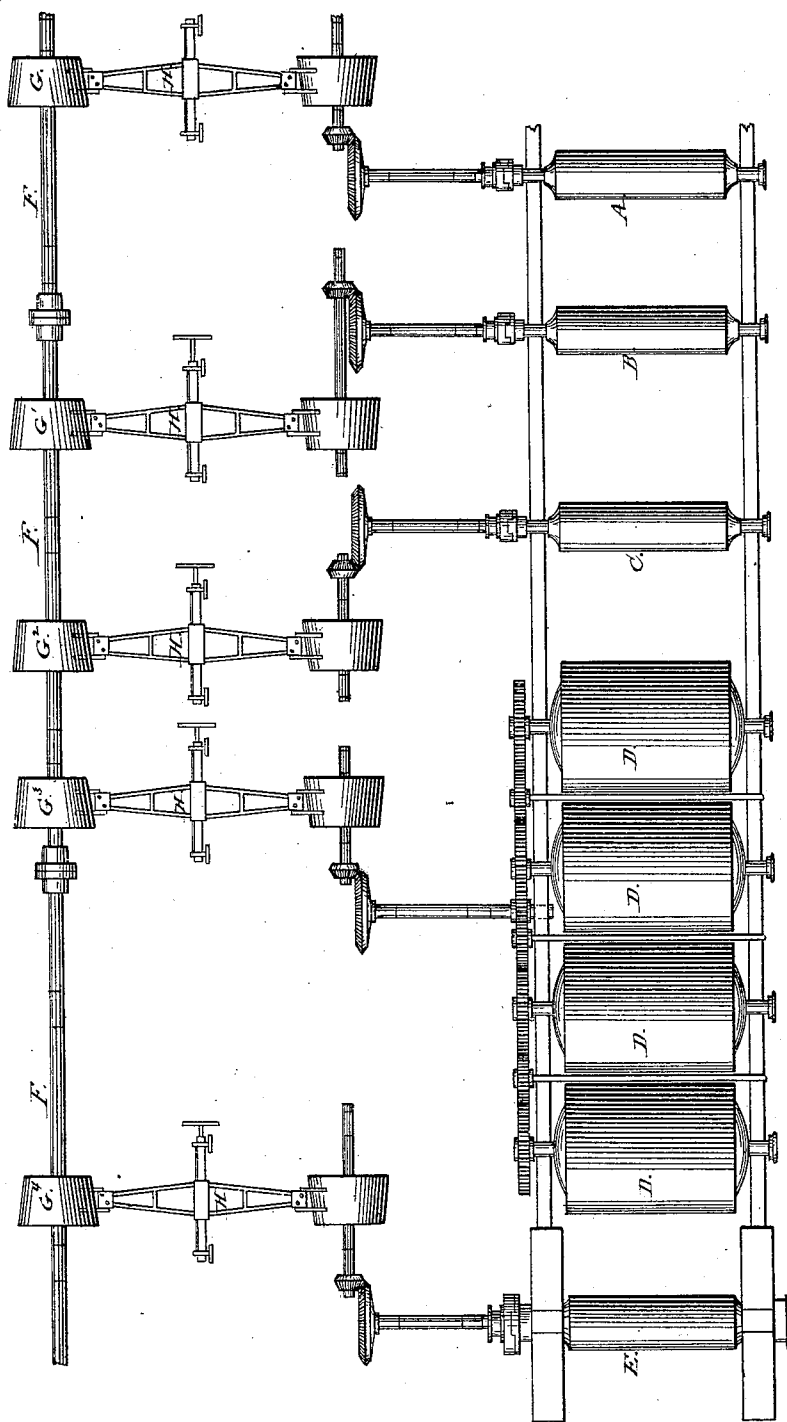


G. E. MARSHALL.
PAPER MAKING MACHINERY.

No. 275,056.

Patented Apr. 3, 1883.

Fig. 1.



Attest:
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C. C. Allen

Inventor:
Geo. E. Marshall.
per Edw. H. Down
Atty.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

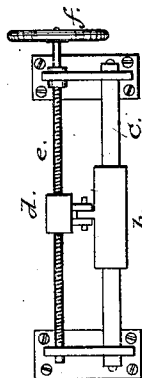
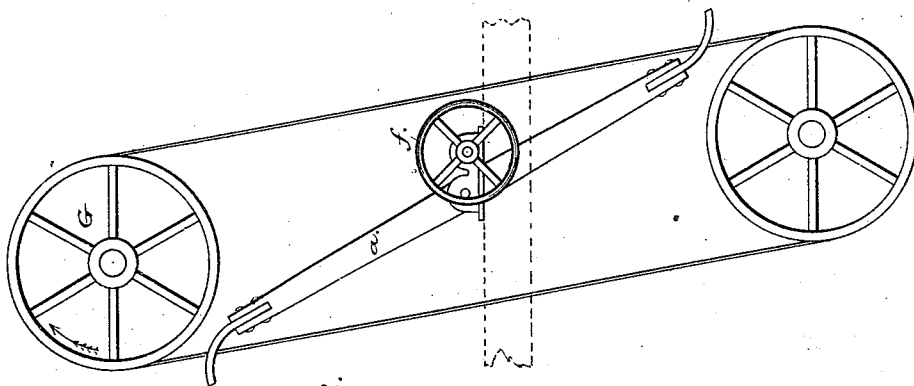


Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE E. MARSHALL, OF TURNER'S FALLS, MASSACHUSETTS.

PAPER-MAKING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 275,056, dated April 3, 1883.

Application filed January 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. MARSHALL, a citizen of the United States, residing at Turner's Falls, in the county of Franklin and Commonwealth of Massachusetts, have invented a new and useful Improvement in Paper-Making Machinery, of which the following is a true and full specification.

My invention relates to that part of the machinery in a paper-mill which drives the machine, the couch-roll, the presser-rolls, the drying-cylinders, and the calenders, by which a much more ready access is had to the machine in doing away with a train of shafting, spur and miter wheels, and a long series of belts on pulleys, all arranged on the floor alongside of the machine and its adjuncts, impeding any approach with safety to the machine, and by making a change of speed on any of the parts of the machine singly or together much more easy and convenient. Ordinarily the whole train is driven from the main shaft, which, by means of spur-wheels, miter-wheels, and pulleys with belts of various widths and lengths, (some very long,) drive the coucher, press-rolls, driers, and calenders in a long line within two or three feet of them and extending nearly their whole length, making approach to the machine difficult and dangerous, even to the loss of life in more than one case in a single mill, since in order to reach the machine for oiling or any other purpose it is necessary to crawl through and between long wide belts when in motion, and the very first principle in using machinery—safety to the operatives—is quite disregarded.

In running a paper-machine it is absolutely necessary that the harmony between the different parts should be maintained by exact and quick adjustments. The paper, while passing over the different parts of the machine, is always kept under a strong but steady tension, which must necessarily stretch it lengthwise, especially while it is wet. The first press, in drawing the web from the wire while it is in a very soft condition, will stretch it somewhat. Another small addition to its length is made by the second press, while it will shrink on the driers, and again become elongated on the calenders. If all the pulleys for driving the different parts have been fixed for

a certain speed, weight of paper, and kind of pulp, so as to adapt themselves to these elongations and contractions, and suddenly a change in the pulp occurs—if it is beaten longer or shorter, if it is thicker, or if imperfections have entered into its composition—it will be found that the first press and following parts are pulling the web either too much or too little for its changed character and tenacity, and the paper breaks or is injured. The same experience will be had if the paper be made thinner or thicker, even if the speed of the whole machine only be changed, everything else remaining as before, the paper may be differently formed on the wire. It may leave the coucher with more or less water, and its tenacity will be increased or decreased. Any inequality of tension, too, is liable to make a wrinkle in the calendering, and much more so to break the sheet. Great quantities of paper are destroyed by these causes, which are constantly occurring, often three or four times during a day's work, making it necessary that the relative speeds of the presses, driers, and calenders should be frequently but slightly changed. The common way of accomplishing this is by what is termed "lagging." A number of strips of canvas or felting or thick cloth about as wide as the face of the pulley, called "lagging," are kept on hand. When a change of speed is desired one of these is smeared with "lagging-wax," so called, and laid on the surface of the driving-pulley to increase its diameter and quicken the speed of the pulley or gear at the other end of the shaft. Through the number and length of the strips held on the pulley by the wax any slight change can be produced, and though a very rude and clumsy expedient, this lagging is in almost universal use at the present time, as nothing practical has yet been found to supercede it. Expanding pulleys of various forms and other devices have been tried; but some have been found too complicated, some get out of order too easily, some cannot be adjusted without stopping the machine, and others, still, require occasional lagging. In the old way, in the train for running the machine are two or three sets of gearing and from four to six heavy belts from twelve to sixteen inches wide and from eight to twenty-four feet long, all very

expensive on the start and difficult to keep in repair, strained to their fullest tension, while my belts, only few in number, are short—none over four inches wide—and all run vertically, not interfering with work and ready access to the machine.

My invention dispenses entirely with lagging, does away with the long and dangerous train of shafting, wheels, pulleys, and belts on the floor by the side of the machine, giving free approach to all its parts. By it danger is avoided, safety increased, regularity of tension secured, speed regulated, power reduced, and production increased.

The accompanying drawings illustrate the invention and form part of this specification, in which—

Figure 1 is a plan view of the machinery. Fig. 3 is a side elevation of a set of pulleys, &c. Fig. 2 is a side view of the belt-shipper and the device for actuating it.

A represents the couch-roll. B and C represent the first and second press-rolls. D represents the drying-cylinders. E represents the calenders. F represents the main driving-shaft running in hangers overhead. G represents one of the pair of cone-pulleys driving the couch. G' represents one of the pair of cone-pulleys driving first press-roll. G² represents one of the pair of cone-pulleys driving second press-roll. G³ represents one of the pair of cone-pulleys driving drying-cylinders. G⁴ represents one of the pair of cone-pulleys driving the calender-rolls.

The main shaft F runs overhead instead of on the floor. This removes the great obstacle to approaching the machine, and although placing shafting overhead rather than on the floor is not of itself new, yet in running the machinery of a paper-machine, in connection with the other devices of my invention, it has never before been done. On the shaft F are fixed conical pulleys or drums, each of which is connected by a belt with another corresponding one below, driving each of the presses, the driers, and the calenders. To any one at all familiar with mechanics it will be obvious that when the belt is moved up on the increasing form of one of these cone-pulleys, it is correspondingly moved down on the decreasing face of the other pulley, and thereby increases its speed and consequently that of the roller or drier, to which it is connected by a miter-wheel gearing into a shaft on which the roller or drier is fixed at a right angle to that running the cone-pulley; and, vice versa, when the belt running over the cone-pulley on the driving-shaft overhead is shifted toward the decreasing face of the pulley, the one on which it turns below will be diminished in speed. Now, the capability to increase or decrease the speed of any one of these rollers—couch, press, calender, or driers—at will in a moment's time, and to any extent ever so small, has never been effectually done on any paper-machine ever made, and it is what I accomplish by means of these cone-

pulleys and the belt-shippers hereinafter described.

The belt-shipper H—one for each pair of cone-pulleys—is hung at a convenient height midway between the two pulleys, and of a length suitable to reach from the upper to the lower pulley. The ends are forked as usual in belt-shippers of all kinds. To enable the shipper, which is of some length, to be held firmly in place, and yet to move readily when required, the arms *a* are formed at their middle into a sleeve or box, *b*—say, fourteen to sixteen inches long—through which passes a bar, *c*, securely bolted to supports, and on this bar the shipper moves steadily. To the upper side of this sleeve *b* is bolted a box, nut, or female screw, through which passes the male screw *e*, running in fixed gudgeons on the same supports that hold the bar *c*, and having on one end a hand-wheel, *f*, by which the screw is readily turned.

The operation of these devices will be readily seen, and how the speed of any of the rollers can be adjusted instantly to suit circumstances. For instance, if from a slight change in the stock in thickness, or in its being beaten up, it should take more water, and should, in passing over the driers, gain a trifle more on the calenders than it had been running, so as to become a little slack on reaching the calender, the machine-tender in an instant seizes the hand-wheel on the belt-shipper, moving the belt on G⁴, which runs the calender-rolls, gives it two or three turns to the left, runs the belt upon G⁴, and correspondingly down on the opposite pulley on the shaft below, and instantly brings up the speed to the extent required; and so with any one or all.

I am aware that cone-pulleys have long been in use for changing speed on various machines, and in various ways, but never in any such combination as I present, by the operation of which, as described, I secure greater convenience and certainty in controlling the speed of every member of the machine, more equal tension of the stock and paper, a very considerable saving of power in running the machine, a very decided saving of labor in avoiding lagging, and also much expense in the care and straining of long heavy belts, by which I get a very large increase in the production of paper, much more room in working about the machine, which, most important of all, allows the machine-tender easy and comfortable access to every part of the machine with entire safety, and unexposed to the constant danger of losing his life among the complication of belts and gearing of machines as at present used.

What I claim, and desire to secure by Letters Patent in a paper-making machine, is—

1. A belt-shifter composed of a pivoted arm, H, mounted upon a fixed bar, and provided with a suitable fork adapted to engage the belt, in combination with a laterally-moving

screw-mechanism, as and for the purpose set forth.

2. The combination, with a set of cone-pulleys, one of which is fixed upon the belt-driving shaft, and the other fixed upon a shaft which carries a pinion adapted to drive directly or indirectly the couch-rolls, the press-rolls, the drying-cylinders or the calender-rolls of a paper-mill, of the belt-shifting device adapted to move the belt connecting the said cone-cylinders in a direction parallel with said driving-shaft, all arranged substantially as and for the purpose set forth.

3. The combination, of the cone-pulleys, and a shipper with the couch-rolls of a paper-machine, substantially as described.

4. The combination of the cone-pulleys and a shipper with the first and with the second press-rolls, substantially as described and shown.

5. The combination of the cone-pulleys and a shipper with the drying-cylinders of a paper-machine, substantially as shown and described.

6. The combination of the cone-pulleys and a shipper with the calender-rolls of a paper-machine, all substantially as shown and described.

GEORGE E. MARSHALL.

Witnesses:

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FRANCIS M. THOMPSON.