No. 846,879. PATENTED MAR. 12, 1907.

M. WADDELL.

APPARATUS FOR FORMING FILAMENTS OF METAMORPHOSED CELLULOSE, &c.

APPLICATION FILED JAN. 22, 1906.

4 SHEETS—SHEET 1.

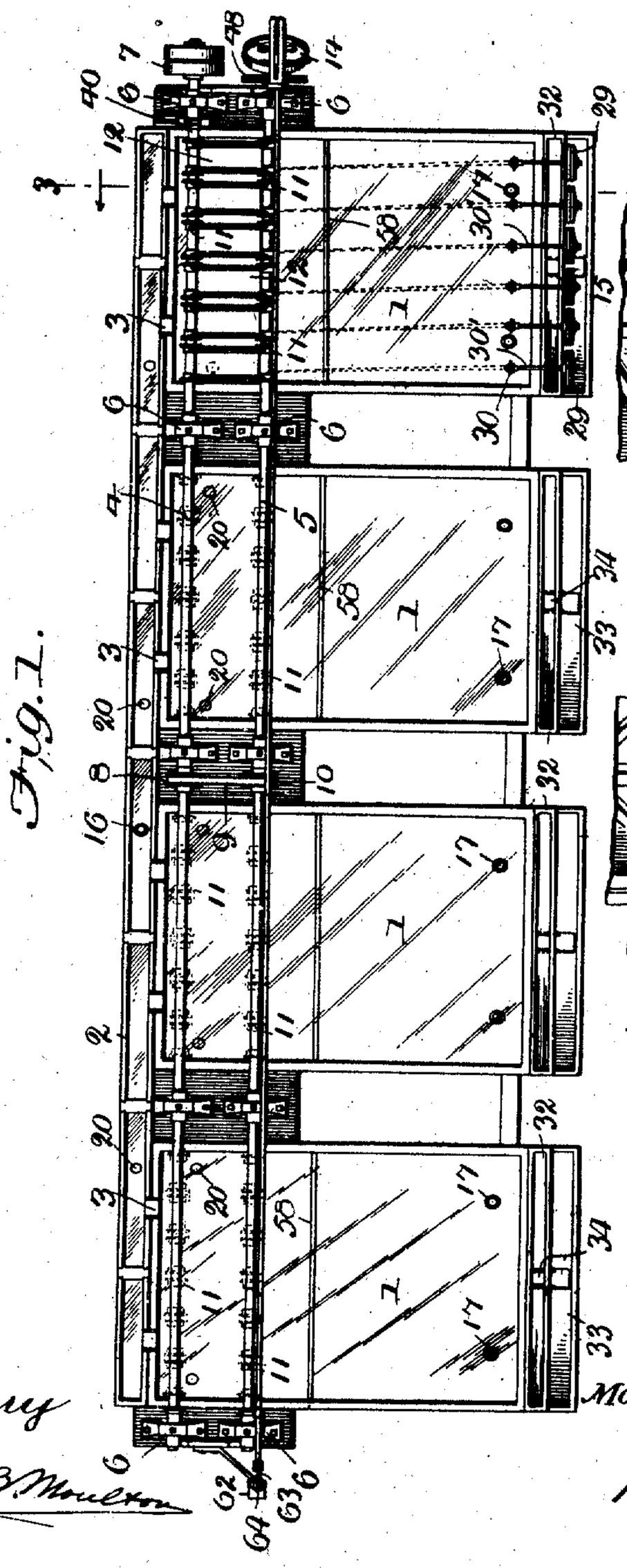

Fig. 1.

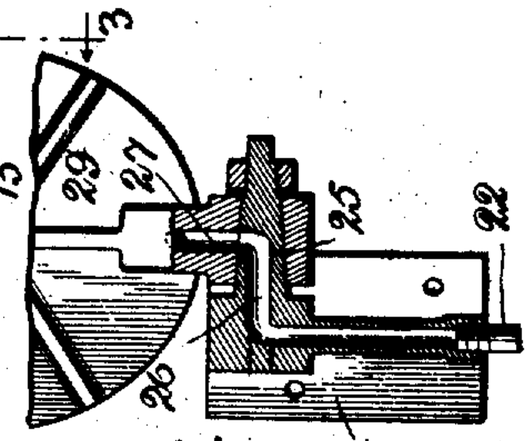

Fig. 6.

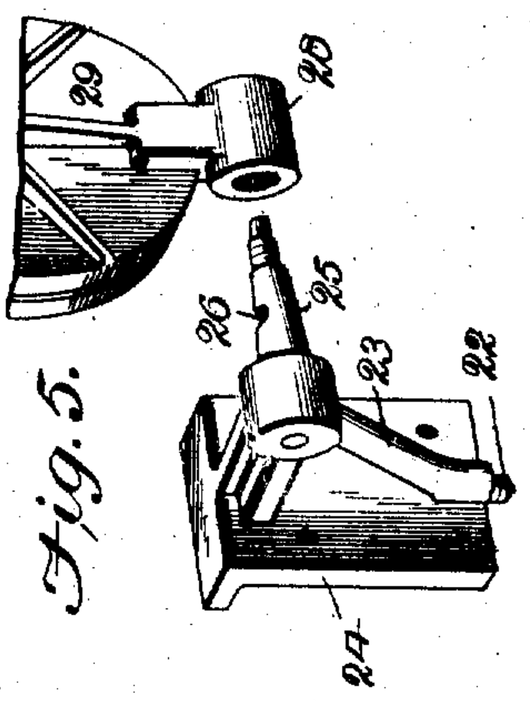

Fig. 5.

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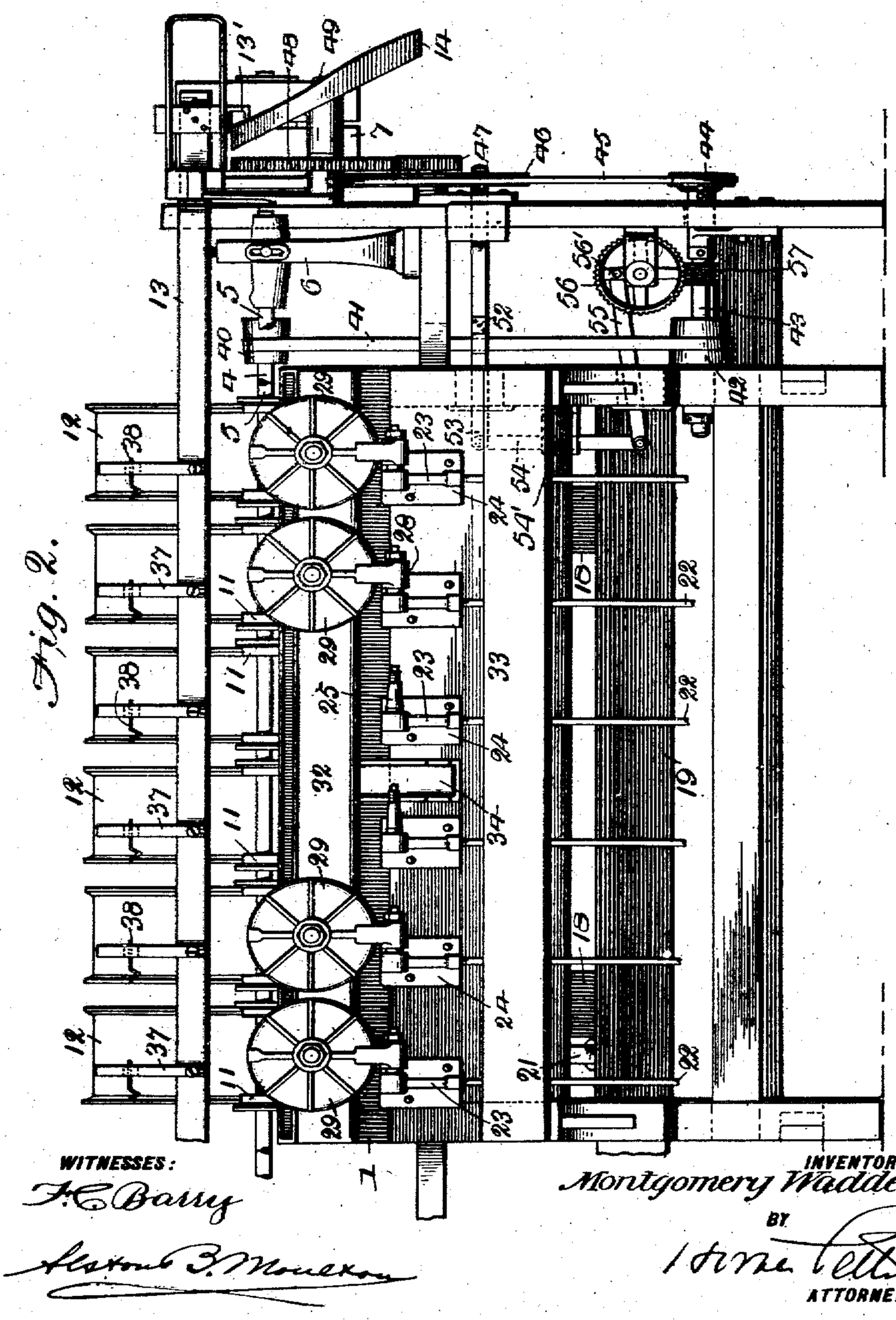
4 SHEETS—SHEET 2.

Fig. 2.



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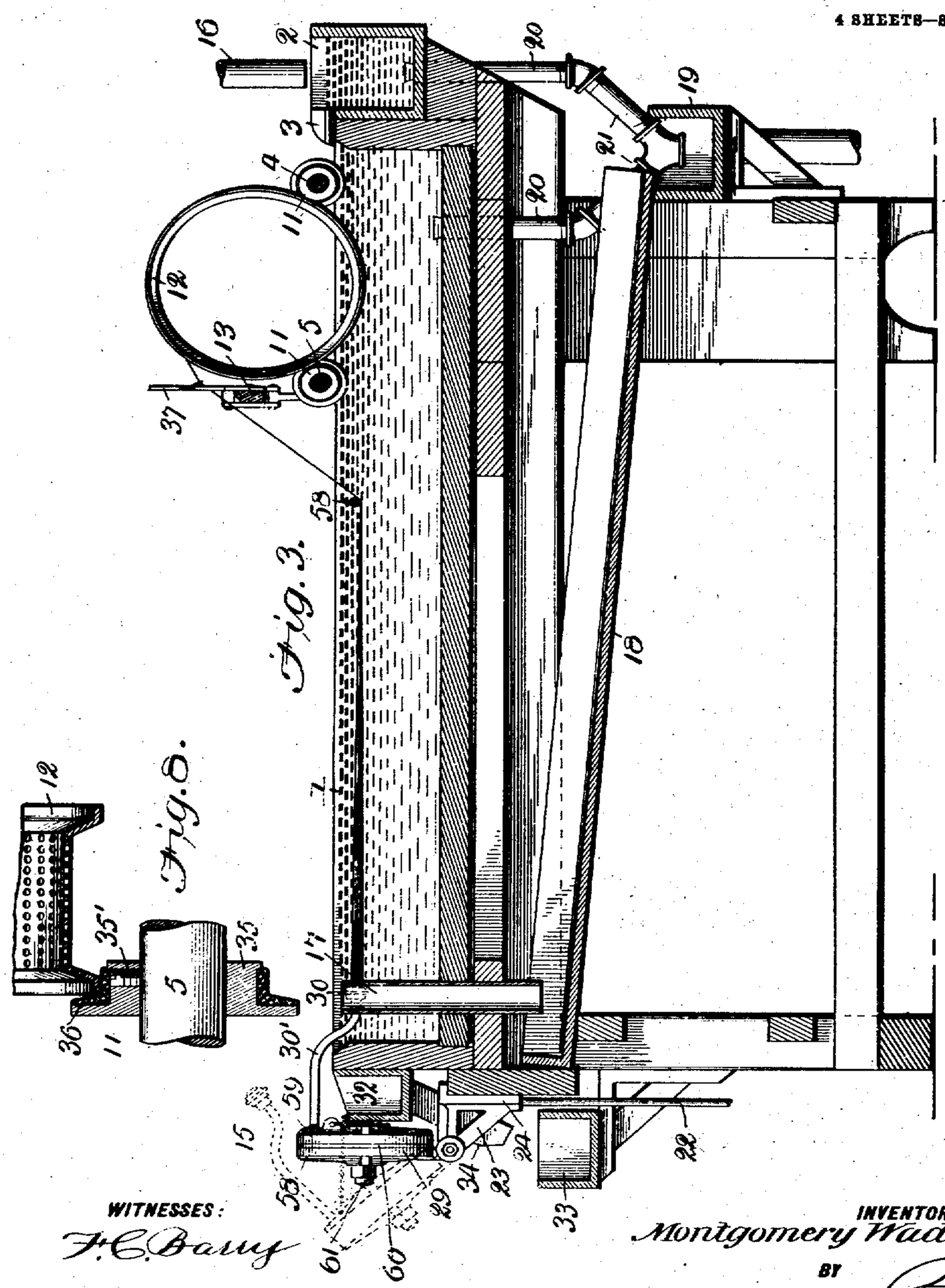
4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

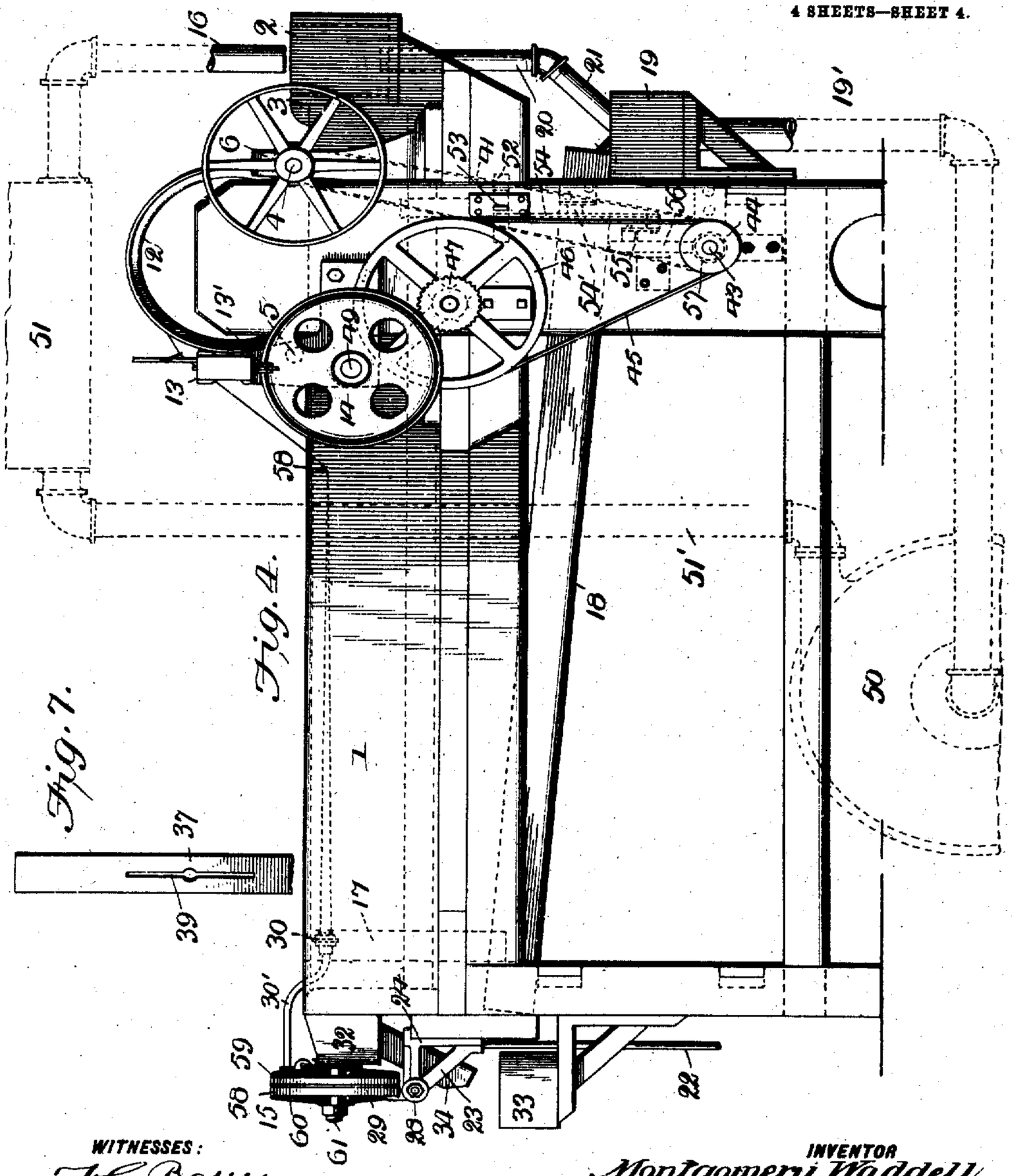

Fig. 4.

Fig. 7.

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UNITED STATES PATENT OFFICE.

MONTGOMERY WADDELL, OF NEW YORK, N. Y., ASSIGNOR TO SILAS W. PETTIT, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR FORMING FILAMENTS OF METAMORPHOSED CELLULOSE, &c.

No. 846,879. Specification of Letters Patent. Patented March 12, 1907.

Application filed January 22, 1906. Serial No. 297,115.

To all whom it may concern:

Be it known that I, MONTGOMERY WADDELL, a subject of the King of Great Britain, and a resident of the city of New York, county and State of New York, have invented certain new and useful improvements in apparatus for forming filaments of metamorphosed cellulose or similar material in the manufacture of artificial silk or like substances, of which the following is a full, clear, and complete description.

My invention relates to certain improvements in the construction and arrangement of the various parts of a machine for forming filaments of metamorphosed cellulose or similar substances, and has for one of its objects the providing of means whereby the filaments are at all times accessible or within the reach of the operator.

A further object of my invention is the securing of a complete and thorough treatment of the filaments as they traverse the fixing-bath into which the celluluose is ejected and also as they are being wound by maintaining a circulation of the fixing solution in the tank containing the same and by causing the filaments to traverse the bath in a direction opposite to that of the fixing solution.

A further object of my invention is to provide a means upon which the spun filaments are wound and by which they are handled in the latter steps of the process of reverting and washing which will not stain or impart an undesirable color to the filaments contained thereon and will protect the filaments from injury.

A further object of my invention is to construct a machine for spinning filaments of metamorphosed cellulose in which the bodies upon which the thread is wound as it is spun may be rotated at a constant speed without producing an objectionable variation in the diameter of the finished thread.

A further object of my invention is to wind the spun filaments in open, regular, and even courses upon a suitable body for holding the same.

In the drawings forming a part of this specification, Figure 1 represents a plan view of the machine provided with the improvements constituting my invention. Fig. 2 is a side elevational view of my machine. Fig. 3 is a sectional view through one of the tanks of my machine taken on the line 3 3, Fig. 1. Fig. 4 is an end elevational view showing the means for imparting motion to the various parts thereof and the means for circulating the fixing liquid, the pump-reservoir and connections being indicated in dotted lines. Figs. 5 and 6 are views of the pivotal support for the filters and the means for conducting the viscose to the filters. Fig. 7 is a view of one of the details of my invention and showing one of the supports carried by the traverse-bar for holding the thread-guides, and Fig. 8 shows a modified form of flanged ring upon which the spun fibers are wound and the details of one of the rollers by which said ring is supported and rotated.

My machine consists of a series of comparatively narrow tanks 1, adapted to contain a suitable fixing solution. One end of each tank is connected to an auxiliary supply-trough 2, from which the fixing solution is discharged over dams 3 into the fixing-tank 1. Extending transversely over the series of tanks are the shafts 4 5, supported in suitable journals or boxes 6. The shaft 4 carries at one end the tight pulley 7, by which the machine is driven, and midway its ends a pulley 8, from which the motion of shaft 4 is communicated or transmitted to shaft 5 by a belt 9 and pulley 10, mounted on said shaft 5.

On the shafts 4 and 5 and over each tank are arranged a series of rollers 11, arranged to support and rotate the flanged rings 12, upon which the newly-formed filaments are wound as they emerge from the fixing-bath. It is, however, fully within the scope of my invention to support the said rings directly upon said shafts, dispensing with the rollers 11. 13 indicates a traverse rod or bar also situated over the series of tanks and adjacent the flanged rings 12 for laying the filaments in courses upon said rings. This traverse-bar is actuated from one end by a cam 14, receiving its motion from the tight pulley in a manner to be described later in the specification. The shafts 4 5 are arranged at such a distance apart that a considerable portion of the periphery of the flanged rings is submerged beneath the surface of the fixing liquid, as is plainly shown in Fig. 3.

On the side of the tanks opposite to that at which the auxiliary feed-trough and flanged rings are located are arranged a series of com-

bined filtering and spinning heads 15, arranged to eject the viscose or similar viscous material beneath the surface of the liquid in the fixing-tank. In Fig. 3 is shown an enlarged view of one of the tanks, showing clearly the relation of the auxiliary feed-trough, the combined filtering and spinning heads, the rollers mounted on the roller-carrying shafts, the flanged rings, and the traverse-rod, all referred to above.

The liquid is supplied to the auxiliary feed-trough from the reservoir 51 through the pipe 16, located, preferably, midway between the ends of said trough, and the liquid in said auxiliary feed-trough flows over the dam 3 into the fixing-tank 1. In order to make the flow of the liquid from the auxiliary feed-trough to the fixing-tank equal, the dams 3 are made slightly inclined in the direction of their length, the higher portion thereof being adjacent the supply-pipe 16, for it is evident that unless some provision were made the liquid would flow into the tanks nearer the said supply-pipe 16 faster than it would to those more remote therefrom.

On the side of the tank adjacent the combined filtering and spinning heads 15 are overflow-pipes 17 17, by which the level of the liquid in the tank is maintained constant. The fixing liquid flowing through the pipe 16 is conducted back to the opposite side of the machine by the inclined trough 18, which discharges into an overflow-tank 19, from which the liquid is pumped back through the pipe 19′, pump 50, and pipe 51′ to the supply tank or reservoir 51, from which it is again fed to the auxiliary feed-trough through the pipe 16. The auxiliary feed-trough 2 and the fixing-tank 1 are provided with openings 20, normally closed by a plug or other suitable means by which the tanks may be drained or emptied through the pipes 21 when it is desised to clean the same.

My combined spinning and filtering head consists of two disks 58 59, adapted to compress between them a suitable filtering material 60, the disks being clamped together by a bolt 61 passing through the center of each disk. One disk is provided with a lug 28, which has an opening 27, communicating with the interior of said disk, and with a transverse tapering hole adapted to fit through the pivot 25, which also has a passage or opening 26, communicating with the opening 27. The bracket 24 has a hollow brace or arm 23, which affords a passage from the pipe 22 through the pivot 25 to the filter. To the disk 59 is attached a tube 30′, which carries at its outer end a spinneret 30.

Between the filler and the fixing-tank is arranged a drip-tank 32, which discharges into a suitable collecting-tank 33 through the inclined trough 34. The drip-trough 32 is located in such a position that when the filter is swung to the position indicated in dotted lines in Fig. 3, as it is in the beginning of the operation, the viscose discharged through the spinning-head will flow therein and be collected in the tank 33, and the tank 33 is so located that when the filter is taken apart for the purpose of cleaning the same any of the viscose contained therein will fall and be collected in the said trough.

Heretofore it has been necessary to impart to the spools or bobbins upon which the thread is wound as it emerges from the fixing-bath a constantly-decreasing speed of rotation in order that the surface at the point at which the thread is being wound may have a constant speed, since it is apparent that otherwise the thread on the outer course of the spools would be smaller in diameter than that on the first or inner course. I have provided a construction in which rings of a comparatively large diameter may be employed to receive the thread, with the result that the rings may be rotated at a constant angular velocity, and the difference between the surface speed of the first and the last course will not be so great as to produce an objectionable variation in the diameter of the finished thread. So far as I am aware I am the first to wind the threads as they emerge from the setting-bath upon rings of a large diameter, which are rotated at a constant angular velocity.

The flanged rings 12, upon which the filaments are wound, may be made by striking up a sheet of metal into cylindrical form and then forming flanges on either end of said cylinder by spinning the metal in a direction radial to the axis of the cylinder, and then spinning the edges of the flanges so formed back parallel with the axis of the cylinder. The flanged rings are then carefully enameled over their entire surface and fired to form a vitreous coating completely covering the metal, whereby the fixing solution is prevented from coming into contact with the metal of the flanged rings, since the metals which would be ordinarily used for such purposes are readily acted upon by the fixing solutions generally employed and impart an undesirable color or tinge thereto and also to the filaments wound thereon. In order to provide for the ready access of the fixing solution to the filaments wound upon the flanged rings, I may perforate the cylindrical portion of said rings in the manner indicated in Fig. 8. I may, however, employ a fixing solution which does not act to any extent upon the metal employed in the construction of the rings, in which case the outer surfaces only of the rings would be enameled for the purpose of preventing a contact of the thread with the metal of the ring.

The outer ends of the flanges spun parallel to the axis of the body of the rings, as described, are to provide the flanges with a sufficient surface to engage the rollers upon

which they are supported and driven, without effecting an unnecessary wear upon said rollers. One of the rollers upon which the flanged wings are supported and rotated is shown in Fig. 8 of the drawings and consists of the flanged body 35, secured to the shaft by means of a set-screw 35′ and provided with an elastic tire or rim 36, which also has a flange fitting against the flange of the body portion of the roller.

The traverse rod or bar 13 is arranged adjacent one side of the series of flanged rings and carries adjacent the surface of each ring a support 37, which in turn is provided with a thread-guide 38. I preferably construct the support 37 of wood and to provide it with a clamping portion by which the thread-guide is held in the support by boring through said support a hole slightly smaller than the shank of the thread-guide and cutting slits 39, extending from said hole in opposite directions, as illustrated in Fig. 7, since when the stem of the thread-guide is forced into the hole the support will spring sufficiently to permit the adjustment of said thread-guide and will then hold with sufficient rigidity to guide the threads to the rings. Any slight adjustment of the thread-guide may, however, be readily effected by tapping the guide to bring it into a position adjacent the flanged ring upon which the filament is being wound.

Secured to the shaft 4, which carries the tight pulley 7, is a cone-pulley 40, which through the belt 41 is connected and drives a second cone-pulley 42, mounted on the counter-shaft 43 near the bottom of the framework of the machine. The shaft 43 also carries a pulley 44, which by belt 45 drives pulley 46, which in turn carries gear 47, which meshes with a gear 48 upon the cam-shaft 49, to which is secured the cam 14. Traverse-rod 13 is provided with a downwardly-extending follower 13′, which engages the outer surface of the cam 14 and is held in contact therewith by any suitable means, such as a weight 62, attached to the other end of the traverse-rod 13 by a chain 63, passing over a pulley 64, as indicated in Fig. 1. Through the above train of gearing it is apparent that as the driving-shaft 4 is rotated motion is communicated to the flanged rings 12, supported on the rollers 11, secured to the shafts 4 and 5, and the cam 14 will be rotated, causing the traverse-rod 13 to reciprocate and to carry the thread-guides 38 backward and forward across the face of the rings 12. I have found, however, that in a traverse motion consisting merely of the parts enumerated above it often occurs that the number of turns which one of the flanged rings will make in a given time will be an exact multiple of the number of reciprocations which the traverse-rod will make in the same time, with the result that the filaments will not be laid in smooth and even courses over the surface of the flanged rings, but will be piled up on ridges on the surface of said rings. In order to obviate this, I have provided the belt 41 with a shifter 52, located between the cones 40 and 42, and I reciprocate this belt-shifter in the following manner: Secured to the near end of said shifter is a link 53, connected to one end of a lever 54, pivoted, as at 54′. The other end of said lever 54 is connected by a link 55 with a stud 56′, carried by a worm-wheel 56, suitably secured to the framework of the machine and meshing with a worm 57, carried by the shaft 43. As the shaft 43 revolves, carrying with it the worm 57, the gear 56 is rotated and in turn oscillates the lever 54, causing the belt-shifter 52 to move the belt 41 slowly back and forth over the cone-pulleys 40 and 42, whereby the traverse-rod 13 will be driven at variable speeds and the building up of the thread in ridges upon the rings is absolutely prevented.

By employing a series of comparatively narrow fixing-tanks and circulating a substantially fixed quantity or amount of fixing solution through all the tanks from a common feed or supply trough I may form a large number of filaments in a substantially uniform bath and at the same time all the filaments may be readily reached by an operator for the purpose of starting the spinning from any particular spinning-head or for the purpose of attaching the filaments to the flanged rings or for the purpose of catching or repairing a broken filament.

The operation of my machine is as follows: Motion being communicated to the winding-rings 12 and to the traverse-rod 13 in the manner described above and the combined filtering and spinning heads swung on their pivots into the position indicated in dotted lines in Fig. 3, the viscose or similar substance is forced through the pipe 22 and bracket 24 to the filter 29 and thence through the tube 30′ to the spinneret 30. The viscose emerging from the spinneret 30 is allowed to drop into the tank 32 until it is flowing evenly through the spinneret, whereupon the filter is swung into the position shown in full lines in Fig. 3, with the spinneret 30 beneath the surface of the liquid. The filaments are then conducted under the rod 58 to the winding-rings 12 through the thread-guides 38. The fixing liquid is caused to circulate from the feed-trough 2 over the dams into the tanks and thence through the overflow-pipes 17 and inclined troughs 18 to the tank 19 in the manner described above in the specification. It will be seen that the filaments and the bath or tank travel in the opposite direction to that of the flow of the fixing liquid in the tank and a thorough and complete action of the liquid on the filaments traversing it is effected. The filaments being laid in open courses upon the rings 12, which rings themselves dip beneath the sur-

face of the fixing liquid in the tank, secures a further action of the liquid upon the filaments, the filaments being in actual contact with the fixing liquid a much longer time than has hitherto been possible in other machines of this class.

Having thus described my invention, what I claim, and desire to protect by Letters Patent of the United States, is—

1. In a machine for forming filaments of metamorphosed cellulose, the combination with a tank of a series of spinning-heads located at one side of said tank, means for supplying a fixing solution to said tank from the opposite side thereof, and means adjacent the supply end of said tank for winding said filaments, whereby the circulation of the fixing solution in the tank is in a direction opposite to that of the travel of the filaments being spun.

2. In a machine for forming filaments of metamorphosed cellulose, the combination with a tank of a series of spinning-heads at one side of said tank, a supplemental trough for supplying a fixing solution to said tank from the side opposite said spinning-heads, and a means located adjacent said trough, for winding the spun filaments.

3. In a machine for forming filaments of metamorphosed cellulose, a tank, a pair of shafts arranged transverse to said tank and a winding-ring, supported on and rotated by said shafts, for receiving said filaments as they are delivered from said tank.

4. In a machine for forming filaments of metamorphosed cellulose, a tank, a pair of shafts arranged transverse to said tank, a series of rollers mounted on said shafts, flanged winding-rings supported and rotated by said shafts for receiving said filaments as they are delivered from said tanks.

5. In a machine for forming filaments of metamorphosed cellulose, a tank, a pair of shafts arranged transverse to said tanks, a flanged winding-ring supported and rotated by said shafts for receiving said filaments as they are delivered from said tanks.

6. In a machine for forming filaments of metamorphosed cellulose, a tank, a body upon which the filaments are wound as they are delivered from said tank, means for rotating said body at a constant angular velocity by peripheral contact, a traverse-rod for laying the thread upon said body in courses, and means to reciprocate said traverse-rod at a constantly changing speed.

7. In a machine for forming filaments of metamorphosed cellulose, a series of tanks, a pair of shafts arranged transverse to said tanks, rollers mounted on said shafts, and flanged rings supported upon and rotated by said rollers, for receiving the filaments as they are delivered from said troughs.

8. In a machine for forming filaments of metamorphosed cellulose, the combination of a tank, a pair of shafts transverse to said tank, a series of rollers mounted on said shafts, a flanged winding-ring supported and rotated by said rollers, said ring contacting with said rollers by its flanges only.

9. In a machine for forming filaments of metamorphosed cellulose, the combination with a series of tanks, a pair of shafts arranged transverse to said series of tanks, rollers mounted on said shafts, and flanged rings supported on and rotated by said rollers, the distance between said rollers being such that the flanged rings supported thereon dip for a portion of their circumference below the level of the liquid in the tank.

10. In a machine for forming filaments of metamorphosed cellulose, the combination with a tank, of shafts arranged transverse to said tank, a series of rollers mounted on said shafts, means for rotating said shafts, a flanged winding-ring mounted on said rollers and rotated thereby, said flanged ring being supported on said rollers by its flanges only.

11. In a machine for forming filaments of metamorphosed cellulose, the combination with a series of tanks, a series of spinning-heads mounted at one end of each tank, means for supplying a fixed solution to said tanks from the side thereof opposite said spinning-heads, parallel shafts arranged transverse to said tanks and on the side thereof opposite said spinning-heads, rollers mounted on said shafts, flanged rings located on said rollers and rotated thereby, and a traverse-rod adjacent the surface of said flanged rings.

12. In a machine for spinning filaments of metamorphosed cellulose, the combination with a pair of parallel shafts, means to rotate said shafts, a series of rollers mounted on said shafts, flanged rings supported on and rotated by said rollers by the contact of its flanges with said rollers, a traverse-rod adjacent the surface of said rings, and means to impart to said traverse-rod a reciprocatory motion.

13. In a machine for forming filaments of metamorphosed cellulose, the combination with a pair of parallel shafts, means to rotate said shafts, a series of rollers mounted on said shafts, flanged rings supported on and rotated by said rollers by the contact of their flanges with said rollers, a traverse-rod adjacent the surface of said rings, and means to impart to said traverse-rod a variable reciprocatory motion.

14. In a machine for forming filaments of metamorphosed cellulose, a series of tanks a pair of driving-shafts transverse to said series of tanks, means to rotate shafts, rollers mounted on said shafts, rings provided with flanges for winding the filaments, said rings being supported and rotated by their contact with said rollers, a third shaft, means for rotating said shaft, a cam mounted on said

shaft, a traverse-rod reciprocated from said cam, and thread-guides supported on said traverse-rods adjacent said rings.

15. In a machine for spinning filaments of metamorphosed cellulose, the combination with a fixing-tank, a pair of parallel shafts transverse to said tank, a series of flanged rollers mounted on said shafts, flanged rims or tires mounted on said rollers, and flanged winding-rings supported on said rims by their flanges and driven thereby.

16. In a machine for spinning filaments of metamorphosed cellulose, the combination of a tank, a pair of parallel shafts running transverse to said tank, flanged rollers mounted on said shafts, flanged rings supported on said rollers and driven thereby, the distance between said shafts being such that the rings dip beneath the surface of the liquid in the tank.

17. In a machine for forming filaments of metamorphosed cellulose, a seamless winding-ring made from a single piece of sheet metal, and consisting of a cylindrical body portion and flanges, said flanges extending first radially from and then parallel to the body of said ring.

18. In a machine for forming filaments of metamorphosed cellulose, a seamless winding-ring made from a single piece of sheet metal, and consisting of a cylindrical body portion and flanges, said flanges extending first substantially radially from and then parallel to the body of said ring, the thread-carrying surface of said ring being enameled.

19. In a machine for forming filaments of metamorphosed cellulose, a seamless winding-ring made from a single piece of sheet metal, and consisting of a cylindrical body portion and flanges, said flanges extending first radially from and then parallel to the body of said ring, the entire surface of said ring being covered with a vitrified enamel.

20. In a machine for forming filaments of metamorphosed cellulose, a seamless winding-ring made from a single piece of sheet metal, consisting of a perforated cylindrical body portion, and flanges, said flanges extending first radially from and then parallel to the body of said ring.

21. In a machine for forming filaments of metamorphosed cellulose, a ring for receiving the thread as it is formed, a traverse-bar adjacent the surface of said ring, a support carried by said traverse-bar and provided with slots, and a thread-guide frictionally held in said slots.

22. In a machine for forming filaments of metamorphosed cellulose, the combination with a tank, means for causing a fixing liquid to traverse said tank in one direction, and means for forcing viscose, or similar material, into said fixing solution and for causing the same to traverse the tank in a direction opposite to that of the flow of the fixing solution.

23. In a machine for forming filaments of metamorphosed cellulose, the combination of a series of tanks, a supplemental feed-trough, common to said tanks, means for causing a fixing solution in said feed-trough to flow into each tank at one side thereof, overflow-pipes located on the opposite side of each tank, a reservoir, means for conducting the overflow from said overflow-pipes to said reservoir, and thence back to said supplemental feed-trough, means for forcing viscose, or similar material into said fixing solution and means for causing the viscose to traverse the tank in a direction opposite to that of the flow of the fixing solution.

24. In a machine for forming filaments of metamorphosed cellulose, a spinning means, a pair of parallel shafts, a winding-ring supported on and rotated by said shafts for receiving said filaments as they are formed.

25. In a machine for forming filaments of metamorphosed cellulose, a spinning means, a winding-ring for receiving the filaments as they are formed, and means to rotate said ring by peripheral contact.

26. In a machine for forming filaments of metamorphosed cellulose, a spinning means, a flanged winding-ring for receiving the filaments as they are formed, and means to rotate said ring by peripheral contact.

27. In a machine for forming filaments of metamorphosed cellulose, a spinning-head, a tank, a winding-ring for receiving said filaments as they are formed, and means for rotating said ring by peripheral contact.

28. In a machine for spinning filaments of metamorphosed cellulose, the combination of a tank, a pair of parallel shafts running across said tank, a winding-ring supported on and rotated by said shafts for receiving the filaments as they are delivered from said tank, the distance between said shafts being such that the ring dips beneath the surface of the liquid in the tank.

29. In a machine for spinning filaments of metamorphosed cellulose, the combination of a tank, a pair of parallel shafts running across said tank, a flanged winding-ring supported on and rotated by said shafts for receiving the filaments as they are delivered from said tank, the distance between said shafts being such that the ring dips beneath the surface of the liquid in the tank.

30. In a machine for forming filaments of metamorphosed cellulose, a winding-ring having a cylindrical body portion and flanges, said flanges extending first outwardly from and then parallel to the body of said ring.

31. In a machine for forming filaments of metamorphosed cellulose, a winding-ring consisting of a perforated cylindrical body portion and flanges, said flanges extending

first outwardly from and then parallel to the body of said ring.

32. In a machine for forming filaments of metamorphosed cellulose, a combined filtering and spinning head, comprising two disks forming an outside casing, a fibrous filtering material, means passing through the center of the said disk and said filtering material for holding said casing together and for compressing said filtering material, a bracket, a stud extending from said bracket and a lug on one of said disks fitting over said stud, said bracket, stud, lug and disk being provided with communicating passages for conducting the liquid to one side of the said filtering material.

33. In a machine for forming filaments of metamorphosed cellulose, a combined filtering and spinning head, comprising two disks forming an outside casing, a fibrous filtering material, means passing through the center of the said disk and said filtering material for holding said casing together and for compressing said filtering material, a bracket, a stud extending from said bracket, a lug on one of said disks fitting over said stud, said bracket, stud, lug and disk being provided with communicating passages for conducting said liquid to one side of said filtering material, and a spinneret mounted on the other of said disks.

In witness whereof I have hereunto set my hand this 19th day of January, A. D. 1906.

MONTGOMERY WADDELL.

Witnesses:
ALSTON B. MOULTON,
ALEXANDER PARK.

Corrections in Letters Patent No. 846,879.

It is hereby certified that in Letters Patent No. 846,879, granted March 12, 1907, upon the application of Montgomery Waddell, of New York, N. Y., for an improvement in "Apparatus for Forming Filaments of Metamorphosed Cellulose, &c.," errors appear in the printed specification requiring correction, as follows: In lines 42–43, page 2, the word "desised" should read *desired*, and in line 94, the word "fixed" should read *fixing;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of April, A. D., 1907.

[SEAL.]

E. B. MOORE,
Acting Commissioner of Patents.

first outwardly from and then parallel to the body of said ring.

32. In a machine for forming filaments of metamorphosed cellulose, a combined filtering and spinning head, comprising two disks forming an outside casing, a fibrous filtering material, means passing through the center of the said disk and said filtering material for holding said casing together and for compressing said filtering material, a bracket, a stud extending from said bracket and a lug on one of said disks fitting over said stud, said bracket, stud, lug and disk being provided with communicating passages for conducting the liquid to one side of the said filtering material.

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Acting Commissioner of Patents.

Corrections in Letters Patent No. 846,879.

It is hereby certified that in Letters Patent No. 846,879, granted March 12, 1907, upon the application of Montgomery Waddell, of New York, N. Y., for an improvement in "Apparatus for Forming Filaments of Metamorphosed Cellulose, &c.," errors appear in the printed specification requiring correction, as follows: In lines 42–43, page 2, the word "desised" should read *desired*, and in line 94, the word "fixed" should read *fixing;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of April, A. D., 1907.

[SEAL.]

E. B. MOORE,

Acting Commissioner of Patents.