3 Sheets—Sheet 1.

J. W. DIXON.

Paper Making Machine.

No. 201,757. Patented March 26, 1878.

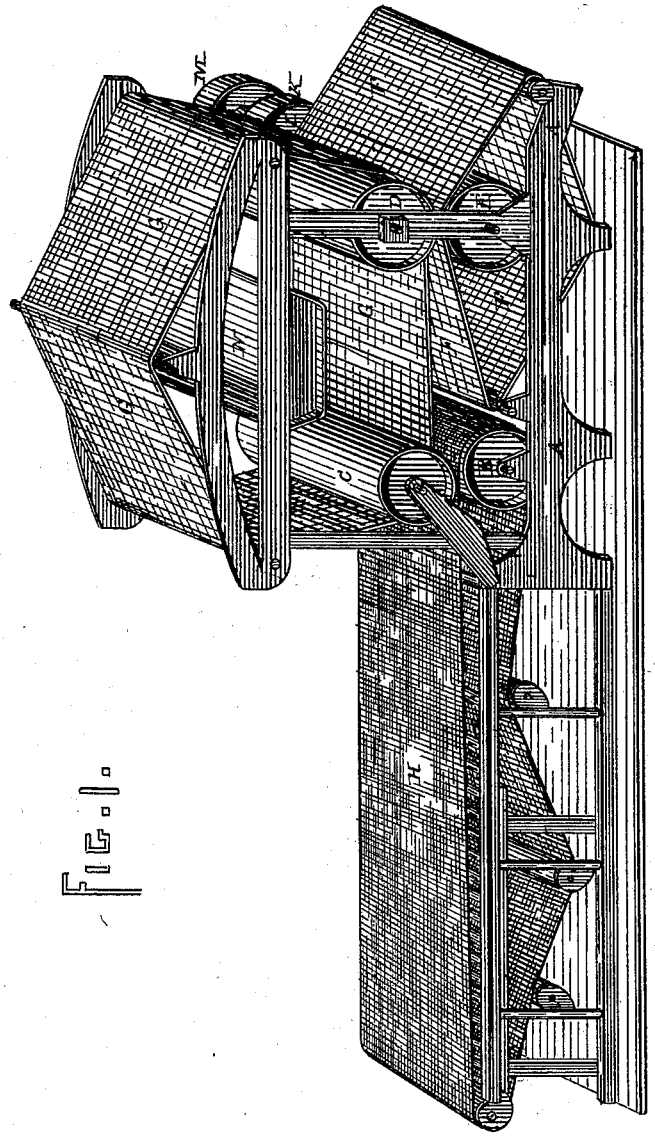

Fig. 1.

Witnesses

Henry V. Buckley

Albert E. Zacherle

Inventor

John W. Dixon

by George E. Buckley

his atty.

3 Sheets—Sheet 2.

J. W. DIXON.

Paper Making Machine.

No. 201,757. Patented March 26, 1878.

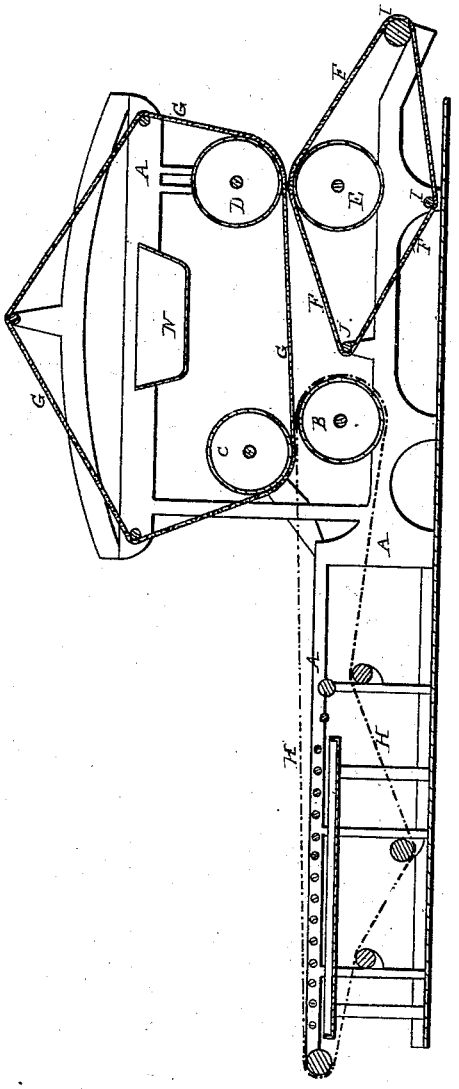

Fig. 3.

Witnesses

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3 Sheets—Sheet 3.

J. W. DIXON.

Paper Making Machine.

No. 201,757. Patented March 26, 1878.

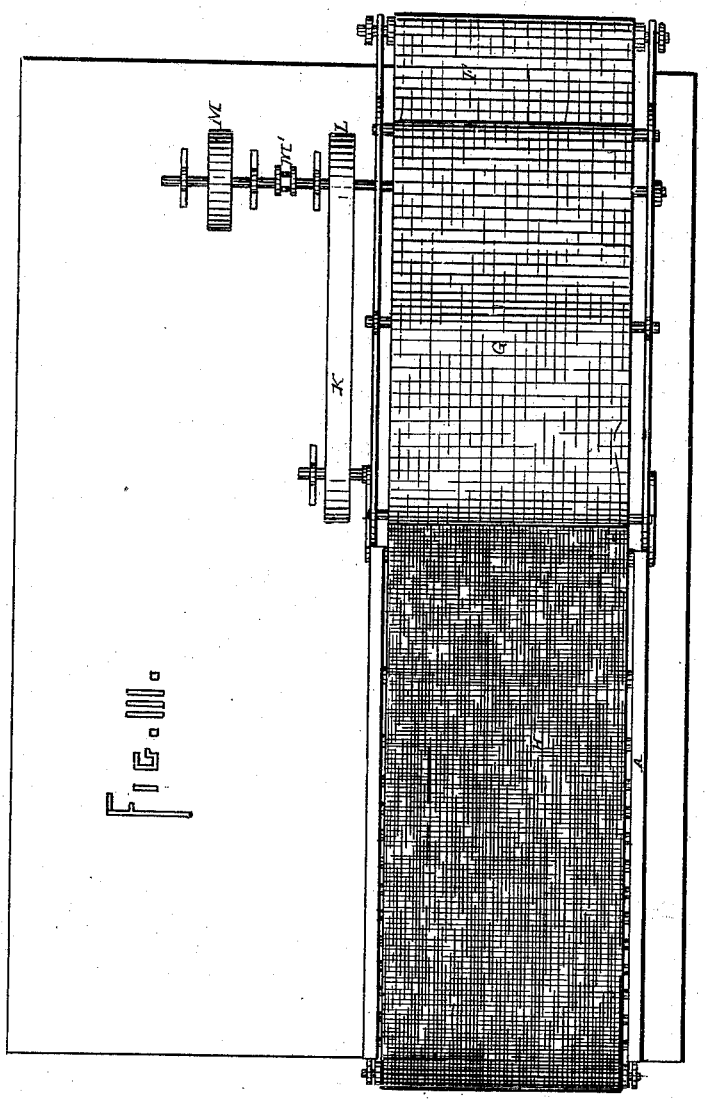

Fig. III.

Witnesses

Henry V. Buckley

Albert E. Zacharda

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John W. Dixon

by George E. Buckley

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UNITED STATES PATENT OFFICE.

JOHN W. DIXON, OF WEST MANAYUNK, PENNSYLVANIA.

IMPROVEMENT IN PAPER-MAKING MACHINES.

Specification forming part of Letters Patent No. **201,757**, dated March 26, 1878; application filed February 25, 1878.

To all whom it may concern:

Be it known that I, JOHN W. DIXON, of West Manayunk, Montgomery county, State of Pennsylvania, have invented certain new and useful Improvements in Paper-Making Machinery; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making part hereof.

My invention is designed to overcome the difficulties which have heretofore existed in Fourdrinier paper-machines, from the necessity of handling the paper to guide and carry it from the wire-cloth to the first press-felt and first press-rollers; and I desire to obviate the trouble and waste of time and material arising from the clinging of the freshly-formed and wet web of paper to the upper couch-roll and going up with it, or from its clinging to and going down with the wire-cloth upon the lower couch-roll.

In order for the paper to support its own weight in the space between the surface of the lower couch-roll and the first press-felt, in which it is unsupported, it has to be couched very dry before reaching that point. This is necessitated, particularly when it is necessary, as in the present machines, to remove it by hand from the surface of the wire-cloth upon the lower couch-roll to carry it to the first press-felt and first press-rolls. In order to so dry it the upper couch-roll had to be pressed very forcibly upon the upper surface of the pulp, to express the water and transform it into a wet web of paper, thus driving its lower surface into and between the meshes of the wire-cloth, and marking the lower surface with the impression of the multitudinous meshes at a stage of the process which made it practically impossible to remove the impression by subsequent manipulation. The paper is then so dry as to make the thorough eradication of the markings impracticable by the after calendering. The paper was thus made to cling so closely and firmly to the wire-cloth as to be very difficult of removal therefrom when upon the lower couch-roll, at which point it became necessary to guide it by hand and conduct it to the first press-felt and first press-rollers, and it was, consequently, carried around upon the wire-cloth. This was particularly the case with thin papers and paper made from wood and straw, the fiber of which is soft and yielding, and very liable to get set into the meshes of the wire-cloth and to follow the same.

In practice there is a guard-board and a roller upon the upper surface of the upper couch-roll. The roller is small, and the space between it and the guard-board is supplied with water to keep the jacket of the upper couch-roll wet and damp, to preserve its cleanliness and to prevent the paper from clinging to it. This guard-board fits closely down upon the revolving couch-roll upon its upper surface, and is prevented from wearing this surface away by an armature of felt secured to it, which receives the friction of the felt jacketing of the couch-roll. Now when the web of paper clings to and runs up on this couch-roll it is immediately wet by coming in contact with the water there, and it jams up under the guard-board in lumps and rolls, which get into masses and act as wedges upon the upper surface of the couch-roll, between it and the guard-board, and force the couch-roll down with undue pressure upon the pulp or paper on the wire-cloth beneath, damaging both the paper and the wire-cloth. In addition to this, these lumps very shortly force themselves through under the guard-board, and, clinging to the surface of the couch-roll, go down with it and damage the wire-cloth by depressing it in spots and forcing it by indentations and flutings out of a true plane surface. This state of affairs necessitates the stoppage of the entire machine, the loosening up of the guard-board, and the entire and thorough scraping of all the parts. The wire is rapidly worn out if all parts of its surface are not plane and true, for it bears a great deal of friction over the various rolls, and the irregularities of surface cause such parts to wear rapidly; moreover, these injuries to the wire are almost irreparable. The paper is also pressed unevenly under the upper couch-roll, and in all places where it comes in contact with these irregularities. I have known this difficulty to occur, in the present machines, three and four times in twenty-four hours.

When the paper, through being very wet, clings to the upper press-roll, to which it is also liable, it is a difficult and arduous task

to get it off, to guide and carry it along to the next step of manipulation. There have been various means devised to prevent this, viz: The upper press-roll has been made of fine brass or gun-metal; it has been cloth-covered, made of hard wood, and frequently turned smooth, and many other devices have been used, but all to no good end, none being effective to remove the difficulty. The hard surface of the roll mashes that surface of the paper which is next to it, and makes it cling. This is particularly the case with thin papers, or paper made from wood or straw. Sometimes when a metal roll is used for an upper first press-roll, the paper will go up upon it and jam in a lump between the doctor-board and the roll, and finally this lump, still adhering to the roll-surface, will pass down and tear off the first felt which is passing over the lower first press-roll, or the lump will jam between the two rolls and stop the machinery. The set-screws upon the journals of the upper rolls being set to a certain pressure upon the felt and paper passing between the rolls, the intrusion of any lumpy or thick foreign mass between the roll and paper will cause such a pressure upon this felt as to inflict considerable damage upon it, and, as named above, will very likely stop the machinery.

There have been several patents taken out in the United States for devices in this general connection. The patent of Scanlan, of June 20, 1865, provides an upper felt at the first pair of press-rolls to make straw-boards. The object of the invention in that case was to permit the water from the board to escape through an upper felt, as well as through one below, and to prevent the upper roll from crushing the board. There being so much water in a thick board the hard upper roll crushed the upper soft surface of the board, as the water could not escape on that surface. The felt did not carry the board, and a thick board, which passes through the rolls at a low rate of speed, is easily prevented from clinging to the roll. Scanlan's upper felt was to give a soft absorbent surface to his roll above.

The patent of Butler, of January 5, 1875, shows a rubber belt which, the inventor claims, by its suction will carry the paper from the couch-rolls to the first pair of press-rolls. He proposed to lift the web by suction. Now, the water could not escape through the gum, and the device utterly failed to lift the web of paper at all. Even if the paper did once stick to the gum it would remain there, and not come off any more readily than it would from a smooth metal surface. It would travel round on the gum belt continuously, sticking to it. I disclaim both these devices.

I overcome all the difficulties above named by providing for the paper a soft surface, by which it will be more readily carried than by the wire-cloth, and yet one which, by allowing the moisture to pass through it, will not admit of the web of paper clinging to it; and I accomplish the result of automatically and invariably carrying the web of paper from the couch-rolls onto the first-press felt, and through the two first press-rolls, delivering it ready to be carried to the second press-rolls without previous handling. I avoid all danger of it being carried around on either of the couch-rolls or either of the first press-rolls.

My invention simplifies the Fourdrinier machine by accomplishing automatically what is now done by hand. I save the great waste occasioned by the old machine, as well as hand labor, for it requires less hands to run the machine, and I dispense with the guard-board and small roll over the upper couch-roll and with the doctor-board on the upper press-roll.

My invention consists of the combination, with the upper couch-roll and upper first press-roll, of an endless upper felt, passing around beneath each from one to the other, traversing with these rolls, so as to automatically carry the web of paper from the wire-cloth to the first press-felt and through the first press-rolls; also, in a Fourdrinier paper-machine, the combination, with the upper couch-roll, the wire-cloth, and the first press-felt, of an endless upper felt passing beneath and upon the upper couch-roll, and in about a horizontal line away from it, to carry the web of paper from the wire-cloth to the first press-felt.

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

In the drawings, Figure 1 is a perspective view of my apparatus; Fig. 2, a longitudinal sectional view of the same; and Fig. 3, a plan.

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

A A is the frame of the machine; B, the lower couch-roll; C, the upper couch-roll; D, the upper first press-roll; E, the lower first press-roll; F, the first press-felt; G, the upper endless felt, represented in the drawing as passing over rollers above, down around and beneath the upper couch-roll, forward under the upper first press-roll, and up again. It traverses in the course indicated by the order of my description. H is the wire-cloth, traversing in a direction above toward the couch-rolls, and, after passing around the lower couch-roll, back again beneath.

The lower first endless press-felt F passes over the lower first press-roll E, and around rollers I I, thence beneath toward and around a roller, J, contiguous to the surface of lower couch-roll B, thence back again to the lower first press-roll.

The construction of these parts of the machine is well known to those skilled in the art to which my invention appertains—to wit, the Fourdrinier paper-machine.

The lower couch-roll B and the lower first press-roll E have each, and at the same relative ends, a pulley. These two pulleys are of the same size, and an endless belt, K, passing over both, drives them, and, consequently, the

rolls B and E at the same speed. The upper rolls C and D are driven by friction from their respective lower rolls; consequently, the wire-cloth H, driven by roll B, and the felts F and G, the rolls B, C, D, and E, are all driven at the same speed.

If the couch-rolls and the first press-rolls are of different sizes, the pulleys at their ends, respectively, should be made of such relative sizes as to drive the press-rolls and the couch-rolls at the same speed.

The pulp, spread in a very wet state, is carried along the upper surface of the wire-cloth H, the water running down through the meshes of the wire-cloth, thence under the upper couch-roll C, which impinges or presses tightly down upon it, and expresses the water through the meshes of the wire-cloth beneath to such a degree as to leave the pulp partially dry, and in the shape of wet paper, and having considerable consistency and strength, but a large proportion of water still remains in it.

The web of paper thus formed is carried between the wire-cloth and the upper felt G a short distance, and then passes over the lower couch-roll B. Now, as the felt G is soft, and the web of paper is still very moist, it clings to this upper felt rather than to the wire-cloth, so that when the wire-cloth passes down around the couch-roll B, leaving the line of traverse of the upper felt G, the paper adheres to this upper felt by preference, and is carried forward by it until the lower first press-felt F joins it beneath. The web is thence carried forward between the two felts and between the first two press-rolls D and E, whence the pressure expresses almost all its remaining moisture; and when it emerges from between them, being comparatively dry, it does not cling to either felt, as it would to a hard or smooth surface, but lies, by its gravity, upon the lower felt F, and is carried by it to the second press-rolls, which I have not shown in the drawings.

The carrying of the web by the upper felt removes the necessity of couching it so dry as to enable it to be carried forward by hand, as hereinabove mentioned, so that its tendency to stick to the meshes of the wire-cloth is done away with.

The method I use to apply power to drive this part of the machine is through the pulley L, upon the shaft of the lower first press-roll E. A corresponding shaft, in line with the shaft of press-roll E, and driven by a pulley, M, terminates at a point close to the end of the shaft of pulley L, and these two shafts are connected, when desired, by a loose coupling, M′, for throwing into or out of gear, to start or stop this part of the machine.

N is a box above, to catch the drippings resulting from washing the upper felt, when it is done by a beater. This felt may be washed by means of the newly-devised suction-box upon it, to suck the water and dirt through.

The upper felt is not essentially carried so far up as is shown in the drawings. It can, if desired, be passed over and around the upper couch-roll and the upper first press-roll, like a belt over two pulleys; but my arrangement of it gives increased length, thereby making it last longer, and require less washing, as the friction and dirt are spread over a larger surface.

The term "felt" is here employed in the sense used in the paper-making trade, and includes any soft woven or fibrous fabric, as well as true felt.

My machine, through its automatic manipulation of the paper, can be run at a much higher rate of speed than when the web of paper has to be guided and carried to the first press-felt by the hands of the operative.

Although I have spoken above of the upper felt leaving the upper couch-roll at or about in a horizontal line, and have so worded it in the claim, it will readily appear to those skilled in the art that it may pass and carry the paper at an angle out of a horizontal, so that it is carried toward the first press-rolls, and I desire that term to have this broad significance.

I am aware of the Letters Patent of the United States heretofore granted, and numbered 34,633; and I do not claim the device therein shown. My device shows an upper felt in addition to the first press-felt.

A roller or round bar may be passed across and upon the upper felt at a point directly after it leaves the wire-cloth, as now shown in the drawings, at a lower level than the felt is there shown to pass, to compel it to accompany the wire-cloth a short distance down the face of the lower couch-roll to take the web of paper from the wire-cloth farther down. This roller or bar may be run in journals or set in bearings, at its ends, attached to the frame.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the upper couch-roll and upper first press-roll, of an endless upper felt passing around beneath each of them and from one to the other, traversing with these rolls, so as automatically to carry the web of paper from the wire-cloth to the first press-felt and through the first press-rolls, substantially as described.

2. In a Fourdrinier paper-machine, the combination, with the upper couch-roll, the wire-cloth, and the first press-felt, of an additional endless upper felt, passing beneath and upon the upper couch-roll, and in about a horizontal line away from it, to carry the web of paper from the wire-cloth to the first press-felt, substantially as described.

JOHN W. DIXON.

Witnesses:
H. V. BUCKLEY,
THOMAS BIRKMIRE.