

D. Crosby,

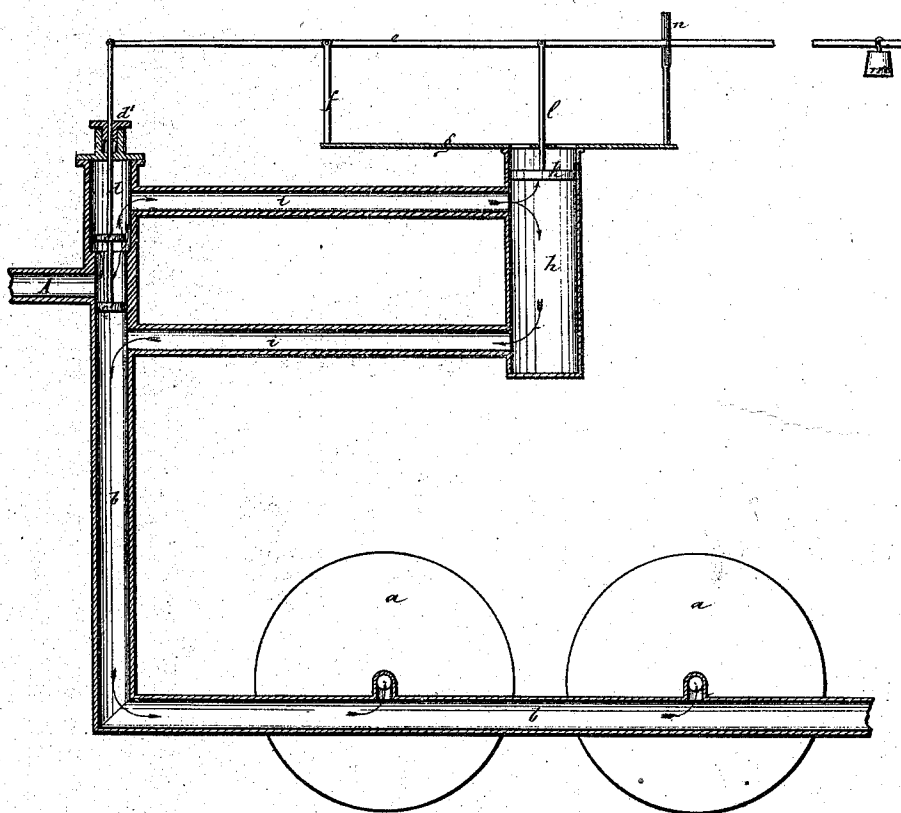
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Governor.

No. 112,422.

Patented Mar. 7. 1871.

Fig. 1



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by Geo. E. Brown,

his Attorney.

Witnesses.

H. J. Streetz
John A. Vernon

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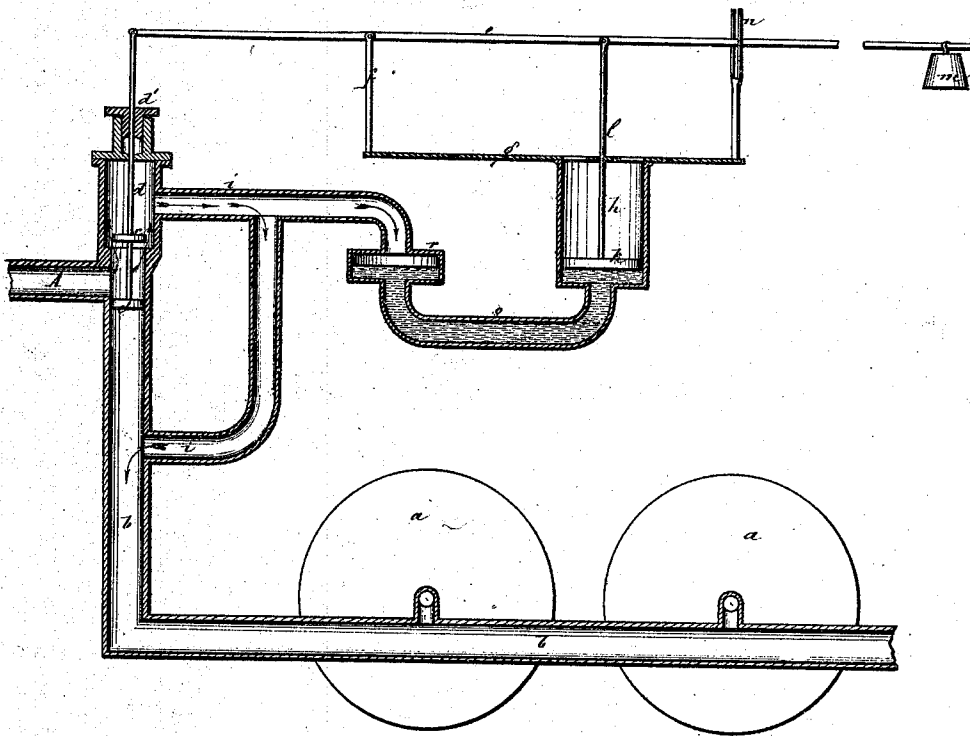
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Fig. 2.



Witnesses.

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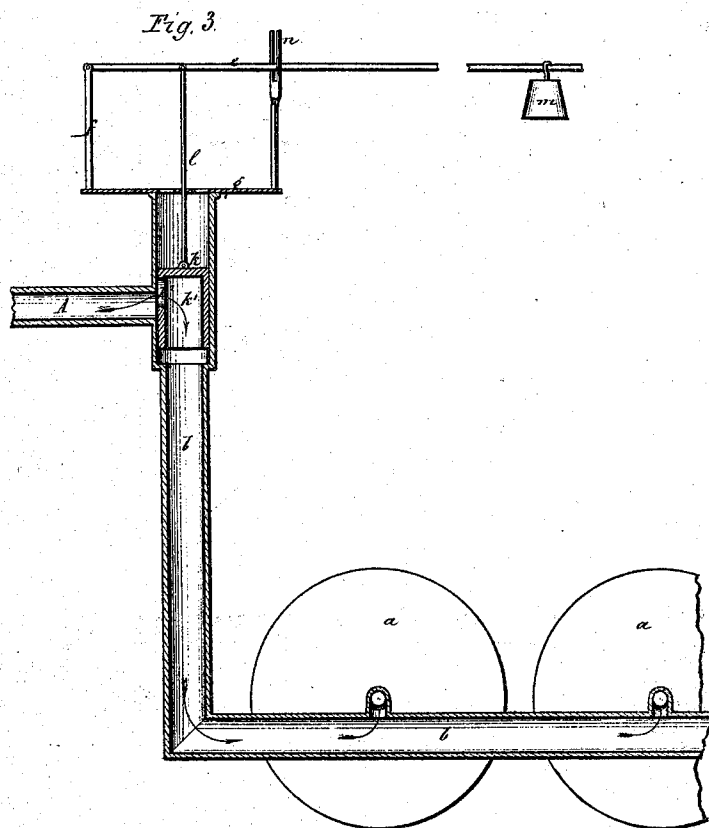
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3. Sheets, Sheet 3.

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No. 112,422.

Patented Mar. 7. 1871.



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United States Patent Office.

DANIEL CROSBY, OF HAMPDEN, MAINE.

Letters Patent No. 112,422, dated March 7, 1871.

IMPROVEMENT IN STEAM-REGULATORS FOR PAPER-DRIERS.

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

I, DANIEL CROSBY, of Hampden, Penobscot county, Maine, have invented an Improved Steam-Regulator for Paper-machine Driers, and for other purposes, of which the following is a specification.

Figures 1, 2, and 3 are sectional elevations of different varieties of my invention.

This invention has for its object, generally, to obtain from a boiler the amount of steam, within which varies from time to time, a constant amount of steam within a vessel communicating with the boiler; and particularly to obtain from a boiler a constant amount of steam within the driers of a paper-machine, to the end that paper may be dried uniformly.

The invention consists in a safety-valve, so arranged with reference to the pipe by which steam is conducted from the boiler to the driers as to regulate by its movements the admission of steam to the latter, allowing only enough to pass to maintain a constant quantity within the driers.

Referring to the drawing—

a are the driers of a paper-machine, or the large hollow cylinders, around the perimeters of which the paper passes in a moist state, and which require to be kept filled with steam in order to furnish the heat necessary for drying the paper during its passage.

b is the pipe by which steam is admitted to the driers.

In order to secure within the driers a constant supply of steam, either of two mechanisms may be employed, which, though differing to some extent in construction, are alike in principle, one of which mechanisms is shown in figs. 1 and 2, and the other in fig. 3, both of them agreeing in this, that the steam from the boiler, before entering the driers, has to pass a safety-valve, by the movements of which the requisite constancy of supply is obtained.

In figs. 1 and 2, *A* is the pipe by which steam is taken from the boiler, and in which the quantity of steam varies, the same as in the boiler, the said pipe opening directly into the pipe *b*. Within the latter are placed two disks, *c c'*, both fitting the pipe closely, one above and the other below the mouth of the pipe *A*, said disks being rigidly attached to a stem, *d*, which extends through a stuffing-box, *d'*, located in the upper end of the pipe *b*, and at its top is jointed to the extremity of the shorter arm of a lever, *e*, which has its fulcrum in a standard, *f*, that springs from a strap, *g*, which passes across and projects to either side of the open top of a vertical pipe, *h*, that is connected with the pipe *b* by means of horizontal pipes *i*, which open into the pipe *b* one above the upper disk *c* and the other below the lower disk *c'*.

Within the pipe *h* is located a safety-valve, *k*, the stem *l* of which passes through the strap *g*, and is jointed at its upper end to the longer arm of the lever

e, to the extremity of which the weight *m* is hung, the said lever being guided in its vibrations by a slotted standard, *n*, springing from the strap *g*, through which standard the lever *e* passes.

It will be observed that the disks *c c'* are at one side of the fulcrum of the lever *e*, and the valve *k* at the other side, so that when one rises the other must descend.

Before steam enters the pipe *b*, the weight *m* has raised the disks *c c'* so far that the upper disk is above its seat, say half an inch, when the diameter of the pipe *A* is one and one-quarter inch, leaving an opening beneath said upper disk, through which steam may flow. The lower disk *c'* is never raised to the level of the pipe *A*, and consequently no steam ever flows beneath it.

The weight *m* should be placed at a point on the lever where it may exert on the stem *l* a pressure nearly equal to that which it is desired should always be exerted by steam on the valve *k*, allowance being made for the friction of the valve-stems and lever.

The pressure of steam on the valve *k* is to be kept as nearly as possible constant. If five pounds to the square inch be the pressure desired for the safety-valve, the weight *m* should be stationed so as to draw downward upon the stem *l* with a force nearly equal to the number of square inches in the area of the valve multiplied by five.

The moment the steam from the boiler flowing past the upper disk *c* exerts upon the safety-valve a pressure greater than that for which it is weighted, the safety-valve rises, the disks *c c'* at the same time descending and cutting off the supply of steam.

When the upper disk arrives at its seat the two disks together constitute a balanced valve, so that when the pressure within the pipes *b h i* falls below the amount for which the safety-valve is weighted, the latter descends, the disks *c c'* rise, and the disk *c* again admits steam into the pipe *b*. As soon as the pressure upon the safety-valve again exceeds the prescribed limit, the steam is once more shut off as before, and as soon as the pressure again falls below the prescribed limit, steam is once more admitted as before, and thus the process goes on, the result being the keeping of a nearly constant quantity of steam in the driers.

In fig. 2 is shown a slightly different arrangement, the pipe *h* not being connected directly with the pipes *i*, but being connected at its lower end by a tube, *o*, with the bottom of a chamber, *r*, into the top of which the upper pipe *i* opens.

The pipe *o* is filled with mercury, of which there is a quantity sufficient to also fill the chamber *r*. The office of the mercury is simply that of a packing, to prevent the escape of any steam past the safety-

valve, the operation of the latter being the same as in the apparatus shown in fig. 1.

In fig. 3 the safety-valve *k* is shown as discharging, in addition to the office hereinbefore assigned to it, that also of the balanced valve *c c'*, the latter being in this instance dispensed with, as also is the whole system of pipes *i h*, the safety-valve being made not only to perform the functions of the balanced valve *c c'*, but also to occupy its position in the pipe *b*, which in this case is devoid of the stuffing-box *b'*, and is open at the top, except in so far as the strap *g* covers it.

The valve *k* forms the head of a tube, *k'*, which closely fits the inside of the pipe *b*, and extends downward therein past the mouth of the pipe *A*, said tube having on the side next the pipe *A* an orifice, *k''*, of the same diameter as the pipe, and being open at its lower end.

Prior to the admission of steam, the tube *k'* is held down by the weight *m* so far in the pipe *b* that the orifice *k''* forms a continuation of the pipe *A*; but after steam has entered the pipe *b*, as soon as it presses

upon the valve *k* with a force greater than that of the weight *m*, the valve rises, and the tube *k'*, closing the mouth of the pipe *A*, shuts off steam from the pipe *b*.

As soon as the pressure within the latter falls below that of the weight, the valve descends and admits more steam. This apparatus has the advantage of being more simple than the latter, and is, perhaps, equally efficient.

I claim as my invention—

A safety-valve, arranged, substantially as described, with reference to the pipe by which steam is conducted from a boiler to the driers of a paper-machine or any other vessel that communicates with the boiler, as to regulate by its movements the admission of steam to such vessel, allowing only enough to pass to maintain a constant quantity within the latter.

DANIEL CROSBY.

Witnesses:

E. J. DUDLEY,
JOHN CROSBY.