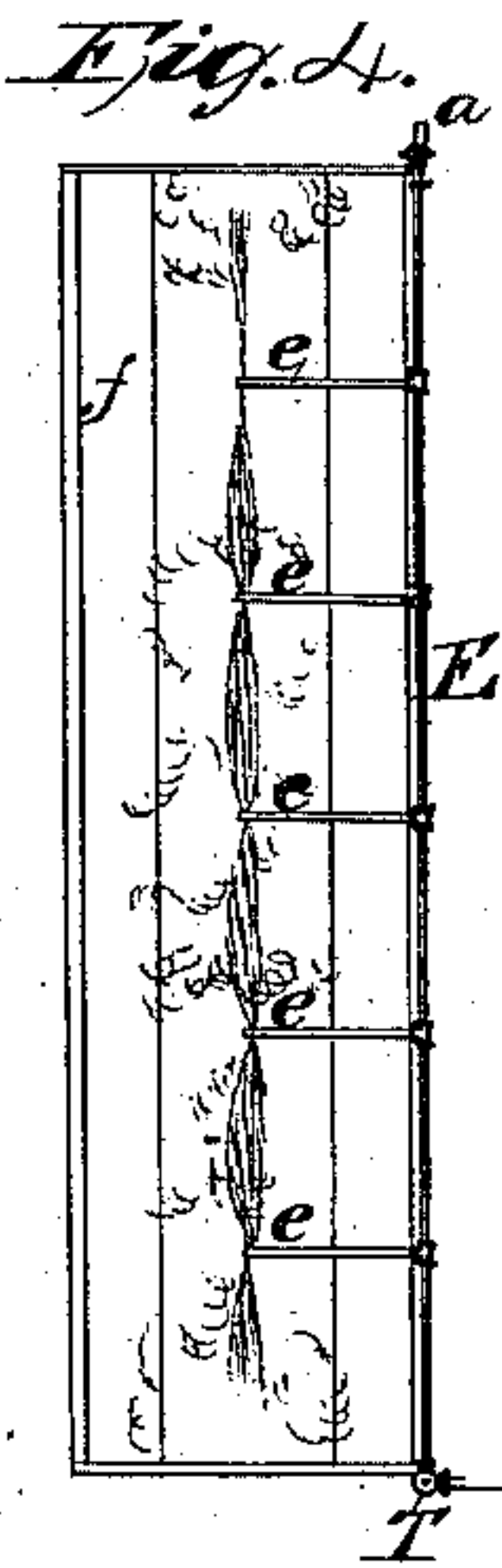
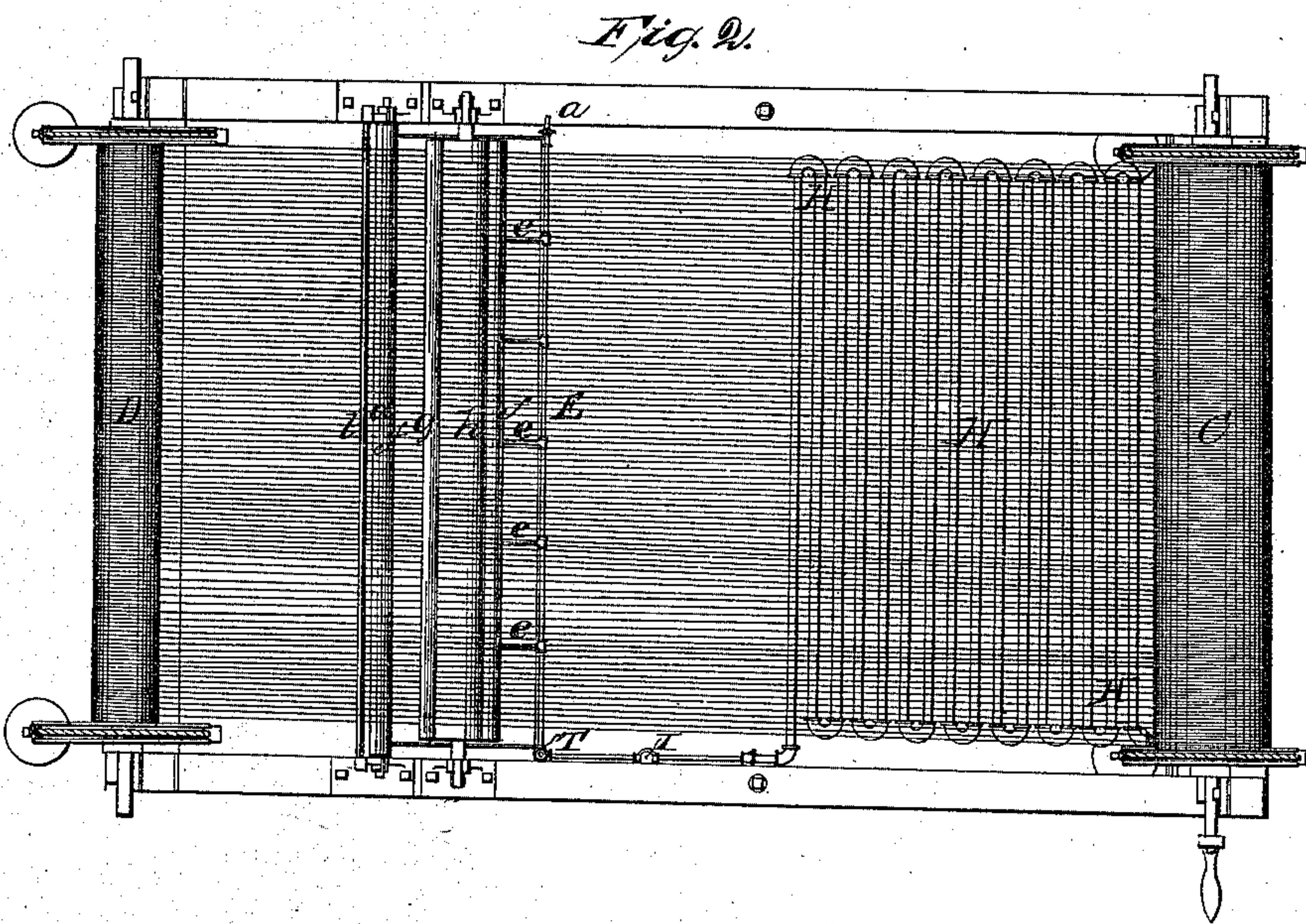
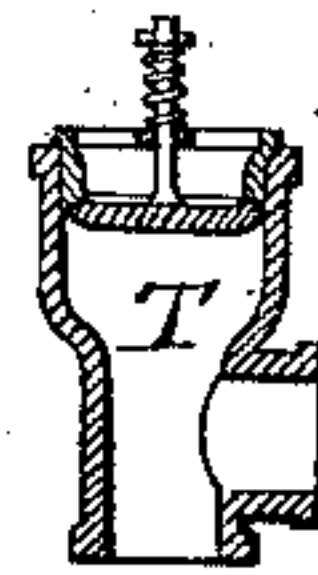
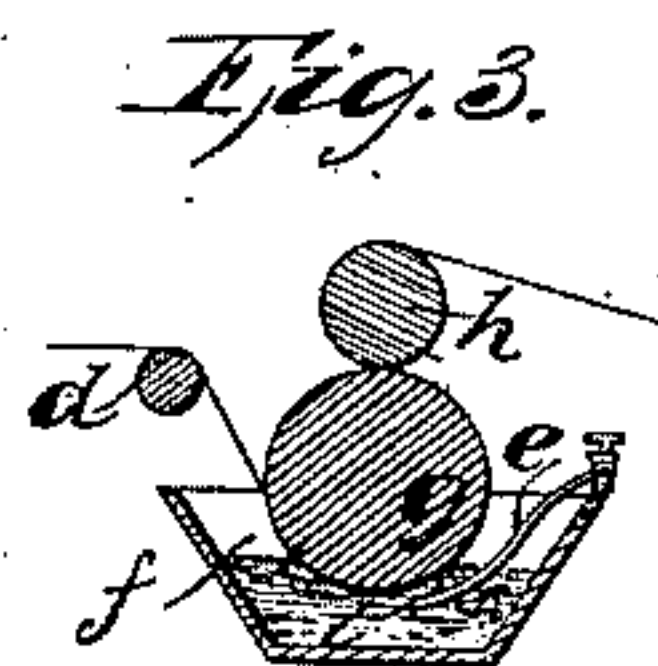
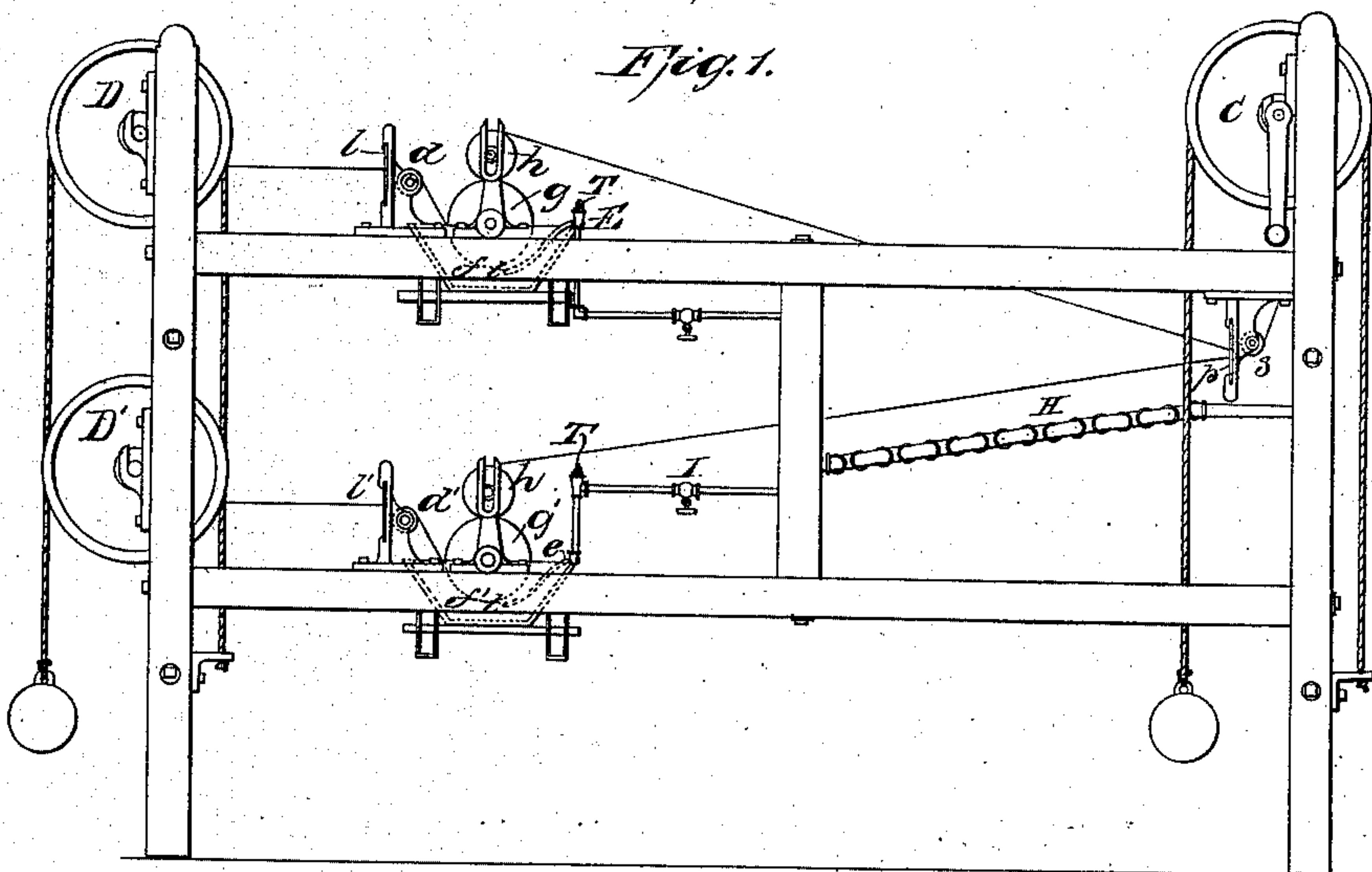


J. A. RHODES.  
YARNS FOR WARPS.

No. 35,262.

Patented May 13, 1862.





# UNITED STATES PATENT OFFICE.

JOHN A. RHODES, OF PROVIDENCE, RHODE ISLAND.

## IMPROVEMENT IN THE PROCESS OF SIZING YARNS FOR WARPS.

Specification forming part of Letters Patent No. 35,262, dated May 13, 1862.

### *To all whom it may concern:*

Be it known that I, JOHN A. RHODES, of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in the Process of Sizing Yarns for Warps, &c., which is also applicable to sizing or starching cloths, &c., and for other purposes; 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, making part of this specification, in which—

Figure 1 is a side elevation of a machine for sizing or dressing yarns for warps arranged with my improvement. Fig. 2 is a plan of the same. Fig. 3 is a vertical section of the size receptacle and rollers detached from the machine. Fig. 4 is a plan of the same. Fig. 5 is a plan and section of the vacuum-valve T, which forms a portion of my improved apparatus.

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

In the operation of sizing or dressing yarn for warps as now generally practiced the yarn to be sized is arranged upon the yarn-beams D D', Figs. 1 and 2, from which it is drawn and passes through the yarn-guides LL', over the guide-rollers d d', thence into the sizing in the receptacles f f', under the size-rollers g g', then between said rollers and the rollers h h'; thence it passes over the steam-driers H, through the guides p, under the guide-roller s to the yarn-beam C, upon which the yarn is finally wound to be woven in the loom. In some machines the yarn passes directly between the rollers g and h, instead of under and around them in the manner shown, in which case a quantity of the size adheres to the rollers g g' and is applied to the yarn at the point of intersection with the roller h h'.

In the operation of sizing or starching cloths, &c., a similar system of rollers, in connection with a receptacle for the size, is employed, the drying being a separate operation.

The size generally used is composed of equal parts of wheat and potato starch, with a proportion of British gum, (gum substitute.) These are compounded by boiling with steam or otherwise, and the size thus formed is supplied to the receptacles f f' as it is required. This size or paste is applied to the surface of the yarn or cloth and rubbed in

between the fibers by means of brushes, or it is crushed in by passing the goods between weighted rollers in the act of expelling the superfluous size or paste.

Another method of sizing yarns for warps, &c., is set forth in the description of Lillies's sizing-machine in *Ure on the Cotton Manufacture of Great Britain*, volume 2, pages 250, 251, edition of 1836, as follows:

"It is a fact well known, particularly to dyers, that stuffs are not well penetrated by a fluid; &c., if they are not alternately immersed in the fluid and then squeezed out again for the purpose of expelling the air contained in the fibrous matter. With this view the sizing-machine (Lillies's) has been constructed, which consists of a large trough filled with size, through which the warp is drawn; but instead of passing it simply through the fluid it passes over a set of rollers which turn by the friction of the traveling warp. This motion, by which the warp is pressed tight upon the rollers and left loose again in the space between every two of them, effects a complete impregnation of the fibers of the yarn."

It is proper further to state by way of description that of the rollers mentioned a series of some "twenty or more are generally used," that both the said rollers and the traveling warp are entirely submerged in the size or paste, and that there are a number of openings in the bottom of the said trough, through which steam is admitted into the paste contained therein.

Both methods are also subject to the principal difficulty experienced in dressing yarn for warps, &c.—that of drying the yarn except by extraordinary means of heating apparatus, hot rooms, &c.—which limits the production of the machine to less than one-half its capacity if the yarn could be dried as rapidly as the size can be applied; and it is a well-known fact that during a season of continued dampness, and unless the dressing-room is heated to a very high temperature it is often found necessary to suspend operations from inability to dry the yarn, or, in other words, to evaporate the moisture from the size.

To overcome these and other difficulties and to size and penetrate yarns, cloths, and fibrous matter effectually with the least possible



quantity of size or other fluid is the object of invention.

My improvement consists in the use of steam impinging yarns, cloths, and fibrous matter while immersed in size, paste, or other fluid with which said yarn, cloth, &c., is to be sized or dressed, substantially as hereinafter described; also, in the use of steam impinging the surface of the roller or other device used for immersing or applying the size, paste, or other fluid used to penetrate and treat the yarn, cloth, or other fibrous matter, substantially as hereinafter described.

To enable others skilled in the art to make use of my invention, I will proceed to describe the same.

In connection with the size-receptacles *ff'*, I arrange an apparatus consisting of a steam-pipe, *E*, extending lengthwise near the edge of the same, having branch pipes *eeee*, more or less in number, extending therefrom into the said receptacles, and provided with a vacuum-valve, *T*, (fully shown in Fig. 5,) an escape-cock, *a*, together with a suitable induction-valve, *I*, for regulating the supply of steam. The ends of the branch pipes *e* extend beneath the surface of the size in the receptacle, and, being perforated upon each side at *t*, Figs. 3 and 4, jets of steam issue in opposite directions therefrom, so as to impinge that portion of the yarn which is immersed in the size by passing under the rollers *g g'*, or otherwise.

Instead of a number of pipes like *ee*, one pipe having a row of perforations or a narrow slit extending lengthwise therein and arranged so as to eject the steam issuing therefrom directly against the immersed yarn may be employed.

The action of steam impinging the yarn while removed from the air by immersion, as shown and described, effectually expels the air from between the fibers, while the current of heated moisture carries with it the diluted or thinner portion of the size, which is thus made to penetrate to the inmost fiber and take the place of the expelled air. By this means so minute a quantity of the size is incorporated with the yarn, and by the application of such an intense moist heat, that the superfluous moisture is exhaled by exposure to the air, which is cooler, and the sized yarn dries as quickly as can be desired.

The impinging steam also has the effect of destroying that elasticity of the fiber which is the resistance in spinning or twisting the same, which obliges each fiber to conform to the position and retain the shape into which it is twisted or otherwise wrought, in consequence of which a much less quantity of the size is required. The fibers are laid more compactly together, and the yarn, being thereby rendered much stronger, is less liable to break in undergoing subsequent operations. Owing to this peculiar effect yarn for warps may be sufficiently dressed or prepared to undergo successfully the operation of weaving

without any size by using water only for immersion in the receptacle.

With impinging steam I am enabled to make use of certain gums, glues, and glutinous matter which could not be used for sizing purposes except in connection with such a powerful solvent.

The effect of steam in destroying the elasticity of the fiber, as above described, suggests its application to the roving in the operation of spinning, as well as to the yarn afterward.

The best result is obtained—that is, the yarn is most effectually sized with the least quantity of size—when the perforations in the pipes from which the steam issues are most nearly in contact with the yarn itself—say at a distance of one thirty-second of an inch therefrom—and only diminished results will be obtained at more remote distances therefrom in approaching that point at which the size is simply boiled in the receptacle, and it is this peculiarity of my invention which distinguishes it from the use of steam for boiling the size in a separate vessel or for boiling the size or paste in the receptacle, as practiced in Lillies's sizing-machine, it being insufficient that the size is simply boiled in the receptacle, or that it is applied to the yarn, &c., boiling hot. The steam must impinge the yarn or fiber in order to produce the desired result, as above described.

The action of the steam impinging the surface of the roller *g* or its equivalent instead of the yarn imparts an intense moist heat to the surface of said roller, and is found to greatly facilitate the operation of sizing yarns for warps, &c., in machines in which the yarn passes directly between the rollers *g* and *h*, as before explained. In addition to this it entirely prevents the size from adhering to the said rollers, from which much inconvenience and loss of time are now experienced from the necessity of frequently stopping the machine to remove the adhering size from the rollers.

The steam may impinge the yarn, cloth, &c., at any desired point upon the circumference of the roller—that is to say, either upon the under side of the roller, upon the side which receives the yarn or cloth, or upon the side which delivers the yarn or cloth, and also at the point of intersection of the said roller *g* with an auxiliary roller, *h*.

The vacuum-valve *T*, Fig. 5, admits air to the steam-pipes *Ee* when a vacuum is formed therein by the condensation of steam after the induction-valve *I* is closed, thus preventing the size from running into and clogging the pipes, and is therefore an important auxiliary in connection with this apparatus, though in itself it is without novelty. Should the said pipes, however, by any circumstance become clogged, they may be cleared by opening the escape-cock *a* and blowing the steam through the pipe *E*.

In using this process by means of the ap-



paratus described or one equivalent thereto, I first mix the required quantity of size in a separate vessel, in consistency according to the nature of the size material, and pour it into the receptacles  $f f'$ , and let on the steam about thirty seconds before starting the machine, when the operation may proceed. Should it be found that the yarn is taking up too much size, the perforated ends of the pipes  $e$  should be moved closer to the yarn. If it is found that the yarn does not take up as much size as is desirable, the said ends are to be moved farther off, the variation of the distance being effected by simply turning the main pipe  $E$ , or in any other equally convenient way.

Having thus described my invention and the different modifications and applications of the same contemplated, I wish it to be understood that I do not restrict myself to the use of the particular apparatus described. Neither do I restrict myself to any particular size or fluid for immersion, or its application to any particular fiber or manufacture thereof.

I do not claim simply boiling the size or other fluid in the receptacle by steam or otherwise. Neither do I claim the use of boiling-hot size, or simply steam in combination with size or other fluid, as the same have been previously known and used.

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

1. The use of steam impinging yarns, cloths, and other fibrous matters while immersed in size, paste, or other fluid with which said yarn, cloth, &c., is to be sized or dressed, substantially as described, for the purpose specified.

2. The use of steam impinging the surface of the roller  $g$  or other device used for immersing or applying the size, paste, or other fluid with which the yarn, cloth, or other fibrous matter is to be sized or dressed, substantially as herein described, for the purpose specified.

JOHN A. RHODES.

Witnesses:

JAMES LAIRD,  
R. GAWLEY.