

No. 775,512.

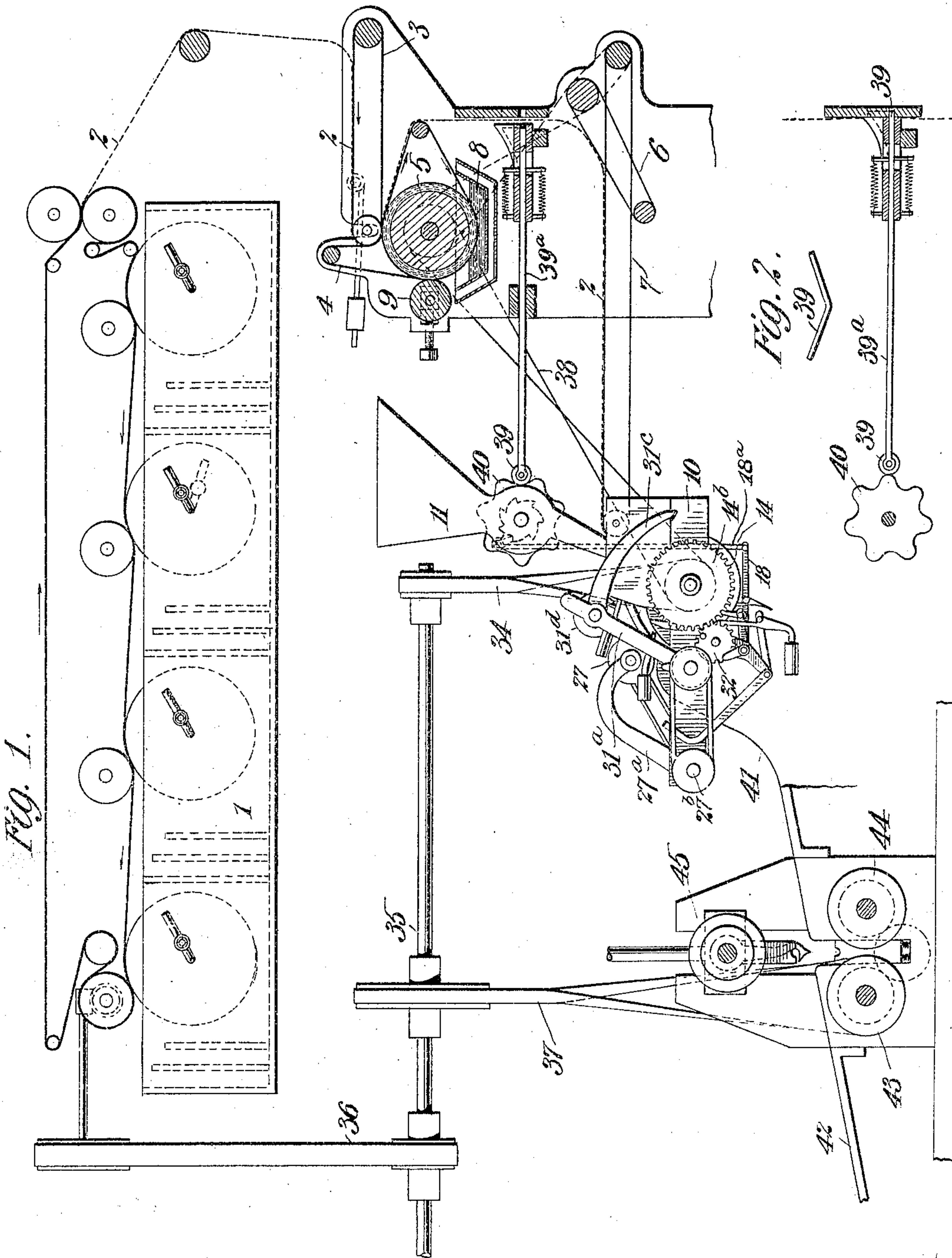
PATENTED NOV. 22, 1904.

R. BINNS.
TUBE OR SPOOL MAKING APPARATUS.

APPLICATION FILED FEB. 23, 1904.

NO MODEL.

5 SHEETS—SHEET 1.



Witnesses
Frank S. Ober
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No. 775,512.

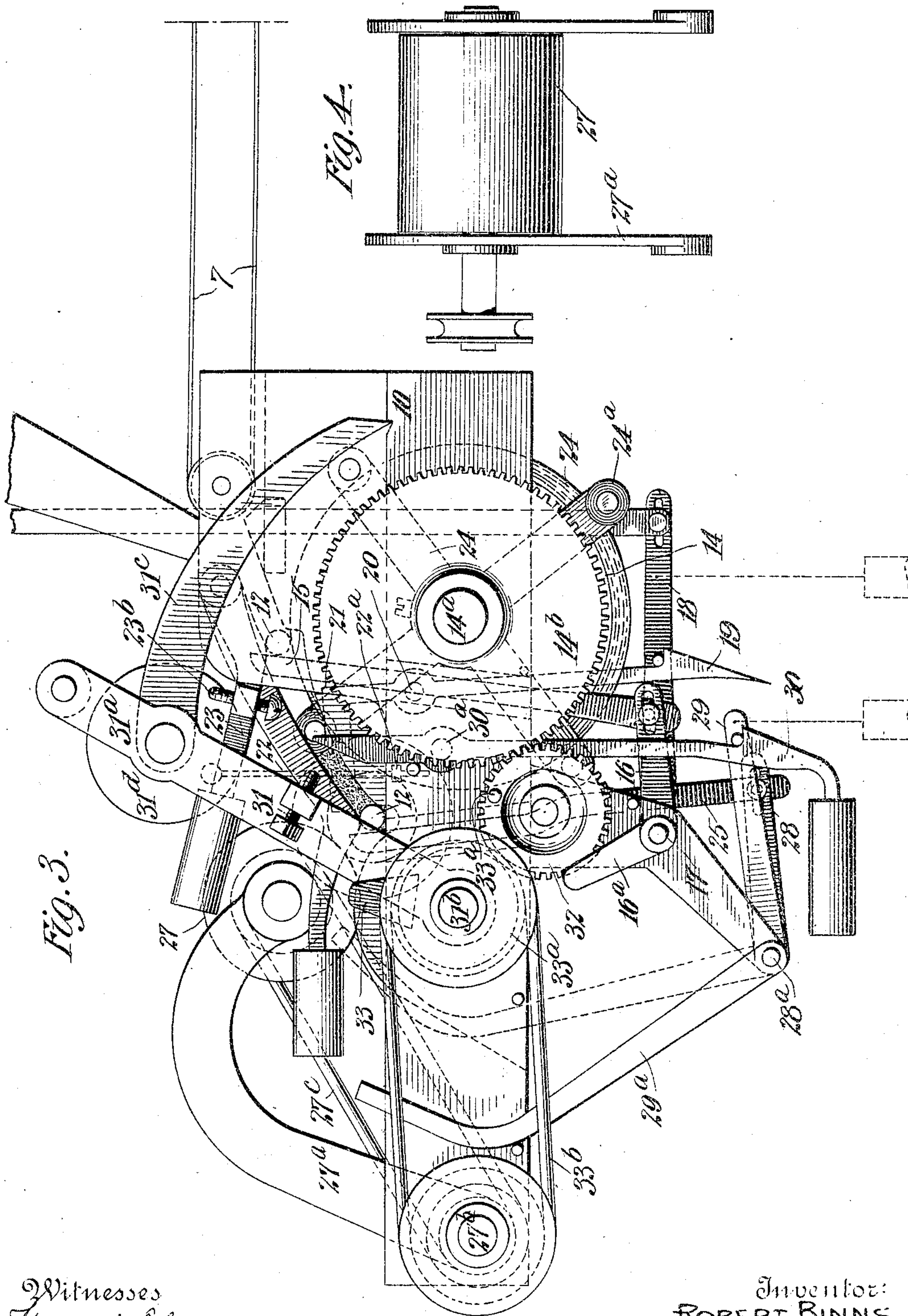
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5 SHEETS—SHEET 2.



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PATENTED NOV. 22, 1904.

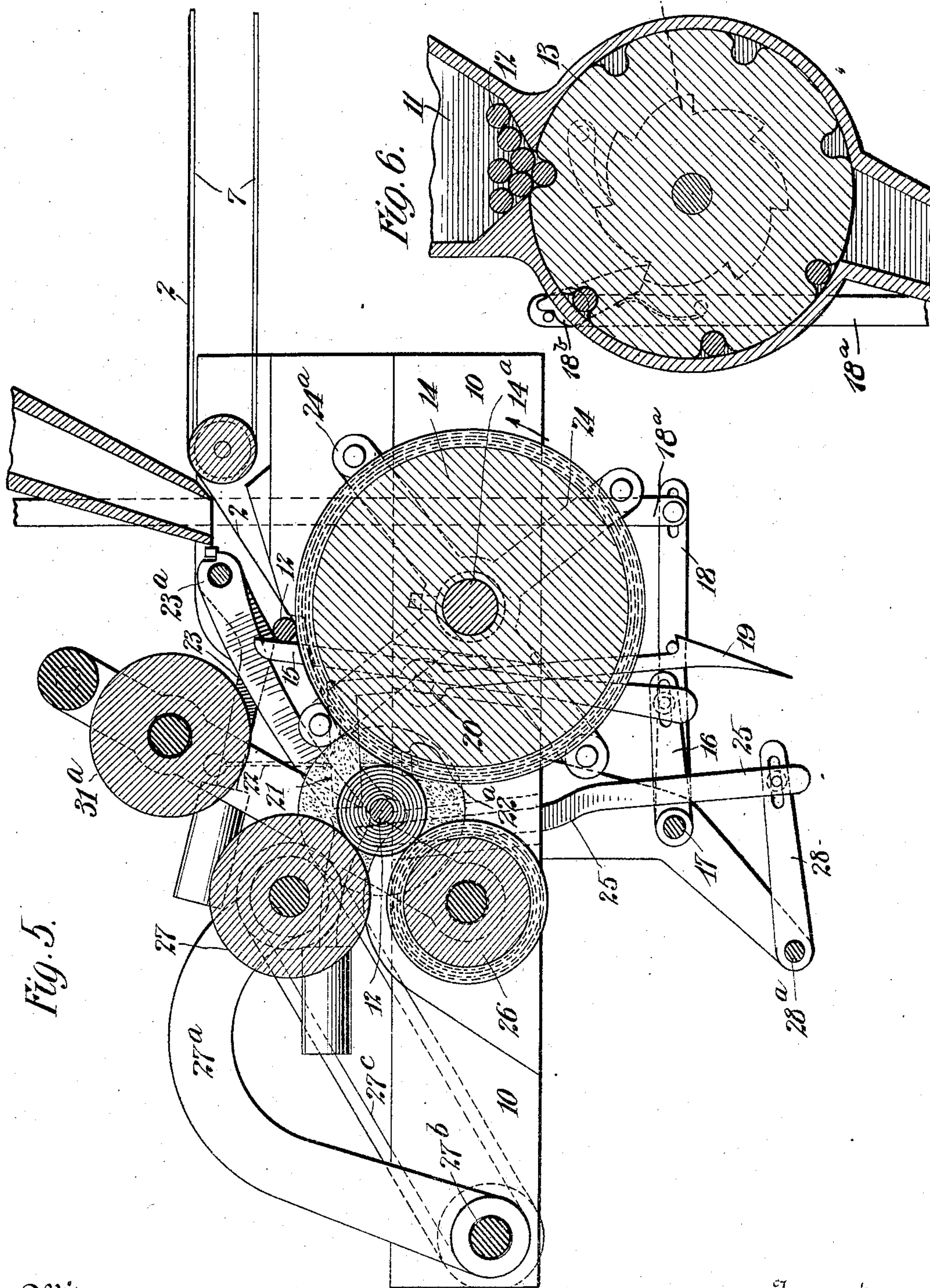
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APPLICATION FILED FEB. 23, 1904.

NO MODEL.

5 SHEETS—SHEET 3.



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5 SHEETS—SHEET 4.

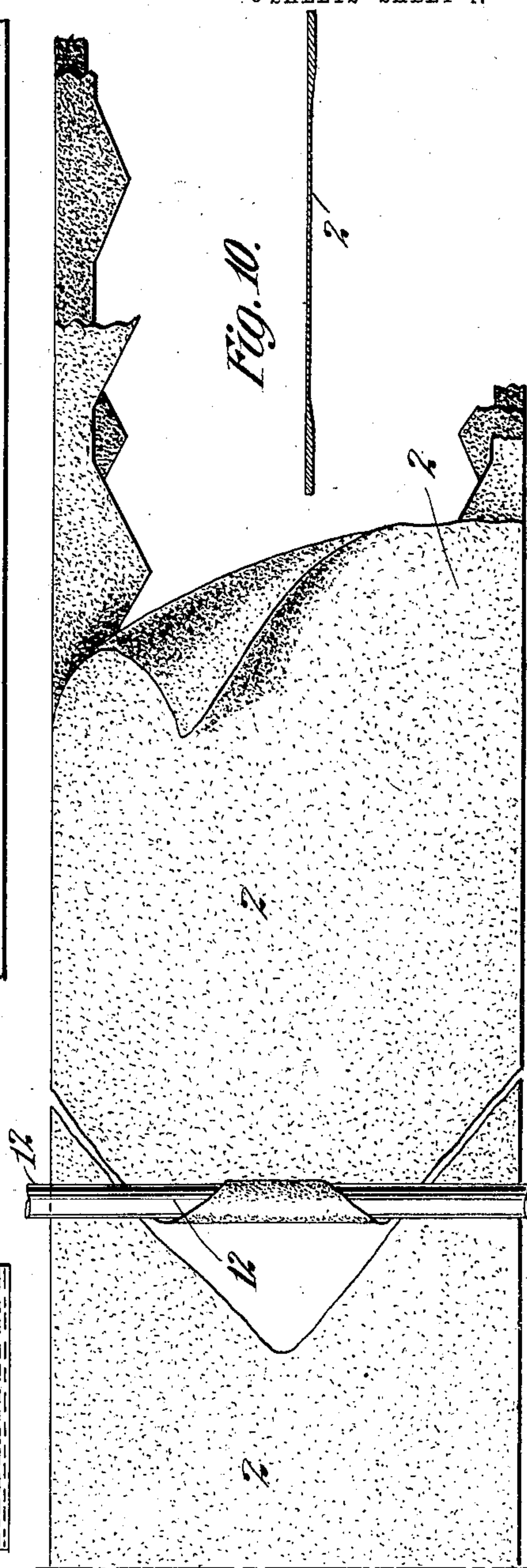
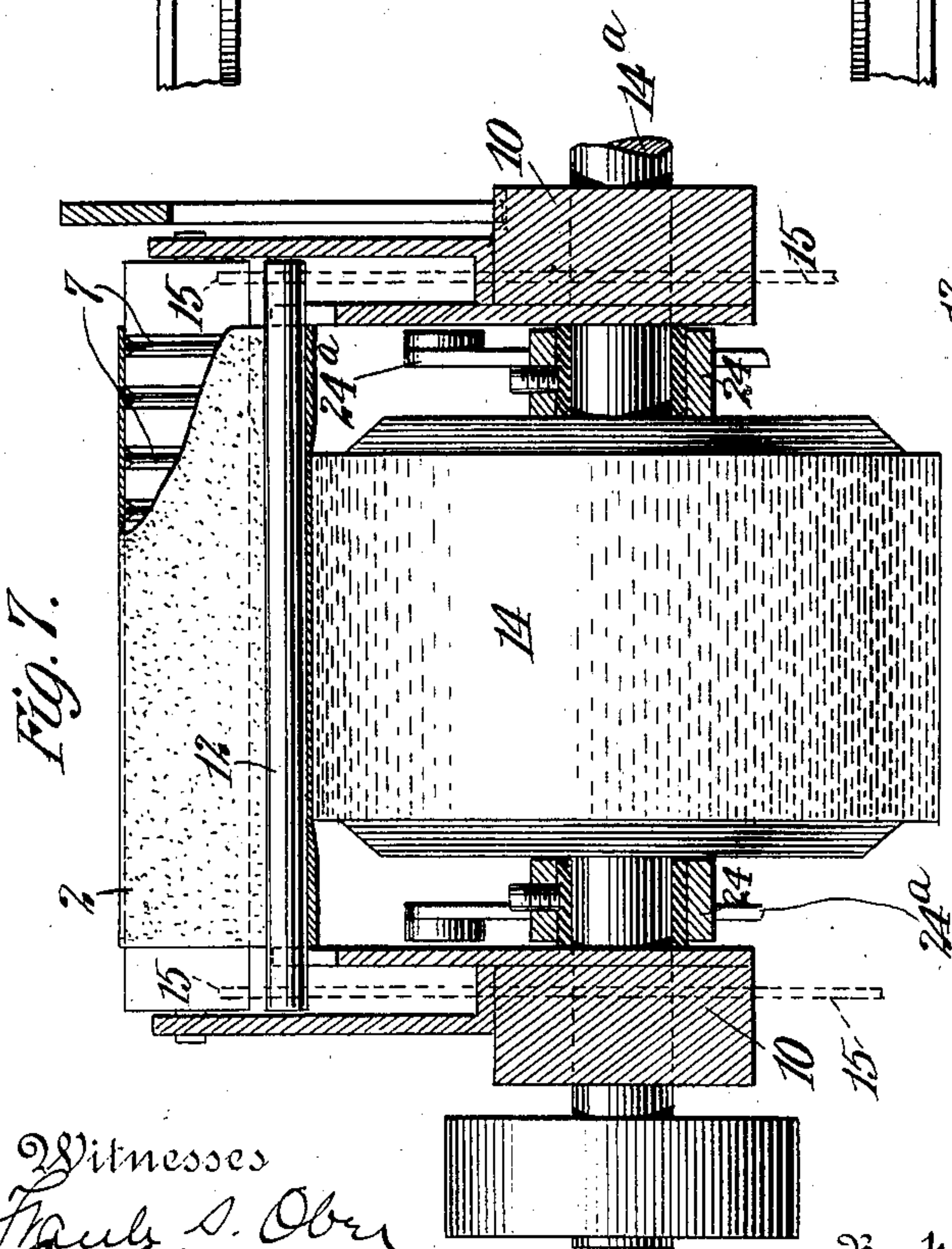
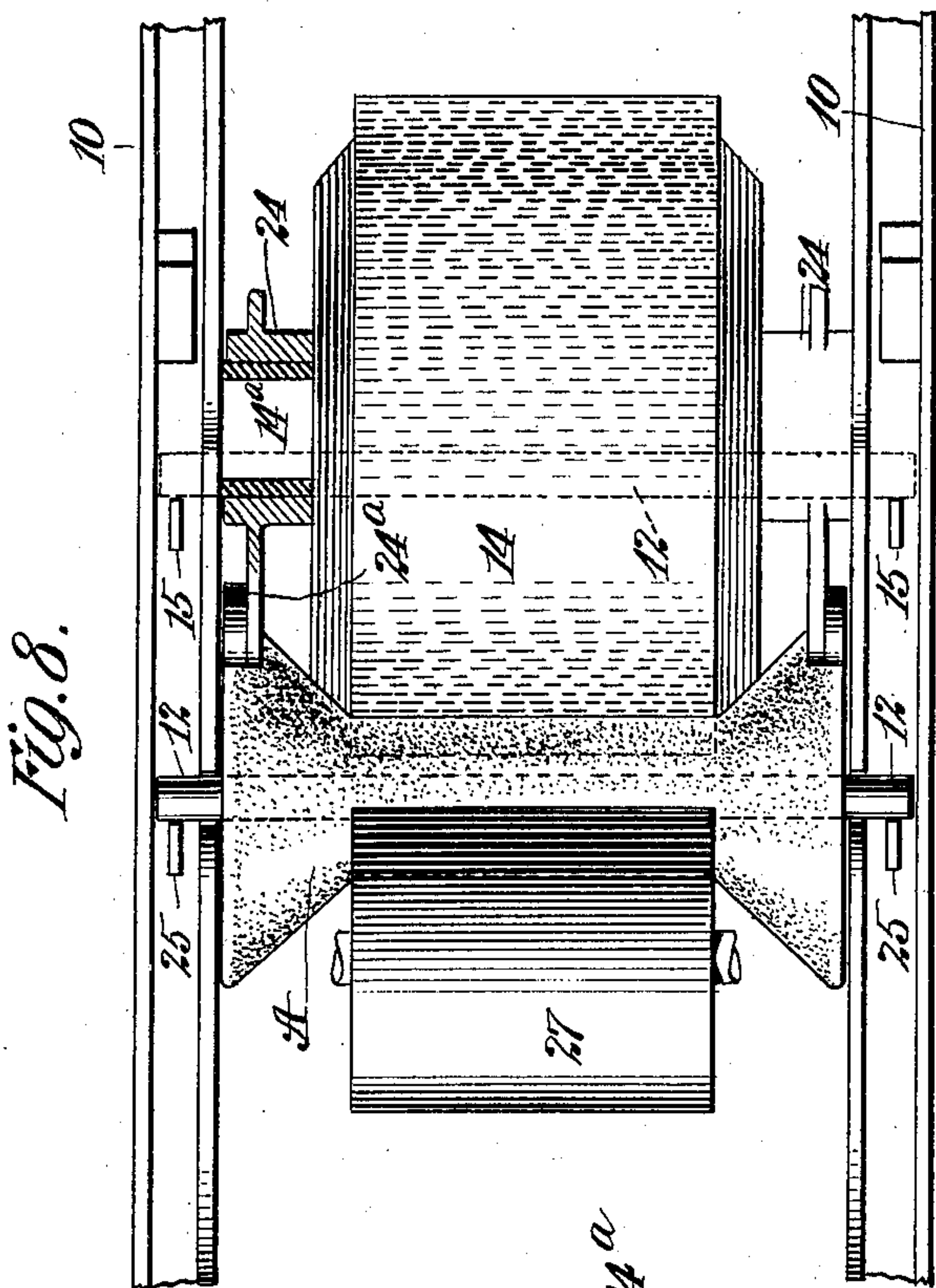


Fig. 9.

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5 SHEETS—SHEET 5.

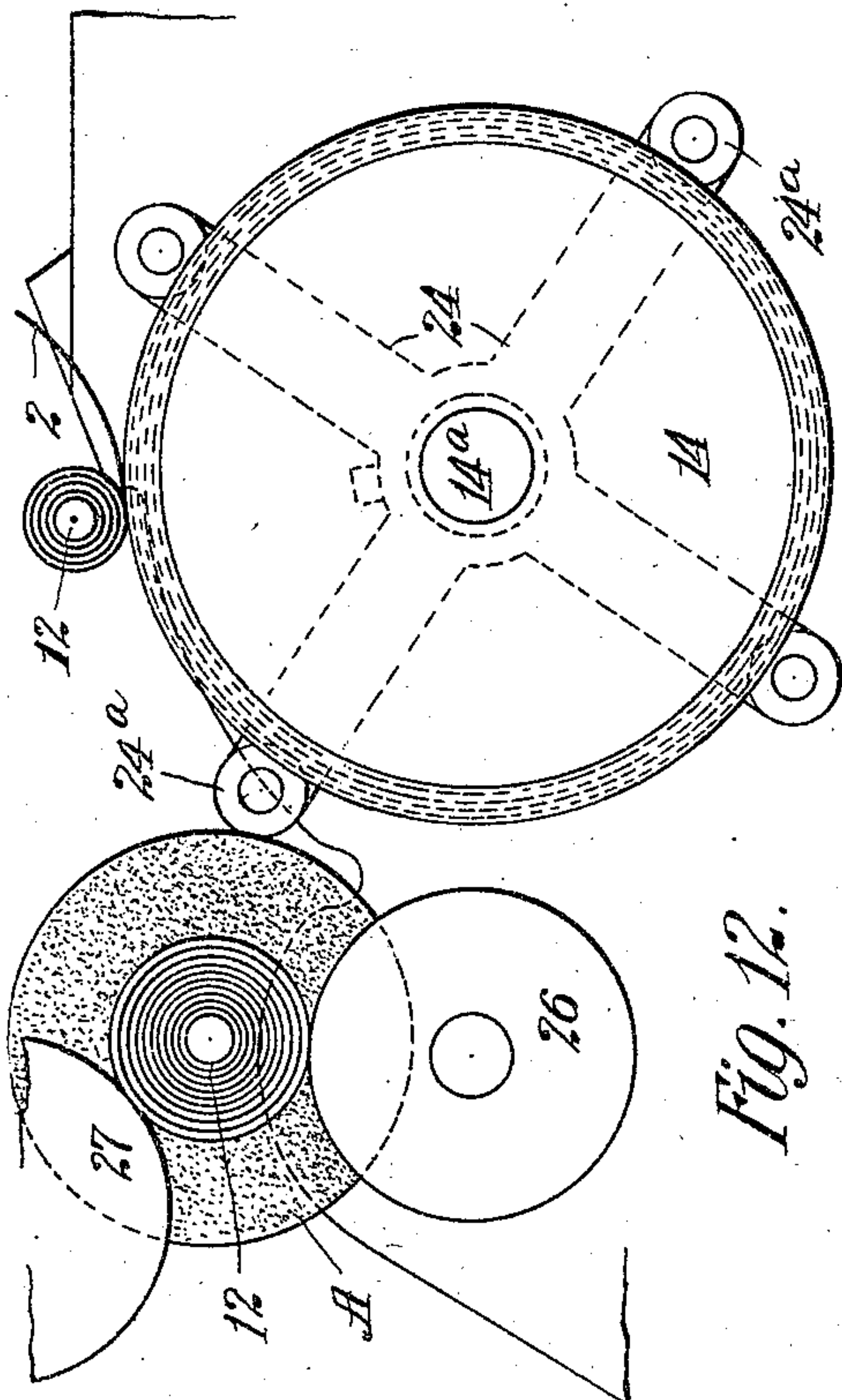


Fig. 12.

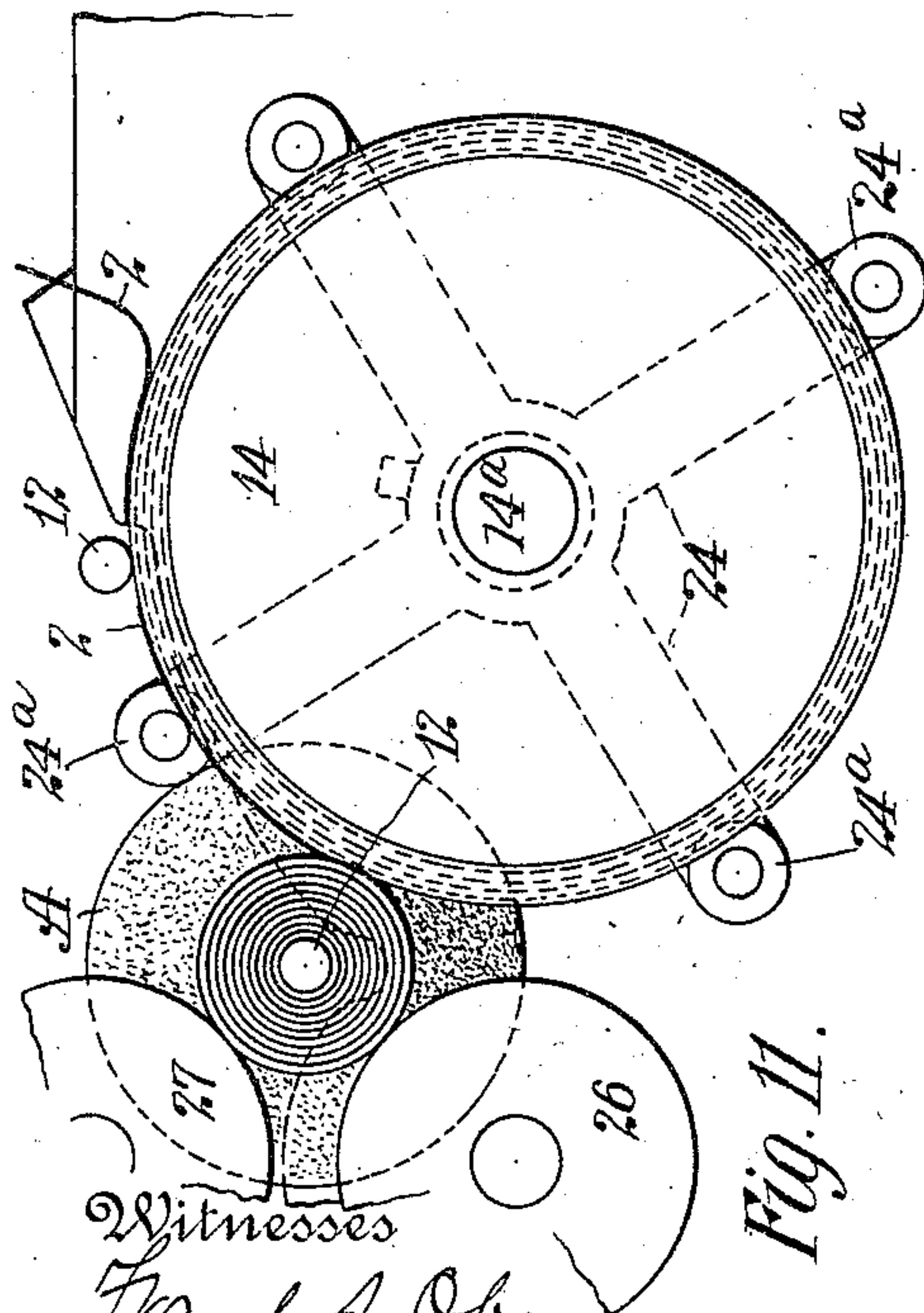


Fig. 11.

Witnesses

Frank S. Ober
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Fig. 14.

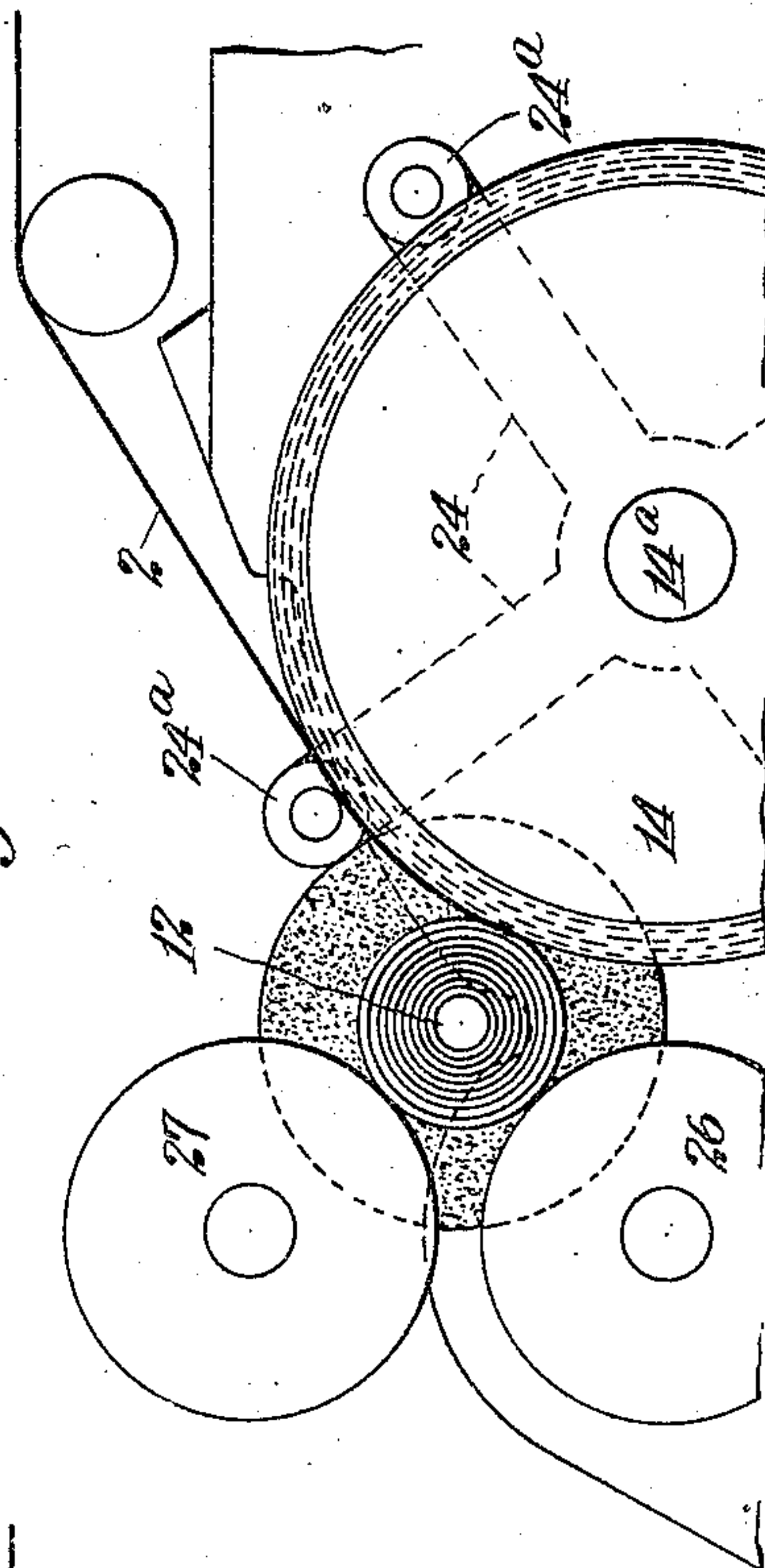
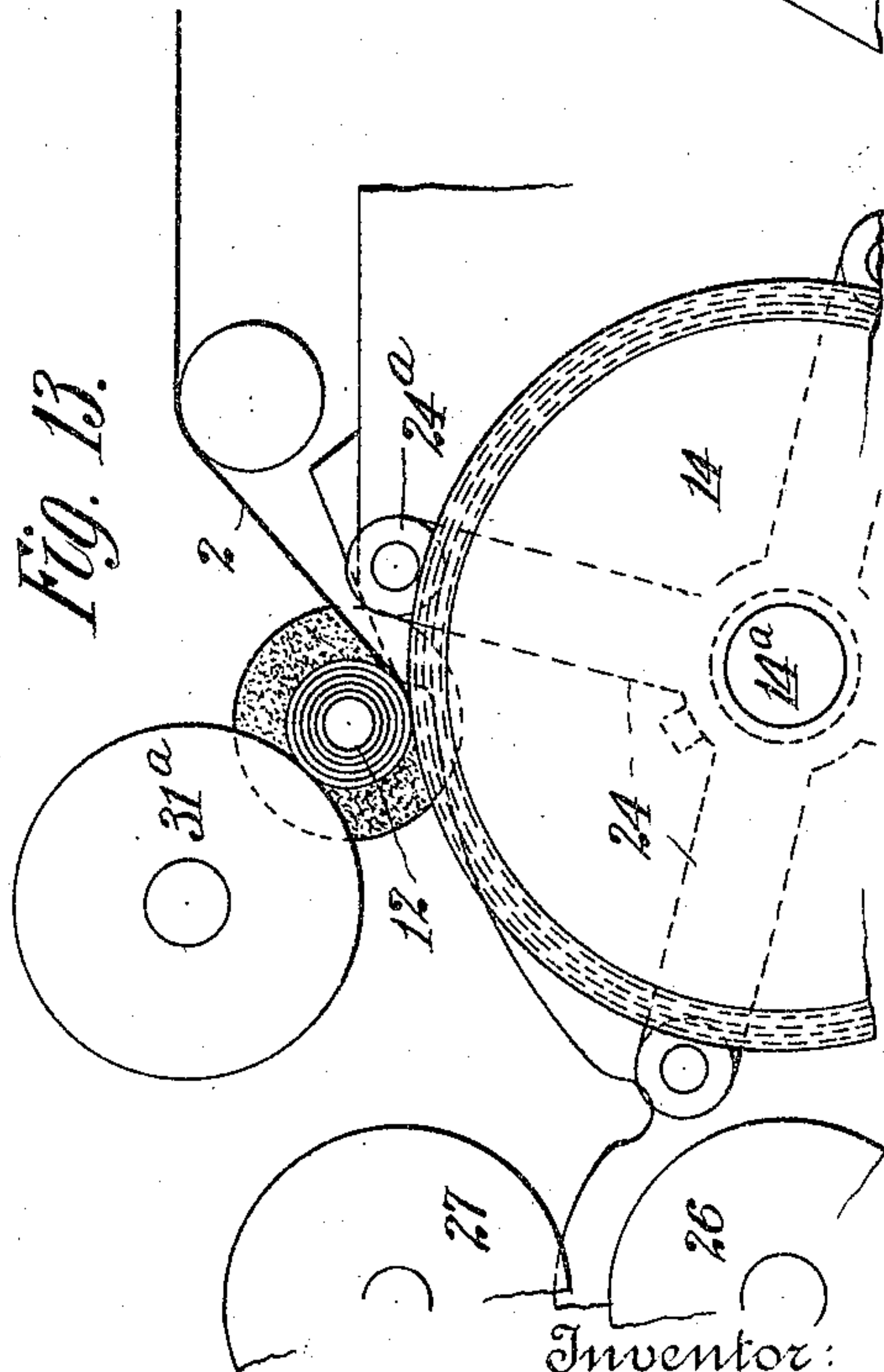


Fig. 13.



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UNITED STATES PATENT OFFICE.

ROBERT BINNS, OF SOUTH WINDHAM, CONNECTICUT.

TUBE OR SPOOL MAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 775,512, dated November 22, 1904.

Application filed February 23, 1904. Serial No. 194,788. (No model.)

To all whom it may concern:

Be it known that I, ROBERT BINNS, a citizen of the United States, residing at South Windham, in the county of Windham, State of Connecticut, have invented certain new and useful Improvements in Tube or Spool Making Apparatus, of which the following is a full, clear, and exact description.

My invention relates to apparatus for manufacturing tubes, spools, and the like; and it consists in suitable mechanism for forming a web from a suitable pulp, then transferring said web to a winding-machine, wherein it is wound, and finally transferred to a rolling and shaping machine, from which it is ejected a finished article. The web or paper making machine by itself in an improved form is described and claimed independently in a separate application filed by me on February 23, 1904, serially numbered 194,787. The final rolling and shaping mechanism is also described and claimed by itself in a separate application filed by me February 23, 1904, serially numbered 194,790. Therefore in this application it is not necessary to describe in detail these portions of the apparatus.

In the drawings, Figure 1, I have shown an assembled view of a paper-making machine, spool-making machine, and the final rolling and shaping machine. Incidentally in this view I have shown glue-applying apparatus and a cutting apparatus whereby the web as it comes from the paper-making machine has glue applied thereto in the transit of the web from the paper-making machine to the spool-making machine and is automatically cut off at certain predetermined lengths. Fig. 2 is a diagrammatic view of parts of the web-severing apparatus. Fig. 3 is a side elevation of the winding-machine. Fig. 4 is an end elevation of certain details of construction of the winding-machine. Fig. 5 is a central longitudinal section of Fig. 3. Fig. 6 is a vertical section of a detail of construction. Fig. 7 is a vertical section of certain parts shown in Fig. 5, other parts being shown in elevation. Fig. 8 is a plan of a portion of the machine. Fig. 9 is a plan of the paper web with the ends severed and with one end being picked up by the rolling-spindle. Fig. 10 is

a transverse section of the paper web. Figs. 11, 12, 13, and 14 are diagrammatic views illustrating successive steps in the operation of the machine, respectively.

1 represents a paper-making machine adapted to make a web of paper 2. (Indicated in dotted lines, Fig. 1.) In making spools the machine should be of suitable construction to form a web having reinforcements or thickened portions along opposite edges thereof, as indicated in Fig. 10. In the operation of forming a spool this web is transferred to an endless conveyer 3, which carries the web into contact with a conveyer 4, which traverses adjacent to a gluing-roll 5. As the web contacts with the roll 5 one surface of the same is smeared with glue, and said web is then transferred by suitable means—for example, endless conveyers 6 and 7—to the winding-machine, which will hereinafter be described in detail.

Referring more particularly to the gluing apparatus, 8 is a glue-pot into which the surface of the roll 5 projects, so as to keep a fresh supply of glue thereon as said roll is revolved. 9 is a roll which presses against the surface of the roll 5 with variable force, depending upon the needs, and by which the quantity of glue on that part of the glue-roll where it engages the web 2 may be varied as the occasion requires.

Now referring to the winding apparatus, which, together with the gluing and web-cutting apparatus coacting therewith, is the main subject of this invention, 10 is a frame supporting the various parts. 11 is a hopper arranged to contain spindles 12 12, upon which the spools are wound. The bottom of the hopper is closed by a roll 13. (See Fig. 6.) On the shaft of roll 13 is a ratchet-wheel 13^a. In the periphery of the roll 13 grooves are formed, each of a size to receive one spindle 12. As this roll 13 revolves it conveys successively the spindles to the winding apparatus, the time of delivery of each spindle being in keeping with the capacity of the machine, as hereinafter described, and being controlled automatically thereby. The frame 10 comprises mainly two outside plates spaced apart to a width to receive the spindles 12 12.

When the spindle enters the winding-machine, it first assumes the position shown in Fig. 5, in which said spindle rests upon a driving-drum 14, driven positively in the direction of the arrow. A felt covering for the drum 14 forms a porous and elastic surface, while the surface of each spindle 12 is relatively non-porous. When the web 2 is fed into the winding-machine by the conveyer 7, it enters between the drum 14 and the spindle 12. The web 2 being moist clings by suction to the surface of the non-porous spindle 12, and since said spindle 12 is rotated or driven by the drum 14 the said moist web 2 will readily leave the porous surface of said drum 14 and continue to cling to and be built up convolutely on the revolving spindle 12. In Fig. 9 I have shown the end of the web 2 as it starts to wind upon the surface or non-porous spindle 12. It will be observed that the end of the web 2 is preferably tapered or pointed, so that it will be picked up more evenly and rapidly by the non-porous surface of the roll-like spindle 12. The spindle 12 is supported, as above stated, by the drum 14, and it is for a time prevented, by means of detents 15 15, from being pushed ahead. These detents are arranged at each end of the spindle and hold it until such time as the spool shall have assumed suitable proportions. At this time (but just before the spool is full size) the detents 15 are released and move away from the spindle 12 to allow the partially-formed spool to move on to a second position, hereinafter described. The means for operating the detents 15 when the spool has acquired certain predetermined proportions comprises a lever 16, keyed to shaft 17, so as to move simultaneously with 16, and vice versa. The lever 18 is held normally by a hook 19, pivoted at 20 and having a bell-crank extension 21. 22 22 are links carried by the levers 23 23 on opposite sides of the machine, and these links carry adjustable stops 22^a, which are arranged to engage at the proper time with the bell-crank end 21 of the hooks 19, previously described. The levers 23 are pivoted at 23^a, and these levers rest upon the ends of the spindles 12 when the same are located in the first position shown on top of the drum 14, Fig. 5. As the spool builds up it is obvious that the spindles 12 will be elevated and will lift the levers 23, which in turn elevate the links 22 until they engage with the bell-crank extension of the hooks 19, so as to trip said hooks, whereupon the levers 18 and 16 fall by gravity and carry down the detents 15, freeing the spindle 12 and the partially-formed spool thereon. When freed, this partially-formed spool is moved to the left into a second winding position, as viewed in Fig. 5. This action may be produced entirely by the friction of the surface of the drum 14 acting to the left, or this movement may be effected by

means of a rotary pushing and binding device comprising the following parts, to wit: a multi-armed frame 24, frictionally mounted upon the shaft 14^a of the drum 14. 24^a 24^a are heads revolubly mounted at the ends of the arms of frame 24. The frame 24 being frictionally mounted on the shaft of the drum 14, the tendency of this frictional mounting is to move the frame 24 and the heads 24^a 24^a in the same direction as the surface of the drum 14. Hence these heads aid in shifting the partially-formed spool from the first position to the second position, hereinafter described, and finally aid in shifting and discharging the fully-formed spool from said second position.

The heads 24^a not only aid in the shifting and ejecting of the spool, but also serve to clamp the edges of the web onto the edges of the spool-head as the same is being built up, thus firmly holding the edges of the web while the presser-roll compacts the intermediate portion against the barrel or body of the spool, which act slightly stretches the web transversely. (See Figs. 7 and 8.) Were it not for the presence of these clamping-heads or other equivalent means the tendency of the roll 27 in pressing down the intermediate portion of the web would be to draw the edges of the web toward the center of the spool, and thus reduce the diameter of the spool-head as it is building up. This means, however, absolutely prevents this result. It is in connection with this mechanism that means may be provided whereby the spindle-feed roll 13 will be actuated simultaneously therewith. As before stated, when the hook 19 is freed the lever 18 will drop. Connected to this lever is a link 18^a, and connected to this link 18^a is a pawl 18^b, which engages with the ratchet-wheel 13^a. Obviously as the lever 18 rises and falls the ratchet 13^a will be rotated step by step, so as to feed the spindles to the winding-machine one by one and in the proper time.

Having thus shown how the spool is first partially formed and then transferred to the second position, I will now describe the operation of the machine when the final winding is taking place. In this second position the spindle comes in contact with the detents 25 25, which stand in front of said spindle and hold it in the position indicated at the left of the roll 14. In this position the barrel or body of the spool bears between the surface of the roll 14 and the surface of a second roll 26 and is prevented from being pushed out of this position mainly by the detents 25. 27 is a driven presser-roll carried by the frame 27^a on shaft 27^b and which may bear upon the body of the partially-finished spool as it appears in the last-mentioned position. The force of these various rolls is to cause the convolute layers of web to be pressed into intimate contact and give approximately the final form to the spool. By frictional contact with

these driven rolls 14, 26, and 27 the spool continues to build up until finished. This continues until the spool is of the desired size and may continue until just before it is time to cause the next partially-formed spool to take its second position, whereupon it is ejected. This ejection of the finished spool is accomplished by releasing the detents 25. To begin with, the detents 25 are supported on levers 28, keyed to a shaft 28^a. Keyed upon the same shaft is another lever 29, which is engaged by the hooks 30, pivoted at 30^a. 31 is an adjustable stop carried by the frame 31^a, which rocks on the center 31^b and carries the pawl 31^c, which, as shown in Fig. 5, in its normal position engages in a notch in the frame 10. The lever 23 carries an adjustable stop 23^b adjacent the pawl 31^c. Now as the lever 23 is lifted and when it reaches a certain height the stop 23^b engages the pawl 31^c, freeing it from the notch in the frame 10, whereupon the frame 31^a drops toward the roll 14. In this movement the stop 31 trips the hook 30, freeing it from lever 29, which thereupon drops, carrying down lever 28 and detent 25. This frees the spindle 12 of the completed spool, which may then move out either by gravity or by the assistance of the heads 24^a on the frame 24, which move in a direction to eject the finished spool. The next succeeding head 24^a then takes up against the rear of the partially-formed spool, which shortly reaches the predetermined size to cast off the hooks 19 to allow the detents 15 to drop, whereupon, as before stated, the partially-formed spool moves into the second position, taking the place of the finished spool. To limit the movement of the frame 31^a, I provide a roll 31^d, which bears upon the surface of the partially-finished spool as it stands in its first position.

To restore the detents 15 and 25 and the frame 31^a to their normal positions—to wit, that shown in Fig. 3—I provide the following mechanism: To restore detent 15, I provide an arm 16^a, which stands adjacent to a gear-wheel 32, which may have a projection 32^a, which once in every revolution will engage the arm 16^a, lifting the lever 16 and the lever 18 and detent 15 until the hook 19 shall again engage said lever 18. To restore the detent 25, I provide an arm 29^a, keyed to the shaft 28^a, the free end of said arm 29^a standing in the path of movement of a projection 33, mounted on a gear-wheel 33^a. When the lever 29^a stands in the position indicated in dotted lines, Fig. 3, the projection 33 will strike said lever and throw it back to the position indicated in solid lines, wherein the hook 30 will engage the lever 29 and hold it in the position indicated in Fig. 3, in which position the detents 25 stand in the path of movement of the spindle 12 of the spool being completed.

The roll 31^a is in the form shown the only idle roller, the drums 14, 26, and 27 being posi-

tively driven at all times. This driving is effected by means of gear-wheels 14^b, 32, and 33^a, the gear 14^b being mounted on the same shaft with the drum 26, while the gear 32 acts as an intermediate gear to connect the first two.

The roll 27 is driven by means of a belt 27^c, which leads to a pulley keyed on the shaft 27^b. This shaft 27^b is driven by a belt 33^b, leading from a pulley adjacent to the gear 33^a and to a second pulley keyed on the shaft 27^b. By this train of gearing and belts the rotative movement of the roll 14 is transmitted to all of the rolls excepting 31^a.

34 is a belt from the main driving-shaft to a pulley mounted on the shaft 14^a.

35 is a main driving-shaft, from which power may be transmitted to the entire apparatus—for example, by the belt 36 to the paper-machine and by the belt 37 to the final rolling apparatus, hereinafter referred to. A belt 38 may lead from the winding-machine to the gluing apparatus, so as to rotate the gluing-roll 5, while the conveyers 3, 6, and 7 may be driven by means of any suitable belts leading thereto from any other adjacent power-driven part.

The web-severing apparatus comprises a reciprocating knife or breaker 39, (see Figs. 1 and 2,) which preferably has an angular face, as shown in Fig. 2. 39^a is a reciprocating rod connected to the breaker 39. 39^b is a roll adapted to bear against the multiple cam 40, which may be mounted on the same shaft with the roll 13, so that as the latter rotates step by step whenever it is desired to feed an unwound spindle into the winding-machine the strip of paper web will be severed by the reciprocal action of the breaker 39, actuated by one of the points of the multiple cam 40.

In the diagrammatic views Figs. 11 to 14 I have shown the cycle of operation conventionally in a manner that will be perhaps best understood. In Fig. 11 I have shown a spool A in its second position and about finished, the short unwound end of the web being shown as resting upon the drum 14. An unwound spindle 12 is shown in place, with the adjacent end of a new strip of web 2 about to encounter it. When this occurs, the web clings thereto and winds thereon, and meanwhile the finished spool A may continue to be operated on by the several arms adjacent thereto, which serve to compact the convolutions of the said spool preparatory to discharging it. In Fig. 12 the spool 2 is being delivered and the spindle 12 is shown as having been partially wound. The frame 24 with the heads 24^a is shown as ejecting the finished spool A. In Fig. 13 the finished spool is entirely ejected and one of the heads 24^a of the frame 24 lies to the rear of the partially-formed spool in the first position, the idle-roll 31^a has dropped by reason of the fact that the hook 30 has been released, and said roller is pressing upon the barrel

portion of the partially-formed spool. When this spool has been built up to a certain degree as before explained, the detents 15 drop to allow the said partially-formed spool to be transferred to the second position. (Shown in Figs. 11 and 14.) In Fig. 14 the spool is in the second position to receive the final winding and the next unwound spindle 12 has not yet been released. The next position of the parts is shown in Fig. 11. Thus Figs. 11 to 14 show successive steps in the cycle of operation of the apparatus.

Referring back to Fig. 1, it will be seen that when the finished spool is discharged it may ride down the incline 41 to the final rolling and shaping apparatus, which compresses each spool and gives it its final and definite shape, from whence it is removed or discharged automatically, so as to ride down the delivery-incline 42. As the particular construction of this rolling apparatus forms no part of this invention, I need not describe the same in detail further than to say that the spool is subjected to high compression between the power-driven revolving shaping-rollers 43, 44, and 45, which give to the spool its final contour and finish.

What I claim is—

1. In an apparatus of the character described, a driving-drum having a porous surface, a non-porous spindle for receiving the free end of a web of pulp, said spindle pressing toward said drum and being rotated thereby, means for holding said spindle in a position to cause said web to be wound upon the same to build up a body of predetermined diameter, means for releasing said body when it has attained a predetermined diameter, a second driving-drum and means for transferring said spindle to said second driving-drum and for releasing and bringing a second spindle into the position originally occupied by the first-mentioned spindle.

2. In an apparatus of the character described, a driving-drum having a porous surface, a non-porous spindle for receiving the free end of a web of pulp, said spindle pressing toward said drum and being rotated thereby, means for holding said spindle in a position to cause said web to be wound upon the same to build up a body of predetermined diameter, means for releasing said body when it has attained a predetermined diameter, a second driving-drum and means for transferring said spindle to said second driving-drum and for releasing and bringing a second spindle into the position originally occupied by the first-mentioned spindle, and means for severing the web and conveying the free end of the severed web to the said second-mentioned spindle.

3. In a tube or spool making machine, means for feeding a web of pulp thereto, a spindle for receiving the same, means for rotating said spindle so as to cause said web to build

up convolutely thereon, said spindle being yieldingly supported by said rotating means, means for breaking said web at certain predetermined lengths and for transferring the partially-formed spool to a second position, means for continuing to rotate said spindle and partially-formed spool until it assumes a predetermined size and means for releasing said completed spool and spindle.

4. In an apparatus of the character described, a plurality of driving-drums, spindle-feeding apparatus, means for conveying said spindles to said driving-drums successively, whereby said spindles may be yieldingly supported thereon, means for holding said spindles adjacent to each of said driving-drums for certain predetermined periods and means for feeding a web of paper-pulp to said spindle and means for severing said web at certain predetermined points.

5. In a spool or tube making machine arranged to wind a pulp web in convolute form in combination, a smooth, imperforate non-porous mandrel or spindle, a driver adjacent thereto, the surface of said driver being relatively porous, said pulp web passing between said porous driver and said mandrel or spindle,

6. In a spool or tube making apparatus arranged to wind a pulp web in convolute form in combination, a driving-drum having a porous bearing-surface, a smooth, imperforate mandrel or spindle having a relatively non-porous surface arranged to bear upon said driving-drum and receive and hold said web.

7. In a spool or tube making apparatus arranged to wind a pulp web in convolute form in combination, a driving-drum having a porous bearing-surface, a mandrel or spindle having a relatively non-porous surface arranged to bear upon said driving-drum and receive and hold said web, a second driving-drum and means for moving said spindle having a partially-formed spool or tube thereon into engagement with said second driving-drum and means to automatically break the web leading to said mandrel or spindle.

8. In a spool or tube making machine, a driving-drum, a spindle for receiving a pulp web, said spindle being rotated by said driving-drum, detents for holding said spindle adjacent to said drum, automatic means for releasing said detents when the tube or spool body on said spindle has assumed a certain size, means for shifting said spindle and partially-formed spool to a second position, a second driving-drum supporting said spindle and partially-formed spool in said second position to complete said spool, detents adjacent thereto to hold the spindle in said second position and automatic means for releasing said detents and discharging said spindle and completed spool from said winding-machine.

9. In an apparatus of the character described, a plurality of driving-drums, having non-yielding supports, a plurality of movable

spindle-holding detents adjacent thereto, a spindle-feeding mechanism, a web-feeding mechanism, a presser-roll adjacent to one of said driving-drums arranged to press toward
 5 the same, means for automatically and independently operating said detents to release said spindles and means for conveying the spindles successively to said driving-drums and in engagement with said detents and
 10 finally discharging said spindle.

10. In an apparatus of the character described, a plurality of driving-drums having non-yielding supports, a plurality of movable spindle-holding detents adjacent thereto, a
 15 spindle-feeding mechanism, a web-feeding mechanism, a presser-roll adjacent to one of said driving-drums arranged to press toward the same, means for automatically and independently operating to press toward the same,
 20 means for automatically operating said detents to release the spindles and means for conveying the spindles successively to said driving-drums and in engagement with said detents and finally discharging said spindle, and means
 25 for breaking said web.

11. In a tube or spool making apparatus for winding pulp web in convolute form in combination, a spindle, means for yieldingly supporting said spindle, driving means, means to
 30 feed a pulp web into the space between said spindle and driving-drum and means for applying a binding or adhesive agent to one surface of said web.

12. In a tube or spool making apparatus for
 35 winding pulp web in convolute form in combination, a spindle, means for yieldingly supporting said spindle, driving means, means to feed a pulp web into the space between said spindle and driving-drum, means for applying
 40 a binding or adhesive agent to one surface of said web and means for breaking said web at certain predetermined lengths.

13. In an apparatus for making spools or tubes, means for making a moist pulp web in
 45 combination with means coacting therewith and arranged to apply to one surface of said web a binding or adhesive agent and means

for winding said web into convolute form to a certain predetermined size and means for automatically breaking said web at certain
 50 predetermined lengths, substantially as described.

14. In an apparatus for making spools or tubes, means for making a moist pulp web in combination with means coacting therewith
 55 and arranged to apply to one surface of said web a binding or adhesive agent and means for winding said web into convolute form to a certain predetermined size and means for automatically breaking said web at certain prede-
 60 termined lengths substantially as described, and an apparatus coöperating with the aforesaid apparatus and arranged to compress and shape the spool after it is delivered from the winding apparatus.
 65

15. In a spool-making apparatus, means for making a moist web of pulp or the like, means for reinforcing the edges of said web to thicken the same relatively to the central or body portion of said web, means for applying a binding
 70 or adhesive agent to one surface of said web and for breaking said web at certain predetermined lengths and means coöperating with the aforesaid means for winding said sections of web in convolute form and pressing
 75 each layer thereof into intimate contact with the underlying layer, substantially as described.

16. In a spool-making apparatus, a spindle for receiving a strip of web, means for revolving
 80 said spindle and winding said web thereon and means located adjacent to the edges of the web and bearing frictionally thereon for clamping the ends of said web toward said spindle and a presser-roll intermediate of said
 85 clamping means arranged to compress the intermediate portion of the web.

Signed at South Windham, Connecticut, this
 9th day of February, 1904.

ROBERT BINNS.

Witnesses:

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 S. ARNOLD PECKHAM.