

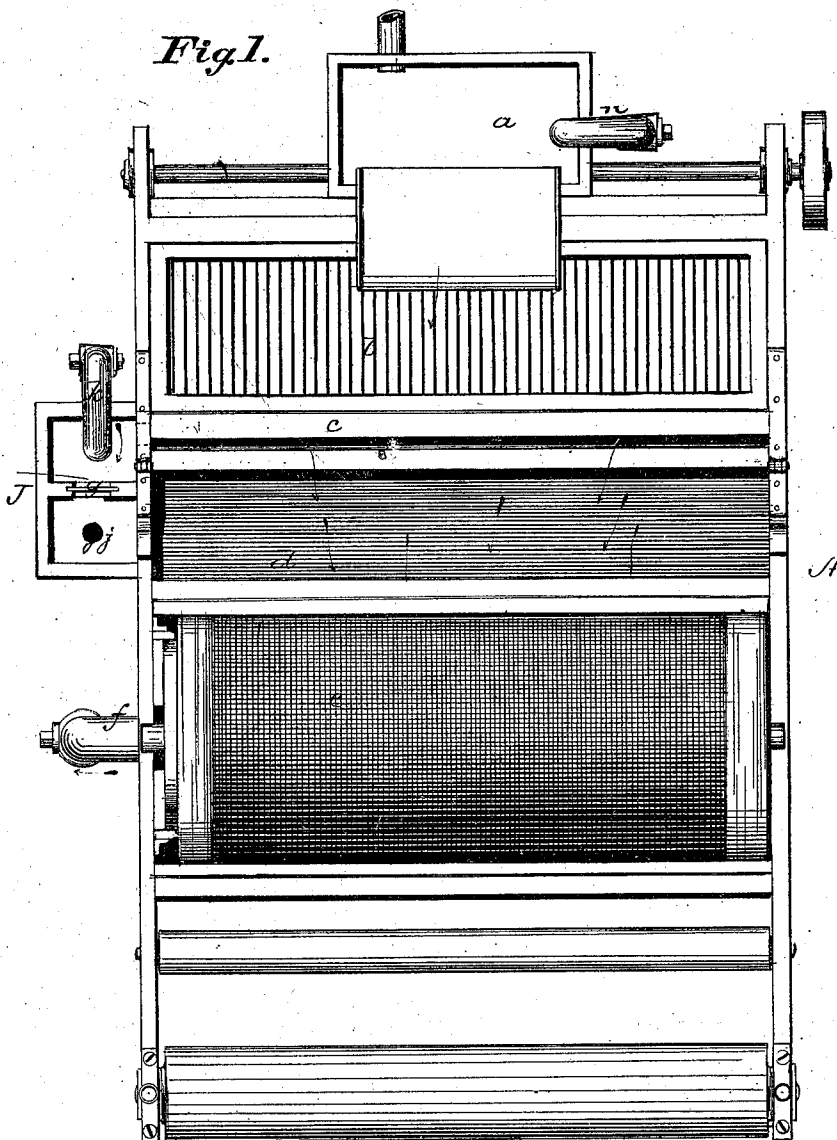
G. E. MARSHALL.

PROCESS OF AND APPARATUS FOR THE MANUFACTURE OF PAPER.

No. 105,585.

Patented July 19, 1870.

Fig. 1.



Witnesses,

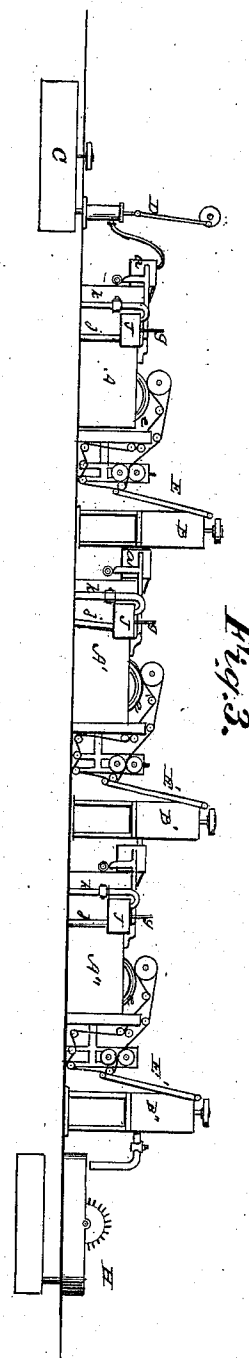
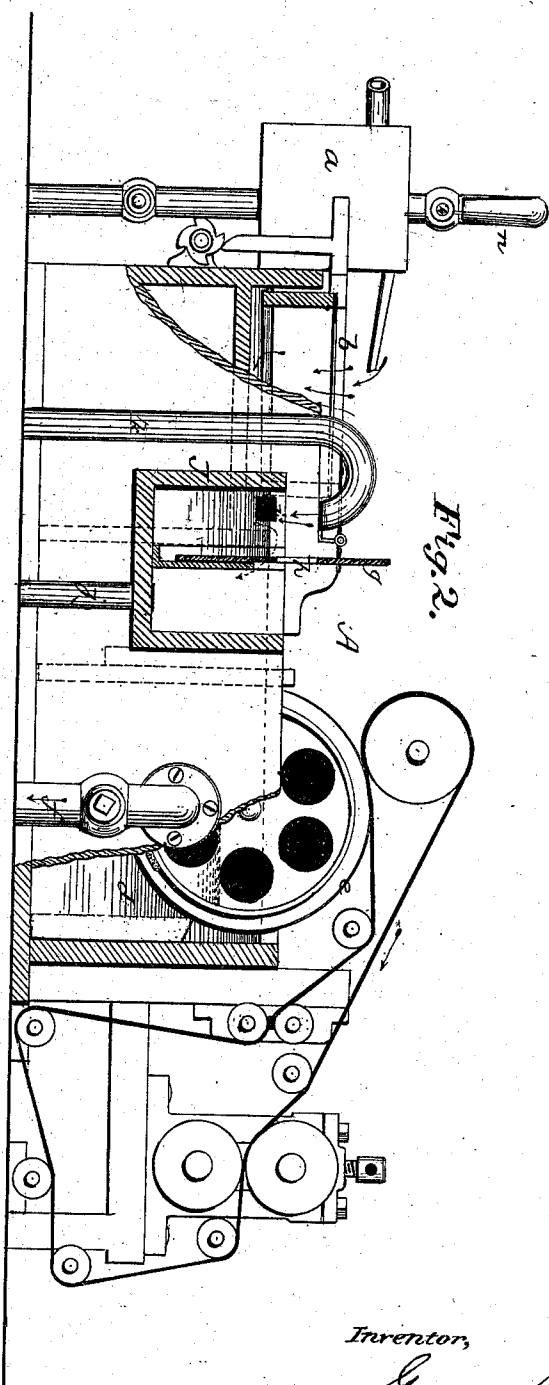
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GEORGE E. MARSHALL, OF LAUREL, INDIANA.

Letters Patent No. 105,585, dated July 19, 1870.

IMPROVEMENT IN PROCESS AND APPARATUS FOR THE MANUFACTURE OF PAPER.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern :

Be it known that I, GEORGE E. MARSHALL, of Laurel, in the county of Franklin and State of Indiana, have invented certain new and useful Improvements in the Manufacture of Paper and Machines for the same; and I do hereby declare that the following in a full, clear, and exact description thereof, reference being had to the accompanying drawing making part of this specification, and to the letters of reference marked thereon, like letters indicating like parts wherever they occur.

To enable others skilled in the art to construct and use my invention, I will proceed to describe it.

My invention relates to the manufacture of paper; and

It consists in an improved method of washing, bleaching, and cleansing paper-stock or pulp made from straw, wood, manilla rope, esparto grass, and old printers' paper, and also in a novel arrangement of mechanical devices for carrying out the said process.

In the manufacture of white paper from wood, straw, &c., it is of great importance, after such stock has been boiled in an alkaline solution, that the pulp thus produced should be thoroughly cleansed from the alkali and saccharine or glutinous matters remaining in it before the said pulp is subjected to the action of chlorine for bleaching it for white paper. And, after the stock has been bleached with chlorine, it is equally important that all traces of the chlorine be removed from the pulp before it is run out on the paper-machine into any white paper.

It is a fact well known to the best paper-makers that the more thoroughly the pulp is cleansed from alkali, and glutinous matter remaining in it, after it has been boiled, the less chlorine it takes to produce a given shade of white, and it is equally well known that the action of the chlorine tends to weaken and destroy the fiber, and that the less chlorine used, the stronger and more pliable is the paper produced from straw and like fibrous material. Hence the necessity of a thorough washing or cleansing of the pulp before it is bleached, as well as afterward.

Another fact is, that the longer the stock is allowed to remain in the pulpy state, after being bleached, before the chlorine is washed out, the more hard, crisp, and brittle is the paper produced; hence it is of importance that such fibrous material be bleached quickly, and the chlorine immediately washed out.

Still another fact, but one not generally known, is that, if a certain amount of chlorine is to be used for bleaching a certain amount of stock, if, instead of using the whole quantity of chlorine at one time, a portion only is used to bleach the stock, and the stock then dried sufficiently to be handled, and the chlorine washed out, and then the remaining chlorine used to

rebleach the stock, a much whiter and cleaner paper is produced.

For example, if twenty pounds of chlorine are to be used to bleach a hundred pounds of pulp, instead of using all the chlorine in one operation, first use, say, fifteen pounds to bleach the one hundred pounds of pulp, and then, after thoroughly washing the pulp, use the remaining five pounds of chlorine to rebleach the whole quantity of pulp. But, to perform these operations in mills as now constructed, would require a great amount of extra time and labor.

As now practiced in the best paper-mills in the country, the pulp, as it comes from the boilers, is placed in an ordinary rag-engine, and partially washed. It is then emptied into a tank or stuff-chest, and drawn off, by means of a pump, to the mixing-box of an ordinary wet-paper machine, where it is mixed with the water extracted from pulp previously passed through the machine.

The pulp thus mixed is then passed through the screen or pulp-dresser and onward to the wire-gauze cylinder, if a cylinder machine is used, where the water is partially extracted and carried off through the cylinder, and the pulp thereby formed into wet paper on the surface of the cylinder, and from whence it is taken off by the "wet felt."

The wet machine has, I am aware, been in use for the purpose of running out straw and wood-pulp, and removing uncooked portions of the same as it passes through the screen or pulp-dresser, a small portion of the alkali and saccharine matter being also incidentally removed as the wet paper passes through between the press-rolls.

In carrying out my process, I also make use of, among other devices, the ordinary wet machine, with certain improvements.

These improvements consist, first, in allowing the water which passes through into the perforated cylinder to run off to waste, carrying with it, of course, the alkali and saccharine matter held in solution, and, second, in keeping up the supply of water necessary to work the pulp through the screen or dresser, and to form the paper on the cylinder, by discharging fresh, clean water into the receiving-vat or mixing-trough, and an additional supply of clean water into the pulp after it has passed the screen, but before reaching the cylinder, as hereinafter more fully described.

As a much larger amount of water can be passed through the cylinder than through the screen, the amount of water added to the pulp after passing the screen may be very considerable, so that, by these improvements, a much greater quantity of water can be washed through the pulp than by the old method, and consequently the pulp more thoroughly cleansed.

In the drawing—

Figure 1 is a top plan view of a common cylinder wet-paper machine having my improvements applied; Figure 2, a side view of the same, with portions broken away to show the interior; and

Figure 3, a side elevation of a train of three wet machines, with the accompanying bleaching-tanks, stuff-chests, &c., as arranged for carrying out my process.

A, figs. 1 and 2, represents a "wet machine" of the ordinary construction, so far as regards the general features, of screens, vats, perforated cylinder, endless felt press-rolls, &c., and in which—

a represents the receiving-vat for the pulp;

b, the screen or pulp-dresser;

c, the vat which receives the pulp passing through the screen;

d, the trough in which the wire-gauze cylinder is mounted, and which is kept filled with pulp and water;

e, the gauze cylinder; and

f, a pipe communicating with the interior of the cylinder, and with an exhaust-pump for causing a suction inward through the cylinder.

Heretofore it has been customary to have the pipe *f* discharge the water exhausted through it back into the receiving-vat *a*, where it became mixed with new pulp, and in this manner the same water was used over and over again.

In my machine I allow this water to run off to waste, as shown, and provide a pipe, *n*, which discharges fresh, clean water into the receiving-vat *a*, to reduce the pulp to the required thinness.

To one side of the machine I attach a box, *J*, divided into two compartments by means of a vertically adjustable gate, *g*, having an opening, *h*, through it, as shown in fig. 2.

One compartment of the box *J*, I provide with a hole, *i*, communicating with the vat *c*, and the other compartment I provide, at its bottom, with a waste-pipe, *j*, and also arrange a water-supply pipe, *k*, so as to discharge into the compartment which is connected with the vat, as shown in figs. 1 and 2.

Water being discharged through the pipe *k* into box *J*, a portion flows through the hole *i* into vat *c*, and the remainder through gate *g* and off through waste-pipe *j*.

By adjusting the gate *g*, the water may be maintained at any desired height in the box, and as the box has free communication with the vat, the level of the water in the latter is always the same as that of the water in the former, so that, by adjusting the gate *g*, the level of the pulp may be varied as desired.

As the gate is raised and lowered, the quantity of water which flows into the vat is also varied.

By this arrangement of parts I am enabled to work a very large quantity of water through the machine with the pulp, so as to thoroughly dissolve and wash out all alkali and saccharine matters, ink, chlorine, and other foreign matters, which are carried off with the water through the cylinder *e*.

In the old styles of machine, where less water could be worked through, the alkali and saccharine matter were only partially dissolved, and the only portions that were removed were those that were squeezed out from the wet paper in passing through the press-rolls, as all that was held in solution by the water passing through the gauze cylinder was returned with the water to the receiving-vat, and remixed with fresh pulp or stock.

In carrying out my process, I provide two or more of the wet machines *A*, and double the number of bleaching-tanks *B*, and arrange them as shown in fig. 3, placing first a machine and then two tanks, side by side, and so on.

Near the first machine I locate a tank or stuff-chest, *C*, and connect it, by a pump, *D*, with the receiving-vat *a* of said machine.

At the back end of the machine I arrange an elevator, *E*, which may be shifted so as to communicate with either one of the two tanks *B* there located.

Each of the tanks *B*, I provide with a discharge-pipe, emptying into the receiving-vat of the second machine *A'*, and at the back end of this second machine arrange an elevator discharging into the second pair of tanks, and so on continuously, each machine connecting with a pair of tanks, and these tanks with the next machine. The last tank I connect with either a rag-engine, as shown, or with a tank or stuff-chest, according to circumstances.

In operating the train of machines, as shown in fig. 3, the pulp, after being boiled and then washed in an ordinary rag-engine for about an hour, is discharged into the tank *C* as unwashed pulp; or, if properly boiled, the pulp may be taken directly from the boiler to the tank *C* without being passed through the rag-engine.

From the tank *C* the pulp is carried, by the pump *D*, to the first wet machine *A*, where the pulp is thoroughly washed and cleansed, and freed from alkali, saccharine matter, ink, chlorine, and other impurities contained in it.

The pulp, in passing through the machine, is converted into wet paper, and in this form it is delivered to the elevator *E*, which carries the wet paper over into the first bleaching-tank *B*, which is charged with a solution of chlorine, and provided with stirrers or agitators for breaking up the paper and reducing it to the form of pulp again.

When the first of the tanks *B* is sufficiently charged with the wet paper, the elevator *E* is shifted so as to discharge into the adjoining tank, which is, like the first one, charged with chlorine, and provided with agitators.

While the second of the tanks *B* is being filled, steam is admitted into the one which is full, and the contents heated to about 100° above the temperature of the surrounding air, which causes the chlorine to act with great rapidity.

This is continued for about two hours, the agitators being kept in motion the while, when the pulp is discharged in the receiving-vat of the second wet machine *A'*, through which it is passed to wash out the chlorine and coloring matter dissolved by it while in the tank *B*.

This second machine again forms the pulp into wet paper, and then discharges it onto the second elevator *E'*, which delivers it into one of second pair of bleaching-tanks, *B'*, where it undergoes the same treatment as in the first, except that the chlorine solution is of only about one-third the strength of the first.

The pulp is then discharged from this tank *B'* to the third machine *A''*, where it is washed from the chlorine, formed into wet paper, and then, by the elevator *E''*, delivered into the third tank *B''*, where it is again broken up and reduced to pulp.

From this third tank the pulp is discharged into an ordinary rag-engine, and the coloring and sizing matter added to it, and then discharged into a tank or stuff-chest, from whence it is delivered onto the usual paper-machine, and by it formed into finished paper.

It is obvious that the bleaching-tanks may be located in the basement of the building, immediately under the machines; and pumps used to draw the pulp up from each tank to the next machine, and also that the last tank could be dispensed with, and the wet paper put into the rag-engine by hand, but I prefer to locate them as shown, for the reason that I thereby save hand-labor entirely, and also the cost of extra pumps.

The advantages of my process are—

First, a much more rapid and perfect cleansing of the pulp from the alkali and saccharine matter, as in

the same length of time I wash about ten times the quantity of water through it that could be done by the old method.

Second, it requires no drainers, and therefore the labor required under the old method, to remove the stock from the drainers to the rag-engine, is dispensed with, and, besides, in the old method, more or less of the stock was lost in the many handlings from drainers to cars, cars to rag-engines, &c., and still more of it injured by dirt of various kinds getting into it while being thus handled.

By my arrangement it will be seen that the only handling required is in passing the stock, in the first instance, from the boiler to the washing-engine.

My process produces the finest kinds of book-paper from straw, wood, and like fibrous materials, with less labor, trouble, and expense than attended the production of common news printing-paper by the old method, and the quality of paper that can be produced is far superior to that made upon the old plan, and hence will conduce to the use of straw, wood, &c., for the finest paper, instead of the far more expensive stock now used.

Having thus described my invention,
What I claim is--

1. The herein-described process of preparing paper-pulp by subjecting the same to alternate bleachings and washings, substantially as described.

2. The process of washing or cleansing paper-pulp by the addition of a supply of fresh water to the vat, and the carrying away of the water drawn off through the gauze cylinder, substantially as described.

3. The combination of the fresh-water-supply box J with the wet-paper machine, when constructed and arranged to operate substantially as set forth.

4. The fresh-water box J, having an inlet-pipe *k*, a division with a regulating-gate *g* and waste-pipe *j*, all arranged substantially as set forth.

5. The combination of a series of wet-paper machines, provided with the bleaching-tanks, arranged to operate substantially as described.

GEO. E. MARSHALL.

Witnesses:

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PETER C. AKERS.