

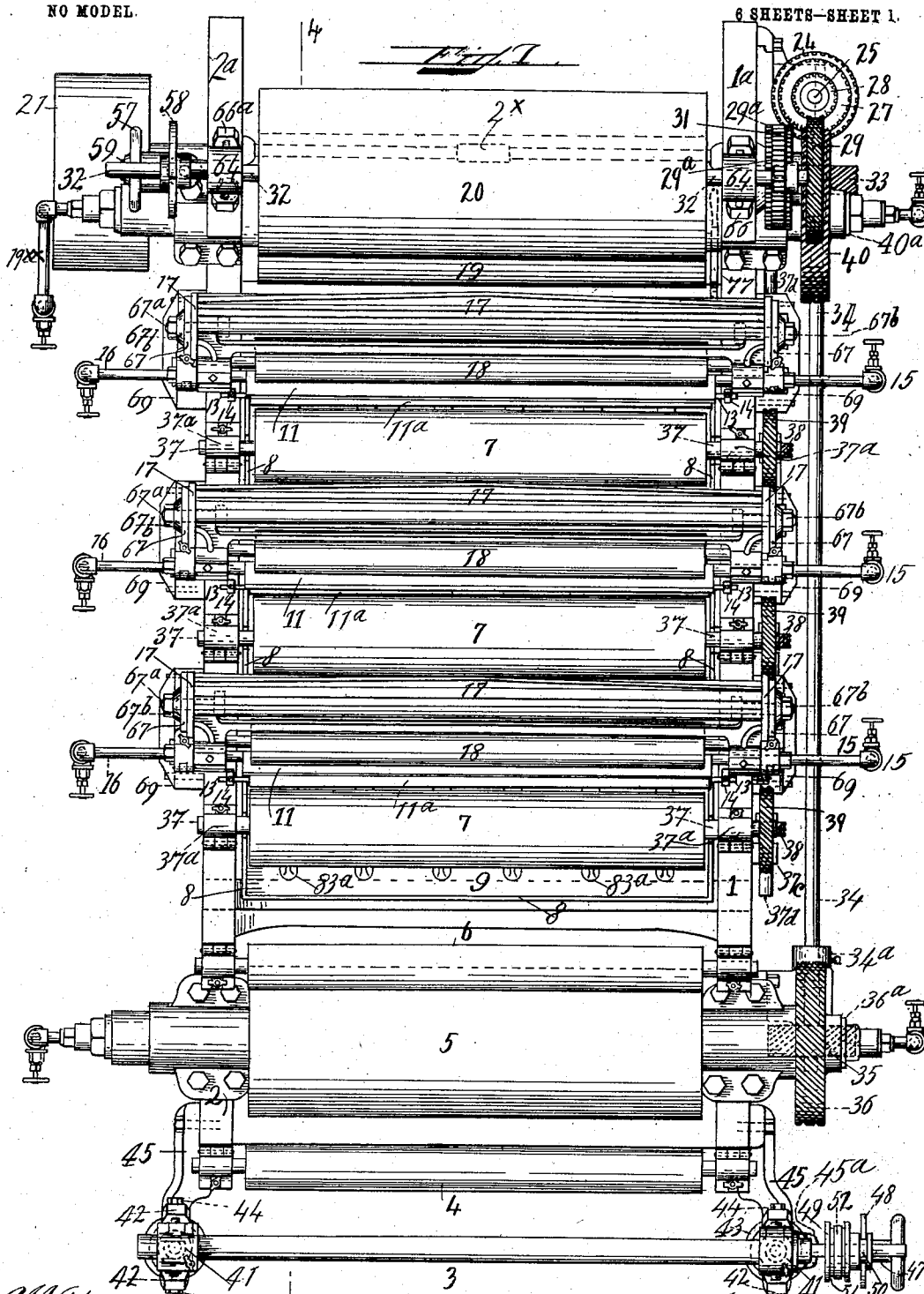
No. 739,813.

PATENTED SEPT. 22, 1903.

F. B. HOW.
MACHINE FOR MAKING CARBON PAPER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.



Witnesses:
M. C. Loveney
E. A. Allen.

Inventor:
Fred Bradford How,
by his attorney,
Edward S. Beach

No. 739,313.

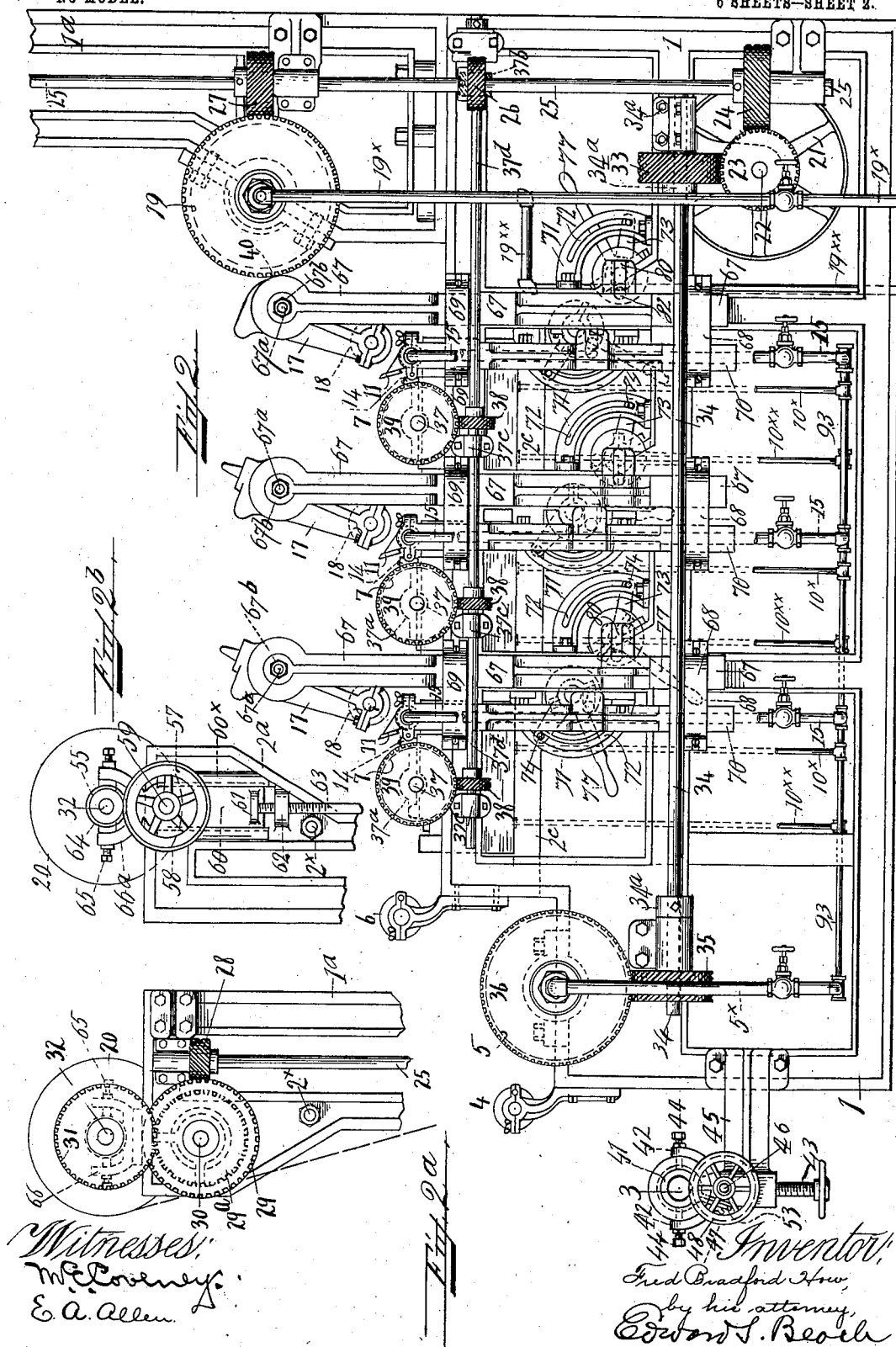
PATENTED SEPT. 22, 1903.

F. B. HOW.
MACHINE FOR MAKING CARBON PAPER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.

6 SHEETS—SHEET 2.



No. 739,313.

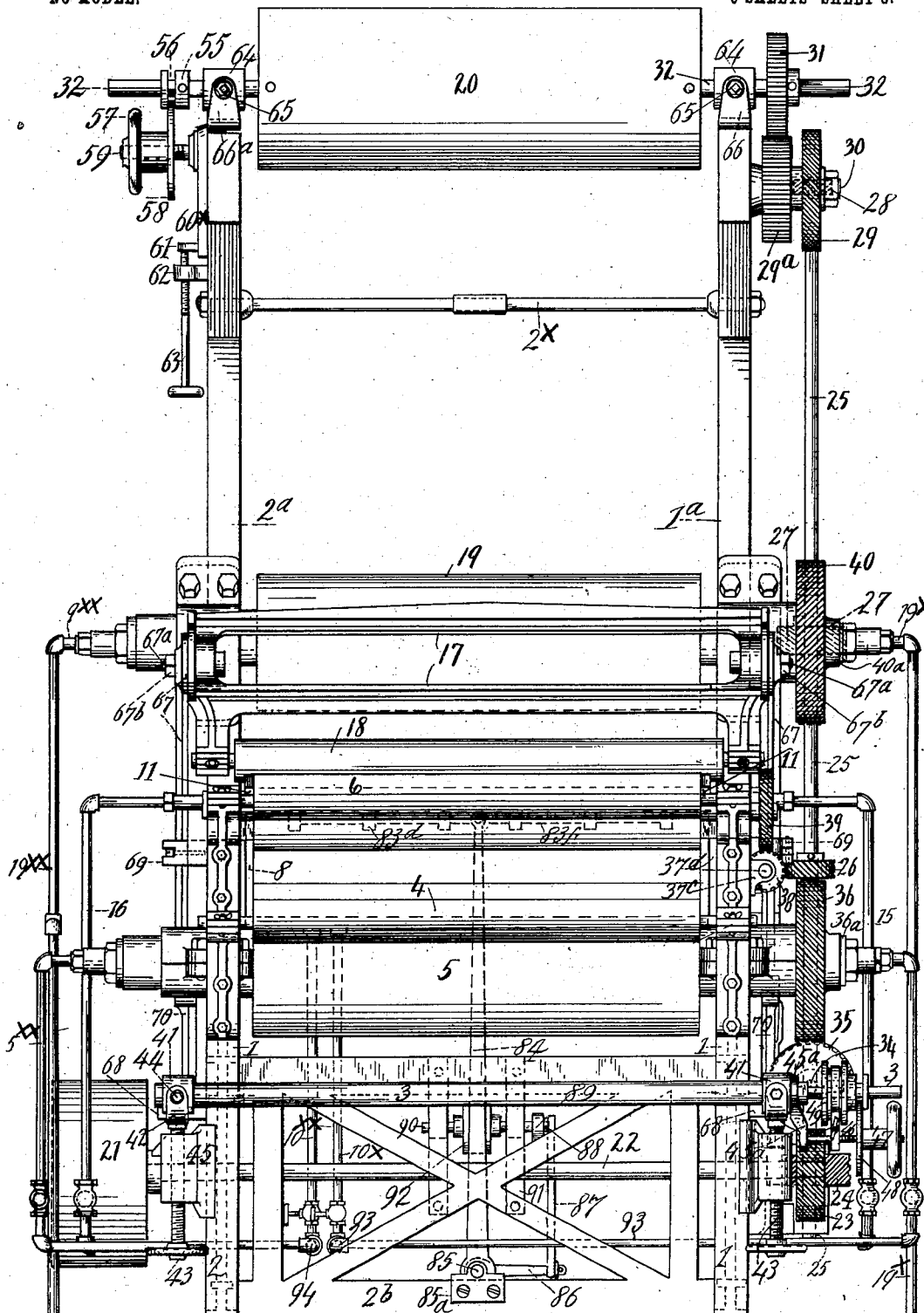
PATENTED SEPT. 22, 1903.

F. B. HOW.
MACHINE FOR MAKING CARBON PAPER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.

6 SHEETS—SHEET 3.



Witnesses
W. C. Allen
E. A. Allen

F. B. HOW. Inventor
Fred Crawford How.
by his attorney
Edward S. Seebach

No. 739,313.

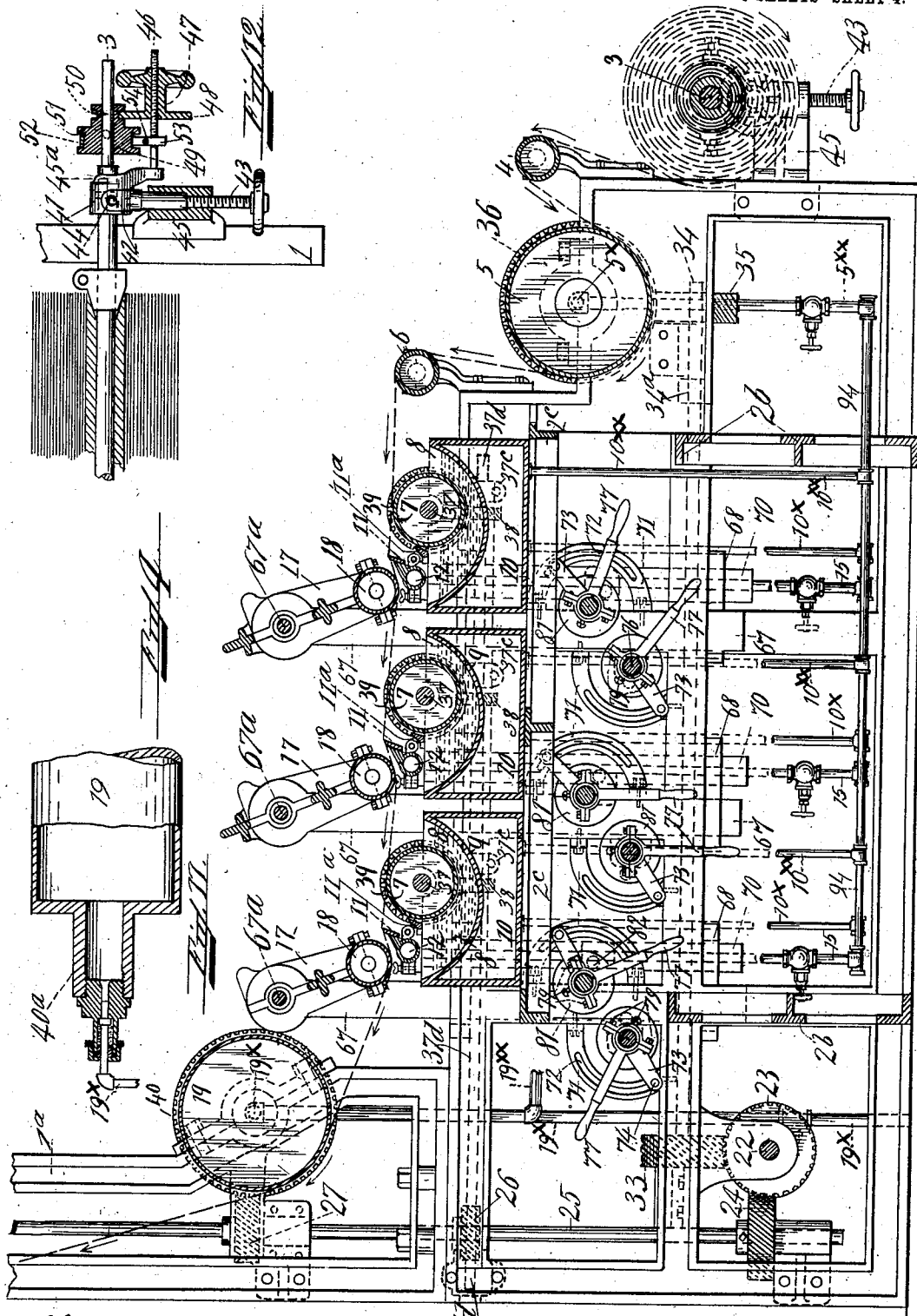
PATENTED SEPT. 22, 1903.

F. B. HOW.
MACHINE FOR MAKING CARBON PAPER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.

6 SHEETS—SHEET 4.



Witnesses:
E. A. Allen.

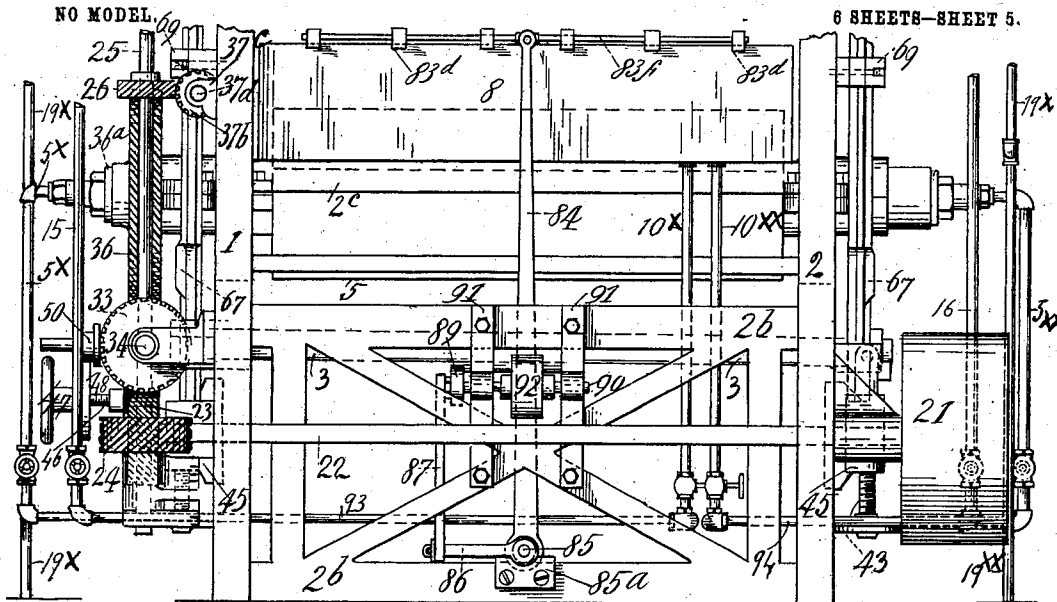
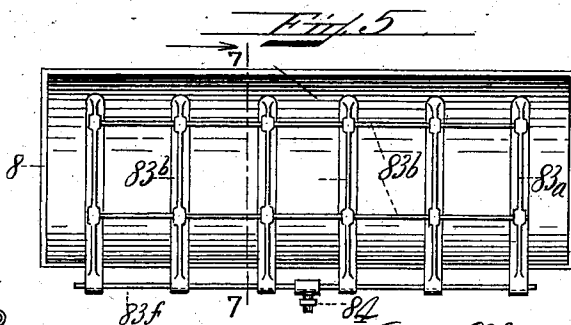
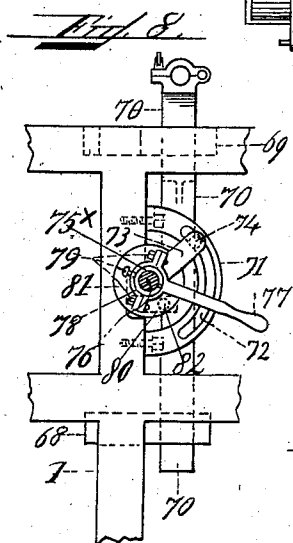
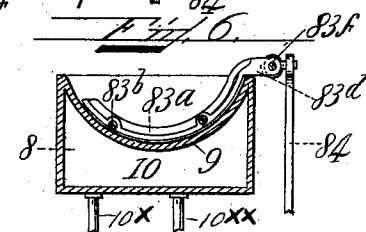
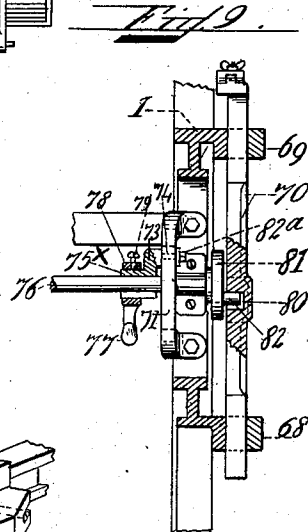
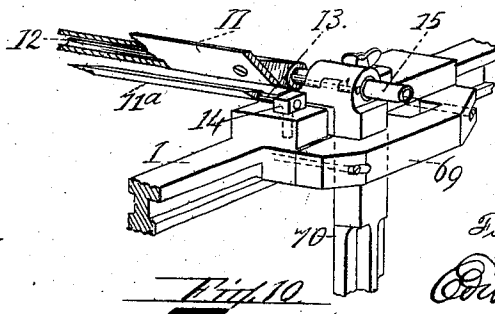
Inventor: F. B. How,
by J. H. Peterson,
Edward J. Beach.

F. B. HOW.
MACHINE FOR MAKING CARBON PAPER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.

6 SHEETS—SHEET 5.



Witnesses:
W. R. Roney
E. A. Allen

Inventor:
Fred Bradford How
by his attorney,
Edward S. Beach

No. 739,313.

PATENTED SEPT. 22, 1903.

F. B. HOW.
MACHINE FOR MAKING CARBON PAPER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.

6 SHEETS—SHEET 6.

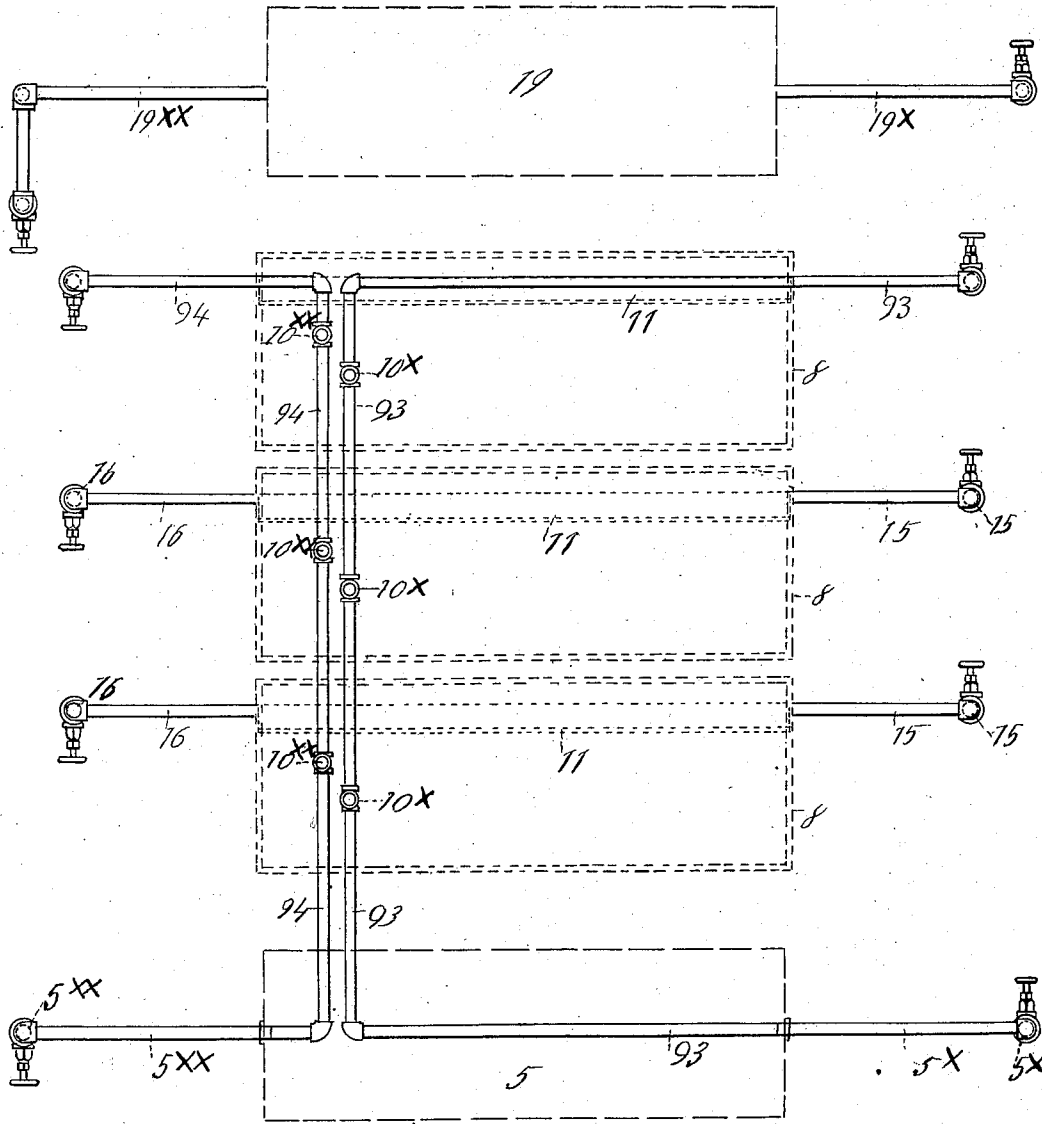


Fig. 13.

Witnesses:
W. E. Coveney
E. A. Allen

Inventor:
Fred Bradford How,
by his attorney,
Oscar S. Beach

UNITED STATES PATENT OFFICE.

FRED BRADFORD HOW, OF WINTHROP, MASSACHUSETTS, ASSIGNOR TO CROWN PAPER COMPANY, OF KITTERY, MAINE, AND BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

MACHINE FOR MAKING CARBON-PAPER.

SPECIFICATION forming part of Letters Patent No. 739,313, dated September 22, 1903.

Application filed February 27, 1902. Serial No. 95,849. (No model.)

To all whom it may concern:

Be it known that I, FRED BRADFORD HOW, a citizen of the United States, residing at Winthrop, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Making Carbon-Paper, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a top plan view of my new machine. Fig. 2 is an elevation of the right-hand side of the machine illustrated in plan in Fig. 1, the parts shown in Fig. 2^a and the agitator mechanisms being omitted. Fig. 2^a is supplementary to Fig. 2 and shows in elevation the right-hand end or side of the take-up reel and its driving mechanism, which are omitted from Fig. 2. Fig. 2^b shows in elevation the left-hand end or side of the take-up reel and its adjusting mechanism. Fig. 3 shows my new machine in front elevation. Fig. 4 is a sectional view on line 4 4 of Fig. 1, the agitator mechanisms being omitted. Fig. 5 illustrates in rear elevation the lower portion of the machine and shows the mechanism that actuates one of the agitators. Fig. 6 is a detail showing in top plan view one of the ink-troughs with its agitator in place. Fig. 7 is a sectional view on line 7 7 of Fig. 6. Fig. 8 is a detail showing in interior side elevation the mechanism for adjusting the slides which carry the paper-scrapers and tension-rolls. Fig. 9 is a detail showing partially in sectional view the parts illustrated in Fig. 8. Fig. 10 is a detail showing in perspective the manner in which the paper-scraper and the ink-roll wiper are mounted. Fig. 11 is a detail showing in central longitudinal sectional view the refrigerating-drum and its stuffing-box. Fig. 12 is a detail illustrating the mechanism for adjusting the paper-supply reel. Fig. 13 is a detail in plan of the system of heating and refrigerating pipes.

The general object of my invention is to provide a machine for automatically impregnating paper as it passes from a supply-reel to a take-up reel with any desirable saturating material adapted to be diffused throughout the body of the paper and set or fixed

therein before the paper is wound on the take-up reel.

My new machine is especially adapted to produce in improved kind or species of the old and well-known carbon or manifolding paper, the paper web of which is saturated with a carbon or similar ink containing wax in solution.

The particular purpose which my new machine is designed to effect is the impregnation of the paper with a uniform deposit of carbon diffused regularly throughout the substance of the paper without building up on either of its surfaces a crust or distinct skin of the material with which the body or substance of the paper is impregnated.

In the drawings illustrating the principle of my invention and the best mode in which I have contemplated applying that principle, 1 and 2 are respectively the right and left side frames of the machine when viewed from the paper-supply end, (see Figs. 3 and 1,) and these side frames are braced by the end frames 2^b, the rear one of which is best shown in Fig. 5. Bolted to the rear top portion of the side frames 1 and 2, respectively, are the upright extension-frames 1^a and 2^a, (see Figs. 3, 2, 2^a, 2^b, and 1,) and these extension-frames 1^a and 2^a are braced by the tie-rods 2^x. (See Figs. 3 and 1.)

The web of paper from the roll on the paper-supply reel 3 (see Figs. 4, 2, and 3) is led over the guide-roll 4, then under the hollow drying and smoothing drum 5, and over the second guide-roll 6 to the first ink-roll 7. The drawings show a series of three ink-rolls 7, in rear of each of which are a paper-scraper 11 and a tension-roll 18; but it is manifest that the number of such ink-rolls 7, together with the appurtenant paper-scrapers and tension-rolls, may be varied to meet the requirements of the particular work in hand. After contacting with the several ink-rolls, paper-scrapers, and tension-rolls the paper passes under the refrigerating-drum 19 to the take-up reel 20.

The apparatus for applying the saturating or impregnating solution comprises the ink-rolls 7, which revolve with their under sur-

face immersed in the solution held in the trough 8, supported on a horizontal transverse frame 2^c, the bottom 9 of which trough is semicylindrical or concave upward, as is best shown in Figs. 7 and 4. Beneath the bottom 9 is a heating-chamber 10, to which any suitable heating fluid, preferably steam or hot-air, is admitted through the inlet-pipe 10^x and from which said heating fluid is exhausted through the outlet-pipe 10^{xx}. The constant circulation of the heated fluid in the chamber 10 keeps the solution in the trough 8 in proper condition for diffusion throughout the body of the paper. In rear of the ink-roll 7 is a wiper 11^a, provided with a knife-edge which contacts with the cylindrical surface of the ink-roll 7 and regulates the amount of the solution carried by the ink-roll 7 to the paper. (See Figs. 10 and 4.) The wipers 11^a are formed with journal ends 13, that rest in bearings 14 on the side frames 1 and 2. To force the saturating solution into the paper and distribute it evenly throughout the body of the paper, a paper-scraper 11 is mounted in rear of each ink-roll 7 (see Figs. 4, 2, and 10) and is provided with a hollow shaft 12, into which a suitable heating fluid is admitted through the inlet-pipe 15 and from which said heating fluid is exhausted through the outlet-pipe 16. The paper-scraper 11 is thus kept heated and with its upper edge in contact with the wetted side of the paper forces the solution of impregnating material into the paper and distributes it evenly therein.

To keep the paper under proper tension, so that it will contact properly with the ink-rolls 7 and paper-scrappers 11, a tension-roll 18 is mounted in swing-arms 17 in rear of each ink-roll 7. In its passage from the guide-roll 6 to the refrigerating-drum 19 the upper or unwetted surface of the paper contacts with these tension-rolls 18, as is best shown in Fig. 4.

To harden the solution with which the paper is impregnated and to set the diffused material in the paper, the web is led under the refrigerating-drum 19, within which circulates any suitable cooling fluid, as water. The drum 19 is connected with the source of water-supply by means of the inlet-pipes 19^x, and the outlet-pipes 19^{xx} lead from it to the waste. From the refrigerating-drum the web of paper passes to the take-up reel 20 on the shaft 32, which shaft is journaled in the extension-frames 1^a and 2^a. While it is desirable in many cases to minimize floor-space by putting the take-up reel above the main part or body of the machine, yet a far more important object is attained by this arrangement in my new machine in that the prepared paper may pass between the attendant and the source of light as it is led from the refrigerating-drum to the take-up reel, and thereby any imperfections in the manufacture, such as lack of uniformity or unevenness in the diffusion of the impregnating material, may be detected and corrected.

Paper as it comes from the mill in rolls is often uneven at intervals along its margin or a little wrinkled. It is important in making carbon-paper to have the paper run as smooth and regular as possible in the machine and to have it wind true and not spirally, and to attain these desirable results provision is made in my new machine for adjusting the paper-supply reel 3 and the shaft 32 of the take-up reel 20 laterally toward each other and for making independent vertical and longitudinal adjustments of both of said shafts.

To provide a vertical adjustment of the paper-supply reel 3, (see Figs. 1, 2, and 3,) its journal ends are supported in the journal-boxes 41, held by trunnion-screws 44 in the arms 42 of the Y-screws 43, mounted in brackets 45, secured one to each of the side frames 1 and 2. The lower end of each Y-screw 43 is provided with a hand-wheel, by means of which the Y-screws may be rotated and the arms 42 thereof be raised or lowered, as desired, carrying with them the journal-boxes 41, in which rest the journal ends of the paper-supply reel 3. The lateral adjustment of the paper-supply reel 3 is made by turning the trunnion-screws 44, as will be readily understood.

The longitudinal adjustment of the paper-supply reel 3 is provided for by the following mechanism, (see Figs. 12, 1, and 3:) A lug 45^a projects downwardly from the journal-boxes 41 and supports a screw-threaded spindle 46, engaged by a nut 47, formed with a flange 48, which enters a circumferential groove 50 in a collar 49, fast upon the projecting right-hand end of the paper-supply reel 3. The collar 49 is formed with a circumferential groove 51, adapted to receive a strap 52, tied by a bolt or rivet 54. The downwardly-projecting ends 53 of said strap 52 abut against the screw-spindle 46, so as to prevent the rotation of the strap, which in mechanical effect is made to act as a brake. It is obvious that rotation of the flanged nut 47 will move said nut along the spindle 46 and that the longitudinal movement of the nut 47 will by means of its flange 48, engaged in the circumferential groove 50 in the collar 49, be transmitted to said collar 49 and through said collar to the paper-supply reel 3, upon which said collar is fast.

To effect the vertical adjustment of the shaft 32 of the take-up reel 20, the following mechanism is provided, (see Figs. 3 and 2^b:) In suitable vertical ways 60^x in the extension-frame 2^a is slidably mounted a block 60, from which projects the lug 61, that rests upon the upper end of the adjusting-screw 63, the threads of which engage the threaded walls of a hole in the bracket 62. The slide-block 60 is formed at its upper end with Y-supports 66^a, in which is held by trunnion-screws 65 the left-hand journal-box 64 of the shaft 32, the right-hand journal-box of which shaft is similarly secured in the Y-supports 66, formed

on the upper end of the extension-frame 1^a. The right-hand journal-box 64 is therefore not adjustable, while the left-hand journal-box 64 may be adjusted vertically by turning the adjusting-screw 63, thereby raising or lowering the slide-block 60 in its ways 60^x. The lateral adjustment of the shaft 32 is accomplished by turning the trunnion-screws 65, by means of which the journal-boxes 64 are held in the Y-supports 66 and 66^a.

The mechanism for making the longitudinal adjustment of the shaft 32 comprises a collar 55, fast upon the left-hand end of the shaft 32 (see Figs. 3, 2^b, and 1) and formed with a circumferential groove 56, in which engages the flange 58 on the nut 57, that screws upon the screw-stud 59, projecting from the slide-block 60. As will be evident from the above description and a study of Fig. 3, rotation of the nut 57 will through the engagement of its flange 58 with the collar 55 cause the shaft 32 to move lengthwise.

The above adjustments of the shafts 3 and 32 are made by the operator when required, and usually only slight adjustments are necessary.

In order to gain free access to the ink-rolls 7, wipers 11^a, paper-scrappers 11, and tension-rolls 18, the supports of the paper-scrappers and of the tension-rolls are made independently adjustable. The swing-arms 17, in the free ends of which are journaled the tension-rolls 18, are pivotally mounted in the upper ends of the slides 67, (see Fig. 2,) three of which are on one side and three on the opposite side of the machine. The paper-scrappers 11 are mounted in the upper ends of the slides 70, which are, as are also the slides 67, free to work up and down in guide-holes formed in the supporting-brackets 68 and 69 on the side frames 1 and 2, (see Figs. 2, 10, 9, 8, and 5,) the lower series of said brackets being numbered 68 and the upper series being numbered 69. To raise and lower said slides 67 and 70 and to secure the slides in their adjusted position, the following mechanism is provided for each of said slides: A sector 71 is secured firmly to the inside of the side frame near each slide. (See Figs. 8, 9, 2, and 4.) Journaled in the side frames 1 and 2 are the transverse rock-shafts 76, one rock-shaft for each pair of slides. Near each of its ends the rock-shaft 76 is surrounded by a split bushing 75^x, from which extends radially an arm 73, that carries at its free end a screw-stud 74, which engages a curved slot 72 in the sector 71. On each split bushing 75^x is adjustably secured by screws 79 a sectional hub 78, formed on the handle 77. Mounted on the ends of the rock-shaft 76 are the disks 81, provided with lugs 82, that enter the slots 80, formed in the slides 67 and 70. By raising or lowering the handle 77 the shaft 76, to which it is secured, is rocked and the lug 82 on the disk 81 moved up or down in its slot 80, carrying with it the slide 67 or 70, as the case may be. The arm 73 on the split

bushing 75^x rotates with the rock-shaft 76, and the screw-stud 74 is caused to travel in the curved slot 72 of the sector 71. The slide having been moved so as to raise or lower the paper-scraper or the tension-roll, as the case may be, to the desired position, nuts 82^a on the screw-studs 74 are screwed up, thereby binding the arm 73 against the sector and holding the slide in its adjusted position. This is a convenient arrangement of the parts; but the adjustment of the slides 67 and 70 may be dispensed with if desired.

The swing-arms 17 may be rotated upon their journals 67^a to or from the slides 67, in the upper ends of which they are mounted, and the tension-rolls 18 thereby moved down upon or up from the web of paper to place the paper under the proper tension. The proper adjustment having been obtained, the swing-arms 17 are clamped in position by the nuts 67^b.

To keep the solution, especially when it is carbon-ink containing wax, in good working condition, it is not only heated, but is also constantly agitated during the operation of the machine. To effect this agitation, an agitator is provided for each ink-trough 8. (See Figs. 6, 7, and 5.) This agitator is made up of a series of arms curved to conform to the nearly semicylindrical form of the trough-bottom 9 and held together at their curved part by transverse rods 83^b and at their shank portions 83^a, which ride upon the edge of the trough 8, by the transverse rod 83^c, to which is secured (see Fig. 5) a vertical rocker-arm 84, fast on one end of a rock-shaft 85, mounted in a bracket 85^a, secured to the rear end frame 2^b. Fast on the other end of the rock-shaft 85 is a horizontal rocker-arm 86, the free end of which passes through a hole in the lower end of the connecting-rod 87, which is connected to the crank-pin 88 on the crank-disk 89, fast on one end of the shaft 90, journaled in the supports 91, bolted to the rear end frame 2^b. The shaft 91 is driven by a pulley 92, belt-connected with any suitable shaft. As will be evident from the above description and a study of Fig. 5, rotation of the shaft 90 will oscillate the rock-shaft 85 and rocker-arm 84, and thereby reciprocate the agitator in the ink-trough 8.

The system of heating-pipes for the drying and smoothing drum 5 and the heating-chambers 10 under the ink-troughs 8 and the system of cooling-pipes for the refrigerating-drum 19 are shown in plan in Fig. 13 and in side elevation in Fig. 2. The main steam-inlet pipe 93, Fig. 2, is connected with the drying-drum 5 by the inlet-pipe 5^x and with each of the heating-chambers 10 by an inlet-pipe 10^x. After circulating in drying-drum 5 the steam is exhausted from it through the outlet-pipe 5^{xx} into the main exhaust-pipe 94. Similarly after circulating in the heating-chambers 10 the steam is exhausted therefrom through the outlet-pipes 10^{xx}. Steam is admitted to the hollow shaft 12 of the pa-

per-scraper 11 through the inlet-pipes 15 and is exhausted therefrom through the outlet-pipes 16. Water or other cooling fluid flows into the refrigerating-drum 19 through the pipe 19^x and out of said drum through the pipe 19^{xx}.

My new machine is driven from a main shaft 22, fast upon one end of which is the main pulley 21, belt-connected with any suitable source of power, and fast upon the other end of which is the pinion 23, which meshes with two gears—one, the gear 24, fast on the lower end of the vertical shaft 25, and the other, the gear 33, fast on the rear end of the horizontal shaft 34, journaled in bearings 34^a on the side frame 1. (See Figs. 5, 2, 4, and 1.) From the vertical shaft 25 are driven the ink-rolls 7, the refrigerating-drum 19, and the take-up reel 20, and from the horizontal shaft 34 is driven the drying and smoothing drum 5 by the following connections: The take-up reel 20 is driven from a pinion 28, which is fast upon the upper end of the vertical shaft 25 (see Figs. 3, 1, and 2^a) and which meshes with a gear 29, fast upon the same stub-shaft 30 with which is the pinion 29^a, meshing with a gear 31, fast upon the shaft 32 of the take-up reel 20. The refrigerating-drum 19 is driven from the pinion 27, which is fast upon the vertical shaft 25 (see Fig. 2) and which meshes with a gear 40, fast upon the journal extension 40^a of the drum 19. (See Fig. 11.) The ink-rolls 7 are driven from the pinion 26, which is fast upon the vertical shaft 25 and which meshes with a gear 37^b, fast on the horizontal shaft 37^d, journaled in the bearings 37^c on the side frame 1. The shafts 37 of the ink-rolls 7 are journaled in bearings 37^a on the side frames 1 and 2, and each of said shafts 37 is provided at its right-hand end with a gear 39, which meshes with a pinion 38, fast upon the horizontal shaft 37^d, just referred to. The drying and smoothing drum 5 is driven from the horizontal shaft 34 by a pinion 35, which is fast upon the front end of said shaft 34 and which meshes with a gear 36, fast upon the extension 36^a of the journal of the heating-drum 5. (See Figs. 3 and 2.) From this description it will be plain that the drying and smoothing drum 5, the ink-rolls 7, the refrigerating-drum 19, and the take-up reel are simultaneously rotated by the rotation of the main shaft 22 and that the rotation of the take-up reel 20 will pull the web of paper from the roll on the paper-supply reel 3 over the drum 5, the ink-rolls 7, paper-scrapers 11, and under the tension-rolls 18 and refrigerating-drum 19. (See Fig. 4.)

Having now particularly described and ascertained the nature of my said invention and

in what manner the same is to be performed, I declare that what I claim is—

1. In a machine for impregnating sheet material, the combination with a suitable frame, of a supply-reel and a take-up reel, and means for adjusting both of said reels to various horizontal and vertical planes relative to each other, substantially as described.

2. The combination with a reel-journal and a movable journal-box therefor of means for moving the journal endwise in its box; and means for moving the journal-box to shift the journal laterally.

3. The combination of a supply-reel journal, a take-up-reel journal and movable journal-boxes for said journals of means for moving each of said journals endwise; and means for moving each of said journal-boxes, whereby one or both said journals may be shifted laterally and both reels be relatively adjusted.

4. In a mechanism of the class described, the combination with a suitable frame and a suitable trough arranged therein formed with a hollow body having a concaved upper surface, means for heating the same, an agitator curved to conform to the contour of said concavity, and means for impregnating a web with the contained solution, substantially as described.

5. In a mechanism of the class described, the combination with a main frame and a supply-reel carried thereby, an auxiliary frame extending vertically from said main frame, a take-up reel carried by said auxiliary frame at a distance above and spaced from the main frame, said supply-reel being adapted to carry a supply of web designed to be taken up by the take-up reel, and mechanism interposed between said reels for impregnating the web with the solution, substantially as described.

6. In a mechanism of the class described, the combination with a supply-reel carried thereby, a hollow smoothing-drum, a solution-trough, agitating means therein, an applying-roller rotating within said trough, a roller-scraper, a hollow setting-drum, a take-up reel, means for heating the trough, means for supplying a setting medium into the setting-drum, and means for guiding and retaining a web passing through said mechanisms from the supply to the take-up reel, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRED BRADFORD HOW.

Witnesses:

EDWARD S. BEACH,
E. A. ALLEN.