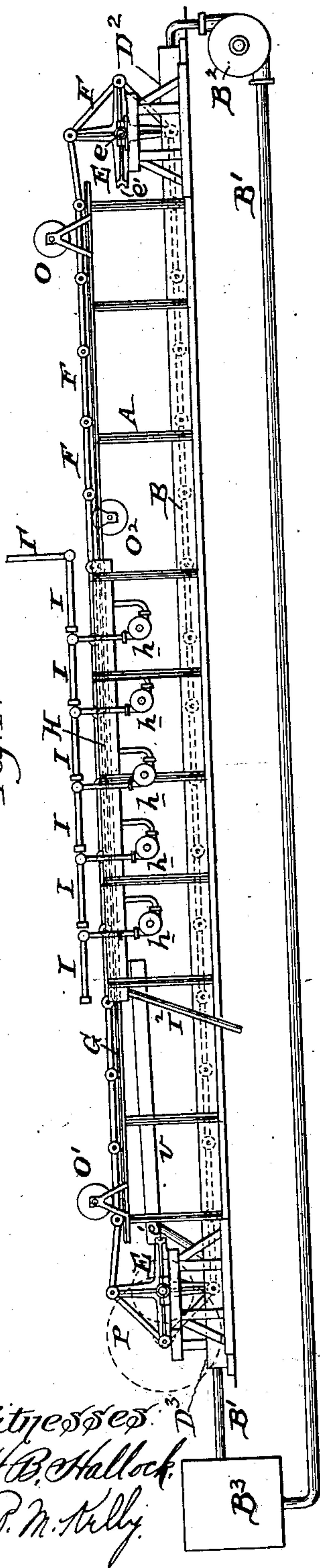


(No Model.)

3 Sheets—Sheet 1.

MERCERIZING MACHINE.
(Application filed July 21, 1900.)

Fig. 1.



Witnesses:
H. B. Hallock.
P. M. Kelly.

Fig. 2.

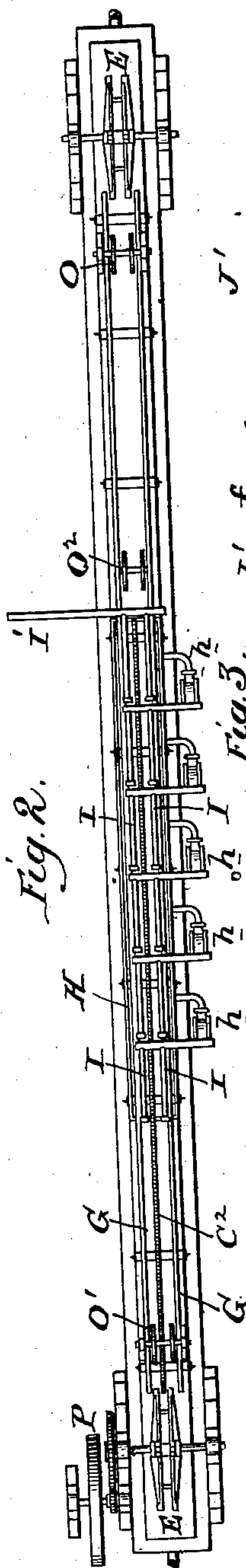
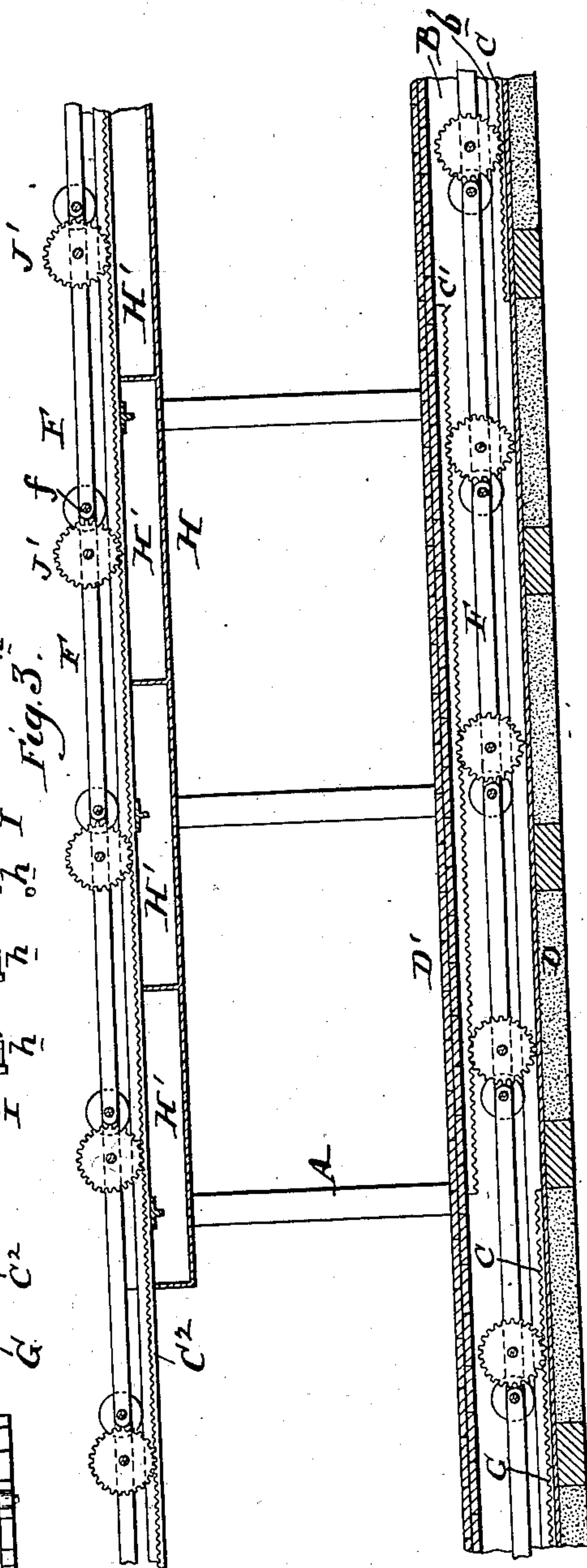


Fig. 3.

Fig. 3.



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 Constantine Shuman
 By A. M. Shuman Atty.

No. 661,649.

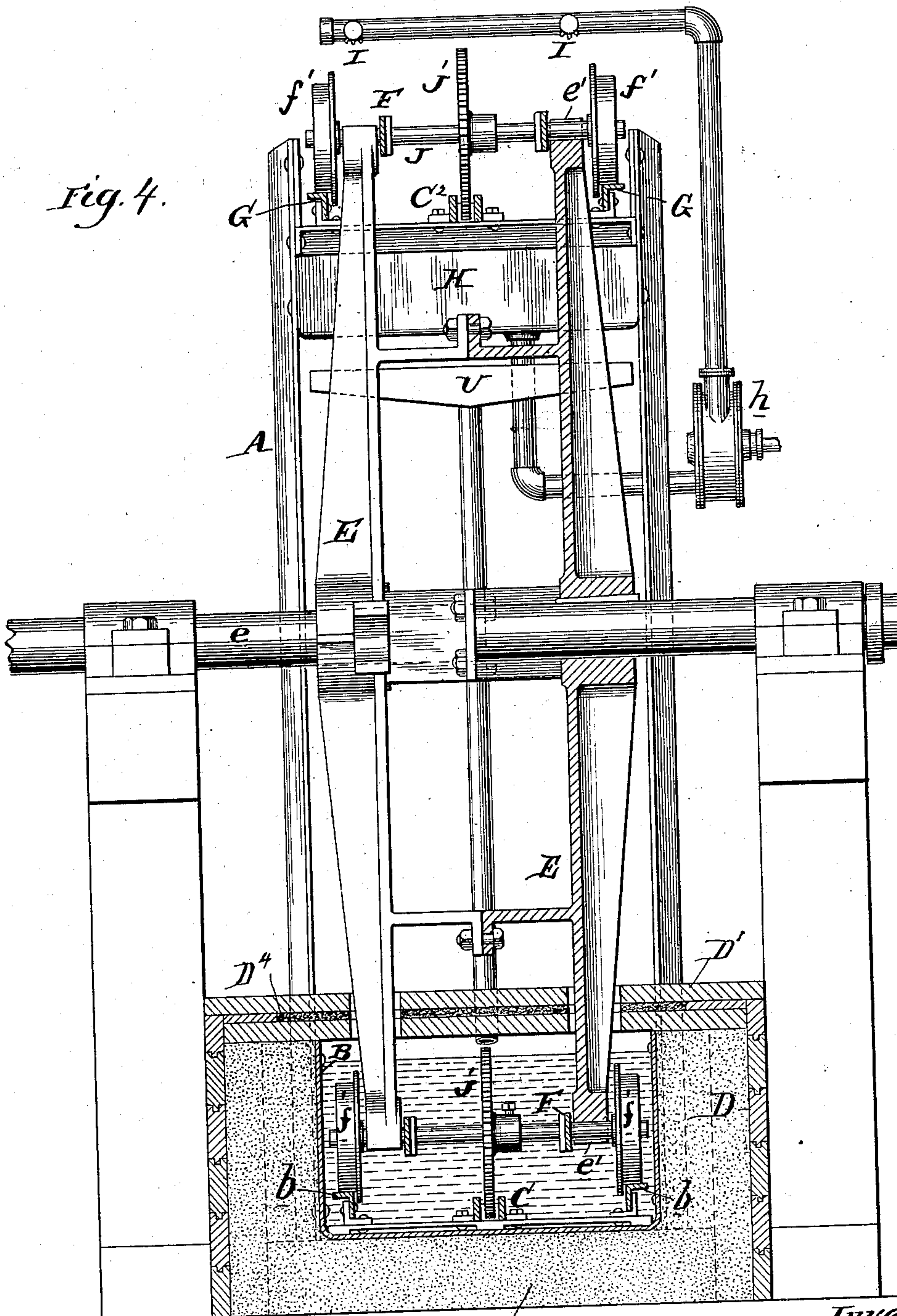
Patented Nov. 13, 1900.

F. & C. SHUMAN.
MERCERIZING MACHINE.

(Application filed July 21, 1900.)

3 Sheets—Sheet 2.

(No Model.)



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No. 661,649.

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MERCERIZING MACHINE.

(Application filed July 21, 1900.)

(No Model.)

3 Sheets—Sheet 3.

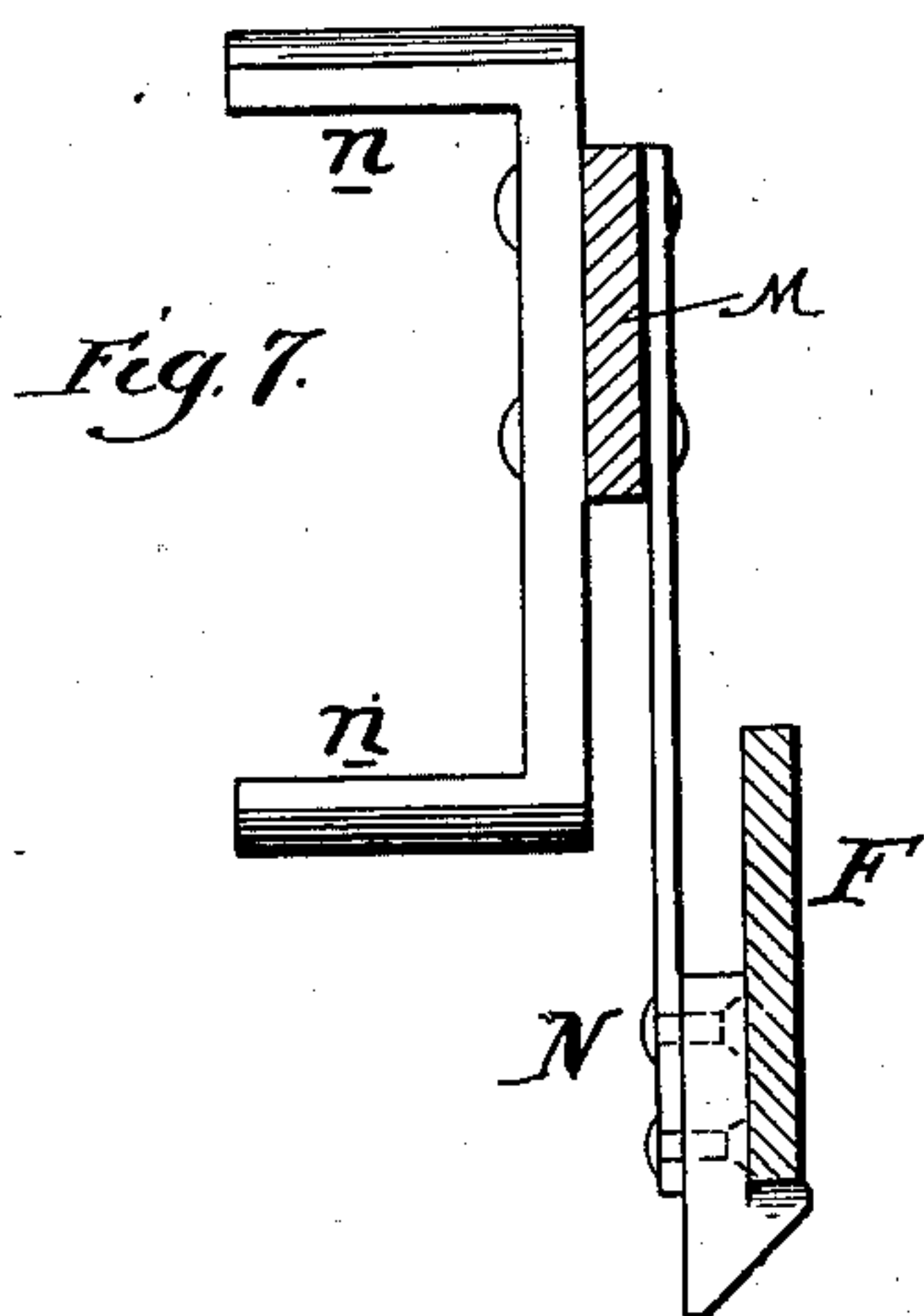
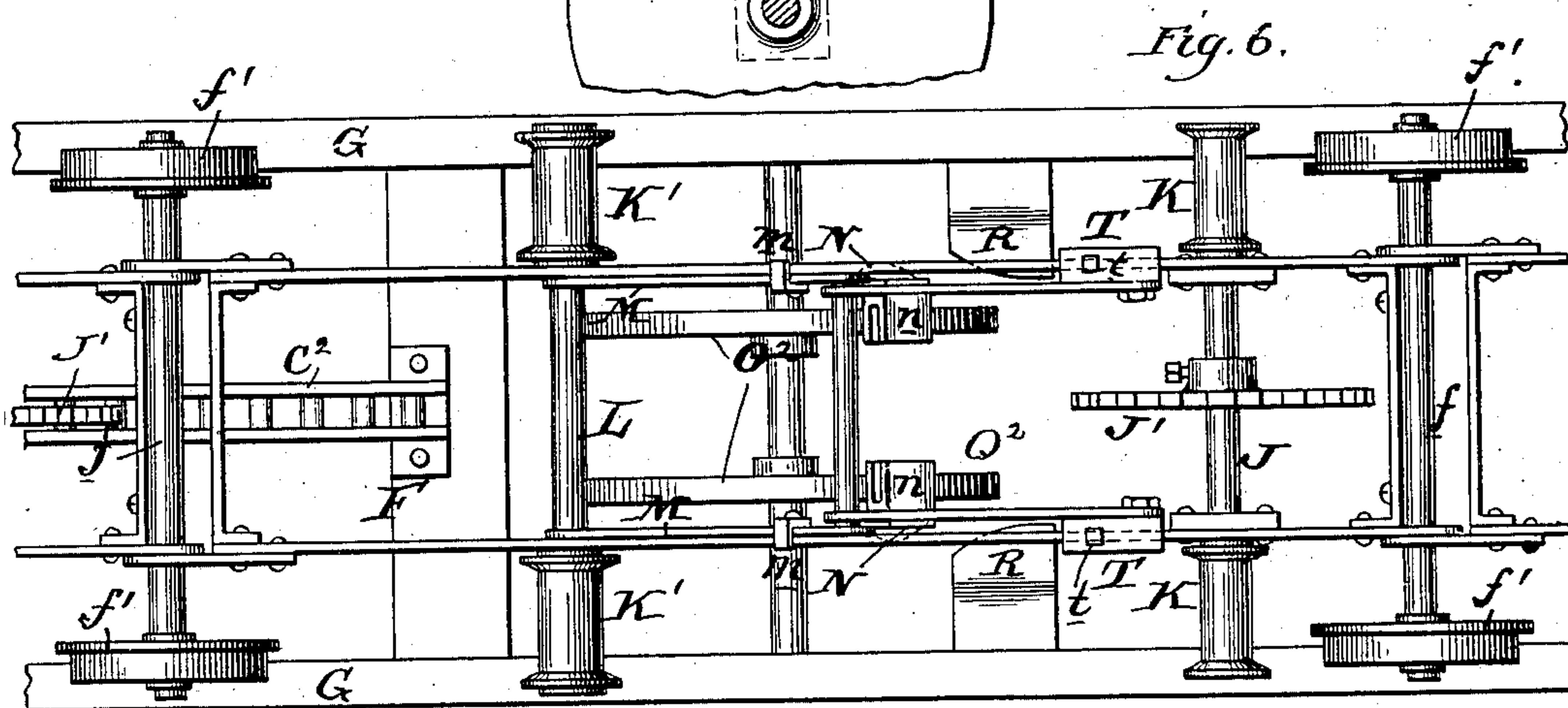
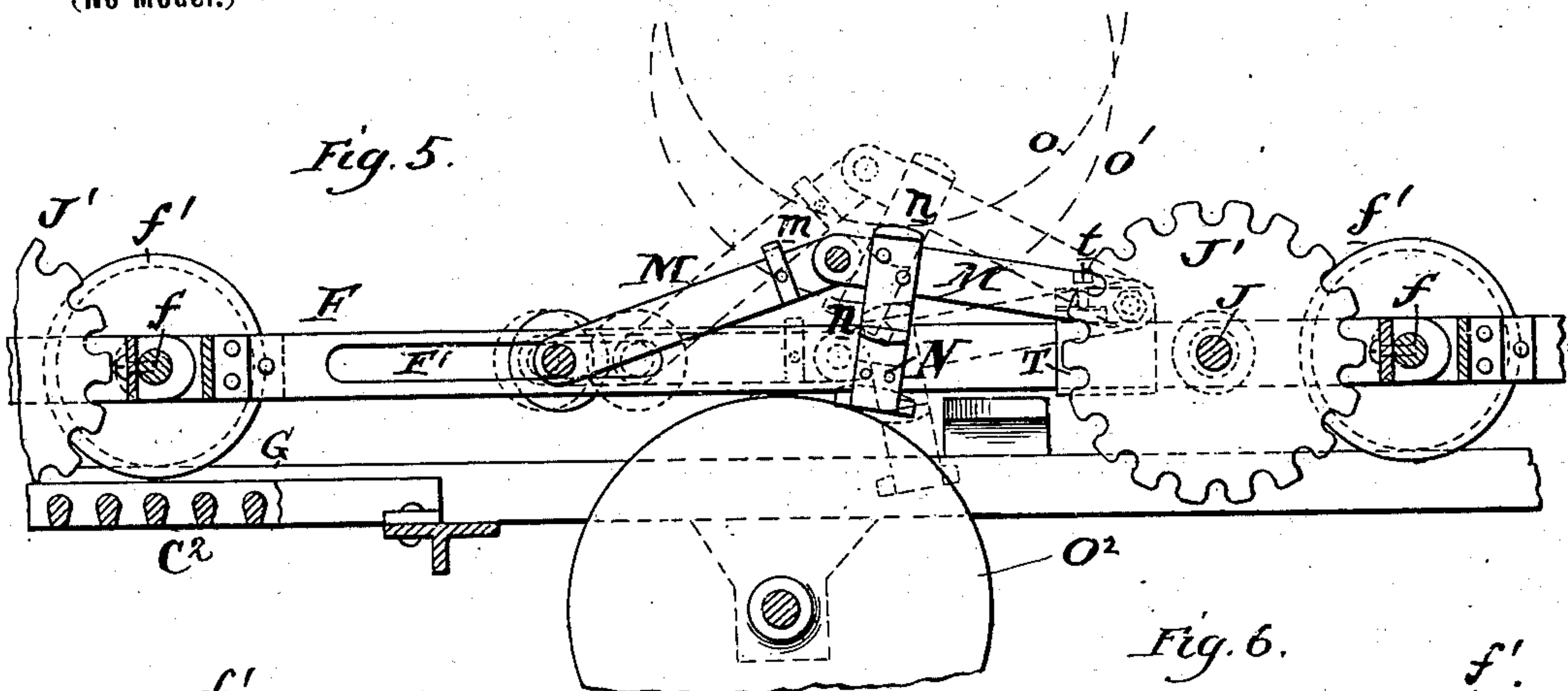
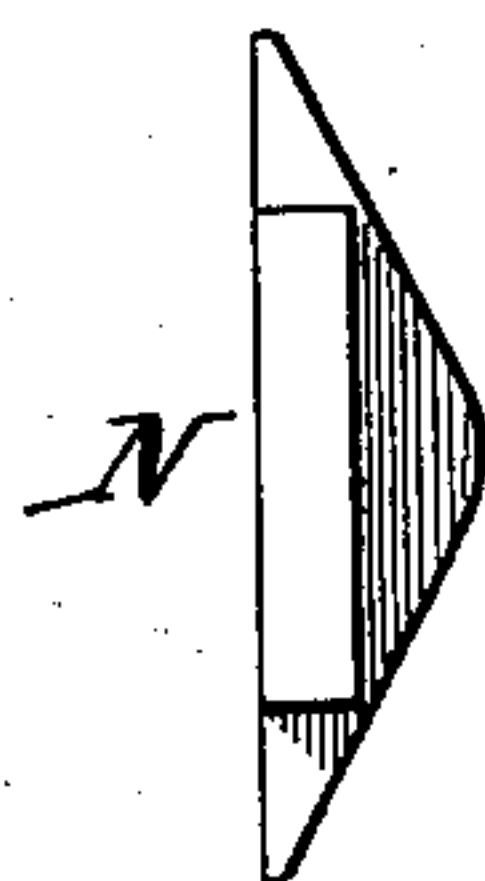


Fig. 8.



Witnesses:
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R. M. Kelly

Inventors
Frank Shuman and
Constantine Shuman
By *[Signature]* Atty.

UNITED STATES PATENT OFFICE.

FRANK SHUMAN AND CONSTANTINE SHUMAN, OF PHILADELPHIA,
PENNSYLVANIA.

MERCERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 661,649, dated November 13, 1900.

Application filed July 21, 1900. Serial No. 24,427. (No model.)

To all whom it may concern:

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

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

The object of our invention is to provide a construction of machine especially adapted to mercerizing yarn which shall be continuous in operation—that is to say, the process of mercerizing yarn goes on continuously while mercerized skeins are removed and unmercerized skeins of yarn are placed upon the machine. The effect of this is that great economy results, in that a greater mercerized product can be produced in a given time with less labor than is possible with other machines in use.

Our object is also to provide a construction of machine which may handle the yarn while subjecting it to great tension and traveling motion over its course during the mercerizing operation which shall not destroy or break the lease-strings employed for holding the loops of yarn in the form of a skein, the result being that skeins when removed from the machine are in perfect condition, untangled and unbroken, so as to be adapted to perfect subsequent operation in weaving or other process in which it is employed.

Our object also comprehends certain special improvements for more thoroughly mercerizing the fiber and subsequently cleansing the same with a view of recovery of the caustic alkali.

In carrying out our invention we employ an endless chain of carriages, each of which is provided with means for holding and stretching skeins of yarn. Combined with such a chain of carriages we employ a long caustic-alkali tank, through which the carriages pass with the yarn and through which the alkali is circulated in a direction preferably opposite to the travel of the carriages by means of a pump or other suitable device, the said al-

kali being cooled, if found necessary, during the circulating operation.

Our invention further comprehends means for elevating the carriages with the mercerized yarn out of the tank and conveying them through the air to and over washing-tanks, and in connection with which washing fluid or water is circulated over the yarn in a suitable manner to insure thorough washing and cleansing of the yarn of the caustic alkali. In our preferred construction of washing apparatus the tank is divided into a series of compartments and fresh water is sprayed over the yarn as it passes over the distant or final compartment. The water is collected in said compartment and pumped to spraying devices upon the yarn passing over the next compartment in advance and so on through the series of compartments until the last or final one is reached, when the saturated solution is drawn off, and by suitable operations the caustic alkali is recovered and employed in further mercerizing processes. By this method of washing it will be seen that the yarn during its travel is subjected to a series of successive washings, each of which is with a water less impregnated with impurities or caustic alkali, until the yarn in its final washed condition emerges from a treatment of pure water. This process insures thorough cleansing and at the same time enables the waste washing liquid to contain practically all of the caustic alkali, which adheres to the yarn and requires to be washed off, to be contained in it and readily recovered without impairing in the smallest manner the final thorough washing of the almost cleansed mercerized yarn with pure water. If desired, the mercerized yarn may be subjected to an increased tension after it has left the caustic-alkali tank, so that during the mercerizing operation, when the yarn is subjected in the air to the caustic alkali carried by its strands, an increased tension may be applied to complete more perfectly the mercerizing operation immediately prior to the washing of the yarn. The endless chain of carriages is provided with spindles furnished with spools upon which the skeins of yarn are placed, and these are arranged in pairs and adapted to be moved to or from each other to put the

yarn under tension or release it for the purpose of removing the mercerized yarn. The mechanism for accomplishing this purpose is operated automatically, so that when the skeins of yarn are placed upon the spools the proper tension is applied, and the yarn in that condition is then conveyed through the caustic-alkali tank. While passing through the said tank suitable racks and pinions cause a rotation of the spools first in one direction and then in the other to shift the position of the skeins upon the spools and at the same time to prevent the breaking of the lease-strings of the skeins, the rupture of which invariably takes place if the rotation of the skeins upon their spools is continued in the same direction for too great a period. During the passage of the yarn through the caustic-alkali tank the solution is circulated through the said tank in the direction opposite to the travel of the yarn and its carriages, the said circulation acting to keep the solution in a thorough agitation and remove all bubbles of air which would otherwise adhere to the surface of the yarn and interfere with the mercerizing action of the caustic alkali.

Our invention also comprehends other details of construction, all of which will be better understood by reference to the drawings, in which—

Figure 1 is an elevation of our improved mercerizing-machine, showing the general arrangement of the parts. Fig. 2 is a plan view of the same with the chain of carriages removed. Fig. 3 is a longitudinal sectional elevation of the central portion of the apparatus adjacent to the washing-tanks. Fig. 4 is a transverse sectional elevation on line 4 4 of Fig. 1. Fig. 5 is an elevation of one of the carriages. Fig. 6 is a plan view thereof. Fig. 7 is a part cross-section thereof on line 7 7, and Fig. 8 is a plan view of the footpiece of the lock shown in Fig. 7.

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

B is a longitudinal caustic-alkali tank arranged near the lower part of the main frame and is provided upon its interior with two guide-rails *b* and a centrally-arranged series of racks C C' C, the two racks C being arranged upon the lower part of the tank near each end and the rack C' being arranged near the upper part of the tank and intermediate to the racks C. The tank may be inclosed by a suitable box-frame D, so as to substantially inclose the tank from one end to the other, but leaving openings therein at D³ and D² for the entrance and withdrawal of the chain of carriages. The box-frame D comprises a boxed-in construction for the sides and bottoms of the tank, with an intermediate packing of sawdust *d* to act as a non-conductor, and the upper portion of the tank is covered by a removable lid portion D', consisting of wood layers with an interposed layer of hair felt D⁴.

B³ is a cooler or refrigerating apparatus of any suitable construction and connects with both ends of the tank B by pipes B' and B'. In the pipe B' is arranged a circulating-pump B², the purpose of which is to withdraw the alkaline solution from one end of the tank and force it through the cooler into the other end of the tank, insuring a positive and forced circulation of the alkaline solution lengthwise of the tank and in the direction contrary to the travel of the endless carriages through the said tank and solution.

Arranged at each end of the tank and main frame of the machine is a transverse shaft *e*, provided with radial arms constituting, in effect, wheels E, about which the endless chain of carriages travels. As shown, there are four sets of arms to each one of these wheels, and the outer ends of the arms are notched or recessed, as at *e'*, for the purpose of receiving the pivot-shafts connecting the successive carriages of the chain. The endless chain of carriages F is guided about the said wheels and is successively caused to travel through the tank B and thence through the air at a higher elevation over the tracks G in the upper part of the main frame A. Intermediate to the ends of the machine and arranged in the upper part thereof is the washing-tank H, which is divided into a series of compartments H' immediately below the tracks G and over which the endless chain of carriages passes. These washing-compartments are each provided with a discharge-pipe, so that the water contained therein may be run off; but said discharge-pipes, with the exception of the one at the left-hand end of Fig. 1, is provided with a circulating-pump *h* for forcing the water upward and through spraying-pipes I, arranged longitudinally over the respective compartments of the washing-tank next to the rear of the compartment from which the water is drawn and also upon opposite sides of the carriages F, so as to cause the water to be forced down upon the yarn carried by said carriages. The carriages F each comprise a light open framework linked to adjacent carriages by transverse hinging-axes *f*, on the ends of which are placed the supporting flanged wheels *f'*, adapted to run upon tracks or rails *b* and G. These axes *f* are also received in the notched ends *e'* of the wheels E for conveying carriages from their elevated to their lowered position, and vice versa. Each of the carriages is also provided with a transverse shaft J, carried in fixed bearings and having upon each end a grooved spool K, about which the yarn is placed. The shaft J is also provided with a sprocket or toothed wheel J', by which it may be rotated by the said toothed wheel coming into contact with the racks CC' in the vat B. It will be observed that on account of the location of the racks in the vat they will operate upon the wheel, first upon one side of its shaft and then upon the other, causing it to rotate first in one direction and then in

the other, and so on. The main frame of the machine is also provided with a central rack C^2 , arranged between the rails G at the upper part, so as to also rotate the toothed wheel and its shaft J after the carriages have left the tank B and been elevated prior to passing over the washing-tanks. By this alternative action the spools K for the yarn will be rotated alternately in opposite directions, so that the final action upon the yarn is to bring it to substantially the position which it originally occupied upon the spool and to obviate and prevent any excessive rotation of the yarn in one direction, which, in view of the excessive strain under which the yarn is placed in mercerizing, would break the lease-strings and permit the yarn to tangle. The said frames of the carriages are provided with longitudinal slots F' , through which is guided a second shaft L , upon the ends of which are arranged spools K' , the construction being such that a skein of yarn is looped over a spool K and spool K' , constituting a pair on each side of the carriage.

M is a toggle comprising two bars hinged together, one of said bars being hinged to the carriage adjacent to the shaft J by an adjustable clamp T and the other having the transverse shaft L journaled therein. By adjusting the clamps T of each of the toggles on the carriage to or from the shaft J the distance to which the shaft L and its spools K' will be moved relatively to the spools K will be increased or diminished with a given movement of the toggles to suit skeins of yarn of different lengths. These clamps T fit over the said frames of the carriage and are provided with clamping-screws t for holding them in any position upon the frame desired. When these toggles are pressed downward or toward the carriage, the spools and their shafts are moved apart, so as to stretch the skein arranged about said spools. The toggles are provided with spring-latches N , fastened to one of the bars of each of the toggles and adapted to catch upon the under side of the frame of the carriage when the toggle is depressed, and thus lock the toggle in its partly-depressed condition. The construction of the toggles is such that upon a further movement of them in a downward direction their jointed points pass below a plane connecting the two shafts J and L , and the toggle is thereby locked under those conditions, with the said shafts and their spools in the farthest-extended position. A laterally-projecting finger m from the toggles strikes the upper part of the carriage-frame and limits the downward movement of the toggles, permitting them to descend just sufficient to lock themselves. These toggles are further provided with inwardly-projecting operating parts n , by which the said toggles are moved downward or upward under the action of locking-wheels O , O' , and O^2 .

The main frame immediately at the rear of the washing-tank H is provided with in-

wardly-curved cam-surfaces R , which operate upon the lower parts of the spring-latches N to release them from the under part of the carriage-frame, and thereby allow the toggle to rise and the shaft L to move toward the shaft J and remove the tension on the finished or mercerized skein, so that it may be removed. The locking-wheels O^2 are arranged between the said curved surfaces R and the washing-tank H and are adapted to release the self-locking action of the toggle to such an extent as to permit the latches N to come into locking position. At this time the curved or cam surfaces R come into play to further release the toggle by acting upon the latches. Under this condition of the carriage the mercerized yarn may be removed and fresh skeins of yarn placed upon the spools. The toggles are then pushed down by hand until the skeins are taut. As the carriages travel forward the locking-wheels O come into play by acting upon the upper surfaces of the inward projections n , so as to force down the toggles until the spring-latches N snap under the lower parts of the frame of the carriage. The yarn will then be put under considerable tension, and the carriages in this condition are fed forward and downward into the caustic-alkali tank B . On entering this tank the yarn is carried beneath the mercerizing fluid and at the same time the shaft J is rotated by means of the toothed wheel J' and the rack C in the tank. The forward motion through the tank causes a given number of revolutions of the spools carrying the yarn, and then the toothed wheel J' comes in contact with the upper rack C' and produces the reverse rotation of the spools and yarn. After a given further travel of the carriage a third rack C , similar to the first, is reached, and the yarn and spools are rotated in the reverse direction, and then the carriage, with its mercerized yarn, is lifted out of the tank B and elevated to the upper tracks G by the wheel E . As soon as the carriage reaches the upper track and its movement backward begins its toggles are brought in contact with the locking-wheels O' , which act upon the inward projections n to depress the toggles to such an extent that they automatically lock themselves. This action gives to the already stretched and mercerized yarn a still further and maximum stretching or tension, so that the mercerizing which goes on while the carriage travels through the air to the washing-tank is preferably with the yarn under a maximum tension, and this action secures an extra luster to the finished product. The mercerized yarn in this condition passes over the washing-tanks and is first treated with the water of least purity and next to the spray of water of next greatest purity, and so on until when over the last compartment of the washing-tank the cleansed yarn is subjected to a spray of pure water. After this action the releasing-wheels O^2 and curved surfaces R come into play to unlock the toggles.

The machine may be driven by means of suitable power devices P operating upon one of the end wheels E, as shown, and the movement given to the chain of carriages is made very slow, so as to give the requisite time for the complete mercerizing operation by a single passage of the yarn through the apparatus.

While the yarn is being fed forward through the tank of caustic-alkaline solution the skeins are kept in constantly-shifting position upon their spools and at the same time the solution is caused to flow rapidly past the carriages and yarn in a direction opposite to the travel of the carriages, so that all air-bubbles are brushed from off the yarn and perfect mercerizing permitted to take place. The mercerizing liquid is kept cool by virtue of this circulation and the employment of a cooler or refrigerator through which the caustic alkali is constantly passing. By inclosing the tank the alkali solution is retained in a cool condition and reduces the duty of the cooler to a minimum. It is evident that the boxing of the carriages may be extended, if so desired, as the only part of the machine which is required to be exposed is that part which is between the washing-tank and the locking-wheels O—namely, that place where the mercerized yarn is taken from off the spools and the fresh yarn placed thereon by the operator.

Our improved method of washing alkali from the yarn enables the most thorough washing to be secured with a limited supply of water, and at the same time the waste water which is drawn off from the last compartment of the washing-tank is so thoroughly saturated with the alkaline solution that it may be readily concentrated without great expenditure and yet all of the caustic alkali which is washed out of the yarns properly recovered and used over again. This is not possible with the methods commonly employed for washing the treated fabrics or yarns, as the enormous amount of water employed makes it prohibitory to concentrate it for the recovery of the chemicals.

While we have described the apparatus as excellently adapted to our invention and which we have found satisfactory in actual commercial operation, we do not confine ourselves to the minor details, as these may be modified or varied without departing from the spirit of the invention.

What we claim as new, and desire to secure by Letters Patent, is as follows:

1. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the

carriages successively through the tank, and washing devices for washing the yarn after passing through the tank.

2. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, automatic devices for operating the locking devices for putting them into action, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the carriages successively through the tank, washing devices for washing the yarn after passing through the tank, and means for releasing the devices which hold the spools in their extended position whereby the tension may be removed from the yarn.

3. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the carriages successively through the tank, washing devices for washing the yarn after passing through the tank, and means for rotating the spools and yarn upon the carriages while passing through the tank containing the caustic alkali.

4. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the carriages successively through the tank, washing devices for washing the yarn after passing through the tank, and means for rotating the spools and yarn upon the carriages while passing through the tank containing the caustic alkali first in one direction and then in the opposite direction.

5. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the carriages successively through the tank, washing devices for washing the yarn after passing through the tank, and means for circulating

the caustic alkali through the tank in the reverse direction to the travel of the carriages and yarn.

6. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the carriages successively through the tank, washing devices for washing the yarn after passing through the tank, means for circulating the caustic alkali through the tank in the reverse direction to the travel of the carriages and yarn, and means to cool the caustic alkali prior to its circulation through the tank.

7. In a mercerizing-machine, the combination of an endless chain of carriages each of which is provided with two spools to support a skein of yarn to be mercerized, means for moving the said spools relatively to or from each other, locking devices for holding the spools in their extended position for stretching the skein of yarn, a tank for containing caustic alkali through which the carriages are caused to pass, means for feeding the carriages successively through the tank, washing devices for washing the yarn after passing through the tank, and means for releasing and again fastening the locking devices of the spools during the passage of the carriages between the washing devices and their entrance into the tank containing the caustic alkali whereby mercerized skeins may be removed and unmercerized skeins placed upon the spools and stretched.

8. In a mercerizing-machine, the combination of an endless chain of carriages, guiding-wheels, and rails for propelling and guiding the said chain of carriages, means on each of the carriages for supporting and stretching skeins of yarn to be mercerized, a tank containing mercerizing fluid through which the chain of carriages are caused to pass for subjecting the yarn to the action of the mercerizing fluid, means to wash the yarn on the carriages consisting of a series of water-receiving receptacles below the chain of carriages and each provided with spraying-pipes above the chain of carriages, a fresh water-supply pipe to the spraying-pipe of the receptacle through which the carriages last passed, a circulating-pump for drawing the water through each of the several receptacles and discharging it into the spraying-pipes of the next receptacles in advance, and a discharge-pipe from the first receptacle through which the carriage with the mercerized yarn passes for the purpose of carrying away the waste alkaline water produced by the series of washings.

9. In a mercerizing-machine, a carriage for supporting and conveying yarn to be mercer-

ized through caustic-alkaline solution, consisting of a frame, a transverse fixed shaft journaled therein and having one or both ends provided with a yarn-supporting spool, a second shaft adjustably guided in the carriage-frame and movable to and from the fixed shaft and also provided with a supporting-spool for the yarn, means for moving the two shafts and their spools relatively to and from each other, and locking devices for holding the said shafts in their extended position whereby the yarn may be stretched between the spools, consisting of a toggle, one end of which is secured to the carriage and the other end to the adjustable shaft, and latching means for holding the toggle in a depressed position and when the two parts of the toggle are in substantial alinement.

10. In a mercerizing-machine, a carriage for supporting and conveying yarn to be mercerized through caustic-alkaline solution, consisting of a frame, a transverse fixed shaft journaled therein and having one or both ends provided with a yarn-supporting spool, a second shaft adjustably guided in the carriage-frame and movable to and from the fixed shaft and also provided with a supporting-spool for the yarn, means for moving the two shafts and their spools relatively to and from each other, locking devices for holding the said shafts in their extended position whereby the yarn may be stretched between the spools consisting of a toggle one end of which is secured to the carriage and the other end to the adjustable shaft and latching means for holding the toggle in a depressed position and when the two parts of the toggle are in substantial alinement, and a stop to limit the depression of the toggle elements whereby their joint may pass slightly below a plane through the two shafts and the toggle elements themselves lock the two shafts in their most extended position.

11. In a mercerizing-machine, a carriage for supporting and conveying yarn to be mercerized through caustic-alkaline solution, consisting of a frame, a transverse fixed shaft journaled therein and having one or both ends provided with a yarn-supporting spool, a second shaft adjustably guided in the carriage-frame and movable to and from the fixed shaft and also provided with a supporting-spool for the yarn, means for moving the two shafts and their spools relatively to and from each other, locking devices for holding the said shafts in their extended position whereby the yarn may be stretched between the spools consisting of a toggle one end of which is secured to the carriage and the other end to the adjustable shaft and latching means for holding the toggle in a depressed position and when the two parts of the toggle are in substantial alinement, and an adjustable support between the toggle and carriage-frame whereby the toggle may be bodily adjusted to or from the fixed shaft.

12. In a mercerizing-machine, a carriage

for supporting and conveying yarn to be mercerized through caustic-alkaline solution, consisting of a frame, a transverse fixed shaft journaled therein and having one or both ends
 5 provided with a yarn-supporting spool, a second shaft adjustably guided in the carriage-frame and movable to and from the fixed shaft and also provided with a supporting-spool for the yarn, means for moving the two shafts
 10 and their spools relatively to and from each other, locking devices for holding the said shafts in their extended position whereby the yarn may be stretched between the spools, a toothed wheel secured to the transverse shaft
 15 which is adapted to rotate in fixed bearings, a mercerizing-tank, one or more racks in said tank for rotating the toothed wheel and its shaft, and means for propelling and guiding the carriage through the tank.

20 13. In a mercerizing-machine, a carriage for supporting and conveying yarn to be mercerized through caustic-alkaline solution consisting of a frame, a transverse fixed shaft journaled therein and having one or both
 25 ends provided with a yarn-supporting spool, a second shaft adjustably guided in the carriage-frame and movable to and from the fixed shaft and also provided with a supporting-spool for the yarn, means for moving the
 30 two shafts and their spools relatively to and from each other, locking devices for holding the said shafts in their extended position whereby the yarn may be stretched between the spools, a toothed wheel secured to the
 35 transverse shaft which is adapted to rotate in fixed bearings, a mercerizing-tank, one or more racks in said tank for rotating the toothed wheel and its shaft, means for propelling and guiding the carriage through the
 40 tank, and means for circulating the mercerizing fluid through the tank in a direction opposite to the travel of the carriage whereby the air-bubbles are brushed off of the yarn while the same is being rotated on its spools
 45 and fed through the mercerizing-tank.

50 14. In a mercerizing apparatus, the combination of a tank having guides therein, carriages adapted to travel through the tank upon said guides and provided with means for
 55 carrying skeins of yarn to be mercerized, a non-conducting packing about the outer portion of the mercerizing-tank, a non-conducting lid over the upper part of the tank and so arranged as to leave space for the carriage to
 pass into and out of the tank, means for circulating caustic alkali through the tank in a

direction opposite the travel of the carriage, and cooling means for cooling or refrigerating the caustic alkali prior to its being circulated through the tank.

60 15. In a mercerizing-machine, the combination of a tank for containing mercerizing fluid provided with guide-rails, a second set of guide-rails elevated above the tank, an endless chain of carriages arranged to run upon
 65 the guide-rails within the tank and above the tank and be inverted in transferring from one set of rails to the other set, guide-wheels at each end of the two sets of guide-rails for conveying the chain of carriages from one set to
 70 the other, means on each of the carriages for supporting and stretching skeins of yarn, washing devices for washing the yarn upon the carriages arranged adjacent to the upper rails and intermediate of their ends, whereby
 75 the yarn may be mercerized by complete submersion in the tank and the completion of the mercerizing operation carried on in the air prior to meeting the washing devices.

80 16. In a mercerizing-machine, the combination of a tank for containing mercerizing fluid provided with guide-rails, a second set of guide-rails elevated above the tank, an endless chain of carriages arranged to run upon
 85 the guide-rails within the tank and above the tank and be inverted in transferring from one set of rails to the other set, guide-wheels at each end of the two sets of guide-rails for conveying the chain of carriages from one set
 90 to the other, means on each of the carriages for supporting and stretching skeins of yarn, washing devices for washing the yarn upon the carriages arranged adjacent to the upper rails and intermediate of their ends, means
 95 for putting the yarn on the carriages under tension prior to entering the mercerizing-tank, and automatic means for increasing said tension immediately after the carriages and yarn have left the tank and prior to their
 100 reaching the washing devices, whereby the yarn may be mercerized by complete submersion in the tank and the completion of the mercerizing operation carried on in the air under increased tension prior to meeting the
 105 washing devices.

In testimony of which invention we have hereunto set our hands.

FRANK SHUMAN.

CONSTANTINE SHUMAN.

Witnesses:

R. M. HUNTER,

J. W. KENWORTHY.