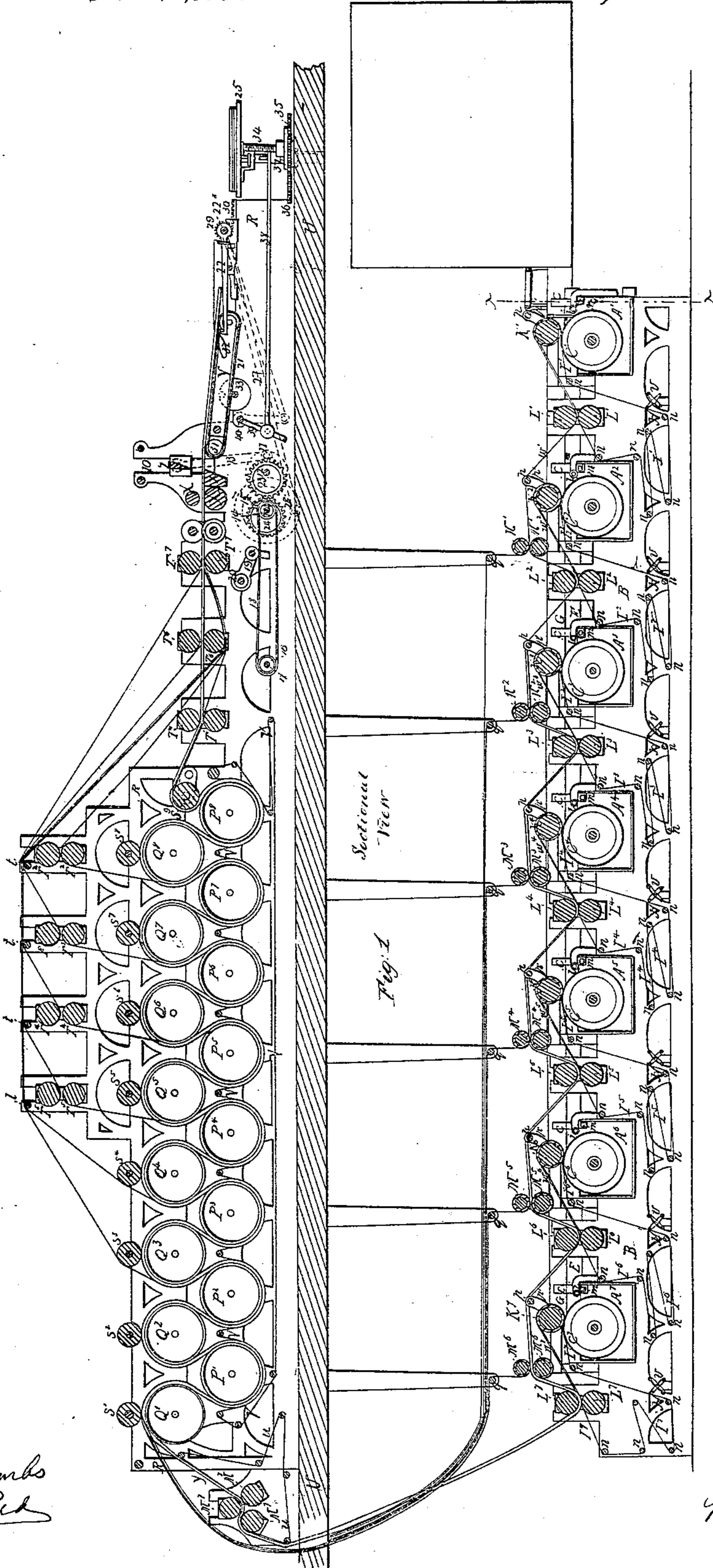


J. F. Jones. Sheet 1.2, Sheets.

Pasteboard Mach.

No 40,265.

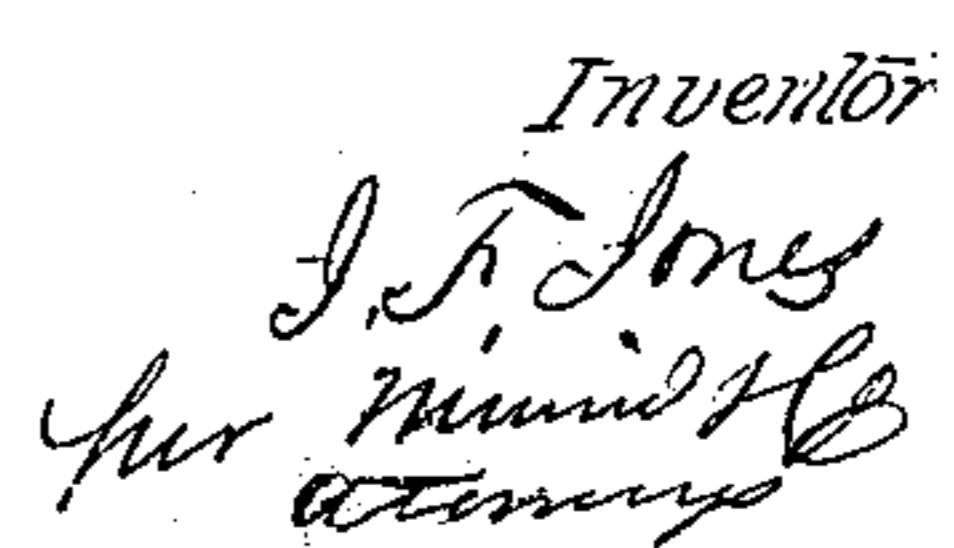
Patented Oct. 13, 1863.



Tissues  
Paper Booms  
W. R. R.

Inventor  
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*Patented Oct. 13, 1863.*



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# UNITED STATES PATENT OFFICE.

JOHN F. JONES, OF ROCHESTER, NEW YORK.

## MACHINE FOR MAKING PAPER AND PAPER BOARDS.

Specification forming part of Letters Patent No. 40,265, dated October 13, 1863.

*To all whom it may concern:*

Be it known that I, JOHN F. JONES, of the city of Rochester, in the county of Monroe and State of New York, have invented certain new and useful improvements in machinery for the manufacture of paper and of the various kinds of boards produced from fibrous substances; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of two floors of a paper-mill, showing a longitudinal vertical section of my machinery. Fig. 2 is a plan of the machinery on the lower floor. Fig. 3 is a plan of a portion of the machinery on the upper floor. Fig. 4 is a transverse vertical section in the plane indicated by the line *x x* in Fig. 1. Fig. 5 is a vertical section of my improved save-all.

Similar letters of reference indicate corresponding parts in the several figures.

The objects of my invention are to economize room, to save labor, and to prevent waste of stock in the manufacture of paper and of such boards as are produced from fibrous materials.

My invention consists, principally, in the construction and arrangement of two or more cylinder-molds in such manner as to deliver their webs of pulp one upon another, for the purpose of being pressed together to form a board of a required thickness, and in the arrangement of drying and calendering apparatus for drying and calendering such board while in a continuous length, and before it is cut into sheets, so that the board is made and finished ready for the market at one continuous operation. The same arrangement of machinery may by very slight additions be adapted for the manufacture of several distinct and separate webs of paper at the same time.

It also consists in a certain novel system of troughs or spouts connecting pipes and valves, whereby a properly regulated supply of pulp and water to each of the several machines and the carrying away of the back-water therefrom are provided for.

It also consists in the employment, in combination with two or more paper-making machines, combined as described, or with a single

machine, of an improved "save-all," composed of a vat for the collection of the back-water from the machine or machines, a reticulated cylinder, like that of a cylinder paper-making machine, working in the said vat for the extraction of the pulp from the water, a coucher for receiving the pulp from the said cylinder, and a scraper for removing the pulp from the coucher and depositing it in a suitable receptacle; and it further consists in certain arrangements of the press-rolls, and of the drying-cylinders and calendering-rolls for drying and calendering either boards or paper.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

The drawings represent seven single-cylinder machines arranged and combined either to manufacture boards or paper.  $A^1 A^2 A^3 A^4 A^5 A^6 A^7$  are the vats, arranged side by side at short distances apart, and supported at some distance above the lower floor of the mill in a suitable framing, *B B*, erected on said floor.

$C^1 C^2 C^3 C^4 C^5 C^6 C^7$  are the rotating reticulated cylinders or cylinder-molds, which may be of the usual or any suitable construction, and packed at their ends in the usual or any suitable manner.

*D D*, Fig. 2, are the pumps, one for each vat, for drawing water from the cylinders, having their suction-pipes *a a* connected with the vats, and their delivery-pipes *b b* connected with an elevated horizontal or slightly-inclined covered spout, *E*, which extends along the back of the whole series of vats. This spout *E* is divided by transverse partitions into a number of compartments corresponding with the number of vats, and its several compartments are connected with the several vats, one with each by means of pipes *m*, for the return to the vats of as much as desirable of the back-water which has been drawn out by the pumps and forced up into the said spout.

*F* is the stuff-chest, containing the pulp for the supply of the vats; and *G* is an open spout running from the stuff-chest along the back of the whole series of vats, with pipes *c* leading to the several vats. This spout *G* is fitted near the stuff-chest *F* with a gate, *d*, connected by a lever, *e*, with a float, *f*, which is

arranged in a box, *g*, at the back of and in communication with the said spout to regulate the depth of pulp in the spout, the said float rising with any increase in such depth, and so lowering and reducing the opening of the gate, and thereby regulating the supply of pulp from the stuff-chest.

The pipes *c* are severally fitted at their junction with the spout *G* with gates or valves *h h*, adjustable by hand to regulate the quantity of pulp passing from the said spout to the vats, and the said pipes connect with the pipes *m* of their respective vats, so that the pulp and the returned back-water enter the vats together and the back-water keeps the mouth of the pulp pipe clear.

*H*, Figs. 2 and 4, is a pipe running all along the back of the whole series of vats, and receiving water under a suitable pressure from an elevated reservoir or by other means, for the supply of the two series of shower-pipes *i j'*; and the first-mentioned series of shower-pipes *i* are arranged to throw showers upon the several cylinders in the same manner as the shower-pipes of other cylinder paper-making machines, and the other series, *j*, are arranged opposite the rotary felt-beaters *v v*, to wash the felts *I' I<sup>2</sup> I<sup>3</sup> I<sup>4</sup> I<sup>5</sup> I<sup>6</sup> I<sup>7</sup>* of the several machines.

Directly under the spout *E* before mentioned there is another covered spout, *J*, which also extends along the back of the whole series of vats, and this spout is connected with the several compartments of the spout *E* by a series of upright pipes, *k*, Fig. 4, one opposite to each vat, and each of these pipes *k* is fitted at its junction with the bottom of the spout *E*, with a valve, *l*, which is attached to a lever, *l'*, and the said lever is connected by a rod, *l<sup>2</sup>*, with a float working in a box, *l<sup>3</sup>*, attached to the back of and communicating with its respective vat, the object of the said floats and valves being to regulate the height of the water in the several vats. While the water remains below a certain level in any one of the vats, the weight of its respective float keeps its respective valve closed, and prevents the water in the spout *E* from running down the pipe *k*, opposite to the said vat, and so keeps up the supply of returning back-water through its respective pipe *m*, but when the water rises up to or above that level the float is raised, and the valve thereby opened to permit the water to escape from the spout *E* into the lower spout, *J*, whence it escapes to the save-all.

*K' K<sup>2</sup> K<sup>3</sup> K<sup>4</sup> K<sup>5</sup> K<sup>6</sup> K<sup>7</sup>* are the couchers, applied in relation to the cylinders as in other cylinder paper-making machines, and having the endless felts *I' I<sup>2</sup> I<sup>3</sup> I<sup>4</sup> I<sup>5</sup> I<sup>6</sup> I<sup>7</sup>* running round them in the usual manner. In order to obtain the requisite length for the felts, and yet bring the vats *A' A<sup>2</sup>*, &c., very near together, the felts are severally arranged to pass down between their respective vats and the next vats in advance of them, and to run back and forth one, two, or more times under the latter,

as shown in Fig. 1, and it is to permit this arrangement of the felts that the vats are raised some distance from the floor instead of being placed directly upon the floor, as has heretofore been the common practice.

*n n n n* are the carrying-rolls, carrying the felts.

*v* are the felt-beaters, arranged below the vats opposite the shower-pipes *j j*.

*L' L<sup>2</sup> L<sup>3</sup> L<sup>4</sup> L<sup>5</sup> L<sup>6</sup> L<sup>7</sup>* are the wet press-rolls, and *M' M<sup>2</sup> M<sup>3</sup> M<sup>4</sup> M<sup>5</sup> M<sup>6</sup> M<sup>7</sup>* the second press-rolls, suitably arranged with respect to the felts. The latter rolls are covered with felt.

*p* are carrying-rolls arranged in the same frames, *p'*, in which the couchers are arranged.

*q* are carrying-rolls arranged in hangers suspended from the floor above the vats.

My machinery, as far as I have described it, will be recognized by the practical paper-maker as composed of a series of distinct cylinder paper-making machines, each of which is capable of producing a separate and distinct web of paper. The several webs thus produced may be either united or finished separately, as may be desired, as will be hereinafter explained, after the construction and arrangement of the rest of the machinery and apparatus have been described.

*N*, Figs. 2 and 5, is the save-all vat, arranged behind the vat *A<sup>7</sup>*, which is the farthest of the series *A' A<sup>2</sup>*, &c., from the stuff-chest.

*N* is the reticulated rotating cylinder running in the said vat, and *N<sup>2</sup>* is the coucher running directly in contact with the said cylinder. The cylinder *N'* may be fitted and packed to one end of the vat in the same manner as the cylinders of cylinder paper-machines, and have a suction-pipe, *r*, applied in the same manner to produce a partial vacuum within the cylinder.

*O* is a scraper, set by adjusting screws *s s* in a suitable fixed position above the coucher to scrape the surface of the latter. The back-water, containing a greater or less quantity of pulp, escaping by the spout *J*, is delivered into the vat *N*, and by the action of the cylinder *N'* and its attached suction apparatus the pulp is extracted and taken up on the surface of the said cylinder, whence it is taken by the coucher. The revolution of the coucher in contact with the scraper causes the pulp to be scraped off from it and deposited in a suitable box, *O'*, or other receptacle. The water passes off by the suction-pipe *r* in the same manner as from a cylinder paper-making machine. This save-all may be used in connection with a single cylinder paper-making machine or with a Fourdrinier machine.

*P' P<sup>2</sup> P<sup>3</sup> P<sup>4</sup> P<sup>5</sup> P<sup>6</sup> P<sup>7</sup> P<sup>8</sup>* and *Q' Q<sup>2</sup> Q<sup>3</sup> Q<sup>4</sup> Q<sup>5</sup> Q<sup>6</sup> Q<sup>7</sup> Q<sup>8</sup>* are two tiers of steam drying-cylinders arranged in suitable bearings in a framing, *R*, erected on the upper floor over the series of machines hereinbefore described, the upper tier of cylinders being arranged over the spaces between the lower ones.

*u* is an endless apron running under the lower series of drying-cylinders upon a system of

carrying-rolls, V V, so arranged as to keep it pressing against a large portion of the circumference of each of said cylinders for the purpose of holding the paper or board in contact therewith as it passes under the said cylinders.

S' S<sup>2</sup> S<sup>3</sup> S<sup>4</sup> S<sup>5</sup> S<sup>6</sup> S<sup>7</sup> S<sup>8</sup> are calender rolls, arranged above the upper drying-cylinders, to operate in combination with the said cylinders; and S<sup>9</sup> is a calender-roll, arranged above the last drying-cylinder P<sup>3</sup>, to operate in combination therewith.

T' T<sup>2</sup> T<sup>3</sup> T<sup>4</sup> T<sup>5</sup> T<sup>6</sup> T<sup>7</sup> are calender-rolls, arranged in pairs, the number of pairs corresponding with the number of cylinder-machines on the lower floor, four pairs being arranged above the drying-cylinders, and the other three pairs, beyond the end of the series of drying-cylinders, between it and the apparatus by which the paper or board is cut into sheets, and which will not be described until after the operation of making the paper or board has been described.

t t t t are carrying-rolls, arranged above the calender-rolls T<sup>2</sup> T<sup>3</sup> T<sup>4</sup> T<sup>5</sup>, and only used in making paper.

At the left hand upper corner of Fig. 1 there is represented an improved system of second-press rolls, M<sup>7</sup> M<sup>7</sup> M<sup>7</sup>. These press rolls belong properly to the last machine of the series on the lower floor, but are arranged on the upper floor, and have a separate felt, u. The improvement consists in the use of three instead of two, one arranged above the other two, which are arranged at such distances apart that the upper one may press upon both of them, and the web passing between the upper one and both the lower ones, and receiving two pressures with the use of but three rolls.

The several cylinder paper-making machines, and the several pressing-rolls, drying-cylinders, and calender-rolls are driven by a suitable system or systems of gearing, having motion communicated by water, steam, or other power.

The manufacture of board, which is the principal purpose for which my machinery is designed, is performed in the following manner: Each of the machines upon the lower floor produces a separate web, as though it were separately used for the manufacture of paper. The web w', from the first machine, after leaving its felt I, and passing between the second press-rolls M', is deposited upon the web w<sup>2</sup> from the second machine while the latter is upon its felt I<sup>2</sup>, and before it passes between its wet press-rolls L<sup>2</sup>, and both of these webs pass together, and are pressed between the latter rolls and between the second press-rolls M<sup>2</sup>, and are deposited upon the third web, w<sup>3</sup>, after which the three together pass between the press-rolls L<sup>3</sup> and L<sup>3</sup>, and on to the next machine to be deposited on the fourth web, w<sup>4</sup>, and so on throughout the whole series of machines, as

shown in red color in Fig. 1, to the last wet press-rolls, L<sup>7</sup>, by which all the webs are pressed together, and from which they pass upward through the floor to the second press-rolls M<sup>7</sup>. The successive pressing operations to which the webs or layers are subjected after each additional web or layer is applied causes them to be united by the natural adhesiveness of the pulp, and the several webs or layers are thus combined to form one thick web or board, which only requires to be dried and calendered to be fit for the market, being either cut up into sheets or not, according as may be desired. The drying of the combined web or board y is performed by its passing alternately over the upper steam-heated cylinders, Q' Q<sup>2</sup>, &c., and under the lower ones, P' P<sup>2</sup>, &c., as illustrated in the upper part of Fig. 1, being calendered on one side in the drying operation by the rolls S' to S<sup>8</sup>, and on the opposite side by the roll S<sup>9</sup>, and afterward subjected to a final calendering operation on both sides by passing between the several pairs of rolls T', T<sup>6</sup>, and T<sup>7</sup>, whence it may pass to a roll or to the cutting machinery hereinafter described to be cut into sheets.

In manufacturing paper the webs w' w<sup>2</sup> w<sup>3</sup> w<sup>4</sup> w<sup>5</sup> w<sup>6</sup> w<sup>7</sup>, from the several machines on the lower floor, instead of being laid and pressed together as they leave the machines, as described with reference to the manufacture of boards, are only pressed separately between their respective wet press-rolls and second press-rolls, and from the second press-rolls they pass singly, as shown in blue color in Fig. 1, to the carrying-rolls g g, and thence to the drying-cylinders. The several webs pass together round the drying-cylinders Q' P' Q<sup>2</sup> P<sup>2</sup> and over Q<sup>3</sup>, and at the latter cylinder the upper web of paper is separated to pass singly over the carrying-rolls t t to the calender-rolls T<sup>7</sup>, where it is calendered. The other webs all pass together to the cylinder Q<sup>4</sup>, where w<sup>6</sup> is separated to pass over the carrying-rollers t t to the calender-rolls T<sup>6</sup>, and the rest severally pass onward between the cylinders till at suitable points in the train of cylinders w<sup>5</sup>, w<sup>4</sup>, w<sup>3</sup>, and w<sup>2</sup>, are separated to pass respectively between the calender-rolls T<sup>5</sup>, T<sup>4</sup>, T<sup>3</sup>, and T<sup>2</sup>, the lower web, w', only passing through the whole train of cylinders and passing singly to and between the rolls T'. The webs w<sup>5</sup> w<sup>4</sup> w<sup>3</sup> w<sup>2</sup> pass from their respective calender-rolls over the rolls t t, and thence down under the rolls T<sup>6</sup> and T<sup>7</sup>, and the whole of the webs are brought together at the pair of delivery-rolls X, which carries them all together to the cutting apparatus to be cut into sheets, or delivers them to rolls, upon which they may be separately rolled up as desired.

The cutting apparatus, which may be used for either paper or boards, is composed of a stationary horizontal blade, x, and a vertically-moving horizontal blade, z, which works in stationary guides 10 10 in the framing R.

The paper or board is delivered by the rolls over the stationary blade  $x$  and under the moving one  $z$ , and cut by the descent of the latter at regular intervals into sheets of uniform length, which may be varied by making the cutter descend more or less frequently. The blade  $z$  is driven by two cranks, 11, at opposite ends of a shaft, 12, and two rods, 13, connecting it with the said cranks. The shaft 12 derives rotary motion through a pair of eccentric gears, 23 44, through gearing from a shaft, 14, which carries one of a pair of cone-pulleys, 15 16, the other of said pulleys being upon a shaft, 17, which derives motion through a belt or gearing at a uniform speed relatively to the calendering-rolls and the delivering-rolls X. The eccentric gears produce an accelerated motion of the upper blade,  $z$ , as it comes in contact with the board or paper, and thereby enable it to cut easily through any desirable thickness of board or paper. The belt 18, running around the cone-pulleys, has applied to it a shifter, 19, operated by a screw, 20, by which the frequency with which the cutter descends relatively to the velocity at which the paper or board is delivered may be adjusted to regulate or varied to vary the length of the sheets.

In front of the cutters there is a horizontal frame, Y, in which run a series of endless moving tapes or bands, 21, which, receiving the sheets one at a time as they are cut off, carry them forward onto a swinging-flier or lay-boy, 22, which by making half a revolution turns them over and deposits them upon a piling-table, 25, which descends a distance equal to the thickness of one sheet every time a sheet has been placed upon it. The flier or lay-boy derives a horizontal reciprocating motion from two cranks, 28, on opposite ends of the shaft 14, which are connected with its own shaft 22\* by two connecting-rods, 27, and its turning over is effected by means of two pinions, 29, on the shaft 22\*, working in racks 30 on the framing R. To enable the points of the flier-arms to pass under the sheet as the flier moves back, and to prevent them from catching the front edge of the sheet, the frame Y is made capable of a slight tipping motion by having the end next the cutters arranged upon a horizontal shaft, 31. As the flier moves toward the cutters to take the sheet, the turned-up points of its arms pass under inclined projections 32 on the frame Y, and so lift it up high enough to insure the arms passing under the sheet. After the points of the arms have passed the projections 32, the frame Y drops onto the fixed rest 33 arranged between it, and in returning with the sheet the arms of the flier pass over the said projections.

The descent of the piling-table 25 is effected by means of two upright screws, 34, of similar pitch, attached firmly to its under side and passing through nuts secured firmly in the hubs of two spur-gears, 35, of similar size,

which are geared together by an intermediate gear, 36. The gears 35 are prevented from moving vertically, and hence by turning them they are caused to produce a vertical movement of the screws and of the table. One of the gears 35 has applied to it a vibrating friction-dog, 37, which is connected by a rod, 38, with the arm 39 of a horizontal rock-shaft, 40, which derives motion by being connected by a rod, 41, with the flier. The dog 37 is so fitted to a projecting flange on the gear that it will turn the gear in the direction to depress its screw, but not in the other direction. The two gears 35, being geared together, are caused to be turned uniformly, and hence the table is kept perfectly level.

I will remark, in conclusion, that in carrying out my invention there may be instead of a single cylinder two or more cylinders working in each vat.

I do not claim the invention of making boards of any description by one or more cylinder-molds with felts and press-rolls running until a sheet or board is of proper thickness to take off from roll by breaking it at a groove in the press-roll in its wet state a single board at a time; nor do I claim reeling the webs on reels and doubling the sheet from the reels and then passing it over the drying-machine after having acquired a proper thickness; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The arrangement and combination of two or more cylinder-molds, vats, felts, and press-rolls, substantially as herein described, whereby in the same machine any desired number of continuous webs of pulp of indefinite length may be either deposited one upon another for the continuous manufacture of boards, or may be kept separate from each other for the manufacture of several continuous distinct sheets of paper.

2. The combination, with such a system of cylinder-molds, vats, felts, and press-rolls, of a series of guide-rolls,  $n\ n$ , for separating the several webs of pulp as they are delivered from the press-rolls, substantially as herein specified, in the manufacture of paper.

3. The combination of such a system of cylinder-molds as hereinabove specified and a continuous series of drying-cylinders and calendering-rolls in such manner that the manufacture of boards or of several webs of paper may be carried on by a continuous process, substantially as herein described.

4. The arrangement of the several spouts, G E J, pipes  $c$ ,  $m$ , and  $j$ , valve  $l^2$ , and self-acting feed-gate  $d$ , in combination with each other and with the several vats, substantially as and for the purpose herein specified.

5. The save-all composed of a vat, a cylinder-mold, a coucher, and a scraper, combined and applied in connection with one or more paper-making machines, substantially as herein specified.

6. The combination of press-rolls, illustrated by M<sup>7</sup> M<sup>7</sup> M<sup>7</sup> in Fig. 1, to obtain two pressures from three rolls, as herein described.

7. The employment of calender-rolls on the top of drying-cylinders, substantially as herein described, to equalize the water in the board and make it of uniform dryness as it

passes over the driers and partially effect the glazing and calendering process while the board is being dried.

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