No. 665,648.

Patented Jan. 8, 1901.

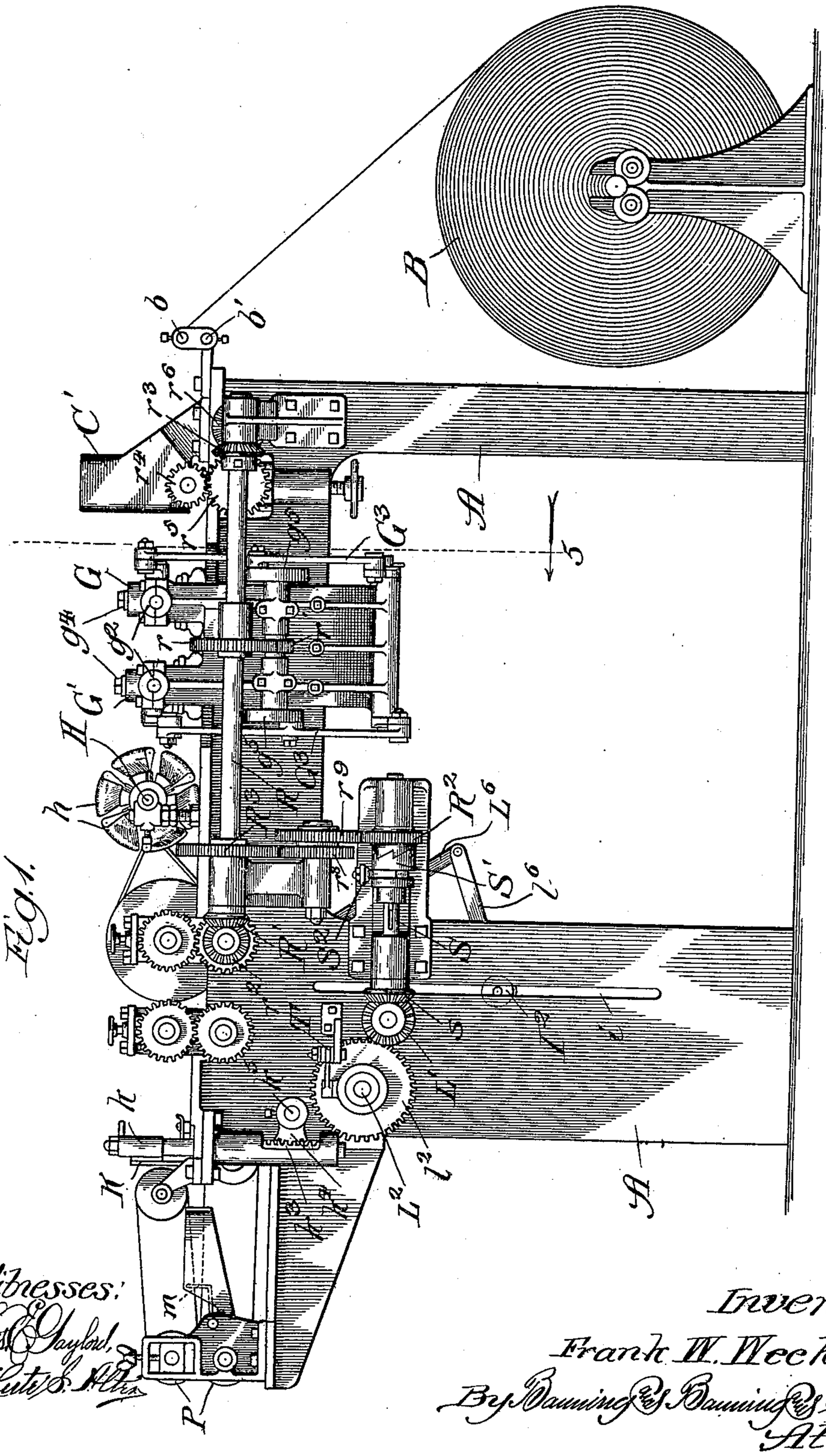
F. W. WEEKS.

MACHINE FOR COATING PAPER WITH CARBON.

(Application filed Feb. 23, 1898.)

(No Model.)

6 Sheets—Sheet 1.



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No. 665,648. Patented Jan. 8, 1901.

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(No Model.) 6 Sheets—Sheet 2.

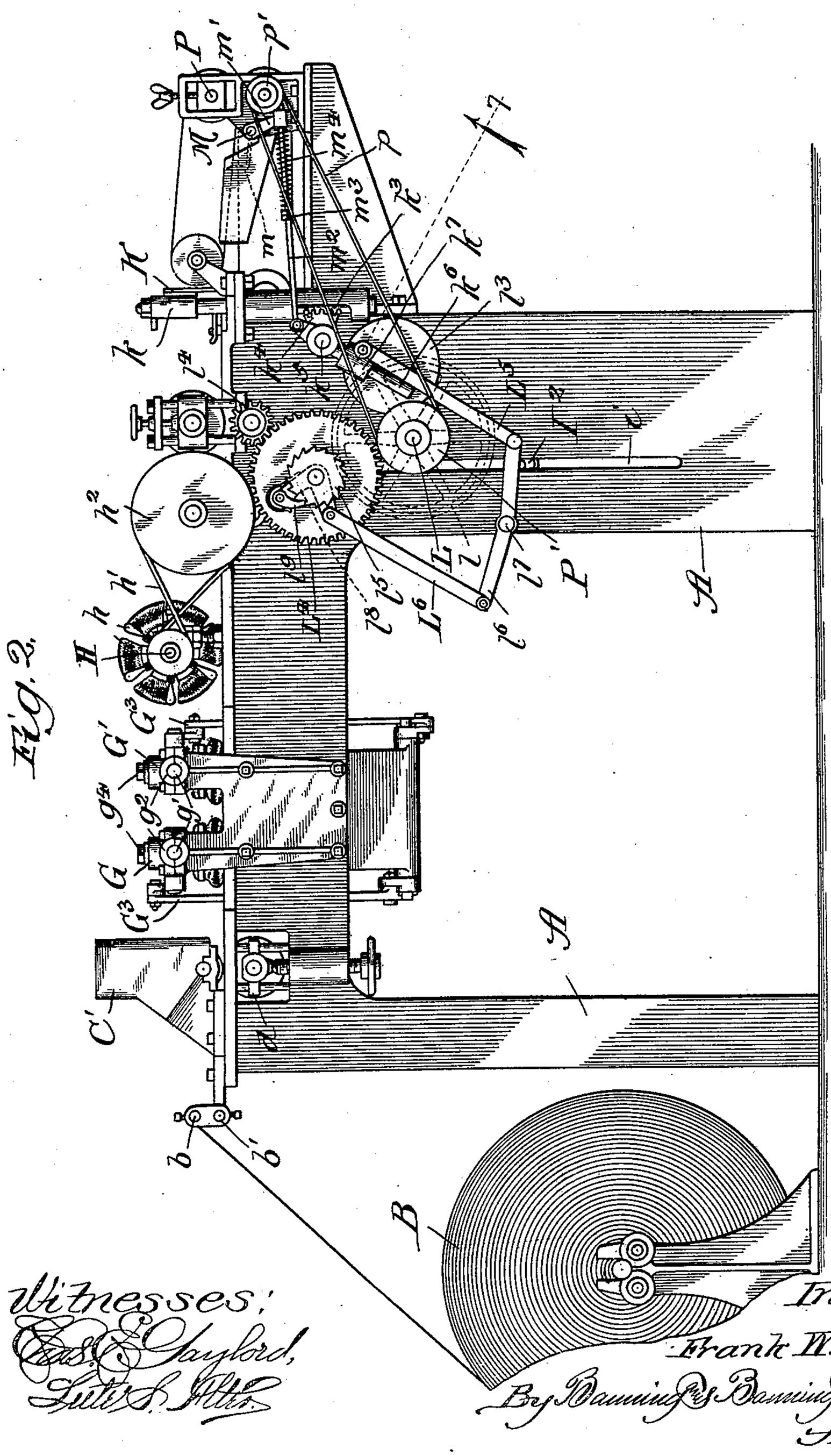

Fig. 2.

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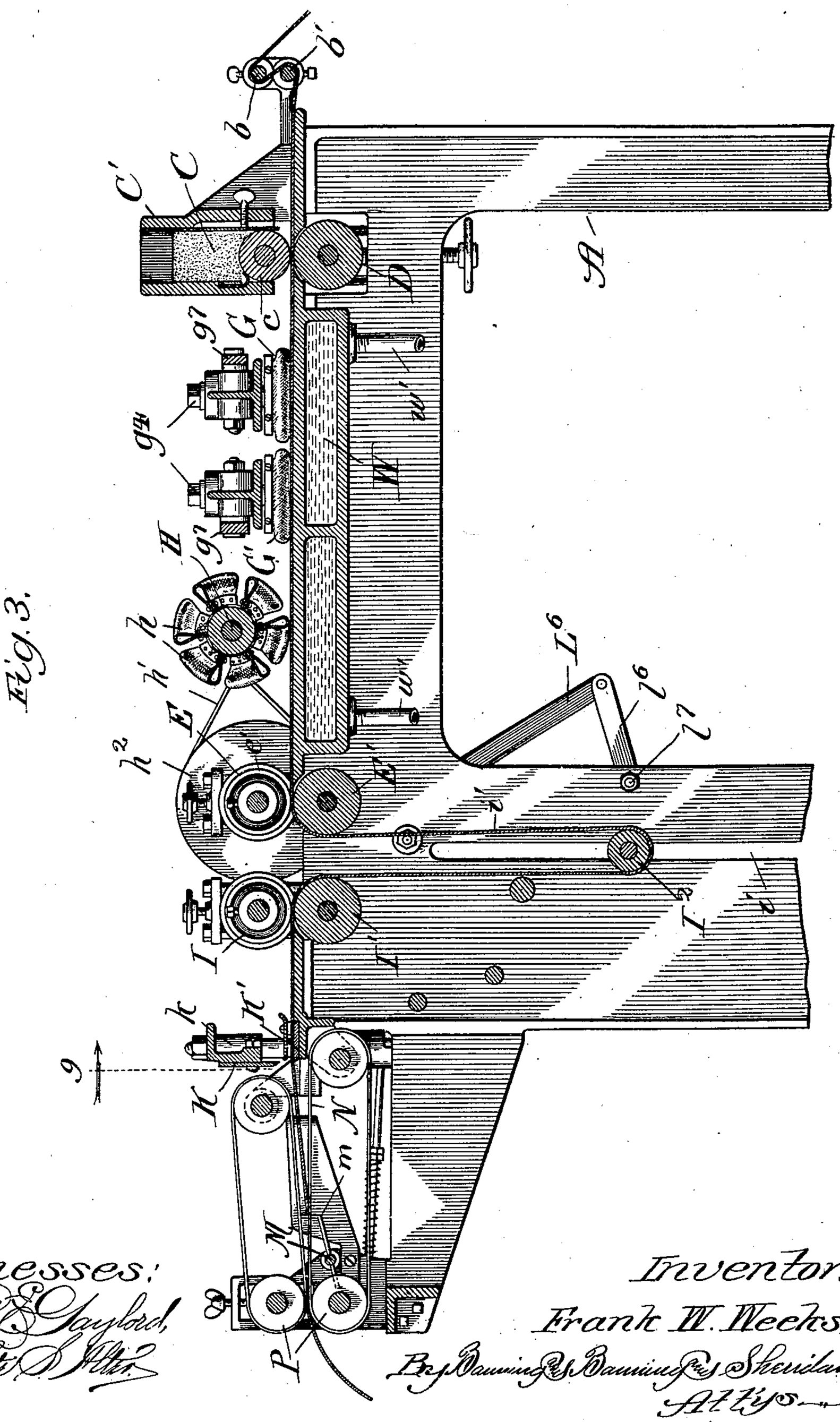
(Application filed Feb. 23, 1898.)

(No Model.) 6 Sheets—Sheet 3.



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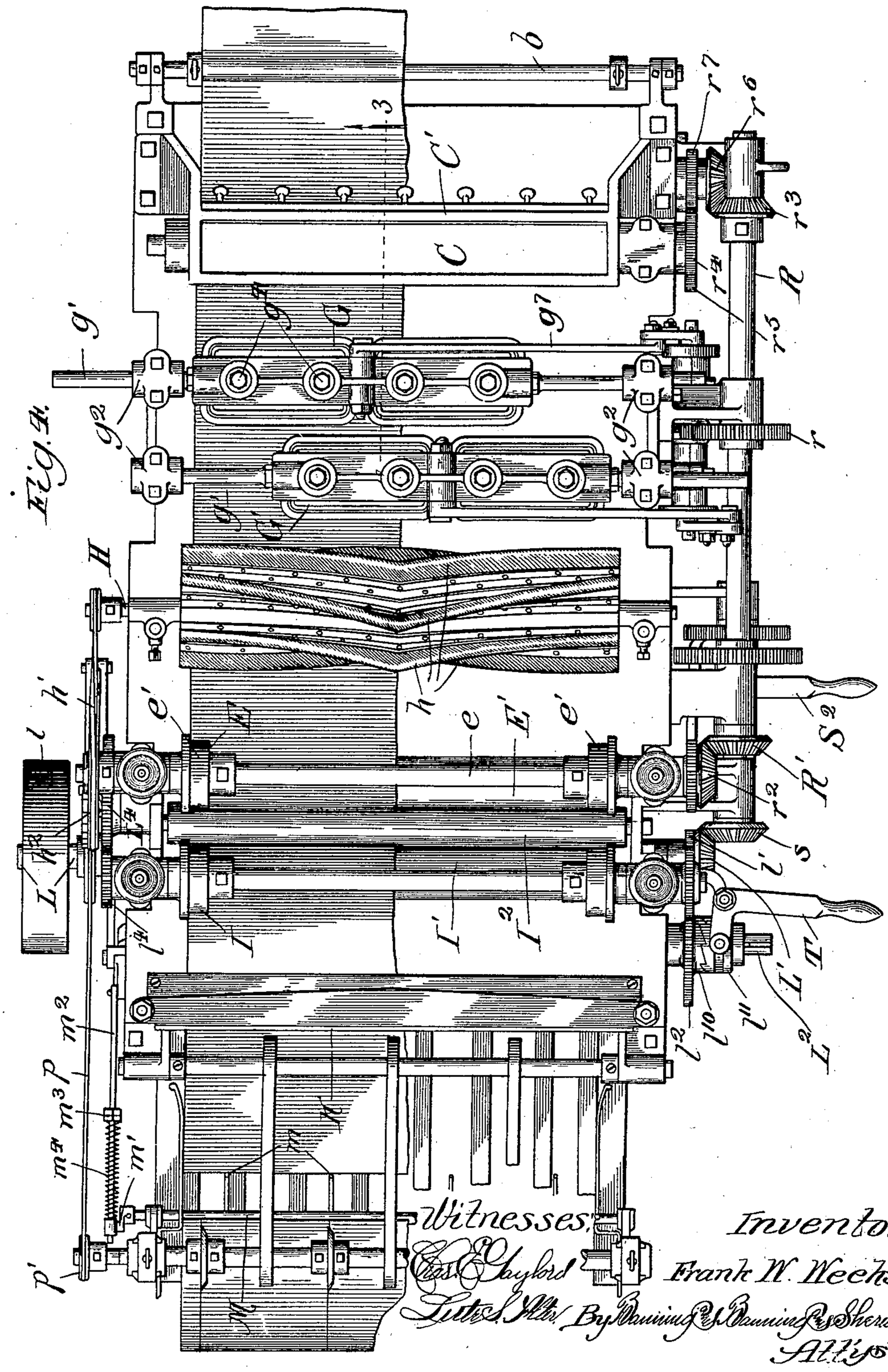
MACHINE FOR COATING PAPER WITH CARBON.

(Application filed Feb. 23, 1898.)

(No Model.) 6 Sheets—Sheet 4.



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MACHINE FOR COATING PAPER WITH CARBON.

(Application filed Feb. 23, 1898.)

(No Model.) 6 Sheets—Sheet 5.

Fig. 5.

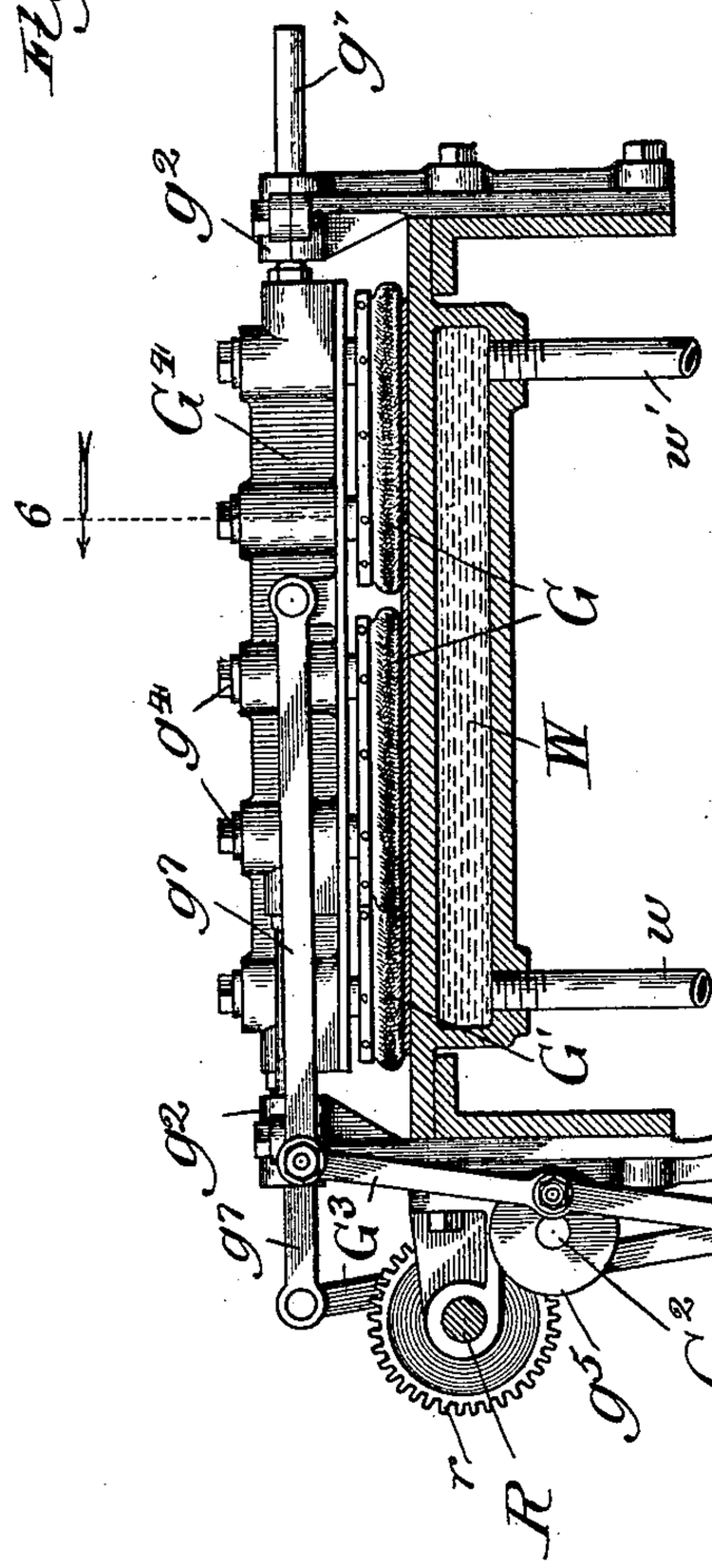


Fig. 7.

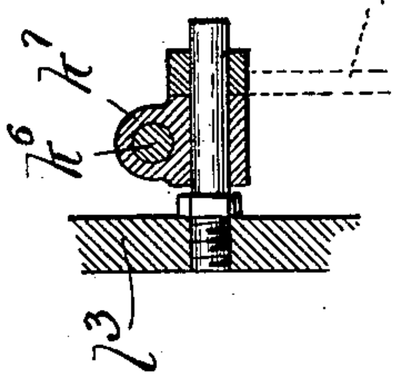
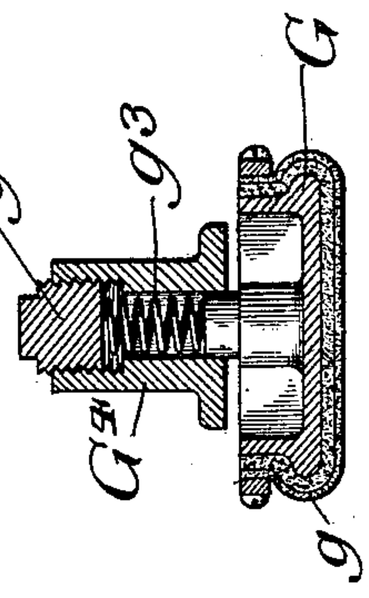


Fig. 6.



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MACHINE FOR COATING PAPER WITH CARBON.

(Application filed Feb. 23, 1898.)

(No Model.) 6 Sheets—Sheet 6.

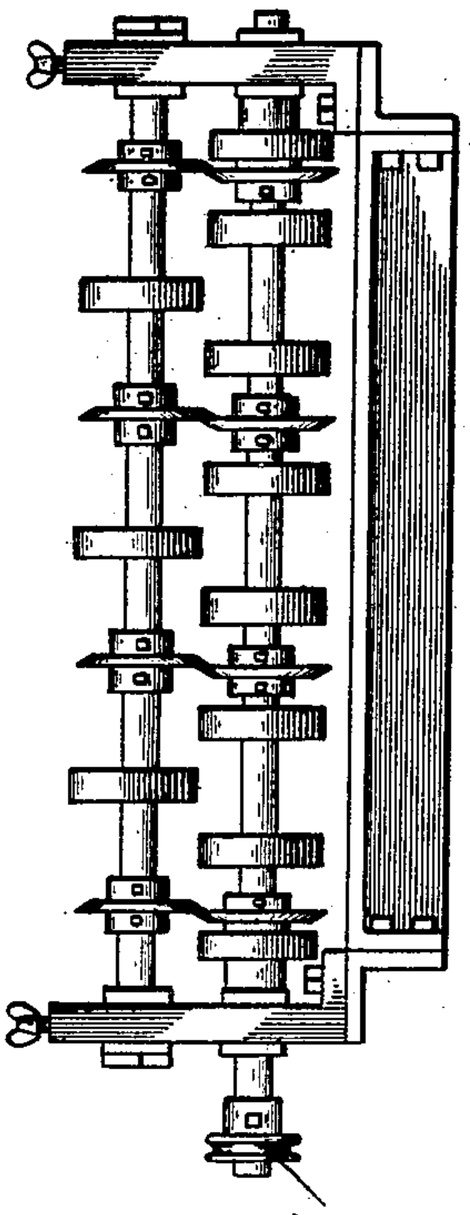

Fig. 8.

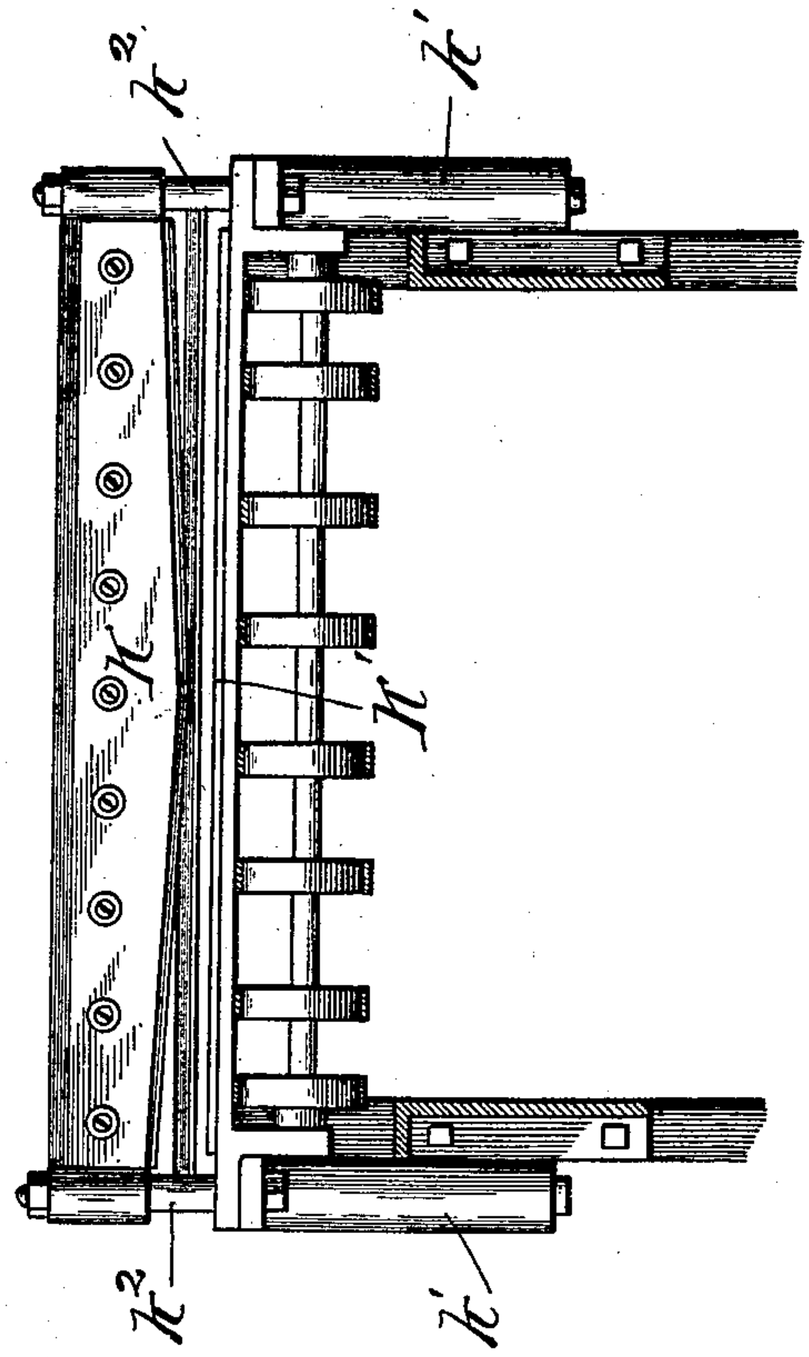

Fig. 9.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR COATING PAPER WITH CARBON.

SPECIFICATION forming part of Letters Patent No. 665,648, dated January 8, 1901.

Application filed February 23, 1898. Serial No. 671,281. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. 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 and Similar Materials, of which the following is a specification.

This invention relates to machines for applying a coating of carbon to one side of a sheet of paper, and has for its principal object the providing of a simple, economical, and efficient machine for that purpose.

A further object of the invention is to provide a machine that will apply a coating of carbon to one side of a sheet of paper and cut it into sheets of desired sizes.

Further objects of the invention will appear from an inspection of the accompanying drawings and the following description and claims.

The invention consists principally in the combination of means for supplying the paper with carbon and means for spreading the carbon evenly over and affixing it to one surface of the paper.

The invention consists, further, in the combination of means for supplying the paper with carbon, means for spreading the carbon evenly over and affixing it to one surface of the paper, and means for polishing or hardening the exposed surface of the carbon.

The invention consists, further, in the combination of means for continuously feeding a strip of paper through the machine, means for coating one side of the paper with carbon and hardening its surface, and means for intermittently cutting the carbon-coated paper into sheets.

The invention consists, further and finally, 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, a side elevation of the reverse side of the machine shown in Fig. 1; Fig. 3, a longitudinal sectional elevation taken on the line 3 of Fig. 4 looking at it in the direction of the arrow; Fig. 4, a plan view of the machine looking at it from the top and showing a broken strip of paper as it is being fed into and operated on by the mechanisms; Fig. 5, a transverse sectional elevation of a portion of the machine, taken on the line 5 of Fig. 1; Fig. 6, a sectional detailed elevation taken on the line 6 of Fig. 5 looking in the direction of the arrow; Fig. 7, a sectional detail view taken on the line 7 of Fig. 2; Fig. 8, an end view of the slitting or cutting mechanism looking at it from the left of Fig. 1, and Fig. 9 a transverse sectional elevation taken on the line 9 of Fig. 3 looking at it in the direction of the arrow.

In the art to which this invention relates it is well known that the ordinary paper of commerce as usually manufactured is made by applying 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 and 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. A further objection to the article is that in handling the paper the carbon comes off on the fingers and discolors the same and also discolors the adjacent sheets of paper which may come into contact with it. This class 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 carbon, and in cases where a large number of entries have to be made on different sheets of paper it occupies considerable time.

It is desirable, especially with regard to railroad-work, that sheets of paper be produced one side of which may be ruled or printed with the necessary instructions or data and the other side provided with a thin coating of carbon permanently affixed thereto and hardened in such a manner that it will not come off to soil the fingers or adjacent sheets of paper unless an extra amount of force is used. The advantages incident to the use of a book constructed with leaves or sheets prepared in this

manner are that considerable time is saved and the work of making a large number of entries facilitated in an economical manner, while the objection of soiling the fingers or hands 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 a simple, economical, and efficient manner and which will remove the objections incident to the first-named 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 A of the desired size, shape, and strength to hold the operative and other parts in position. A roll of paper B is arranged adjacent to one end of the machine, so that it can be fed into the machine over a set of tension-rolls *b b'*, which permit the paper to be fed in a taut condition.

The carbon which I prefer to use in connection with the coating of the paper consists of a cake C, formed of a composition of refined tallow, lampblack, and, when desirable, other ingredients, such as Prussian blue, to give it the desired color, of about the consistency of soap, so that it can be applied to the surface of the paper without permeating the paper to discolor the opposite side. The cake of carbon is arranged, preferably, in a pocket C' in such position that it may be fed onto the paper as it enters the machine by means of a friction supplying-roll *c*. This carbon-supplying roll during its rotations contacts the lower surface of the cake of carbon and transfers or carries a certain amount of it to the paper and rolls it onto the surface. This roll, however, may be dispensed with and the cake of carbon be held in such a manner that it may be contacted directly with the surface of the paper and its or an additional weight, spring, or other desirable means be used to hold it in contact with the paper for the purpose of regulating the supply. Arranged directly under this carbon-supplying roll is a second roll D, which rotates with the carbon-supplying roll and is adjustably mounted in bearings *d*, so that its position or the space between it and the carbon-roll may be regulated.

In order to continuously feed the paper through the machine, so as to facilitate the act of coating the paper, I provide a pair of feeding-rolls E and E', which are preferably constructed of shafts *e*, having rubber bands or rings *e'* at or near their end portions, so that only the lateral edges of the carbon-coated paper are caught between the feeding-rolls. This arrangement is a preferred arrangement, in that but a small portion of the resultant product need be wasted and can be easily removed by simply cutting it off, as will be more fully hereinafter described.

When the carbon has been initially supplied to one surface of the paper by means of the supplying-roll, it is desirable to spread the loose particles remaining on the surface in a uniform manner evenly over and affix it to one surface of the paper and afterward to permanently harden the exposed surface of the carbon. To accomplish this result, two sets of mechanisms are used, one of which I will term "distributing" and the other "polishing" mechanism.

Describing the distributing mechanism, it consists of two sets of rubbers G and G', which are made in a shape resembling the ordinary blackboard-eraser and which are provided with a cover *g*, of flannel, chamois, or similar material. These rubbers are moved back and forth transversely across the paper while it is passing through the machine by means of reciprocating rods *g'*, which are mounted in suitable bearings g^2, the rubbers being held down against the paper by means of tension-springs g^3, the tension of which is regulated by tension-screws g^4. In order to reciprocate these rubbers and give them their proper motion, a rotating crank-shaft G^2 is mounted in a suitable bracket on the frame portion, so as to be rotated, as hereinafter described, from the driving-shaft of the machine. This crank-shaft G^2 is provided with a crank-plate g^5 at each end thereof, having engagement with vibrating levers G^3. These vibrating levers are pivotally mounted on links g^6 at the lower ends thereof, which in turn are pivotally mounted on the bracket, while the upper ends of the vibrating levers are pivotally connected by means of the links g^7 with the rubber-carriers G^4 on the reciprocating rods. It will be observed by inspecting Figs. 4 and 5 of the drawings that the wrist-pins on these crank-plates are mounted diametrically opposite each other, this arrangement being preferred for the purpose of giving the rubbers opposite reciprocating motions, thus equalizing the tension of the rubbers on the paper and not tending to disturb the position of or destroy the paper as it is being fed through the machine.

Describing the polishing or hardening mechanism, I provide a rotating shaft H and mount it in suitable adjustable bearings on the bed of the machine. This rotating shaft carries a set of wings *h*, extending radially therefrom and arranged diagonally with relation to the axis of the shaft in such a manner as to meet at or near the center and form obtuse angles, as is particularly shown in Fig. 4 of the drawings. This arrangement is preferred for the purpose of preventing the polisher from striking the paper a violent blow, and thus disturbing or tearing the paper. These wing polishers are coated or covered with flannel, chamois, or similar material and are revolved at a high rate of speed in such a manner as to permanently affix or harden the exposed surface of the carbon coating, so as to minimize the danger of disfiguring the adjacent sheets of paper. In order to operate

this polisher rapidly, I prefer to connect it by means of the belt h' with a pulley h^2 on one of the feed-rolls.

When the paper has been coated on one side, as above described, with a surface of carbon, it is desirable that it should be cut into such sizes as may be required for commerce, either to form loose sheets, leaves of a book, or pad, as may be desired. In order to accomplish this result in the same machine, I provide a set of intermittently-operated feed-rolls I and I', arranged back of the primary set of feed-rolls. Intermediate these two sets of feed-rolls and preferably below the same is an idler-roll I^2, (see Fig. 3,) so arranged that it may be moved up and down in a slot i in such a manner that the web of paper i' may be passed around the same and permit the difference between the constant and intermittent feeds to be taken up—that is, a certain amount of slack or idle paper can be provided for, so that the coating of the paper may be constantly carried on, while the cutting is being done intermittently or at predetermined periods of time.

To cut the paper into the desired size, I provide a cutter K and arrange it upon a vertical movable cross-head k, mounted in guides k' by means of the rods k^2. This cutter is arranged above the path of the paper, so that as the paper is fed through into position shown in Fig. 3 the cutter is moved downwardly and contacts the paper near the longitudinal center and with the aid of the lower cutter K' cuts it into desired length.

The intermittent feeding-rolls are driven as follows: A main driving-shaft L is provided, one end of which carries a driving-pulley l and the opposite end a bevel-gear L'. This shaft is also provided with a spur-pinion l', which engages with a spur-gear l^2 and a shaft L^2. The opposite end of this shaft is provided with a crank-plate l^3. (See Fig. 2.) The lower roll of the intermittent feeding-rolls is provided with a pinion l^4, meshing with a gear L^4, which in turn is provided with a ratchet l^5. A vibrating lever l^6 is provided and mounted on a stud l^7, and one end of this vibrating lever is connected with the crank-plate l^3 by means of the link L^5, while the other end of the vibrating lever is provided with a link L^6, engaging with a rocking lever l^8. This rocking lever is in turn provided with a pawl l^9, the free end of which engages with the ratchet in such a manner that the rotations of the crank-plate cause the rocking lever to vibrate in one direction and allow the pawl to slip over the teeth of the ratchet, while the opposite movement causes the pawl to engage with the teeth of the ratchet and rotate its gear and the feed-rolls one step in their rotation and feed the paper through the desired length.

The reciprocations of the cutter and its cross-head are accomplished as follows: One of the guide-rods k^2 (see Fig. 2) is provided with a rack k^3, which engages with a segmental gear k^4, this gear being secured to a shaft k^5. The shaft upon and by which this segmental gear is mounted is operated by means of a rod k^6, which is passed through a pivoted socket k^7 on the crank-plate, so that during the rotation of the crank-plate an oscillating motion is given to the segmental gear to cause the vertical movements of the cutter. It will be noticed from an inspection of Fig. 2 that the parts are so timed that during the backward motion of the pawl the cutter descends and cuts the paper, while during the forward motion of the pawl and the operation of the intermittent feeding-rolls the cutter is moved upwardly and allows the paper to be fed into position for cutting.

After the paper has been cut into lengths transversely it is desirable to cut it into the width required for commercial sheets, books, or other purposes. In order to accomplish this result, it is first desirable to arrange the paper squarely before it is slit, and in order to accomplish this result I mount a rock-shaft M in a suitable bracket on the machine and provide it with upwardly-extending fingers m, so arranged that they are moved in the path of the paper, as shown in Fig. 3, and as the paper is fed forwardly by means of the delivery-belts N it is arranged squarely thereon and held until the fingers are depressed out of the path of the paper. In order to vibrate the fingers into and out of the path of the paper, the rock-shaft is provided with a lever-arm m', which is in turn engaged by an operating-rod m^2, the engagement being such that the operating-rod may reciprocate through the connection. This operating-rod is provided with nuts m^3, and between these nuts and the arm of the rock-shaft is inserted a helically-coiled spring m^4. The opposite end of this operating-rod is pivotally connected to the rod k^6 of the rocker-shaft k^5, so that during the vibrations of the rocker-shaft in one direction the spring forces the fingers downwardly and out of the path of the paper, while the movement of the operating-rod in the opposite direction releases the tension of the spring from acting on the lever of the rock-shaft, and the weight of such lever lifts the fingers normally up into the path of the paper. After the paper has been squared and the fingers released the delivery tapes or belt N carries it forward into position to be acted on by the slitting-cutters P, which slit it into sheets of the desired width, as shown particularly in Fig. 4, and also cut off the lateral edges of the sheet of paper which have been grasped between the rolls. The slitting-cutters are operated by means of a belt p, which engages a pulley p' on the shaft of the lower slitting-cutters and a pulley P' on the main shaft.

At times the carbon-coating mechanism may act faster than the cutting and slitting mechanisms, while at other times the cutting and slitting mechanisms may act faster than the carbon-coating mechanism. It is desirable, therefore, to provide means by which one

or both of these mechanisms may be thrown into or out of operation.

Describing first the means by which the carbon-coating mechanism is operated, an intermediate driving-shaft R is provided, which has a spur-gear r, engaging with a pinion r' on the crank-shaft of the rubbing mechanism. One end of this intermediate driving-shaft is provided with a bevel-pinion R′, engaging with a bevel-pinion r^2 on the continuous feeding-rolls, so as to drive such rolls. The opposite end of this intermediate shaft is provided with a bevel-pinion r^3, which operates a spur-gear r^4 on the carbon-supplying rolls by means of the gears r^5, r^6, and r^7, so that motion is imparted to this supplying-roll. A driving-pinion R^2 is mounted on a hollow sleeve, which is in turn loosely mounted on a rotating shaft S, one end of the shaft having a bevel-pinion s, engaging with the bevel-pinion L′ on the driving-shaft. This sleeved gear operates a gear R^3 on the intermediate shaft by means of the compound intermediate gears r^8 and r^9, so that when the sleeved gear rotates positively with the shaft S the intermediate shaft is driven or rotated. In order to throw this sleeved gear into or out of operation, a clutch S′ is provided and a lever S^2 arranged to engage it in such a manner as to throw it into and out of engagement with the clutch-face of the sleeve-gear, thus throwing the carbon-coating mechanism into and out of operation.

In order to throw the cutting mechanism into and out of operation whenever it is desirable or necessary, the gear l^2 is provided with a ratchet-face l^{10}. The shaft upon which this gear l^2 is loosely mounted is provided with a clutch l^{11}, arranged to be thrown into and out of engagement with the clutch-face of the gear by means of the lever T, so that the cutting and slitting mechanisms may be thrown into and out of operation at the same time. These mechanisms not only permit of compensating for the differences of speed of the carbon-coating and cutting mechanisms, but also permit the two mechanisms to be operated independently whenever it is desirable or necessary.

During the operation of rubbing and polishing and owing to the friction force exerted on the paper the paper is liable to become heated and, as a consequence, ruptured or destroyed, and the heat also interferes with the coating of the carbon. In order to remove this objection, I provide the bed of the machine with a water-jacket W and provide it with supply and exhaust pipes w and w', so that a constant circulation of water may be had whenever it is desirable or necessary, and thus keep the temperature of the paper as uniform as possible.

While I have described my invention with more or less minuteness as regards details of construction and arrangement and as being embodied in certain precise forms, I do not desire to be limited thereto unduly or any more than is pointed out in the claims. On the contrary, I contemplate all proper changes in form, construction, and arrangement, the omission of immaterial elements, and the substitution of equivalents, as circumstances may suggest or necessity render expedient.

I claim—

1. In a machine for supplying practically-hard carbon to sheets of paper, the combination of means for initially supplying practically-hard carbon to a sheet of paper, and devices for spreading and devices for affixing the carbon on the surface of the paper, substantially as described.

2. In a machine for supplying practically-hard carbon to sheets of paper, the combination of means for primarily supplying practically-hard carbon to a sheet of paper, devices for subsequently spreading the carbon evenly over and devices for affixing it to the surface of the paper, and means for polishing or hardening the exposed surface of the carbon, substantially as described.

3. In a machine for supplying practically-hard carbon to sheets of paper, the combination of means for feeding a sheet or strip of paper through the machine, means for primarily supplying carbon to the sheet of paper, devices for spreading the carbon evenly over and devices for affixing it to the surface of the paper, and means for hardening the exposed surface of the carbon, substantially as described.

4. In a machine for supplying practically-hard carbon to sheets of paper, the combination of means for feeding paper through the machine, means for supplying the paper with practically-hard carbon, devices for spreading the carbon evenly over and devices for affixing it to the surface of the paper, means for hardening or polishing the exposed surface of the carbon, and means for cutting the paper into sheets of desired size, substantially as described.

5. In a machine for supplying practically-hard carbon to sheets of paper, the combination of a pocket for holding a cake of carbon in position to be fed to the paper, reciprocating rubbing mechanism for spreading the carbon evenly over and affixing it to the surface of the paper, and means for polishing or hardening the exposed surface of the carbon, substantially as described.

6. In a machine for supplying practically-hard carbon to sheets of paper, the combination of means for supplying the paper with carbon, reciprocating rubbing mechanism for distributing the carbon evenly over and affixing it to the surface of the paper, and rotating mechanism for polishing or hardening the exposed surface of the carbon, substantially as described.

7. In a machine for supplying practically-hard carbon to sheets of paper, the combination of a pocket for holding a cake of carbon in position to be fed to the paper, two sets of rubbers arranged to reciprocate in opposite

directions and spread the carbon evenly over and affix it to the surface of the paper, a rotating spindle provided with radial projections for polishing or hardening the exposed surface of the carbon, and means for feeding a strip of paper through the machine, substantially as described.

8. In a machine for supplying practically-hard carbon to sheets of paper, the combination of means for supplying the paper with practically-hard carbon, rubbers provided with a covering of flannel, chamois, or similar material for distributing the carbon evenly over and affixing it to the surface of the paper, means for reciprocating the rubbers, a rotating spindle provided with wings arranged radially thereon and having a covering of flannel, chamois, or similar material for the wings to harden or polish the exposed surface of the carbon, means for rotating the wing polishers, and means for feeding the paper through the machine, substantially as described.

9. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll beneath the transferring-roll for the passage of the paper between the rolls to be contacted by the transferring-roll, and means operating on the paper after it leaves the carbon-roll for uniformly and evenly spreading and permanently affixing the carbon on the paper, substantially as described.

10. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll beneath the transferring-roll for the passage of the paper between the rolls to be contacted by the transferring-roll, means operating on the paper after it leaves the carbon-roll for uniformly and evenly spreading and permanently affixing the carbon on the paper, means for polishing and hardening the carbon surface of the paper after it leaves the spreading and affixing means, substantially as described.

11. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll beneath the supply-roll for the passage of the paper between the rolls to be contacted by the supply-roll, means operating on the paper after it has been carboned for uniformly and evenly spreading and permanently affixing the carbon on the paper, means for polishing and hardening the carboned surface of the paper after it leaves the spreading and affixing devices, and continuously-operating feed-rolls between which the paper passes after leaving the polishing and hardening means, substantially as described.

12. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll beneath the supply-roll for the passage of the paper between the rolls to be contacted by the supply-roll, means operating on the paper after it leaves the carbon-roll for uniformly and evenly spreading and permanently affixing the carbon on the paper, means for polishing and hardening the carboned surface of the paper after it leaves the spreading and affixing devices, continuously-operating feed-rolls between which the paper passes after leaving the polishing and hardening means, and cutting mechanism operating on the paper after it leaves the feed-rolls, substantially as described.

13. In a machine of the class described, the combination of a receiver or pocket adapted to contain a cake of carbon and hold the same in position to be fed to a sheet of paper and supply a coating of carbon to the surface of the paper, a reciprocating rubber mechanism transversely operating across the surface of the carboned paper and adapted to uniformly and evenly spread the applied carbon on the surface of the paper and affix the same permanently thereunto, and means for polishing and hardening the carboned surface after it leaves the spreading and affixing rubbers, substantially as described.

14. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coat of carbon, a second roll coacting with the first roll and between which rolls the paper passes to receive the coating of carbon, a reciprocating rubber mechanism transversely operating across the surface of the paper and adapted to uniformly and evenly spread the applied carbon onto the surface of the paper and permanently affix the same thereunto, and a revolving polisher and hardener operating on the affixed carbon, substantially as described.

15. In a machine of the class described, the combination of a receiver or pocket adapted to contain a cake of carbon and hold the same in position to be fed to a sheet of paper for coating the paper with the carbon, two alternately-reciprocating rubbers operating transversely over the surface of the carboned paper and uniformly and evenly spreading the applied carbon on the surface of the paper and permanently affixing the same thereunto, and a rotatable spindle provided with longitudinally-inclined projections radiating from

the center of the spindle toward each end and having a suitable covering adapted to polish and harden the carboned surface of the paper, substantially as described.

16. In a machine of the class described, the combination of a receiver or pocket adapted to contain a cake of carbon and hold the same in position to be fed to a sheet of paper and apply a coating of carbon to the paper, two alternately-reciprocating rubbers transversely operating over the carboned surface of the paper to uniformly and evenly spread the applied carbon on the surface of the paper and permanently affix the same thereunto, a rotating spindle provided with longitudinally-inclined projections radiating from the center of the spindle toward each end and having a covering suitable to polish and harden the carboned surface of the paper, and continuously-operating feed-rolls between which the paper passes after being polished and hardened, substantially as described.

17. In a machine of the class described, the combination of means for primarily supplying the paper with carbon, two sets of rubbers arranged to reciprocate in opposite directions for distributing the carbon evenly over and affixing it to one surface of the paper, a rotating wing polisher for polishing or hardening the exposed surface of the carbon, means for feeding the paper through the machine, means for operating the feeding and carbon-coating mechanism, means for cutting the paper transversely, means for intermittently feeding the paper into position to be cut, means for slitting the paper longitudinally, means for delivering the paper after it has been cut transversely into position for slitting, means for operating the intermittent feeding, cutting and slitting mechanisms simultaneously, and means for throwing the feeding and carbon-coating mechanisms and the intermittent feeding and cutting mechanism into and out of action independently, substantially as described.

18. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll coacting with the supply-roll between which rolls the sheet of paper passes to receive the coating, two rubbers arranged side by side and transversely and alternately reciprocated across the face of the paper, a rotatable spindle provided with longitudinally-inclined projections radiating from the center of the spindle toward each end and having a suitable covering to harden and polish the surface of the carboned paper, a bed portion over which the rubbers operate, and a water-jacket within the bed over which—and out of contact with the water in the jacket—the paper passes and is maintained cool under the friction of the rubbers in spreading and affixing the carbon, substantially as described.

19. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll coacting with the supply-roll for the passage of the paper between the two rolls to receive the coating of carbon, two rubbers, each having a covering of soft material and arranged side by side and transversely and alternately reciprocated across the surface of the paper for distributing the carbon uniformly and evenly and permanently affixing the same onto one surface of the paper, means for alternately reciprocating the rubbers, a rotatable spindle having wings running radially and at an angle to its axis from the center toward each end and provided with a covering of soft material for the wings constituting a polisher and hardener for the carboned surface of the paper, and means for rotating the spindle, substantially as described.

20. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll coacting with the supply-roll for the passage of the paper between the two rolls to receive the coating of carbon, two rubbers, each having a covering of soft material and arranged side by side transversely and alternately reciprocated across the face of the paper, means for alternately reciprocating the rubbers, a rotatable spindle having wings running radially and at an angle to its axis from the center toward each end and provided with a covering of soft material for the wings constituting a polisher and hardener for the carboned surface of the paper, means for rotating the spindle, and continuous feed-rolls operating after the paper leaves the polisher and hardener, substantially as described.

21. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll coacting with the supply-roll between which rolls the paper passes to receive its coating of carbon, two rubbers, each having a covering of soft material and arranged side by side and transversely and alternately reciprocated across the carboned surface of the paper, a rotatable spindle having wings running radially and at an angle to its axis from the center toward each end and provided with a covering of soft material for the wings constituting a polisher and hardener, means for rotating the spindle, continuous feed-rolls receiving the paper

after being hardened and polished, a cutting mechanism operating on the paper after it leaves the continuous feed-rolls, and an intermittent feed mechanism between the continuous feed-rolls and the cutting mechanism, substantially as described.

22. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with the carbon and on the opposite side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll coacting with the supply-roll, between which rolls the paper passes to receive a coating of carbon, two rubbers, each having a covering of soft material and arranged side by side and transversely and alternately reciprocated across the carboned surface of the paper, means for alternately reciprocating the rubbers, a rotatable spindle having wings running radially and at an angle to its axis from the center toward each end and provided with soft material for the wings, means for rotating the spindle, continuous feed-rolls operating on the paper after it is polished and hardened, a revolving cutter longitudinally severing the sheets and a reciprocating cutter transversely severing the sheets, and an intermittent feed mechanism between the continuous feed-rollers and the cutting mechanism, substantially as described.

23. In a machine of the class described, the combination of a roll receiving a supply of carbon contacting on one side with a sheet of paper for transferring and rolling onto the paper a coating of carbon, a second roll coacting with the supply-roll between which rolls the paper passes to receive a coating of carbon, two rubbers, each having a covering of soft material and located side by side and transversely and alternately reciprocated across the carboned surface of the paper, means for reciprocating the rubbers, a rotatable spindle having wings running radially and at an angle to its axis from the center toward each end and provided with a covering of soft material for the wings, means for rotating the spindle, continuously-operating feed-rolls receiving the paper after being polished and hardened, a revolving cutter longitudinally severing the sheet and a reciprocating cutter transversely severing the sheet after it leaves the feed-rollers, an intermittent feed mechanism between the continuous feed-rollers and the coating mechanism, carrying belts receiving and delivering the sheets from the reciprocating cutter, and stop-fingers coacting with the belts and engaging the edge of a sheet of paper for the travel of the belts to straighten the sheet, substantially as described.

24. In a machine of the class described, the combination of tension-applying rollers receiving a continuous sheet of paper, a carbon transferring and applying roll, a second roll coacting with the carbon-applying roll, a spreading and affixing means consisting of two alternately-reciprocating rubbers, a polishing means consisting of a rotatable shaft having radial wings extending from the center toward each end, and continuous feed-rolls coacting with the tension-rolls and maintaining a sheet of paper taut in its passage beneath the carbon applying, the spreading and affixing and the polishing and hardening mechanisms, substantially as described.

25. In a machine of the class described, the combination of tension-applying rollers receiving a continuous sheet of paper, a carbon transferring and affixing roll, a second roll coacting with the carbon-roll, a spreading and affixing mechanism consisting of two rubbers alternately reciprocated across the carbon surface of the paper, a polishing mechanism consisting of a rotatable shaft having wings running radially and at an angle from the center toward each end, continuously-operating feed-rolls coacting with the tension-rolls and maintaining the sheet of paper taut in its passage beneath the carbon applying, the spreading and affixing, and the polishing and hardening mechanisms, and a water bed or support over which the paper travels, substantially as described.

26. In a machine of the class described, the combination of a carbon-applying means, a spreading and affixing means, a polishing and hardening means, continuously-operating feed-rollers, and intermittently-operating feed-rollers for enabling the applying, affixing, hardening and polishing operations to be continuous and the cutting of the carbon-paper to be intermittent at predetermined periods, substantially as described.

27. In a machine of the class described, the combination of a carbon-applying means, a spreading and affixing means, a polishing and hardening means, continuously-operating feed-rollers, a longitudinal cutter, a transverse cutter, and intermittently-operating feed-rollers between the continuous feed-rollers and the cutting mechanism, substantially as described.

28. In a machine for supplying practically-hard carbon to a sheet of paper the combination of means for initially applying the carbon to the surface of the paper, and devices for spreading and affixing the carbon on the surface of the paper.

29. In a machine for supplying practically-hard carbon to the surface only of the sheet of paper, the combination of means for initially applying the carbon to the surface of the paper, means for spreading the carbon evenly over the surface and means for affixing the carbon to the surface so that a practically-hard carbon surface will be formed on the surface only of the paper.

30. A machine for forming a practically-hard carbon surface on paper, comprising

means for initially supplying carbon to the surface of the paper, and means for affixing the carbon on the sheet to form a practically-hard surface.

31. A machine for making hard-carbon-surfaced paper, comprising a paper-feed, means for applying a practically-hard carbon to one surface of the paper and a device for affixing the carbon to the paper to form a hard carbon-coated surface, substantially as described.

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