No. 767,193. PATENTED AUG. 9, 1904.

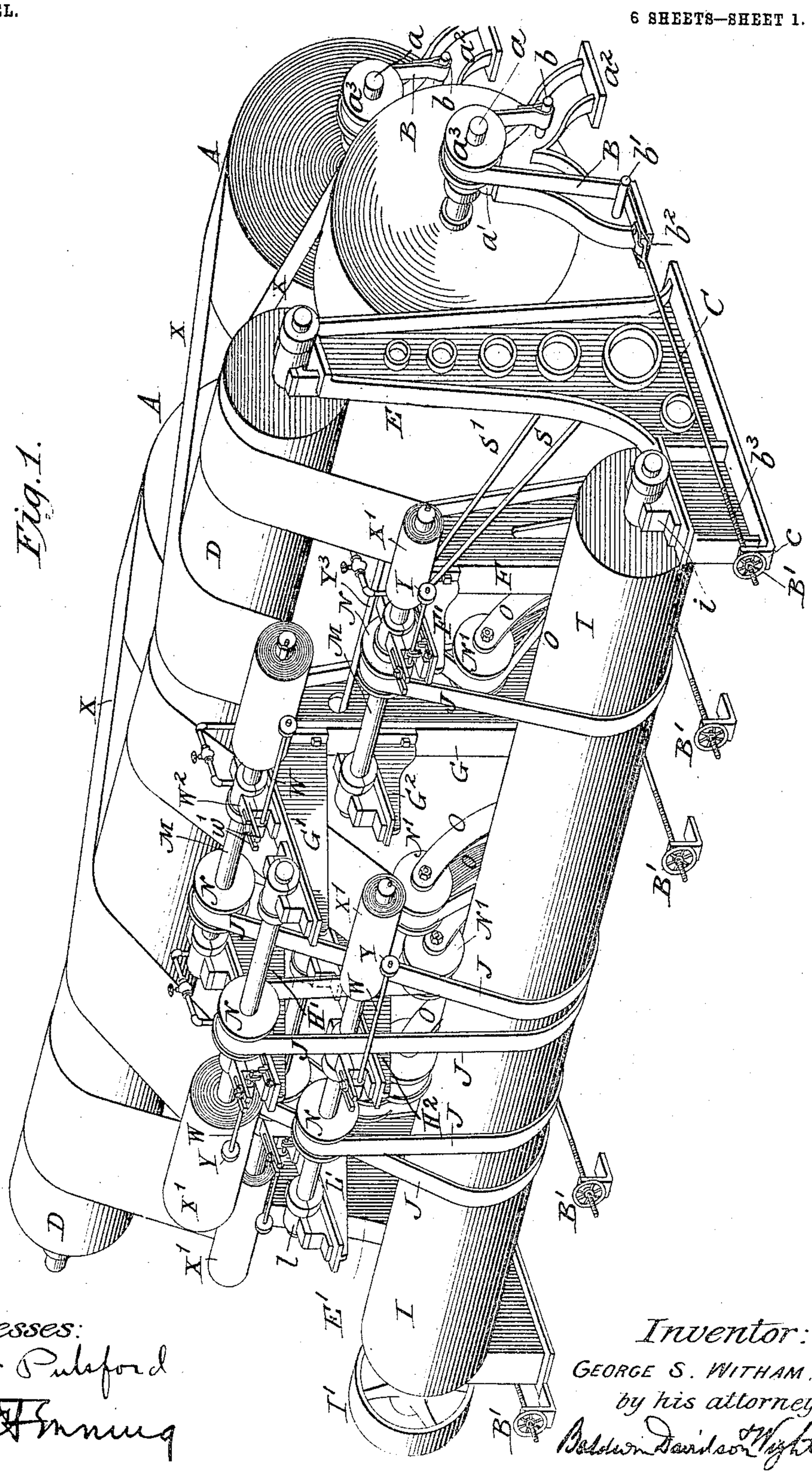
G. S. WITHAM.

PAPER WINDING MACHINE.

APPLICATION FILED JAN. 14, 1904.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1.



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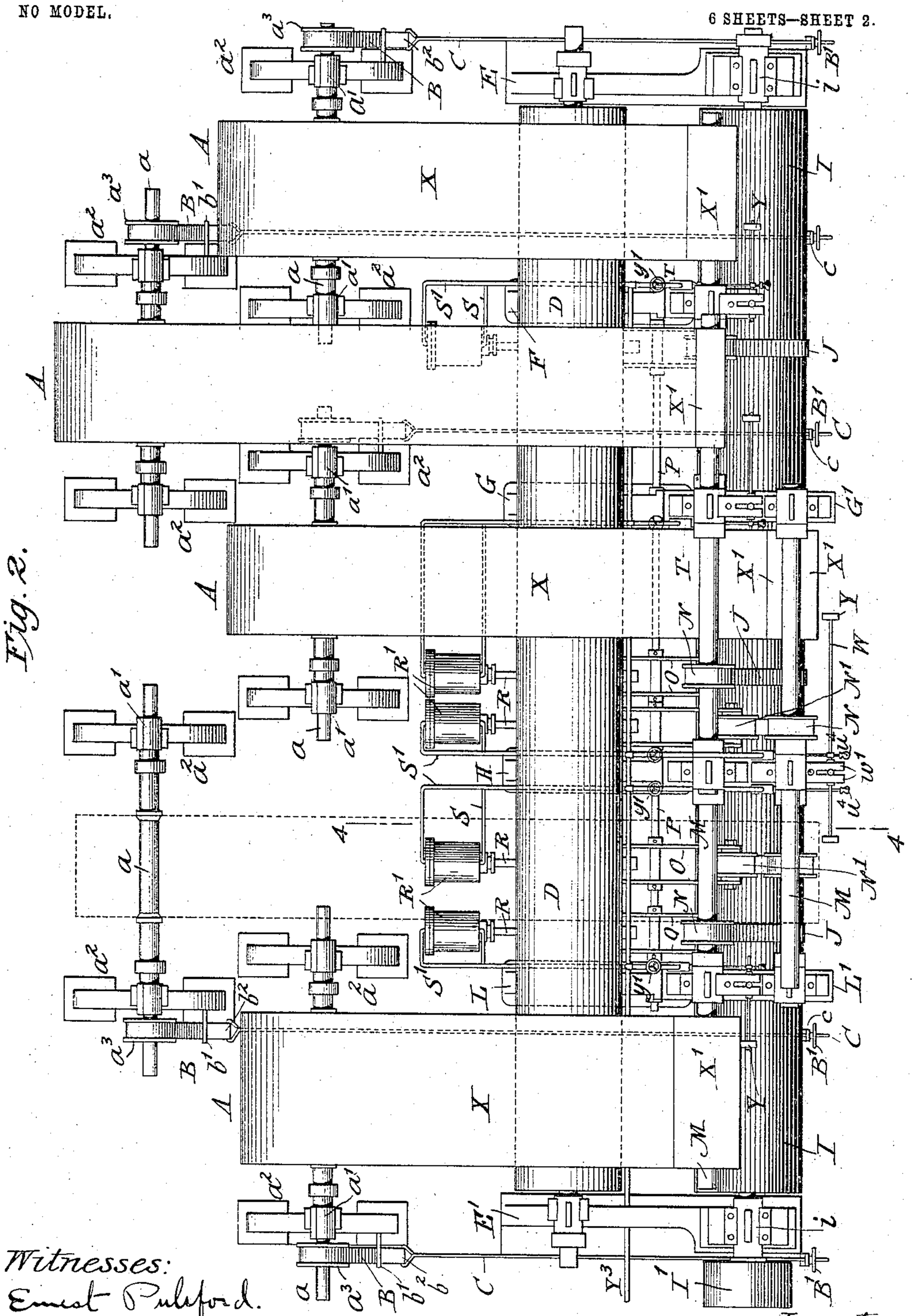
NO MODEL. 6 SHEETS—SHEET 2.



Witnesses:
Ernest Pulsford.

Inventor:
GEORGE S. WITHAM,
by his attorneys
Baldwin Davidson & Wright.

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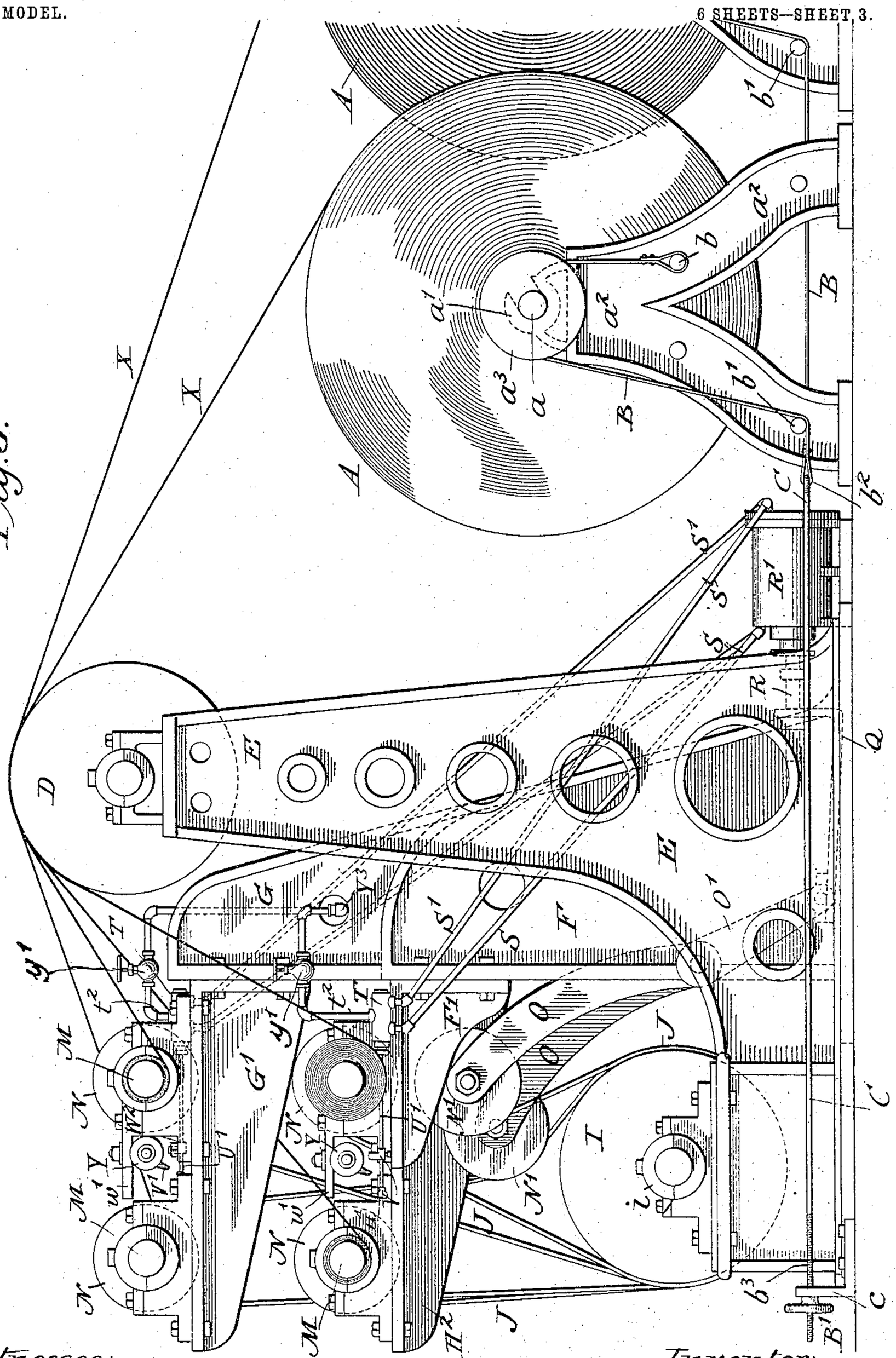
NO MODEL. 6 SHEETS—SHEET 3.

Fig. 3.



Witnesses;
Ernest Pulsford.
[illegible]

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NO MODEL. 6 SHEETS—SHEET 4.

Fig. 5.

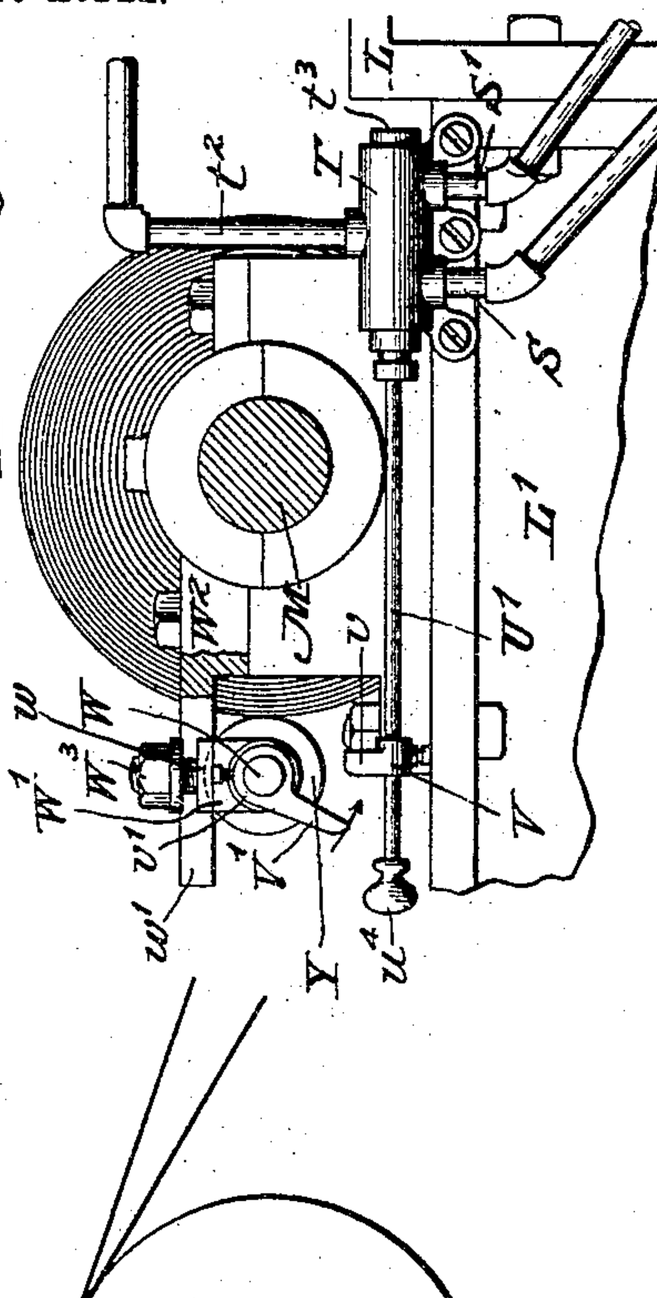

Fig. 6.

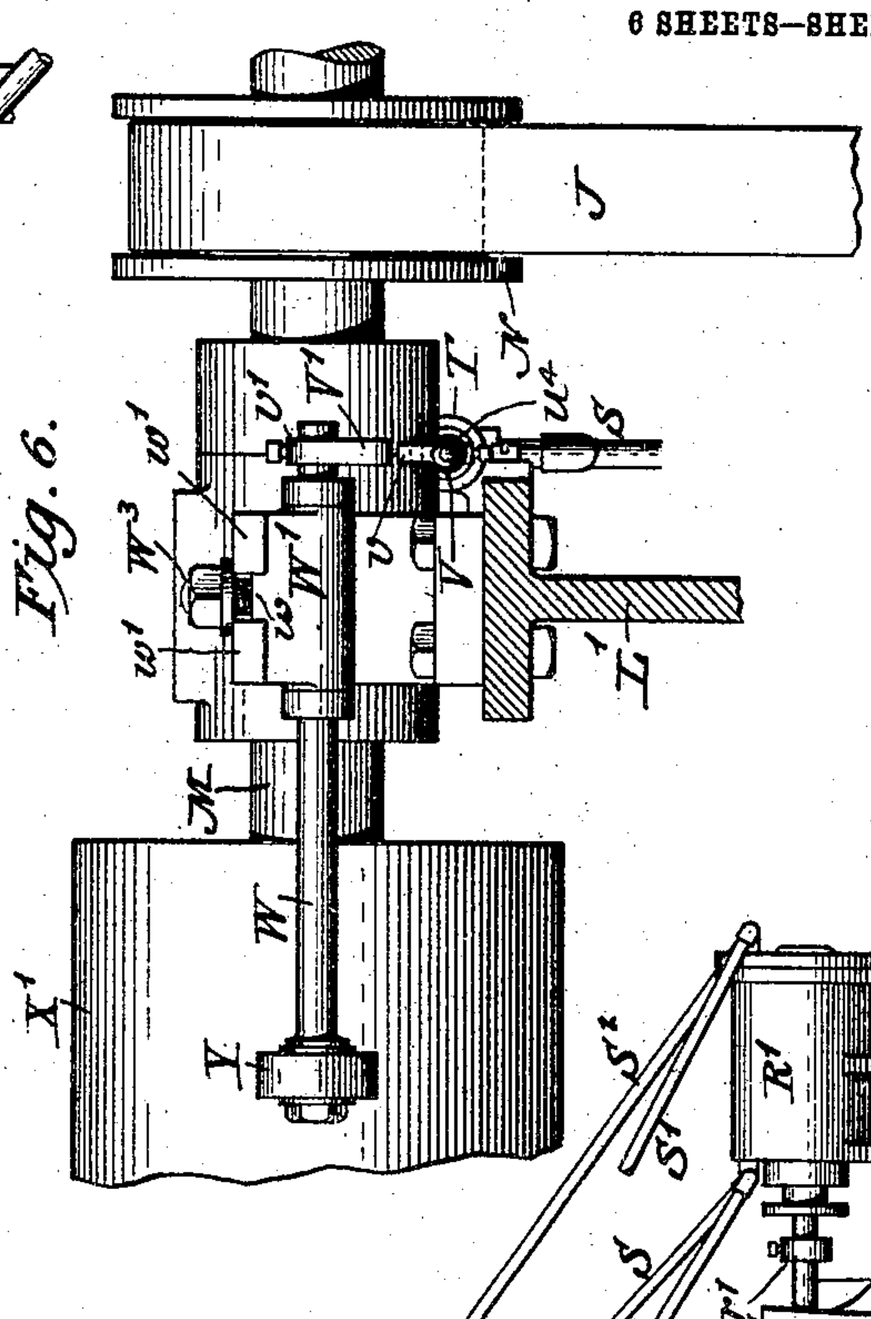

Fig. 4.

Witnesses:
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NO MODEL. 6 SHEETS—SHEET 5.

Fig. 7.

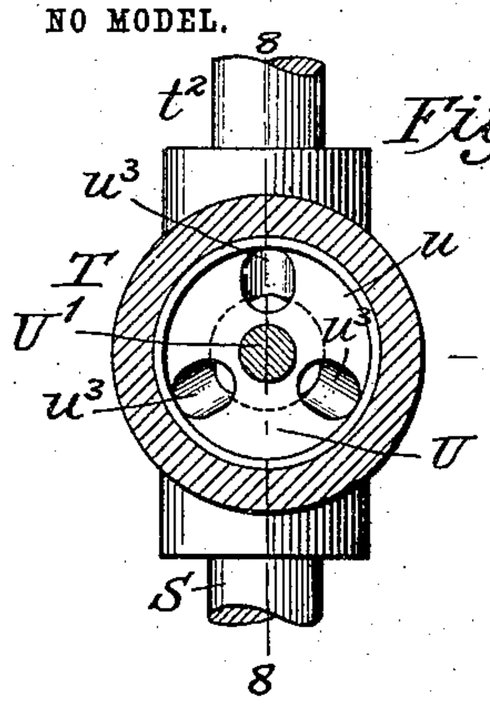


Fig. 8.

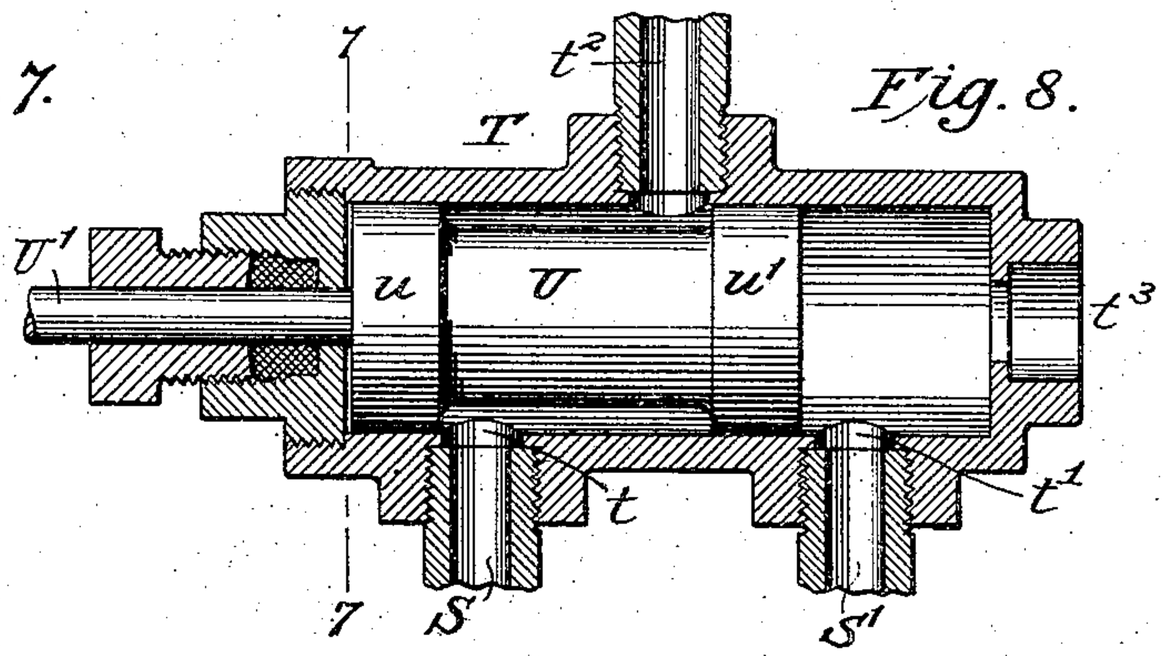


Fig. 9.

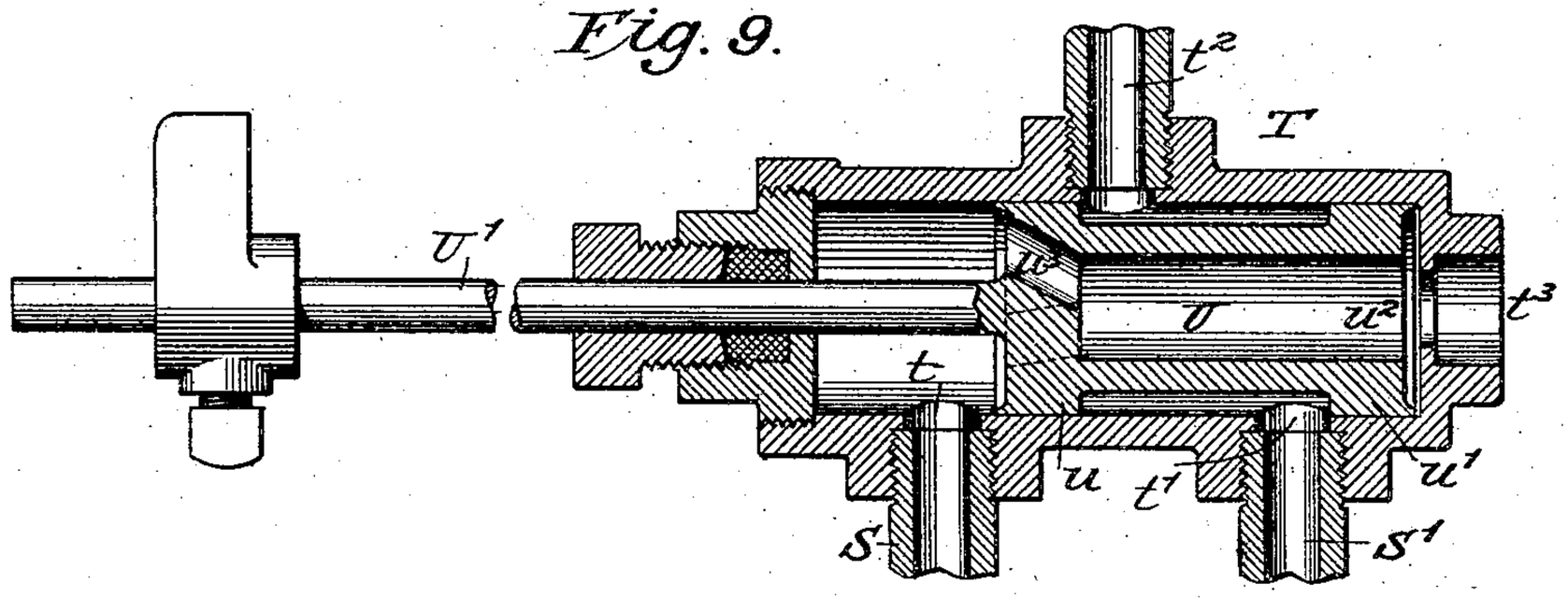
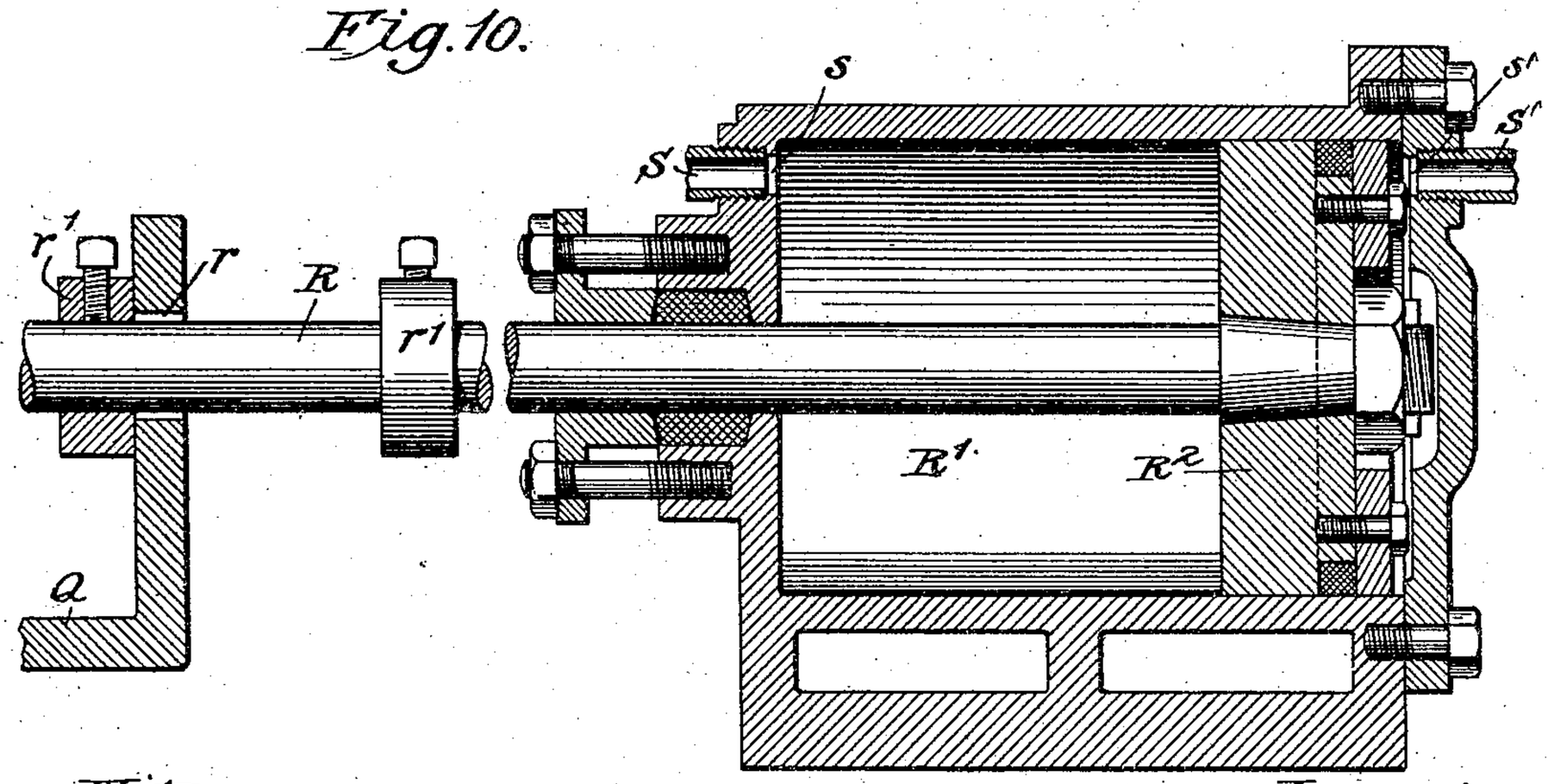


Fig. 10.



Witnesses;
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A. W. Fleming

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No. 767,193. PATENTED AUG. 9, 1904.

G. S. WITHAM.

PAPER WINDING MACHINE.

APPLICATION FILED JAN. 14, 1904.

NO MODEL. 6 SHEETS—SHEET 6.

Fig. 11.

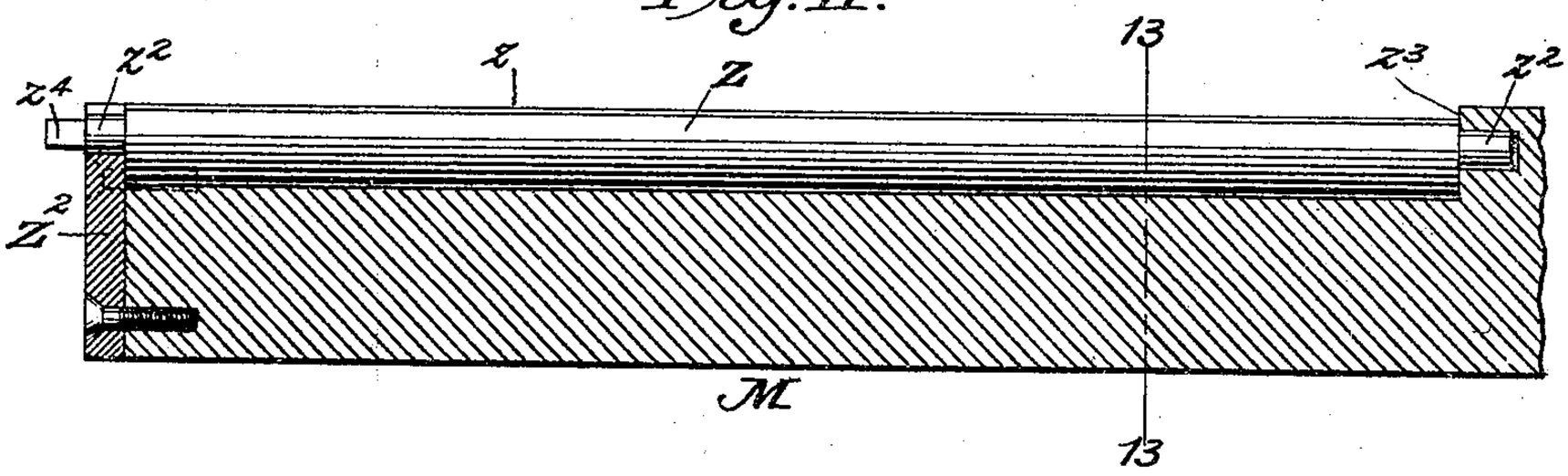


Fig. 12.

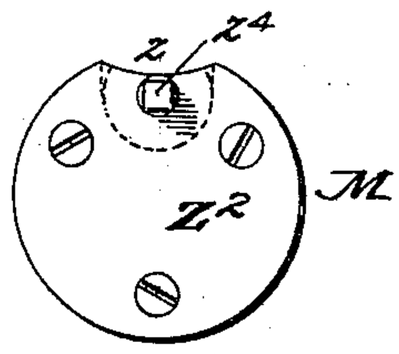


Fig. 13.

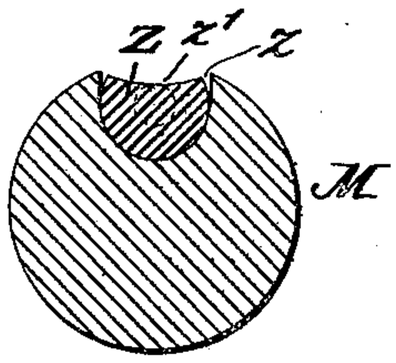


Fig. 14.

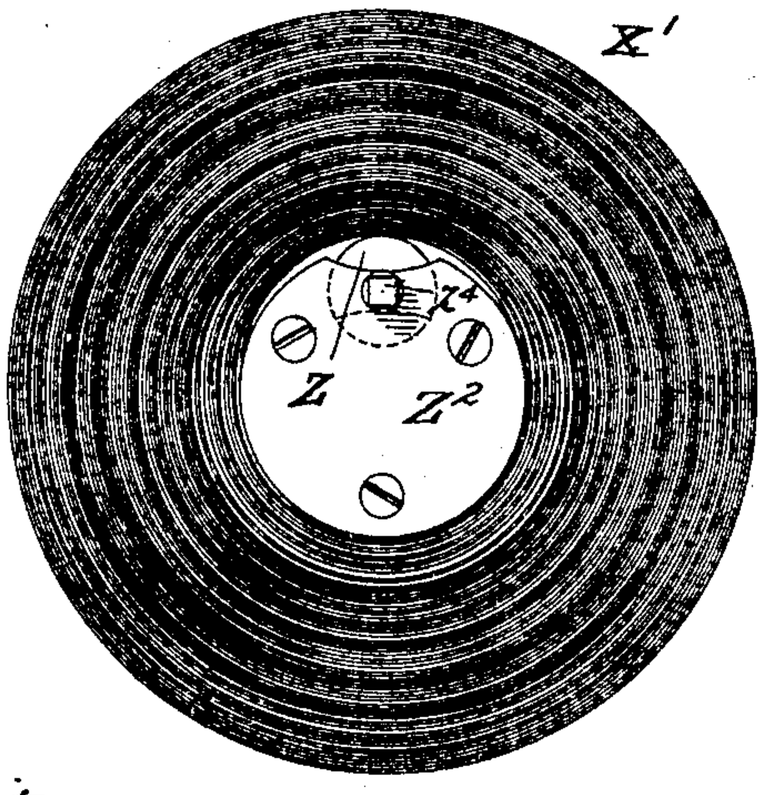
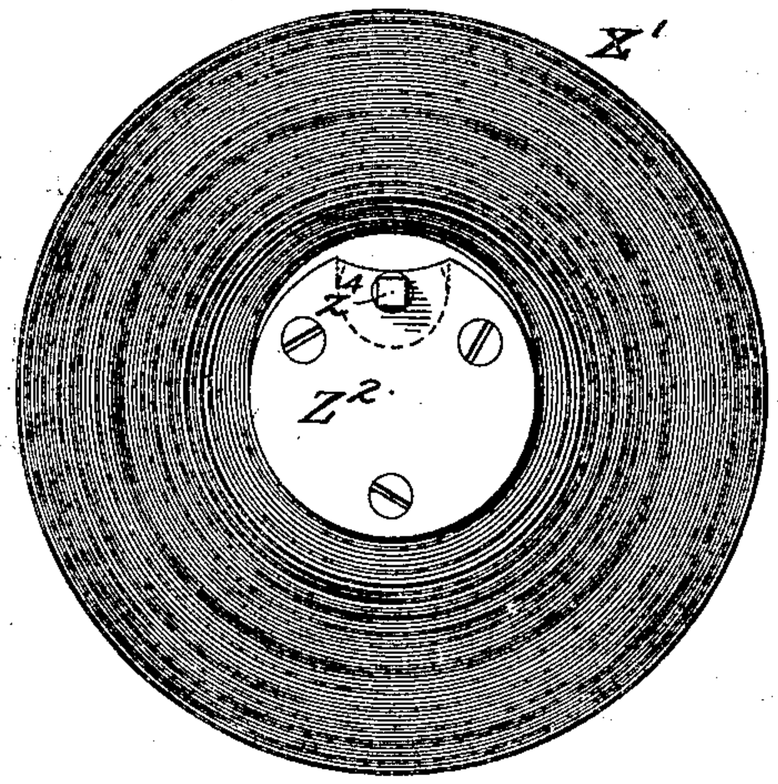


Fig. 15.



Witnesses:
Ernest Pulsford.
[illegible]

Inventor:
GEORGE S. WITHAM,
by his attorneys
Baldwin Davidson & Wright.

No. 767,193. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

GEORGE S. WITHAM, OF MILLINOCKET, MAINE.

PAPER-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 767,193, dated August 9, 1904.

Application filed January 14, 1904. Serial No. 189,044. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. WITHAM, a citizen of the United States, residing in Millinocket, in the county of Penobscot and State of Maine, have invented certain new and useful Improvements in Paper-Winding Machines, of which the following is a specification.

My invention relates to that class of paper-winding machines in which webs of paper from rolls of large diameter are wound into smaller rolls on rapidly-revolving spindles. Paper as it comes from a paper-making machine and calenders is usually very wide, and this wide web is split into narrower webs and rewound into relatively short rolls of large diameter. These last-mentioned rolls of paper then have the webs drawn from them and wound into rolls of small diameter suitable for shipment. Such rolls as used by merchants are usually nine inches in diameter.

My invention relates particularly to machines for forming these last-mentioned rolls of small diameter; and the object of my invention is to provide a machine in which such rolls may be rapidly and accurately formed and may be readily removed when the required diameter has been reached.

Heretofore it has been customary to form several rolls of small diameter on a single revolving shaft or spindle, and it has been necessary if one of the webs of paper is broken to stop the rotation of this spindle, thus delaying the formation of all the rolls thereon. It has been also necessary to form the rolls simultaneously and to remove the spindle or shaft from its bearing when removing one or more of the rolls. It has, however, been proposed to wind the rolls on separate shafts or spindles; but such shafts have been mounted in bearings at each end, and in order to remove the rolls from the shafts it has been necessary to lift the shafts from their bearings.

One feature of my invention consists in mounting the winding-spindles in such manner that the portions thereof upon which the paper is wound are unsupported at one end, so that when the roll is completed it may be slipped off endwise from the spindle without disturbing the bearings.

Another feature of my invention consists in an improved device for releasing the roll from the spindle when it is desired to remove the former from the machine.

It is desirable that the machine should be able to wind several rolls of paper simultaneously, but not necessarily coincidently—that is, one roll may be nearly completed while the other is just commenced. Sometimes the formation of a roll is delayed because of the breakage of the paper web used in the formation of another roll. Therefore it is desirable that the winding mechanism should be easily controlled and that one winding-spindle may be quickly stopped without stopping the operation of other spindles.

In my improved machine each winding-spindle is separately driven and the driving mechanism is controlled by gearing which may be quickly thrown into and out of operation, the controlling means being within easy reach of the attendant. The particular means which I have adopted for this purpose consists in driving each spindle by means of a belt with which engages an idle pulley that is controlled by fluid-pressure-operated devices that cause the pulley to be pressed against the belt or withdrawn therefrom, as may be desired. The fluid-pressure devices are controlled by valve mechanism which may be adjusted by devices within easy reach of the attendant, or they may be automatically operated, if desired, in such manner as to stop the rotation of the spindles as soon as the rolls have attained the desired diameter.

In the accompanying drawings, Figure 1 is a perspective view of a paper-winding machine constructed in accordance with my invention. Fig. 2 is a plan view thereof. Fig. 3 shows a side elevation of the same. Fig. 4 shows a vertical section on the line 4 4 of Fig. 2. The remaining figures are on an enlarged scale. Fig. 5 is a detail view showing the devices for automatically stopping the rotation of the winding-spindle when the roll of paper has attained the desired diameter. Fig. 6 shows another view of these devices. Fig. 7 shows a vertical section on the line 7 7 of Fig. 8 of the valve for controlling the compressed air or other fluid used to operate the

levers which carry the idle pulleys that bear on the driving-belts of the winding-spindles. Fig. 8 shows a vertical section of the same on the line 8 8 of Fig. 7. Fig. 9 is a view similar to Fig. 8 with the valve in section. Fig. 10 shows a section of the piston and cylinder which are connected with the levers that operate the idle pulleys. Figs. 11 to 15, inclusive, are views of the winding-spindle and show the improved clamping-bars which when the paper is being wound hold the convolutions of paper concentric with the axis of the spindle, but which may be turned in such manner as to loosen the rolls on the spindles and permit them to be withdrawn endwise. Fig. 11 shows a longitudinal section of that portion of the spindle containing the clamping-bar. Fig. 12 is a view of the outer end of the spindle. Fig. 13 shows a section on the line 13 13 of Fig. 11. Fig. 14 is an end view of one of the spindles, showing the position of the clamping-bar when paper is being wound upon the spindle. Fig. 15 is a similar view showing the position of the clamping-bar when the roll is completed and it is desired to withdraw it from the spindle.

The main frame of the machine may be constructed in any suitable way, and the main parts may be secured to a bed-plate or to the floor of the room where the machine is located.

In the drawings I have shown a machine adapted to rewind five rolls of paper; but the machine may be constructed to rewind either a smaller or larger number. The large rolls of paper A, from which the paper is drawn to form the smaller rolls, are mounted on shafts a, which rest on bearings a' on standards a^2. These standards are firmly secured to the floor or to a bed-plate. Each shaft a carries a flanged pulley a^3, over which passes a brake-strap B, attached at b to a standard passing over a guide-pin b' on the standard and connected at b^2 to a rod C, extending to the front of the machine and threaded at b^3 to receive a threaded hand-wheel B'. Near its outer end the rod C passes through a guide-bracket c. By this brake mechanism the proper amount of resistance may be applied to the rolls A to make the webs wind tightly on the winding-spindles.

Each web of paper X passes from its roll A over a long drum D, which is preferably made of steel and is mounted in bearings in the top of the end frame-pieces E E' of the machine. This drum is of rather large diameter, and it acts as a drag on the paper, relieving the tension on the paper produced by the winding-spindles. In other words, it sustains part of the strain or tension produced by the spindles, so that if the rolls of paper are slightly "out of round," so as to cause unequal strain to come on one edge of the web, the drum tends to relieve this strain. Between the end frame-pieces E are other vertical frame-pieces or standards F, G, H, and L, which serve to support the winding-spindles in a manner hereinafter described.

The lower front portions of the vertical end frames E support the bearings i for a long driving-drum I, to the shaft of which the driving-pulley I' is attached. This driving-drum may be continuously rotated, and motion is imparted to the winding-spindles by means of belts J in a manner hereinafter described.

It will be observed that the hand-wheels B' for adjusting the brake-straps are all arranged along the front of the machine below the plane of the drum I within convenient reach of the attendant, so that if any web of paper does not run evenly or correctly the attendant may easily make the proper adjustment.

The vertical frame-piece F is provided with a bracket F', which supports one of the bearings for one of the winding-spindles. The vertical frame-piece G carries two brackets G' and G^2. The bracket G^2 supports one of the bearings for one spindle, while the bracket G' supports two bearings of two other spindles. The frame-piece H carries two brackets H' and H^2, also supporting bearings for the winding-spindles in the manner clearly illustrated in the drawings. There is also a vertical frame-piece L similar to the vertical frame-piece F, which supports a bracket L', on which is mounted a bearing l of one of the winding-spindles.

The winding-spindles M are all similar in construction, and they are similarly mounted. Each one of them has two bearings, as illustrated, and to each is attached a flanged pulley N, over which extends a driving-belt J, which is actuated by the driving-drum I. With each belt engages a flanged idle pulley N', carried between two lever-arms O, pivotally mounted on a shaft or rod P, extending horizontally from one end of the machine to the other. The lower or shorter arms O' of the levers are connected with L-shaped connecting-rods Q, each of which is connected with a piston-rod R, that enters a cylinder R', to which compressed air, steam, or other motive fluid is admitted in a manner presently described. The shorter arm of the connecting-rod is perforated, as indicated at r, to permit the piston-rod R to pass through it, and collars r' are adjustably secured to the rod R on opposite sides of the connecting-rod.

If the rod R is moved rearwardly or held in the rearward position shown in Fig. 4, the corresponding belt J will be tightened and motion will be imparted from the drum I to the corresponding winding-spindle. If the piston be moved in the opposite direction, the idle pulley N' will be removed from the belt and the driving connection will be broken, so that the winding-spindle will cease to revolve.

I preferably use compressed air for operating the pistons; but steam or other motive fluid may be used. In fact, so far as part of

my invention is concerned other means may be employed for tightening and loosening the driving-belts J. As shown, however, the rods R enter cylinders R'.

The pistons R^2 are suitably packed and are adapted to move from one end of the cylinders to the other. Each cylinder is provided with ports s s' at opposite ends, which communicate with ports t t' in the valve-casing T by means of pipes S S'.

The valve-casing T is connected with a supply-pipe t^2, and it has an exhaust-port t^3. Within the valve-casing is a piston-valve U, the heads u u' of which closely fit the casing, and the valve is formed between the heads u u' with an annular passage which communicates at all times with the supply-pipe t^2 and which is adapted to alternately communicate with the pipes S S'. As shown in Fig. 9, the valve U is hollow, and it has an open end u^2, communicating at all times with the exhaust-port t^3. This chamber in the valve U also communicates by ports u^3 with the opposite end of the valve-chamber. The valve is attached to an operating-rod U', which is provided with a handle u^4, by means of which it may be moved by hand from the position shown in Fig. 8 to the position shown in Fig. 9, or vice versa. This rod may be also operated automatically in the manner hereinafter described.

When the valve U is in the position shown in Fig. 8, compressed air or other motive fluid will pass from the supply-pipe and through the pipe S to the port s and will hold the piston R^2 at the rear end of the cylinder R', thus holding the idle pulley N' in engagement with the belt J and causing the corresponding winding-spindle to be driven. This is the position of the parts shown in the drawings. If now the valve U be moved to the opposite end of the valve-casing, as shown in Fig. 9, the supply-pipe will be connected with the pipe S' and the motive fluid will pass through the port s', while the fluid in the cylinder will be exhausted through the port s, pipe S, ports u^3, and thence to the exhaust-opening. It will readily be understood that the pulleys N' may thus be made to tighten or loosen the driving-belts very quickly and whenever desired, and as each spindle has its separate driving mechanism any spindle may be started or stopped without interfering with the operation of other spindles. The handles u^4 are all at the front of the machine within easy reach of the attendant.

In order that the winding-spindles may be automatically stopped when the rolls have reached the required diameter, I provide the devices indicated particulary in Figs. 5 and 6. Each valve-operating rod U' carries a collar V, having an upwardly-projecting lug v. The collar is adjustable on the rod U' and may be securely held in any desired position thereon. With the lug v is adapted to engage a finger V', carried by a collar v', attached to a shaft W, supported in bearings in the block W', depending from a bracket W^2, attached to the bearings which support the adjacent winding-spindle. The bracket W^2 is bifurcated, and the block W' has a guiding-lug w between the arms w' of the bracket, and a headed bolt W^3 holds the block W' in place in the manner indicated in Fig. 6. By the devices shown the bearing-block W' may be adjusted toward and from the winding-spindle. The shaft W carries a roller Y, which is adapted to bear against the roll of paper X' when the roll has attained the desired diameter, as indicated in Fig. 5. When the paper has reached this diameter, a rotary motion will be imparted to the roller Y, which will cause the finger V' to move in the direction indicated by the arrow in Fig. 5, and this finger will abut against the lug v, thus pushing the valve-rod U' inward and changing the position of the valve U from that shown in Fig. 8 to that shown in Fig. 9. This movement of the valve causes the idle pulley to be released from the driving-belt J, and when this is done the rotation of the winding-spindle will be stopped. By the devices shown the automatic stopping mechanism may be set for rolls of different diameters without varying the method of operation. The automatic mechanism in no way interferes with the means for stopping or starting the spindles by hand. While the devices which I have shown for starting and stopping the spindles either automatically or by hand are simple and efficient, I do not wish to be limited to the details of construction illustrated, as these may be changed without departing from my invention.

The means for loosening the rolls from the winding-spindles is shown in Figs. 11 to 15, inclusive. It will be understood that when the winding of a web of paper is commenced it is necessary that the spindle should be true and round in order that succeeding convolutions of paper may lie evenly and that a perfect roll may be formed. If this were not so, the paper would either be torn while being wound or an imperfect roll would be produced. The paper should be wound quite tightly, and this being the case after the roll is completed it cannot be withdrawn from the winding-spindle unless some means be provided for loosening the connection between the spindle and the roll of paper. Various devices have been suggested for this purpose; but the device illustrated is found to be more efficient than any with which I am acquainted. As shown, each winding-spindle is formed with a longitudinal groove z, which extends from the outer end of the spindle inward along that part of the spindle on which the paper is wound. Within this groove is arranged a clamping-bar Z, which for the most part is round or cylindrical, but is formed with a flattened or concaved face z'. This

clamping-bar has trunnions z^2, one of which fits in the end wall z^3 of the groove z, while the other extends through a plate Z^2, secured to the outer end of the spindle. This journal is formed with a squared portion z^4, adapted to receive a wrench, by means of which the clamping-bar may be turned. When commencing to wind a roll of paper, the clamping-bar is turned to the position shown in Fig. 14, and when in this position a truly cylindrical roll may be wound on the spindle. After the roll is completed the clamping-bar may be turned to the position shown in Fig. 15, at which time the clamping action will be withdrawn and the roll may be slipped off endwise from the shaft. Each of the five winding-spindles shown is provided with devices of this kind, and as each winding-spindle overhangs its bracket, as clearly shown in Fig. 1, the rolls of paper may be very quickly detached from their spindles without removing the spindles from their bearings or removing any parts of the mechanism from their proper places. In fact, all that it is necessary to do in order to remove the roll of paper from its spindle is to give a slight turn to the clamping-bar Z and to then slip the roll off endwise from the spindle. This may be done without stopping any of the other spindles.

In Fig. 2 I have shown a main supply-pipe Y^3 for compressed air, which may be connected by branch pipes with the separate valve-chambers T, and each of the branch pipes may be provided with a valve y', so that any winding-spindle may be thrown into or out of operation, and its corresponding cylinder R may also be disconnected from the operating fluid.

I claim as my invention—

1. In a paper-winding machine, the combination of a series of winding-spindles each mounted to revolve about a fixed horizontal axis, means for driving the spindles independently, a separate supply-roll for each spindle, and devices for stopping the supply of paper to any one of the spindles without stopping the supply of paper to the others.

2. In a paper-winding machine, the combination of a series of overhanging winding-spindles each mounted to revolve about a fixed horizontal axis, means for driving the spindles independently, a supply-roll for each spindle mounted to revolve about a horizontal axis parallel with that of the axis of the spindle, and devices for stopping the supply of paper to any one of the spindles without stopping the supply of paper to the others.

3. In a paper-winding machine, the combination with a series of winding-spindles each mounted to revolve about a fixed horizontal axis, means for driving the spindles independently, a separate paper-supply roll for each spindle, each mounted to revolve about an axis parallel with that of its spindle, and devices for throwing any of the spindles out of operation without stopping the others.

4. In a paper-winding machine, the combination with a series of supply-rolls, of a drum over which the paper passes, a series of overhanging winding-spindles each mounted to revolve about a fixed horizontal axis parallel with that of the drum, means for driving these spindles independently of each other, and means for stopping the rotation of a spindle without interfering with the operation of the other spindles.

5. In a paper-winding machine, the combination with a series of supply-rolls, of a drum over which the paper passes from the supply-rolls and the axis of which is parallel with that of the supply-rolls, a series of overhanging winding-spindles parallel with the drum and the supply-rolls, a driving-drum, belts connecting the driving-drum with the winding-spindles, and means for tightening and loosening the belts.

6. In a paper-winding machine, the combination with a series of winding-spindles mounted to revolve about horizontal axes, of means for driving them independently, a paper-supply roll for each spindle mounted to revolve about a horizontal axis, brake mechanism for regulating the tension of the paper on said supply-rolls, and devices for throwing any of the spindles out of operation without stopping the others.

7. In a paper-winding machine, the combination of a series of winding-spindles mounted to revolve about fixed horizontal axes, driving-belts for the spindles, idle pulleys engaging the belts, levers carried by said idle pulleys, pistons connected with the levers, valves controlling the admission and exhaust of fluid to the cylinders, and means for adjusting the valves whereby the idle pulleys may be made to tighten or loosen the driving-belts of the winding-spindles to start or stop said spindles.

8. In a paper-winding machine, the combination of a winding-spindle mounted to revolve about a fixed horizontal axis, a driving-belt connected therewith, an idle pulley engaging the driving-belt, a lever carrying said pulley, a piston connected with said lever, a cylinder in which the piston is movable, a valve controlling the admission and exhaust of fluid to and from said cylinder, and devices for moving said valve for the purpose specified.

9. In a paper-winding machine, the combination of a series of winding-spindles each mounted to revolve about a fixed horizontal axis, driving mechanism for the spindles, and means for automatically stopping the rotation of any one of the spindles without stopping the operation of the other spindles when the roll of paper thereon has reached the desired diameter.

10. In a paper-winding machine, the combination with a series of winding-spindles, of driving-belts therefor, idle pulleys for tight-

ening the belts, fluid-operated means for moving the idle pulleys for tightening or loosening the belts, valves controlling the flow of the operating fluid, shafts having fingers adapted to engage the valve-rods and rollers on the shafts adapted to engage the rolls of paper when they have reached the desired diameter.

11. In a paper-winding machine, a winding-spindle formed with a longitudinal groove in combination with a bar confined in said groove adapted to turn on an axis parallel with the axis of the spindle and having a flattened or reduced portion on one side for the purpose specified.

12. In a paper-winding machine, a winding-spindle formed with a longitudinal groove in combination with a clamping-bar arranged in said groove adapted to turn therein about an axis parallel with the axis of the spindle and having a flattened or reduced portion on one side and a convex or circular portion on the opposite side, the arrangement being such that when the convex or circular portion is turned outward paper may be truly wound on the spindle while when the flattened or reduced portion is turned outward the paper-roll may be withdrawn from the spindle in the manner specified.

In testimony whereof I have hereunto subscribed my name.

GEORGE S. WITHAM.

Witnesses:
CLINTON STEVENS,
SIDNEY STEVENS.