may be of any suitable construction.

B and B' are two sprocket or chain wheels carried in suitable bearings at the upper part of the main frame and respectively located at each end thereof. C C' are two similar sprocket or chain wheels located in the main frame immediately below the wheels B B'. Extending over the wheels B B' is an endless chain E, composed of a series of links J, jointed together by transverse hinged rods k, upon the outer ends of which may be placed wheels K, adapted to support the chain in traveling over the guides G and H. A similar chain structure F is arranged to travel about the chain-wheels C C' and are guided over the guides G' and H'. The wheels B and C are driven in opposite directions, so that the chains are caused to travel in such a manner that the adjacent parts move in the same direction while traveling over the guides H H', the said guides being of such shape that they move the chains apart to a greater distance over a portion of their travel than at other times. The links J J of the chain have journaled in them shafts L, on the ends of which are arranged carriers in form of yarn-spools M, and said shafts and spools may be rotated by means of gears m, running in contact with



racks  $m' m^2$ , carried by the cam-guides H H', as described hereinafter.

Extending from one end of the machine to the other and between the two endless chains of carriers for the yarn I arrange a longitudinal girder I, of any suitable construction, and on this girder I provide adjusting-screws P P for directly carrying the cam-guides H and H'. By turning these screws P the cam-guides may be adjusted to or from each other to vary the tension put upon the yarn Y, which is stretched over the spools M M of the two chains, as clearly shown in Figs. 1 and 2. These screws P may be rotated by any suitable means, the worm and worm-wheel mechanism  $p$  shown being excellently adapted to the purpose. A series of these adjusting devices P  $p$  are arranged at intervals along the length of the machine, as the cam-guides H H' are of considerable length. The general elevation of these cam-guides is illustrated in Fig. 1 and the cross-section is illustrated in Fig. 2. It will be seen that said cam-guides are forms adapted to receive the wheels K of the chain on each side of the machine in tracks  $h$  to properly guide the endless chain of carriers properly during their travel. The central parts of the cam-guides H H' are provided, respectively, with the racks  $m' m^2$ , said racks being arranged out of vertical alinement, one beginning substantially in the vertical plane where the other terminates, and said racks are designed to alternately act upon the shafts L of the two chains E F—that is to say, to cause the shafts L and their spools M of the chain F to first rotate, then the shafts and spools of the chain E to rotate in the opposite direction, and so on as often as desired, the number of rotations being somewhat dependent on the sections of rack  $m' m^2$ . Fig. 5 is a diagram designed to represent the alternate arrangement of these racks and also shows them pointing in opposite directions, as will be understood from an examination of Fig. 2, for the purpose of operating on the opposite sides of the wheels  $m$  of the two chains of carriers. The cam-guides H H' are guided in their adjustments on the transverse guide-plates  $i$ ; but this may be omitted, if desired, as the screws P may be relied upon.

N N are two pipes for spraying caustic alkali upon the yarn being carried on the spools of the chains, as more fully illustrated in Fig. 2, the surplus of said alkali being received in a vat N', arranged below the yarn. The alkali is drawn from the said tank N' by a rotary pump O and forced through a refrigerator or cooler O', if desired, and thence by pipe  $n$  into the spraying-pipes N N under a considerable pressure. By these means the skeins of yarn Y, stretched from spool to spool of the two chains, is thoroughly impregnated with the caustic alkali.

While I term the manner of applying the caustic alkali to the yarn as "spraying," it is to be understood that I do not use said term in a limited sense, but wish it to be understood

that said term is used as describing the application of the mercerizing fluid to the yarn by pouring it upon the yarn as distinguished from dipping or running the yarn into a vat of alkali.

Arranged in alinement with the pipes N are the washing-water pipes R for supplying and spraying of water to the yarn after it has been mercerized, and the flow of said water may be regulated by a valve  $r$ . The water after leaving the yarn may flow into a tank R', arranged in alinement with the tank N', and the impure water may then be drawn off and the alkali recovered in any suitable manner. Any droppings from the yarn are received upon the troughs S and flow back into the tank R'.

Supplemental guides H<sup>2</sup> and H<sup>3</sup> may be employed to support the lower chains F at the time they begin to pass onto the cam-guides H' and leave the latter to support said chains and carriers when applying the yarn and removing the same. These supplemental guides may be secured to and moved with the cam-guides, the connection therewith being made beyond where the yarn is applied to or removed from the machine.

By referring to Fig. 1 it will be observed that the cam-guides H H' are nearer together at each end of the machine than at the middle portion, the object of this being to enable the carriers M M of the two chains to be sufficiently close together to the position T T to enable the operator to readily apply the skeins of yarn. Then as the chains move forward from left to right the carriers M of the two chains are moved apart to put the yarn under tension at the place T', where it is subjected to the action of the alkali. It remains under tension during its passage from the position T' to the position T<sup>2</sup>, where the excess of alkali is washed off from the yarn, and after this the carriers M of the two chains are permitted to approach each other, at which time they arrive at the position T<sup>3</sup>, so as to permit the mercerized yarn to be readily removed. The yarn at positions T and T<sup>3</sup> is shown as loosely hung from the two carriers, whereas it is shown at the position T' as tightly stretched. In the operation of the machine the carriers travel continuously at a uniform speed, and the operators at points T and T<sup>3</sup>, respectively, place fresh skeins upon the machine and remove the mercerized skeins without interfering in the least with the continuous operation of the apparatus. The machine is made long enough to insure the proper subjection to the mercerizing fluid and to the washing process, so that the entire travel of the carriers during the treatment of the yarn is substantially in the same direction.

During the travel of the yarn through the machine the carriers of the chains E and F are alternately rotated, so that the skeins are caused to travel over the carriers and present new surfaces to the action of the alkali and washing solutions, and by rotating them first



in one direction and then in the other direction no excessive tension or straining of the yarn will result. For convenience the racks  $m'$   $m^2$  are arranged to operate, respectively, upon the carriers of the two chains E and F; but it will be self-evident to any one skilled in the art that the action of these racks may be applied, if desired, to the carriers of only one of the chains, since it is immaterial whether the reversed operations come upon one set of the carriers or upon each of the two sets alternately.

While it is evident that in carrying out my invention the two sets of carriers on one side of the machine may alone be employed in connection with mercerizing the yarn, I prefer, however, to put carriers on both sides of the machine, as this will double its capacity and at the same time will balance the strains upon the several parts and render the machine far more satisfactory and economical in operation.

In place of putting the two guide-wheels K upon the hinge-rods K' they may be arranged concentric with the carrier-shafts L, being journaled upon hubs on the side of the chain-frames J, as indicated in Fig. 4, the said change not being one which modifies or alters the general operation of the machine.

In some cases it is found more advantageous to subject the yarn during the mercerizing operation to alternate variations in pressure—namely, increasing the tension, then somewhat reducing it, then increasing it, and so on. Where this is desired, I may accomplish it in either of two ways—by shaping the guiding portions  $h'$  of the guide-frames H and H', or either of them, on curved lines, as indicated in Fig. 6, which will cause the chains to be moved outward and inward in traveling over such irregular guides. It is advantageous that both guides H and H' shall be similarly formed under those conditions, so as to keep the pairs of carriers which work in unison upon any skein to normally maintain their relative positions during the operation of mercerizing. In place of making the cam-guides irregular, as indicated in Fig. 6, somewhat the same result may be arrived at by fixing the carrier-spools M eccentrically upon the shafts L, so that when they rotate they will vary the tension put upon the yarn looped about them. It is evident that these eccentrically-arranged carriers may be upon one or both of the chains E and F; but the resulting action would be more uniform where they were confined to one chain, because in rotating it might be possible that both of them, if eccentric, might be caused to rotate in such a manner as to simply move the skein of yarn bodily up and down without varying its tension.

I do not confine myself to any specific details of the general structure of the machine, as these may be modified without changing or altering the general characteristics of the machine or process of treatment. It is also evi-

dent that while it is best that the two chains E E shall be arranged one above the other, as indicated, nevertheless I do not limit myself to any special arrangement of the skeins or carriers, as my invention comprehends, broadly, any arrangement of two sets of carriers between which the yarn may be stretched during the mercerizing operation, and which carriers operate to permit the ready application of the skeins at one place in the machine, then subject the yarn to stretching to a given period in the travel of the carriers, and then remove the tension, so as to permit the mercerized yarn to be removed from the carriers, irrespective of the specific character or nature of the details of such a machine.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mercerizing-machine, two independent series of yarn-carriers between which the yarn is stretched, independent means for supporting and moving each of said two series of carriers while conveying the yarn stretched between them in the same direction, and means for spraying a chemical solution upon the yarn while being conveyed in the stretched condition by the two independently-moved series of carriers.

2. In a mercerizing-machine, two independent series of yarn-carriers having spools on supports about and between which the yarn is stretched, means for moving said two series of carriers in the same direction while conveying the yarn, means for spraying a chemical solution upon the yarn while being conveyed by the two independent series of carriers, and means for causing the carriers of the two series to be moved apart for holding the yarn stretched when being subjected to the chemical solution.

3. In a mercerizing-machine, two independent series of yarn-carriers between which the yarn is stretched, means for moving said two series of carriers while conveying the yarn in the same direction, means for applying a chemical solution to the yarn while being conveyed by the two independent series of carriers, means for causing the carriers of the two series to be moved apart for stretching the yarn when being subjected to the chemical solution, washing devices consisting of means for projecting water upon the yarn for cleansing the yarn while in its stretched condition, and means for removing the tension on the yarn after being cleansed.

4. In a mercerizing-machine, two independent series of yarn-carriers one above the other and between which the yarn is stretched in an upright plane, means for moving said two series of carriers in the same direction while conveying the yarn, means for applying a chemical solution to the yarn while being conveyed by the two independent series of carriers and exposed to the atmosphere, means for applying a washing solution to the yarn while being conveyed by the carriers and



while maintained in the stretched condition, and cam-guides for separating the carriers to put the yarn under tension when being treated by the solution and removing the tension after such treatment.

5. In a mercerizing-machine, two independent series of yarn-carriers between which the yarn is stretched, independent means for supporting and moving each of said two series of carriers (while conveying the yarn stretched between them) in the same direction, means for spraying a chemical solution upon the yarn while being conveyed by the two independent series of carriers, a tank arranged below the two series of carriers to receive the excess of fluid sprayed upon the yarn, and a pump to draw the fluid from the tank and force it through the spraying devices.

6. In a mercerizing-machine, two independent series of yarn-carriers between which the yarn is stretched, means for moving said two series of carriers while conveying the yarn in the same direction, means for spraying a chemical solution upon the yarn while being conveyed by the two independent series of carriers, a tank arranged below the two series of carriers to receive the excess of fluid, a pump to draw the fluid from the tank and force it through the spraying devices, and a refrigerating or cooling device to cool the fluid between its passage from the tank to the spraying devices.

7. In a mercerizing-machine, an endless conveyer of connected yarn-carriers, a second and independent endless conveyer of connected yarn-carriers and between which yarn-carriers of the two conveyers the yarn is stretched, means for moving said independent conveyers of connected carriers (while conveying the yarn) in the same direction, automatic means for moving the conveyers and their carriers apart for stretching the yarn while it is being conveyed, means for applying a chemical solution to the yarn while stretched, and means for rotating the carriers and the yarn (while said carriers are traveling forward and the yarn is being subjected to the chemical solution) first in one direction and then in the reverse direction.

8. In a mercerizing-machine, two independent series of connected yarn-carriers between which the yarn is stretched, means for moving said two series of connected carriers (while conveying the yarn) in the same direction, means for applying a chemical solution to the yarn while being conveyed by the two independent series of connected carriers, and means for rotating the carriers and the yarn (while said carriers are traveling forward and the yarn is being subjected to the chemical solution) first in one direction and then in the reverse direction.

9. In a mercerizing-machine, two independent series of connected yarn-carriers between which the yarn is stretched, means for moving said two series of connected carriers (while conveying the yarn) in the same direction,

means for applying a chemical solution to the yarn while being conveyed by the two independent series of connected carriers, means for automatically causing the carriers of the two series to be moved apart for stretching the yarn when being subjected to the action of the chemical solution, and means for rotating the carriers and yarn first in one direction and then in the other while the yarn is stretched subjected to the chemical solution.

10. In a mercerizing-machine, the combination of two independent series of yarn-carriers between which the yarn is hung and in which each series of carriers is separately connected so as to be independently moved, independent means for moving the two series of carriers in the same direction while supporting the yarn, means for subjecting the yarn to chemical solution, means for washing the yarn, and means for causing the carriers and yarn to be rotated first in one direction and then in the other direction while being subjected to the washing solution.

11. In a mercerizing-machine, the combination of two independent series of connected yarn-carriers between which the yarn is hung, means for moving the connected carriers of the two series supporting the yarn in the same direction, means for subjecting the yarn to chemical solution, means for washing the yarn, and means for causing the carriers and yarn to be rotated first in one direction and then in the other direction while being subjected to the washing solution.

12. In a mercerizing-machine, a carrier mechanism for supporting the skeins of yarn, consisting of two endless chains one above the other and each having a series of carriers upon and between which the skeins are stretched the endless chains moving in different orbits but for a portion of their travel approaching each other to a distance at least equal to the length of the yarn skein, in combination with power devices for causing both series of carriers to move in the same direction at points of nearest approach and when conveying yarn and in opposite direction when farthest apart and not supporting yarn.

13. In a mercerizing-machine, two independent series of carriers between which the skeins are stretched each moving in a different orbit but for portions of their travel approaching each other to a distance at least equal to the length of the yarn skein, in combination with power devices for causing both series of carriers to move in the same direction, means for causing the two series of carriers to be moved apart during a portion of their travel and approach each other immediately before and after they are moved apart said means extending throughout the length of the machine and supported only at its ends beyond the two places where the carriers approach each other before and after they are moved apart for stretching the yarn.

14. In a mercerizing-machine, a carrier mechanism for supporting the skeins of yarn,



consisting of two series of carriers between which the skeins are stretched each moving in a different orbit but for a portion of their travel approaching each other to a distance  
 5 at least equal to the length of the yarn skein, in combination with power devices for causing both series of carriers to move in the same direction, means for automatically moving the carriers apart to put the yarn under great  
 10 tension and mechanically varying the tension of the yarn during its travel and while under tension, and means for subjecting the yarn to a chemical solution while having its tension varied and in the custody of the carriers.

15 15. In a mercerizing-machine, a carrier mechanism for supporting skeins of yarn, consisting of two series of carriers between which the skeins are stretched each series  
 20 moving in a different orbit and for a portion of their travel approaching each other to a distance approximately equal to the length of the skeins, in combination with means for positively moving the carriers of the two series  
 25 at two places nearer toward each other than the length of the skein whereby the skeins may be easily placed upon and removed from the carriers, guides acting upon the carriers of the two series to move them  
 30 apart sufficiently to put the yarn under great tension in passing between the said two places, means for moving both series of carriers, a longitudinal girder or frame extending parallel to the carriers and supporting the guides and  
 35 being supported only at its ends beyond the two places of nearest approach of the carriers, and means for subjecting the yarn to a solution when in its stretched condition.

40 16. In a mercerizing-machine, a carrier mechanism for supporting skeins of yarn, consisting of two series of rotary carriers between which the skeins are stretched each series moving in a different orbit and for a  
 45 portion of their travel approaching each other to a distance approximately equal to the length of the skeins, in combination with means for positively moving the carriers of the two series at two places nearer toward each other than the length of the skein whereby  
 50 the skeins may be easily placed upon and removed from the carrier, automatic means acting upon the carriers of the two series to move them apart sufficiently to put the yarn under tension in passing between the said  
 55 two places, means for moving both series of carriers, means for subjecting the yarn to a solution when in its stretched condition, and means for rotating the carriers and their skeins when in the stretched condition.

60 17. In a mercerizing-machine, a carrier mechanism for supporting skeins of yarn, consisting of two series of rotary carriers between which the skeins are stretched each series moving in a different orbit and for a portion  
 65 of their travel approaching each other to a distance approximately equal to the length of the skeins, in combination with means for

positively moving the carriers of the two series at two places nearer toward each other than the length of the skein whereby the  
 70 skeins may be easily placed upon and removed from the carriers, means acting upon the carriers of the two series to move them apart sufficiently to put the yarn under continued tension in passing between the said two places,  
 75 means for moving both series of carriers, means for subjecting the yarn to a mercerizing solution when in its stretched condition, means for rotating the carriers and their skeins when in the stretched condition, and  
 80 means for automatically increasing and decreasing the tension of the yarn while subjected to the mercerizing solution.

18. In a mercerizing-machine, the combination of an endless chain of carriers, a second endless chain of carriers, wheels for guiding said two chains of carriers in the same  
 85 plane so that they approach each other during a portion of their travel, power devices for moving said chains of carriers at the same speeds, and cam-guides for said chains of carriers for causing said carriers to approach  
 90 nearest together at two places in their travel and separate intermediate of said points sufficiently to put the yarn stretched between the carriers of the two chains under strong tension.

19. In a mercerizing-machine, the combination of an endless chain of carriers, a second endless chain of carriers, wheels for guiding said two chains of carriers in the same  
 100 plane so that they approach each other during a portion of their travel, power devices for moving said chains of carriers at the same speeds, cam-guides for said chains of carriers for causing said carriers to approach nearest  
 105 together at two places in their travel and separate intermediate of said points sufficiently to put the yarn stretched between the carriers of the two chains under strong tension, and means for subjecting the yarn in  
 110 the custody of the carriers to a chemical solution when fully stretched.

20. In a mercerizing-machine, the combination of an endless chain of carriers, a second endless chain of carriers, wheels for guiding said two chains of carriers in the same  
 115 plane so that they approach each other during a portion of their travel, power devices for moving said chains of carriers at the same speeds, cam-guides for said chains of carriers for causing said carriers to approach nearest  
 120 together at two places in their travel and separate intermediate of said points sufficiently to put the yarn stretched between the carriers of the two chains under strong tension, and adjusting devices for adjusting the cam-guides to vary the degree of tension to be put upon the yarn.

21. In a mercerizing-machine, the combination of two endless-chain structures arranged substantially parallel and one above  
 130 the other, transverse shafts carried by said chains and carrying at each end suitable car-



riers for the yarn whereby two series of skeins of yarn are stretched from carrier to carrier of the two chain structures, suitable supports and means to guide the chain structures and  
5 their carriers, power devices for moving the chain structures with their carriers, means for forcing the two chain structures and carriers apart between the points of nearest approach to put the yarn under tension, and  
10 means for subjecting the stretched yarn in the custody of the carriers to a mercerizing solution.

22. In a mercerizing-machine, the combination of two endless-chain structures arranged substantially parallel and one above the other, transverse shafts carried by said chains and carrying at each end suitable carriers for the yarn whereby skeins of yarn are stretched from carrier to carrier of the  
20 two chains, suitable supports and means to guide the chain of carriers, power devices for moving the chains with their carriers, means for forcing the two chains of carriers apart between the points of nearest approach to  
25 put the yarn under tension, means to rotate the shafts and their carriers to shift the yarn when under tension, and means for subjecting the stretched yarn in the custody of the carriers first to a mercerizing solution and  
30 then to a washing solution.

23. In a mercerizing-machine, the combination of a main frame, a longitudinal girder or frame extending the whole length of the machine and supported at each end, an endless chain arranged above the girder, an endless chain arranged below the girder, guide-wheels at the ends for said chains, transverse shafts carried by said chains, carriers on the  
35 ends of said shafts, means to move the parts of the chains adjacent to the girder in the same direction, cam-guides carried by the girder for separating the chains intermediate of their ends for stretching skeins of yarn extending from carrier to carrier of the two  
40 chains, and means for subjecting the carriers

and yarn thereon on each side of the chains to a mercerizing solution.

24. In a mercerizing-machine, the combination of a main frame, a longitudinal girder or frame extending the whole length of the  
50 machine and supported at each end, an endless chain arranged above the girder, an endless chain arranged below the girder, guide-wheels at the ends for said chains, transverse shafts carried by said chains, carriers on the  
55 ends of said shafts, means to move the parts of the chains adjacent to the girder in the same direction, cam-guides for separating the chains intermediate of their ends for stretching skeins of yarn extending from carrier to  
60 carrier of the two chains carried by the girder, means connecting the cam-guides with the longitudinal girder for adjusting the cam-guides to vary the tension under which the yarn is stretched, and means for subjecting  
65 the carrier and yarn thereon on each side of the chains to a mercerizing solution.

25. In a mercerizing-machine, the combination of two independent movable structures provided with carriers between which the  
70 yarn is stretched so as to extend between the carriers of the two independent structures, independent supports for said independent movable structures and their carriers whereby they need not move always in the same  
75 direction, means for separately moving said independent movable structures in the same direction over a given portion of their travel, means for subjecting the yarn on the carriers to a chemical solution, and means for rela-  
80 tively separating the carriers of the two movable structures to stretch the yarn while subjected to the solution.

In testimony of which invention I have hereunto set my hand.

FRANK SHUMAN.

Witnesses:

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DAVID W. HOFFMAN.