No. 669,153. Patented Mar. 5, 1901.

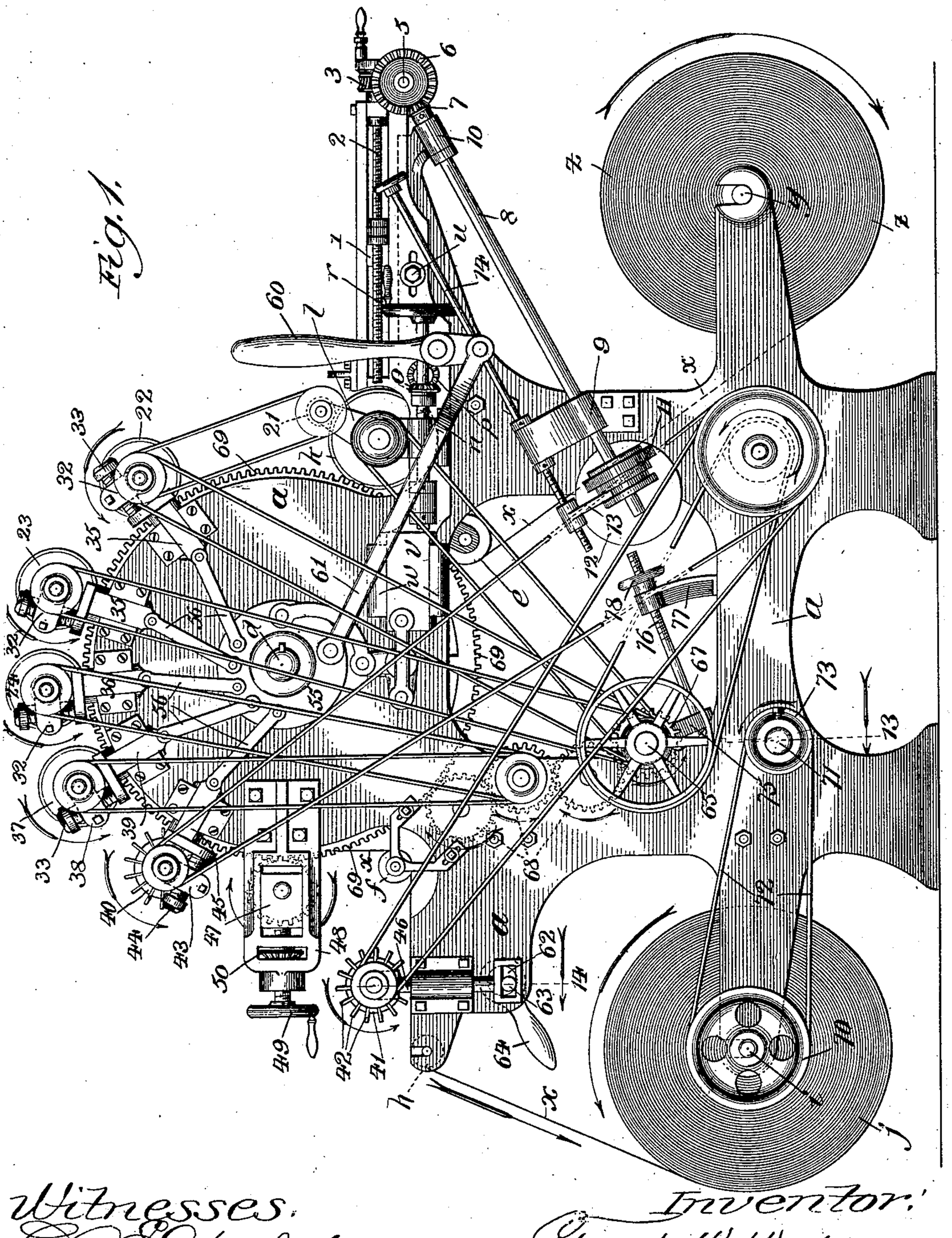
F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

(Application filed Aug. 9, 1900.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.



Witnesses.
Chas. E. Gaylord.
John Enders Jr.

Inventor:
Frank. W. Weeks.
By Thomas F. Sheridan.
Atty.

No. 669,153. Patented Mar. 5, 1901.

F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

(No Model.) (Application filed Aug. 9, 1900.) 6 Sheets—Sheet 2.

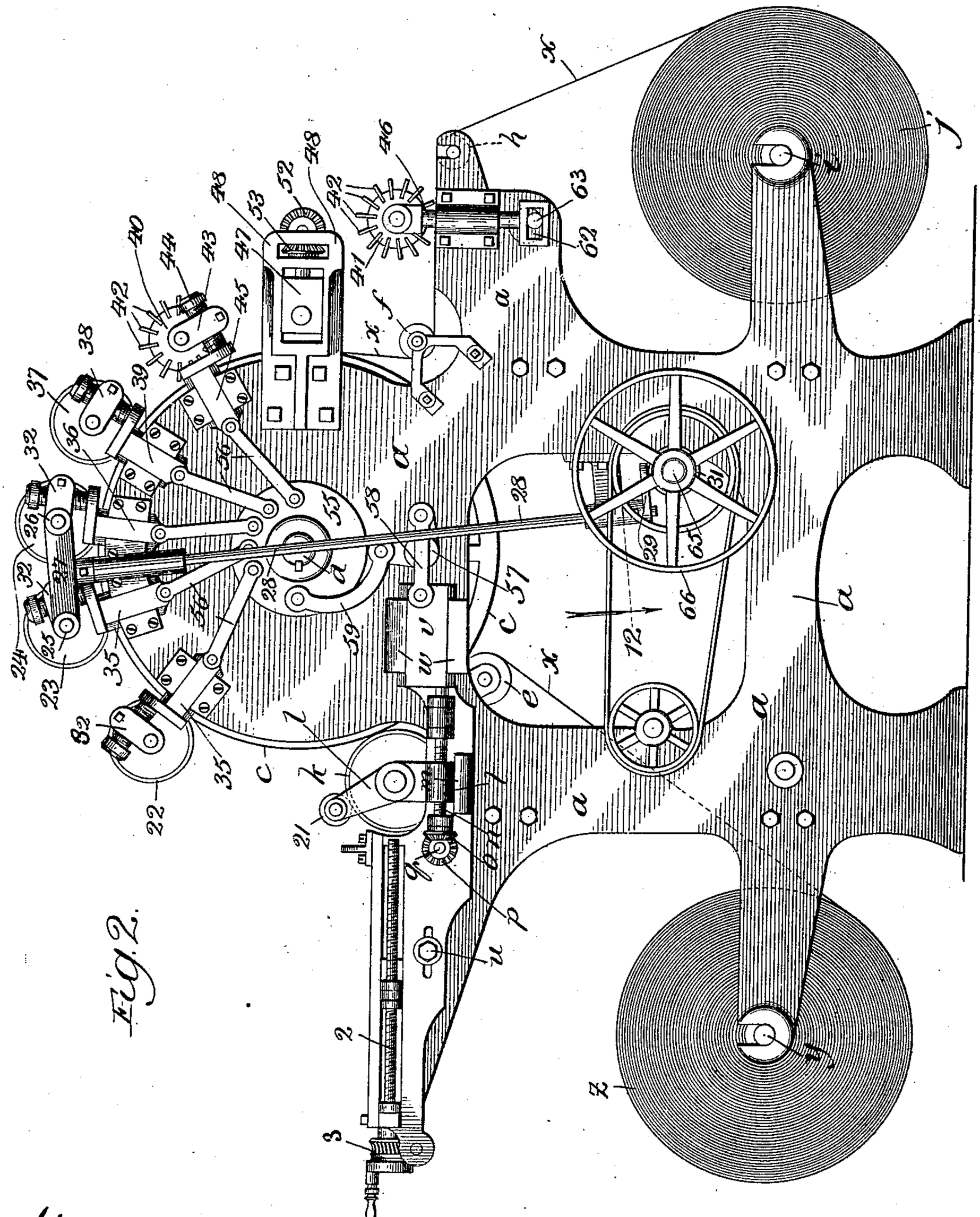


Fig. 2.

Witnesses:
Edw. E. Gaylord.
John Enders Jr.

Inventor:
Frank W. Weeks.
By Thomas E. Sheridan
Atty.

No. 669,153. Patented Mar. 5, 1901.

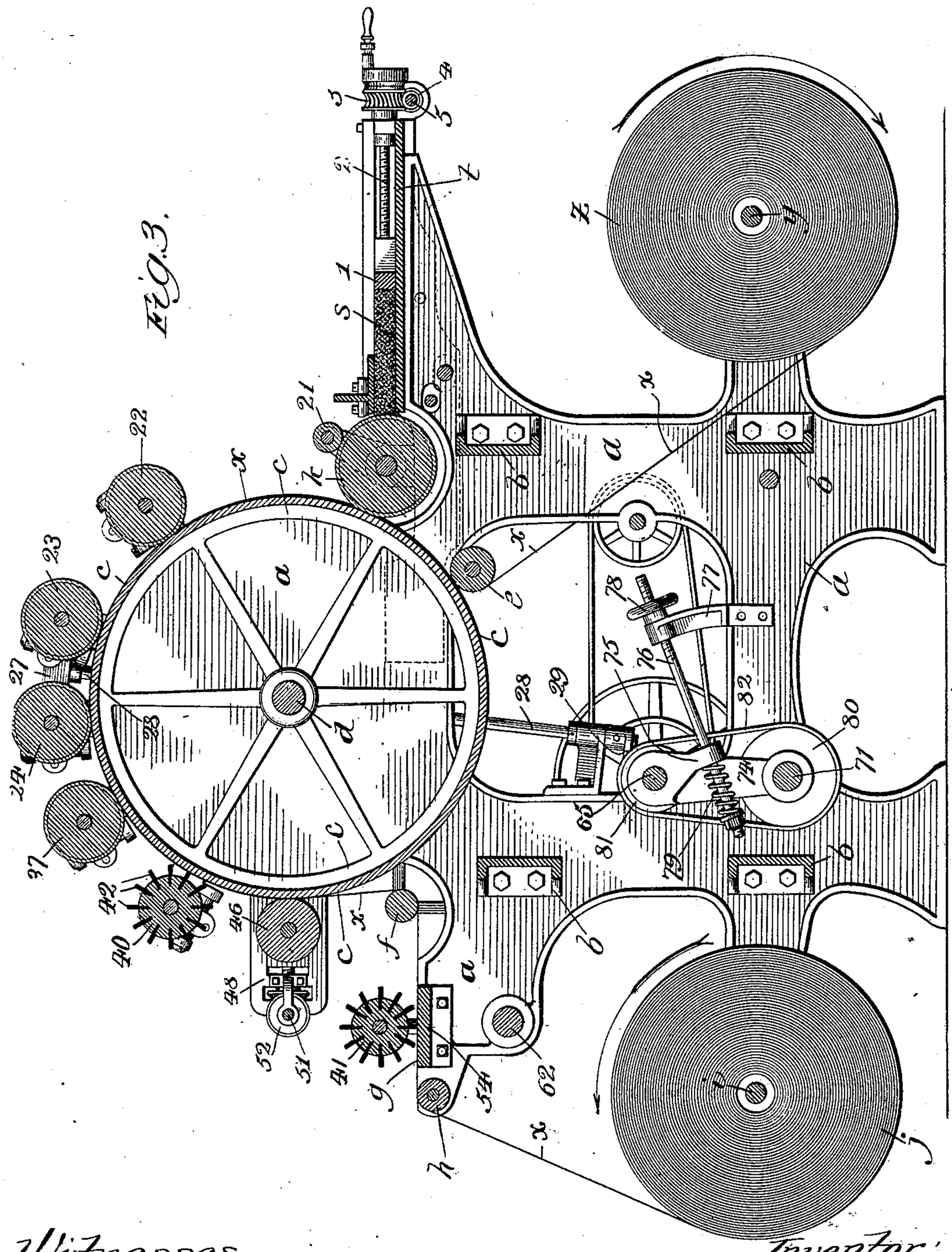
F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

(Application filed Aug. 9, 1900.)

(No Model.) 6 Sheets—Sheet 3.

FIG. 3.



Witnesses.
Chas. C. Gaylord.
John Enders Jr.

Inventor:
Frank W. Weeks.
By Thomas A. Sheridan
Atty

No. 669,153. Patented Mar. 5, 1901.

F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

(Application filed Aug. 9, 1900.)

(No Model.) 6 Sheets—Sheet 4.

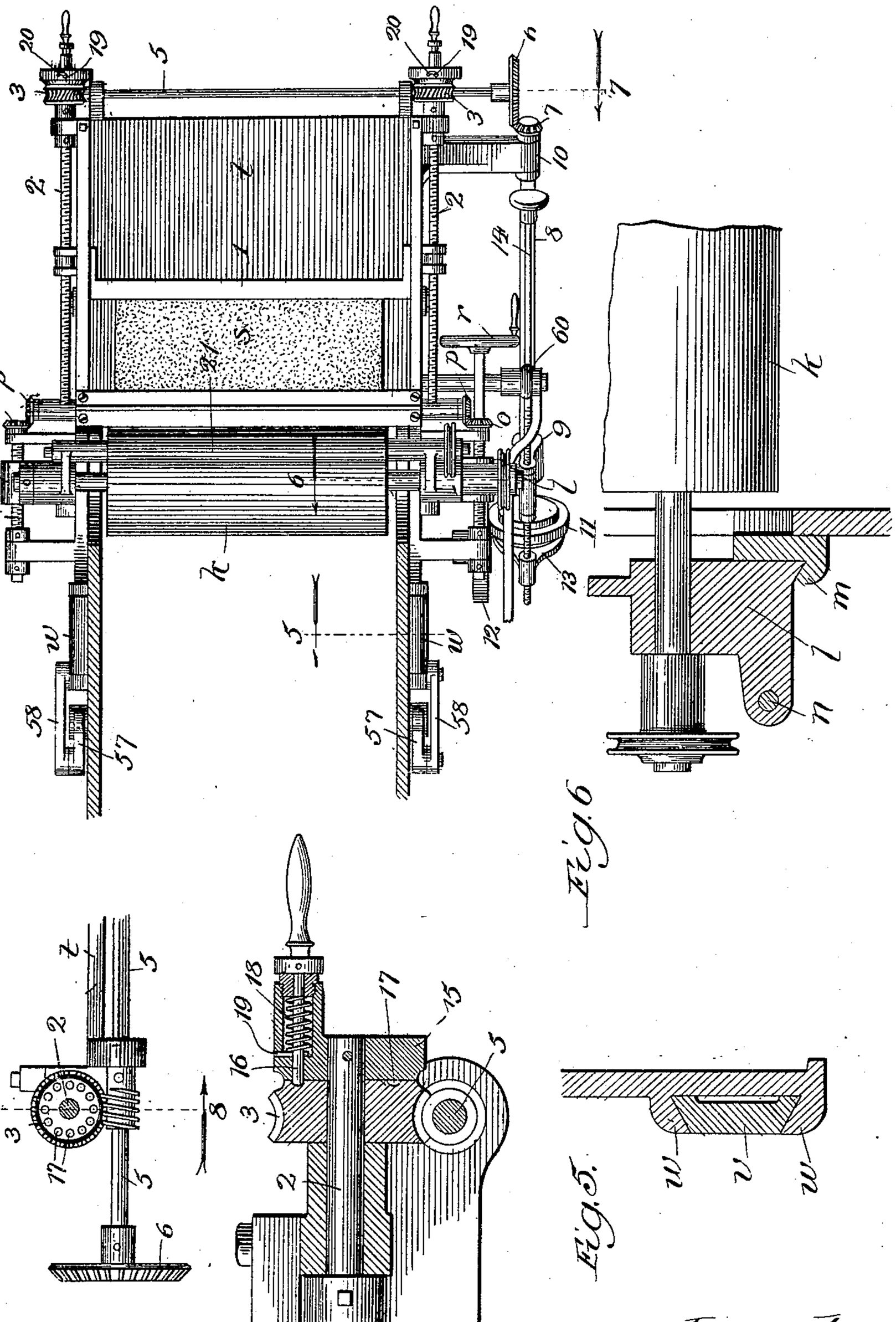


Fig. 4.

Fig. 7.

Fig. 8.

Fig. 6.

Fig. 5.

Witnesses:
Chas. E. Gaylord.
John Enders Jr.

Inventor:
Frank W. Weeks.
By Sherman & Sheridan
Attys.

No. 669,153. Patented Mar. 5, 1901.

F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

(Application filed Aug. 9, 1900.)

(No Model.) 6 Sheets—Sheet 5.

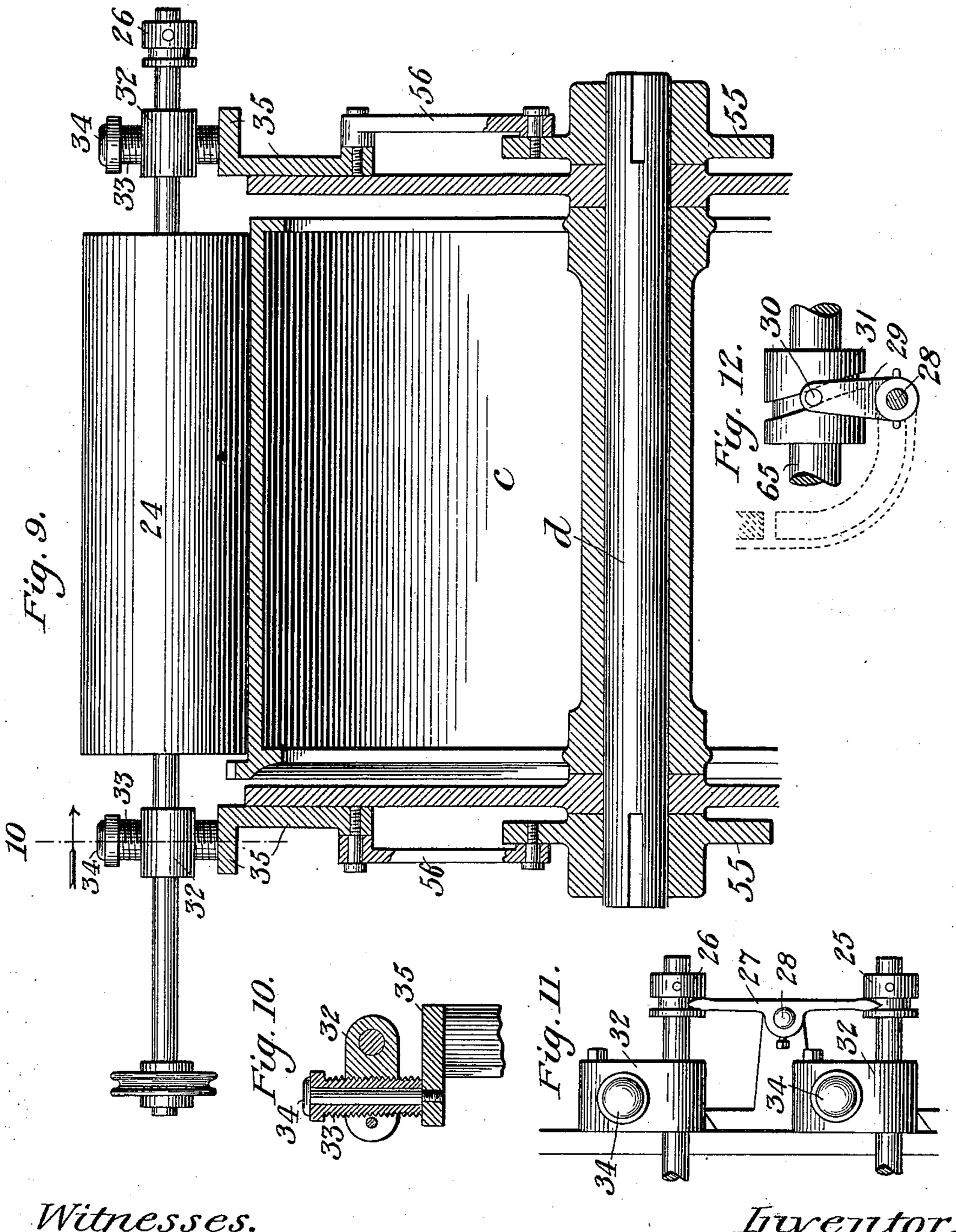


Fig. 9.

Fig. 12.

Fig. 10.

Fig. 11.

Witnesses,
Chas. E. Gaylord.
John Enders Jr.

Inventor,
Frank W. Weeks
By Thomas E. Sheridan.
Atty

No. 669,153. Patented Mar. 5, 1901.

F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

(Application filed Aug. 9, 1900.)

(No Model.) 6 Sheets—Sheet 6.

Fig. 12.

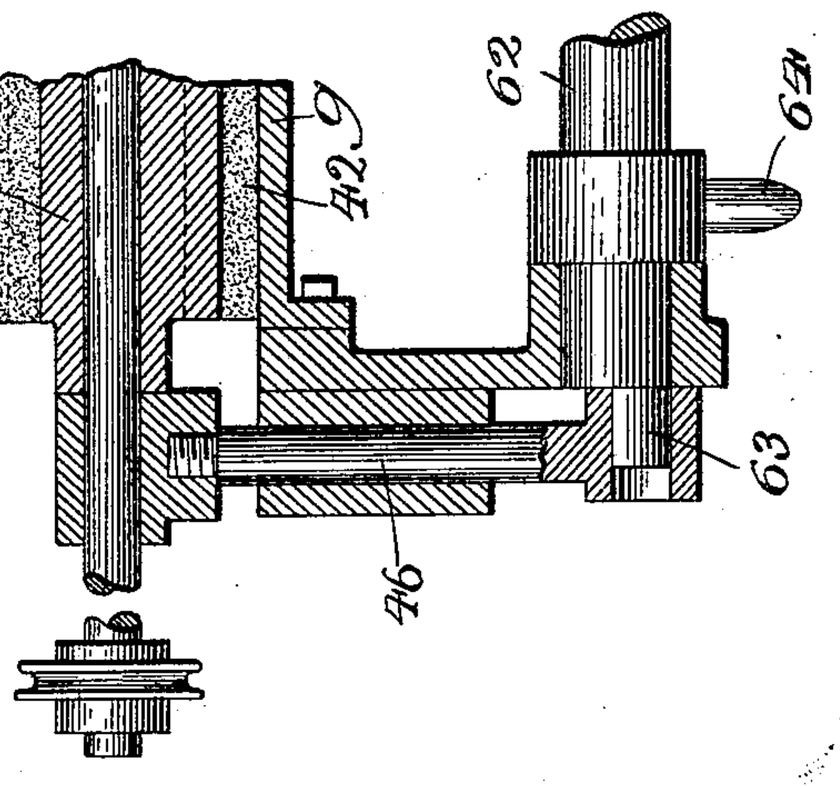
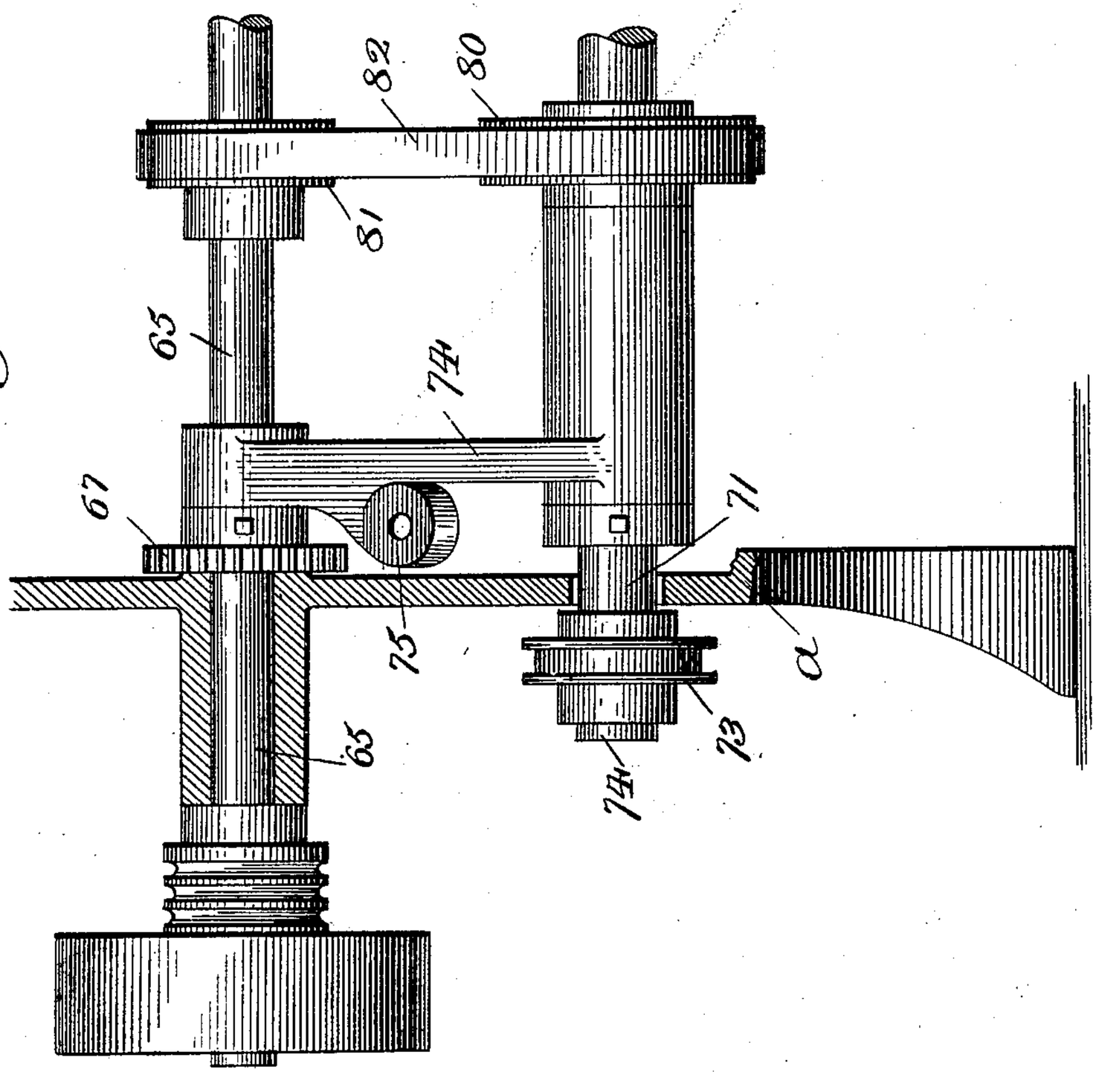


Fig. 13.



Witnesses:
Chas. E. Gaylord.
John Enders Jr.

Inventor:
Frank W. Weeks.
By Thomas G. Hinsdale.
Atty.

UNITED STATES PATENT OFFICE.

FRANK WING WEEKS, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GENERAL MANIFOLD COMPANY, OF FRANKLIN, PENNSYLVANIA.

MACHINE FOR COATING PAPER WITH CARBON OR SIMILAR MATERIALS.

SPECIFICATION forming part of Letters Patent No. 669,153, dated March 5, 1901.

Application filed August 9, 1900. Serial No. 26,362. (No model.)

To all whom it may concern:

Be it known that I, FRANK WING WEEKS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Coating Paper with Carbon or Similar Materials, of which the following is a specification.

This invention relates to that class of machines which are adapted to apply a coating of carbon or similar transferable coloring material to one or both sides of a sheet of paper, which paper may be used for transferring an imprint or impression thereon to an adjacent sheet of paper.

The principal object of the invention is to provide a simple, economical, and efficient machine for affixing, hardening, and polishing carbon on one or both surfaces of a sheet of paper; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a machine constructed in accordance with my improvements. Fig. 2 is a similar view of the opposite side of the machine. Fig. 3 is a sectional elevation of the machine, taken at or about the longitudinal center thereof, with the mechanisms in the position shown in Fig. 1. Fig. 4 is a plan sectional view of a portion of the machine, showing the color-applying mechanism, as will be more fully hereinafter described. Figs. 5 and 6 are enlarged sectional details taken on lines 5 and 6, respectively, of Fig. 4. Fig. 7 is a similar view taken on line 7 of Fig. 4. Fig. 8 is an enlarged sectional detail taken on line 8 of Fig. 7. Fig. 9 is an enlarged transverse sectional view of the upper part of the supporting bed or cylinder with the adjacent mechanisms, as hereinafter described. Fig. 10 is a longitudinal sectional detail taken on line 10 of Fig. 9. Fig. 11 is an enlarged plan view of the mechanism for operating the rotating vibrating rubbing-rolls, as hereinafter described. Fig. 12 is a similar view of a portion of the same mechanism, taken on line 12 of Fig. 2. Fig. 13 is an enlarged sectional detail taken on line 13 of Fig. 1, and Fig. 14 is a similar view taken on line 14 of Fig. 1.

In the art to which this invention relates it is well known that the ordinary carbon-paper of commerce as usually manufactured is made by supplying the carbon to the paper in a liquid form. The resultant article is a paper having a supply of carbon thereon in a loose form, which has permeated the paper to such an extent as to discolor the opposite side and render it unfit for all purposes except that of making manifold copies or reproductions by the interleafing system. A further objection to the article is that in handling the paper the carbon comes off on the fingers and discolors the same, as well as the adjacent sheets of paper which may come in contact therewith. This old type of paper is generally used in what is known as the "interleafing" system of manifolding—that is, carbon-sheets are interposed between two or more leaves, so as to reproduce copies of the original imprint or impression. This method of using it is expensive, in that it requires considerable time to interleaf the sheets of the carbon, and in cases where a large number of entries has to be made on different sheets of paper it occupies considerable time. It is desirable, therefore, especially with regard to railroad and express companies' work, that sheets of paper should be used one side of which shall be provided with a printed blank having the necessary instructions or date and the other side coated with a thin film of carbon mechanically and permanently affixed thereto and hardened, so that it will not come off or soil the fingers unless an extra or unusual amount of force be used. The advantages incident to a book or pad equipped with leaves prepared in this manner are that considerable time is saved and the work of making a large number of entries facilitated as well as economized, while the objection of soiling the fingers of the operator is minimized.

The principal object of my invention therefore is to produce a machine which will manufacture a paper of the last-named type in as simple, economical, and efficient a manner as possible and which will remove the objections incident to the first-named or older class of paper, in that the paper may be printed or ruled on one side and used as the ordinary paper of commerce either for making single or manifold copies thereof.

In constructing a machine in accordance with my improvements I make a frame portion comprising two side pieces *a a*, joined together by cross rods or bars *b*, upon and in which the operative and other parts of the mechanism are sustained.

Movably mounted in suitable bearings in the frame of the machine is a rotatable supporting bed, drum, or cylinder *c* of the desired size, around the peripheral surface of which a strip or sheet of paper *x* may be passed. This supporting bed or drum is used for the purpose of supporting a strip of paper and carrying it around therewith and into contact with mechanisms, hereinafter described, for affixing carbon to a sheet of paper, evenly distributing it over the surface thereof, and finally hardening and finishing it. The advantage of the rotatable drum or cylinder is that it is movable with and carries the paper around with it in such a manner as to minimize the friction of the moving paper over an immovable body and at the same time presents different portions of its surface to the mechanisms for operating thereon, thus enabling this rotatable bed or drum to be brought into and out of engagement alternately with the operating mechanism and at all times serve to keep it in as cool a condition as possible. In the drawings I have shown this rotatable bed as loosely mounted upon a shaft *d*, so that it may have independent rotations thereon, though of course it can be readily seen that the drum or cylinder may have its own journals and be rotatably mounted directly in the frame of the machine.

One end of the frame of the machine is provided with a shaft *y*, upon which a roll of paper *z* may be placed, so that the strip of paper *x* may be passed around an idler-roll *e*, thence over the outer peripheral surface of the rotatable bed, over a second idler-roll *f*, across a supplementary flat bed *g*, and thence down over a third idler-roll *h* into engagement with a second loose shaft *i* to form the finished roll *j*. When the machine is started and the bed rotated, the roll of paper is unwound and the finished roll wound up, and during this operation a coating of carbon or similar coloring material is affixed to the surface of a sheet of paper, as will be more fully hereinafter described.

To supply the required amount of coloring material—such as a mixture of carbon, wax, and tallow which has been thoroughly ground, mixed, melted, and molded to form a cake of the desired size—to the surface of the paper, and preferably on one side only, a color-supply roll *k* is provided and rotatably mounted in suitable bearings, the axes of which are parallel to the axes of the supporting-drum and in such position that its rotatable peripheral surface will contact the surface of the paper on the drum and in a direction against the movement of the paper. This roll consists, preferably, of a shaft portion provided with an intermediate cylindrical portion of wood and an outer covering of felt or similar material, the felt being supplied because in use it more readily takes up the carbon in the desired film and applies it more evenly to the paper. It is necessary that means be provided by which the position of this color-roll may be adjusted at one or both ends, and also that means be provided by which it, with its attached and adjacent mechanisms, may be moved away from or into contact with the paper at any desired time or times. To accomplish this result, the journals of the color-supplying roll are mounted in boxes *l*, the lower ends of which are slidingly mounted in ways *m*, attached to a movable frame or carrier, which will be more fully hereinafter described. Adjusting-screws *n* are provided and passed through threaded openings in the boxes, so that as such screws are rotated the boxes are moved backward or forward, as the case may be. Both boxes which form the journals of the color-supplying roll are provided with these adjusting-screws, as shown in Figs. 1 and 2. It is desirable, therefore, that such adjusting-screws be operated, after they are once set, simultaneously. In order to accomplish this result, both such adjusting-screws are provided with bevel-pinions *o*, engaging with bevel-pinions *p* on a cross-shaft *q*, so that as the handle *r* on one adjusting-screw is turned both adjusting-screws are operated at the same time and the color-supplying roll, with its "evening-roll," as hereinafter described, moved in or out, according to the direction of rotation of the adjusting-screws.

It is highly desirable that the color mixture above described in the shape of a brick *s* and of about the consistency of hard soap be used and that means be provided by which it can be automatically fed so as to contact the color-supply roll, furnish the desired amount of color thereto, and necessarily at the desired rate of speed. In order to accomplish this result, a color-holding frame or box is provided having a base *t* upon which the cake of coloring material is laid. This color-holding box or frame rests upon an extension of the main frame, its lateral edges being provided with downwardly-extending flanges having slots supported upon guide-pins *u*. The inner ends of these downwardly-extending flanges are provided with dovetail slides *v*, engaging with dovetail ways or guides *w*, attached to the main frame of the machine. These downwardly-extending flanges of the color-holding frame carry the ways *m*, in which the boxes of the color-supplying roll are slidingly mounted, as above described, so that when such frame is moved inwardly and outwardly the cake of coloring material, the color-supplying roll, and its attached mechanisms are all moved simultaneously inwardly or outwardly, as the case may be. This color-holding frame is provided with a follower-bar 1, slidingly mounted on the base-plate *t* in such position as to contact the rear

edge of the cake of carbon and by means of the mechanism hereinafter described force it into contact with the peripheral or feeding surface of the color-supplying roll. A pair of feed-screws 2 is provided which engage one with each end of the follower-bar, so that during their rotation they move such bar inwardly or outwardly to force the cake of soap inwardly or permit it to be moved outwardly. The outer ends of these feed-screws are provided with worm-gears 3, engaging with worms 4 on a cross-shaft 5, so that as such cross-shaft is turned in one direction the feed-screws are moved to operate the cake of soap inwardly and if turned in the other direction to release the follower-bar from contact with the cake of coloring material. To operate this cross-shaft at the desired times, its outer end is provided with a bevel-gear 6, engaging with a bevel-pinion 7. This bevel-pinion is mounted upon an intermediate shaft 8, (see Fig. 1,) which is journaled in fixed bearings 9 and 10, and the opposite end is provided with a friction-wheel 11, engaging with the face of a friction-disk 12. The arrangement is such that as the friction-disk is rotated the intermediate shaft is also rotated, which in turn operates the bevel-pinion, gear mechanism, cross-shaft, worms, worm-gears, and feed-screws to move the follower-bar in or out, as the case may be.

It is desirable to vary the feed of the cake of coloring material to suit different circumstances and conditions. In order to accomplish this result, the friction-wheel above referred to is slidingly mounted upon the intermediate shaft, so as to have independent longitudinal motions, but simultaneous rotary motions. This friction-wheel is also provided with an annular groove arranged to be engaged by a yoke 13, having a threaded nut portion engaging with an adjusting-screw 14, so that as the adjusting-screw is rotated in one direction or the other its yoke-nut is moved longitudinally thereon to operate or move the friction-wheel toward or from the axial center of the friction-disk, and thus increase or decrease the speed of the intermediate shaft, and thereby regulate the speed at which the cake of coloring material is fed toward the color-supply roll.

There are times when it may be desirable to feed one end of the cake of coloring material toward the color-supplying roll and permit the other to remain stationary, to arrest the feeding movement of the cake of coloring material, or to move the follower backwardly and insert a fresh cake without stopping the machine. In order to accomplish this result, (see Figs. 7 and 8,) the worm-gears 3, above referred to, are loosely mounted upon the ends of the feed-screws, and disks or plates 15 are secured to the ends of the feed-screws adjacent to the worm-gears, the faces of both of which are in direct contact. These plates are provided with yielding movable holding-pins 16, the ends of which are adapted to engage with indentations 17 in the face of the worm-gears, and helical springs 18 serve to yieldingly hold these pins in engagement with the indentations, so that as the gears are rotated the feed-screws are likewise rotated. These holding-pins are provided with transverse pins 19, passed through irregular perforations 20 in the plates, so that as the holding-pins are drawn backwardly they may be also turned a step into the lateral extending portion of the irregular slot 20 to hold them out of engagement with the worm-gears and permit the rotation of such gears without a consequent rotation of the feed-screws.

The coloring material, as heretofore stated, in this kind of a machine is preferably made of a composition of carbon or other desirable coloring-matter mixed with refined wax and tallow made or molded in the shape of a rectangular cake and of about the consistency of hard soap; but owing to irregularities in density and distribution of the material forming the color cake the color-supplying roll usually takes up more material than is necessary or takes it in patches, and this in spite of the fact that feeding mechanism, hereinafter described, minimizes this objectionable feature. In order to get rid of this surplus and distribute the material evenly over the color-supplying roll, an evening-roll 21, with a felt or rubber covering, is provided (see Figs. 2 and 3) and rotatably mounted in projections of the box portions 1 at each end thereof, so that it may contact the color-supply roll throughout its length and remove or evenly distribute the irregular patches of carbon. Color having been supplied to the paper by means of the color-supplying roll, it is left thereon in a more or less imperfect condition, and in order to distribute the same I provide a primary evening-roll 22 and mount it in suitable bearings 32, so that it can contact the surface of the paper. This roll is rotated in a direction opposite to the movement of the paper, so as to remove the irregular patches of material which are on the surface and assist in distributing it evenly over the paper. This roll can be made of any desired material; but I prefer to make it of a wooden cylinder provided with a covering of felt or other similar material, and it is adjustably mounted in boxes on a slide, exactly as is hereinafter described in connection with the rubbing-rolls 23 and 24. (Shown in Figs. 10 and 11.)

To permanently affix and evenly distribute the coating of carbon on the surface of the paper, a pair of rubbing-rolls 23 and 24 is provided and arranged in suitable bearing-boxes, so that they rotate with their lower surfaces in contact with the carbon-coated surface of the paper. It is desirable that these rolls, the outer surfaces of which are preferably formed of felt or like material, be given a transverse reciprocating motion across the surface of the paper, which will not only serve to more effectually distribute the car-

bon on the paper and rub it into the same, but breaks up any tendency toward making lines or giving the surface of the carbon a grain-like appearance. In order to reciprocate the rubbing-rolls, one end of each of their shafts is provided with a grooved collar 25 and 26, adapted to be engaged by a yoke 27, secured to the upper end of a rock-shaft 28. This rock-shaft has a crank 29 at its lower end, the crank-pin 30 of which engages with a grooved cam *g*, mounted upon one end of a rotating shaft 31. (See Fig. 12.) It is desirable that each end of these rubbing-rolls have an independent adjustment by which it may be lowered toward or raised away from the carbon surface of the paper, so as to provide the necessary engagement or frictional contact for rubbing the carbon into the paper. In order to accomplish this result, the journals of the shafts are mounted in boxes 32 (see Figs. 10 and 11) at or near each end of the same, and these boxes in turn are mounted upon threaded sleeves 33, which in turn are rotatably mounted upon studs 34, screw-threaded into slides 35 and 36, which are slidingly mounted upon each side of the main frame of the machine.

After the carbon coloring material has been distributed and rubbed in, as above described, it is desirable to clean the surface of the paper, and for this purpose a second cleaning-roll 37 is provided and rotatably mounted in suitable bearings, so that its surface will contact the colored surface of the paper and clean off the surplus material which is apt to remain after the rubbing-rolls have done their work. This cleaning-roll is composed of a central steel shaft, which furnishes the journal therefor and supports a pine drum thereon, and the wooden drum is provided with an outer surface of mohair, plush, or felt, and should, preferably, be about five inches in diameter. The cleaning-roll (or journals thereof) is mounted in bearings 38 upon threaded adjustable sleeves similar in their construction to the adjustable sleeves hereinbefore described, and shown in Fig. 10, and by which the roll may be moved toward or from the surface of the paper whenever desirable or necessary. The studs of these sleeves are also mounted on a sliding frame 39, the same as above described in connection with slides 35 and 36. When the operation of cleaning the carbon-coated surface of the paper has been accomplished, it is desirable to polish the surface of the same, and in order to do this a pair of polishing-rolls 40 and 41 is preferably provided. These polishing-rolls are formed of rotatable shafts and pine drums carrying a multiplicity of wings 42, let into the cylindrical surface of the drum and held in place in any desired manner. The wing portions are formed of felt or similar material, which as the rolls are rapidly rotated remove any surplus material on the paper and give a polish unto the hardened surface thereof. The shaft of the roll 40 is mounted in adjustable bearings 43, which in turn are mounted upon the adjusting screw-threaded sleeves 44, the same as described in connection with Fig. 10, and on a sliding frame 45, so that the sleeves may be turned in either direction to raise and lower the adjustable bearings. Roll 41 has its journals in boxes in a vertically-movable stud 46ª, as and for the purpose hereinafter more fully described.

From the foregoing it will be seen that the strip of paper moves with the rotatable or movable bed and is successively brought into contact with color-supply, evening, rubbing, cleaning, and finishing rolls, which revolve or rotate in a direction against the movement of the paper and the rotation of the bed. It will also be seen that the movement of the bed in the direction with and at the same velocity as the paper minimizes the friction, and thereby minimizes the heating effect on the bed. For safety, however, it is desirable to assist the rotatable bed in its function of carrying the paper into contact with the carbon-coating mechanism, and in order to accomplish this result a feed-roll 46 is provided, preferably made of wood covered with rubber and having its journal portions rotatably mounted in boxes 47, which in turn are slidingly mounted in standards 48, secured to the main frame of the machine, as shown in Figs. 1 and 2. These boxes can be moved radially—that is, in such a manner as to carry the feed-roll into and out of contact with the paper on the rotatable drum—by means of rotatable screws, one of which is provided with a hand-wheel 49 (see Fig. 1) and with a bevel-pinion 50, the motion of which is transferred to the other screw by means of a cross-shaft 51, which carries a pair of bevel-gears 52—one at or near each end—gearing with the bevel-pinions 50 and 53 on each adjustable screw, so that by turning the hand-wheel in either direction the boxes are carried inwardly or outwardly to get the desired friction on the paper or release the same. For convenience this feed-roll is placed intermediate the polishing-rolls 40 and 41, one of which is placed so that it polishes the paper while rotating with the drum and the other of which passes over a practically stationary bed portion 54 after the carbon-coated surface of the paper has left the feed and idler rolls, thus giving a last finishing touch to the paper before it is wound in a finished roll *j*.

By means of the mechanisms above described each and all of the rolls may be raised or lowered independently, so as to obtain the desired engagement with the surface of the paper or remove any of the rolls from operation. It is often desirable, however, in operation for a machine of this class to raise or lower all or practically all of the rolls out of and into contact with the paper. This, if possible, should be done at one and the same time or during the same operation. In order to accomplish this, the slides which support the bearing-boxes of the color-supplying,

evening, rubbing, cleaning, and one of the polishing rolls are connected with crank-disks 55, located at each end of the central shaft *d*, by means of connecting-rods or pitmen 56, with the exception of the color-supplying roll, which is connected with such crank-disks by means of the bell-crank levers 57 and connecting-rods 58 and 59. As will be seen from Figs. 1 and 2, these crank-disks are on each side and outside of the main frame of the machine and are connected with slides thereon, so that as the crank-disk, with its shaft, is rotated or vibrated by means of a hand-lever 60 and connecting-link 61 in one direction, the rolls above described are lowered into contact with the paper, as shown in Fig. 1, while the vibration of the lever in the other direction or toward the right moves such slides outwardly and carries their rolls out of contact with the paper. The last finishing-roll 41 is preferably moved independently by means of a rock-shaft 62, which has its eccentric-pins 63 engaging with a slot in the lower part of the stud 46 and which carries a hand-lever 64, as shown particularly in Figs. 1 and 2. If necessary, this handle 64 could be dispensed with and a lever-arm provided and connected by means of a link with one of the above-mentioned crank-disks to obtain the necessary motion for rock-shaft 62. At the same time that the slide *v* is moved backwardly, which operates the color-holding frame, the bevel-gear 6 is moved out of engagement with the bevel-pinion 7, thus stopping the feed of the carbon cake until such a reëngagement of bevel gear and pinion has been effected.

In order to operate or rotate the different mechanisms, a main shaft 65 is provided and rotatably mounted in suitable bearings in the main frame of the machine. This shaft is provided at one end with a main pulley 66, which may be engaged by means of a suitable belt (not shown) with any prime mover—such as a main shaft, counter-shaft, electric motor, or engine—and at the opposite end with a spur-pinion 67, engaging by and through a train of spur-pinions 68 with a spur-gear 69 on the rotatable bed, thus rotating the same in the desired direction. Suitable belting is shown as connecting this main shaft directly or indirectly with the different rolls to be rotated, and as this is shown sufficiently plain in Figs. 1 and 2 it is not thought desirable or necessary to indicate each and every belt by means of index-letters, as it would only tend to render the drawings difficult to read and the tracing of the principal mechanisms hard to follow. This arrangement of belting, however, does not form any particular part of the invention and may be varied to suit different forms and conditions. I will briefly describe, however, the means by which the shaft is driven that winds up the roll of finished carbon-paper, which is shown particularly in Figs. 1, 3, 13, and 14. This shaft *j* is provided with a pulley 70 on one end, engaging with a shaft 71 by means of the belt 72 and a smaller pulley 73. The intermediate driving-shaft 71 is mounted upon swinging arms 74, pivotally mounted on the main shaft, so as to swing concentric therewith. One of these arms is also provided with a second lug 75, projecting out therefrom, through which a tension-screw 76 is passed, and the other end of which is passed through a bracket 77 on the main frame of the machine. The outer end of this tension-screw is provided with a hand-nut 78, engaging with the threaded portion thereof, while a tension-spring 79 is inserted intermediate the lug 75 and the head of the tension-screw. The intermediate shaft is provided with a second pulley 80, engaging with a pulley 81 on the main shaft by means of a belt 82.

From the above description and an examination of the figures alluded to it will be seen that as the hand-nut is moved in one direction the tension of spring 79 is increased and the vibrating arm 74 moved in one direction, so as to tighten the belt 72, while a movement in the other direction loosens the tension of spring 79 and permits the belt 72 to draw the vibrating arm 74 over. This arrangement is provided for the purpose of permitting the roll of paper as it increases in size to attain practically a uniform peripheral velocity, or, in other words, different angles of velocity to suit the increasing diameter of the roll.

I claim—

1. In a machine of the class described, the combination of a movable bed for carrying a strip of paper, means for applying practically hard carbon to the surface of a sheet of paper, and means for spreading and affixing the carbon on the surface of the paper, substantially as described.

2. In a machine of the class described, the combination of a movable bed for carrying a strip of paper, means for affixing practically hard carbon or similar coloring material to the surface of a sheet of paper while it is in engagement with the bed, means for spreading the carbon over such sheet of paper, and means for polishing or hardening the exposed surface of the carbon, substantially as described.

3. In a machine of the class described, the combination of a rotatable bed for carrying a strip of paper on its peripheral surface, means for supplying practically hard carbon to the surface of a sheet of paper, and roll mechanism for spreading the carbon evenly over and hardening it on the surface of the paper, substantially as described.

4. In a machine of the class described, the combination of a rotatable bed for carrying a strip of paper on its peripheral surface, means for supplying practically hard carbon to the surface of a sheet of paper, roll mechanism for spreading the carbon evenly over the surface of the paper, and means for hardening

and finishing the exposed surface of the carbon or similar coloring material on such paper, substantially as described.

5. In a machine of the class described, the combination of a rotatable bed for carrying on its peripheral surface a sheet of paper, a color-supplying roll adapted to receive and primarily affix a supply of substantially hard carbon to the surface of the paper, and rotatable mechanism for rubbing the carbon evenly over and affixing it to the surface of the paper, substantially as described.

6. In a machine of the class described, the combination of a rotatable bed for carrying on its peripheral surface a sheet of paper, a color-supplying roll adapted to receive and primarily affix a supply of substantially hard carbon to the surface of the paper, rotatable mechanism for rubbing the carbon evenly over and affixing it to the surface of the paper, and means for hardening and finishing the exposed surface of the carbon, substantially as described.

7. In a machine of the class described, the combination of a rotatable bed or drum for carrying a strip of paper on its peripheral surface, a color-supplying roll adapted to be moved inwardly and outwardly to obtain the desired contact with the surface of the paper and furnish an initial supply of practically hard carbon, rubbing-rolls having a rotatable and vibratory motion for spreading the carbon evenly over the surface of the paper, rolls for cleaning the surplus carbon, and rotatable winged polishers for polishing and hardening the exposed surface of the carbon, substantially as described.

8. In a machine of the class described, the combination of a rotatable bed or drum for carrying a strip of paper on its peripheral surface, a color-supplying roll adapted to be moved inwardly and outwardly to obtain the desired frictional contact with the surface of the paper and furnish an initial supply of practically hard carbon, rubbing-rolls having a rotatable and vibratory motion for spreading the carbon evenly over the surface of the paper, cleaning-rolls for removing the surplus carbon, rotatable winged polishers for polishing and hardening the exposed surface of the carbon, and a feed-roll arranged to contact the paper and clamp it between it and the rotatable bed and assist in feeding or pulling the paper around therewith, substantially as described.

9. In a machine of the class described, the combination of a rotatable bed or drum for carrying a strip of paper on its peripheral surface, a color-supplying roll adapted to be moved inwardly and outwardly to obtain the desired contact with the surface of the paper and furnish a supply of practically hard carbon, rubbing-rolls having a rotatable and vibratory motion for spreading the carbon evenly over the surface of the paper, cleaning-rolls for removing the surplus carbon, two rotatable winged polishers, one arranged to contact the exposed surface of the carbon and polish or harden it while in connection with the rotatable bed and the other the exposed surface of the carbon on the paper after it has left the rotatable bed, and a feed-roll adjustably mounted in suitable bearings arranged intermediate the two winged polishers to contact the carbon-coated paper and assist in carrying it around with the bed, substantially as described.

10. In a machine of the class described, the combination of a rotatable bed for carrying a strip of paper around therewith, color-supplying mechanism for furnishing a supply of practically hard carbon, rubbing-rolls and winged polishing mechanism adapted to operate upon the exposed surface of the carbon on the paper to evenly distribute it, clean it and harden it, and means for independently moving such operating mechanisms inwardly and outwardly into and out of contact with the surface of the paper, substantially as described.

11. In a machine of the class described, the combination of a rotatable bed for carrying a strip of paper around therewith, color-supplying mechanism for furnishing a supply of practically hard carbon, rubbing-rolls and winged polishing mechanism adapted to operate upon the exposed surface of the carbon on the paper to evenly distribute it, clean it and harden it, means for independently and means simultaneously moving such color-supplying, wing-polisher and rubbing-roll mechanism into and out of contact with the surface of the paper, substantially as described.

12. In a machine of the class described, the combination of a rotatable bed for carrying a strip of paper on its peripheral surface, and roll mechanisms arranged around the axial center of the bed or substantially so to successively apply practically hard carbon, evenly distribute, clean and harden it on the surface of the paper, substantially as described.

13. In a machine of the class described, the combination of a rotatable bed for carrying a strip of paper on its peripheral surface, roll mechanism mounted for furnishing a supply of practically hard carbon to the surface of the paper, a slide upon which such roll is mounted provided with a color-holding box or frame, mechanism for rubbing the carbon or coloring material into the surface of the paper, slide mechanism upon which such rubbing mechanism is mounted, roll mechanism for cleaning and hardening the surface of the carbon, slide mechanism for holding such roll mechanism in position, and crank-disk and link mechanism connecting with the slide mechanism, whereby such slides are operated simultaneously and thrown into and out of engagement with the surface of the paper by the vibrations of the disk, substantially as described.

14. In a machine of the class described, the combination of a rotatable bed for carrying a

strip of paper on its peripheral surface, roll mechanism mounted for furnishing a supply of practically hard carbon to the surface of the paper, a slide upon which such roll is mounted provided with a color-holding box or frame, mechanism for rubbing the carbon or coloring material into the surface of the paper, slide mechanism upon which such rubbing mechanism is mounted, roll mechanism for cleaning and hardening the surface of the carbon, slide mechanism for holding such roll mechanism in position, crank-disk and link mechanism connected with such slides, whereby they are operated simultaneously and thrown into and out of engagement with the surface of the paper, a shaft upon which such crank-disk is mounted, and an operating-lever connected with such crank-disk, whereby its movements are transmitted to the crank-disk mechanism and the slides with their rolls operated to bring them into and out of contact with the paper, substantially as described.

FRANK WING WEEKS.

Witnesses:
GEO. H. GLOVER,
MARY E. THAYER.