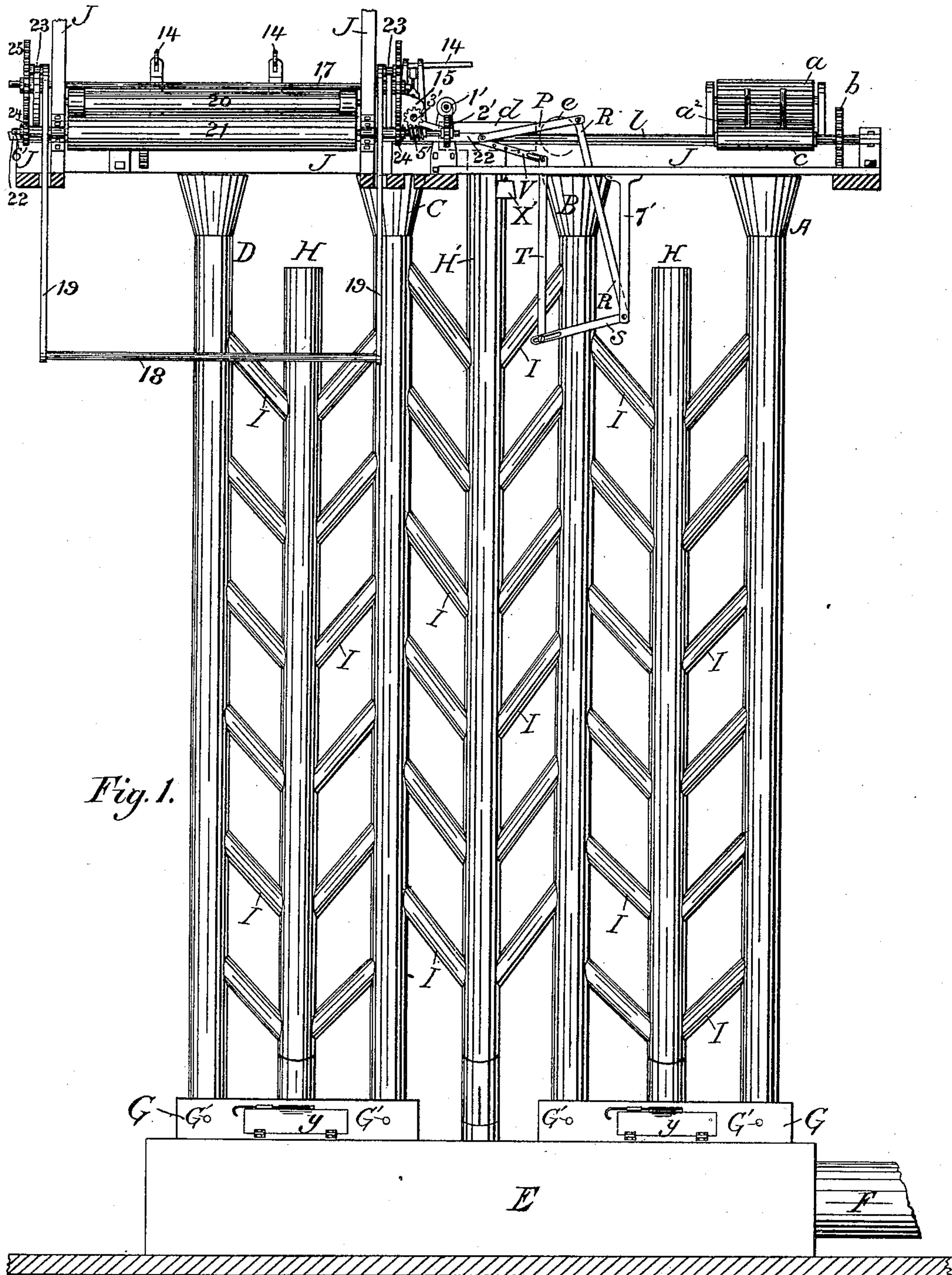


5 Sheets—Sheet 1.

MACHINE FOR DRYING WARPS, &c.

Patented Oct. 9, 1888.



Witnesses,
 Wm. S. Edwards,
 Geo. N. Fernald.

Inventor.
Frank Naskie.
BY GE. S. BID ATTORNEY

(No Model.)

5 Sheets—Sheet 2.

F. HASKELL.

MACHINE FOR DRYING WARPS, &c.

No. 390,963.

Patented Oct. 9, 1888.

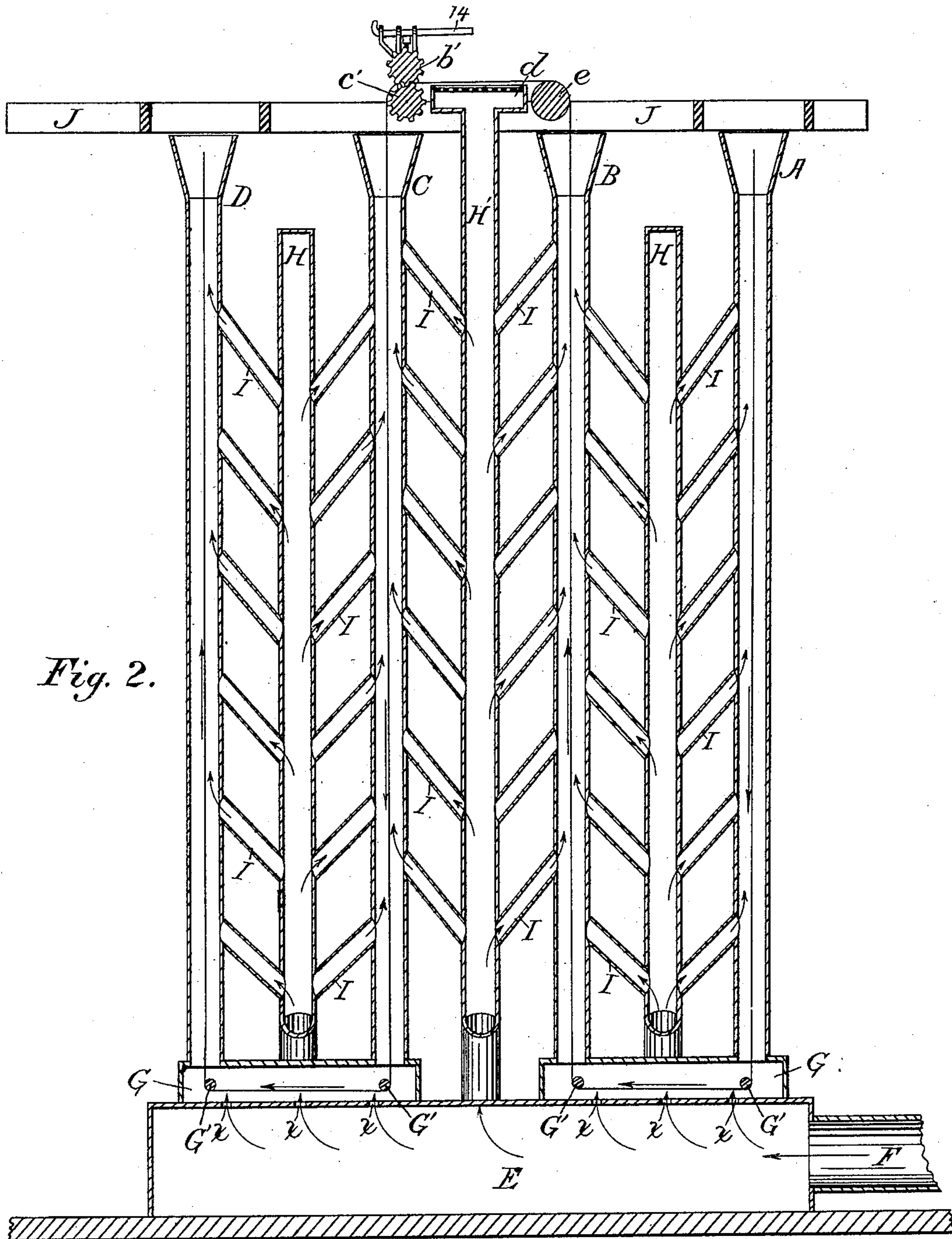


Fig. 2.

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(No Model.)

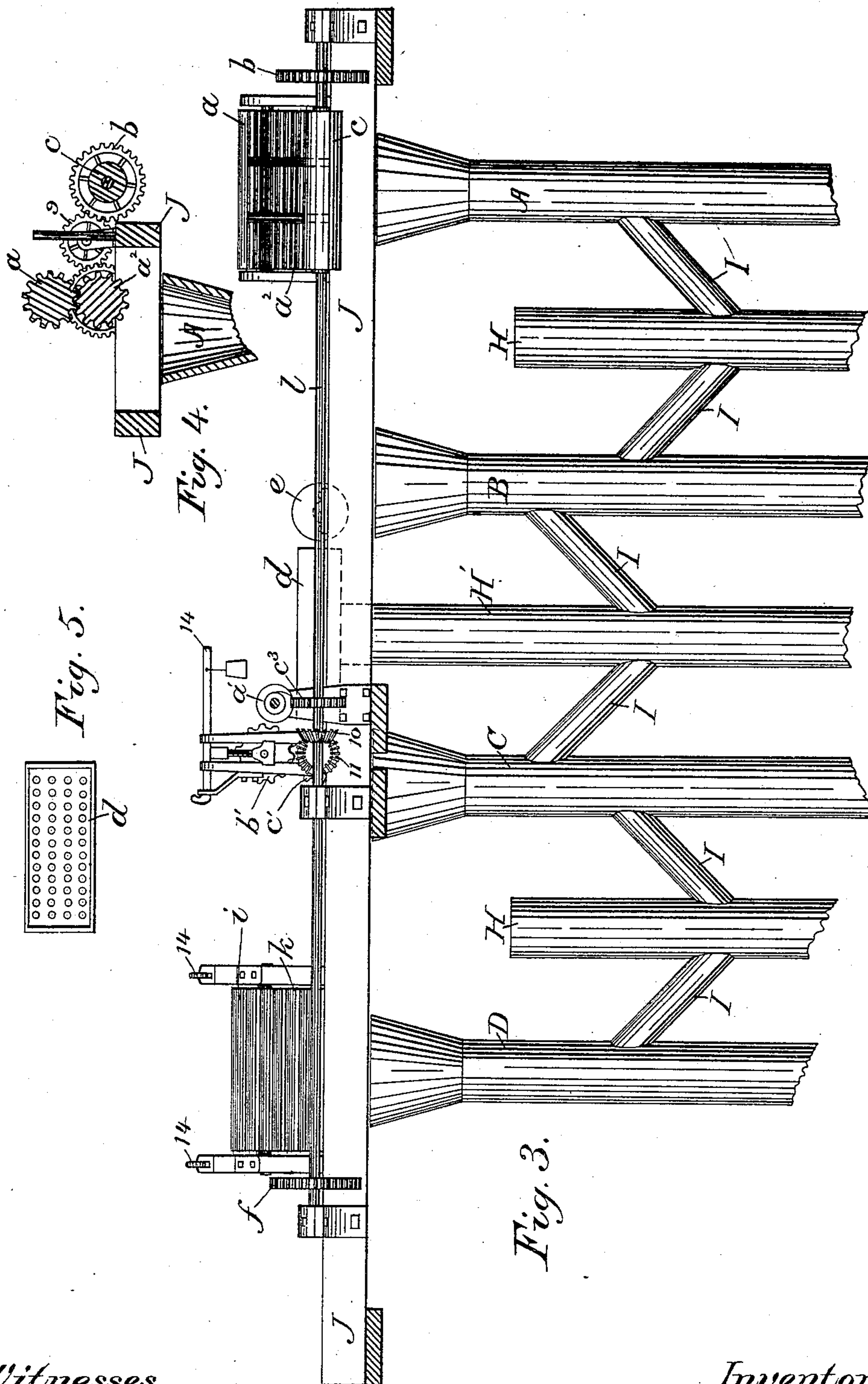
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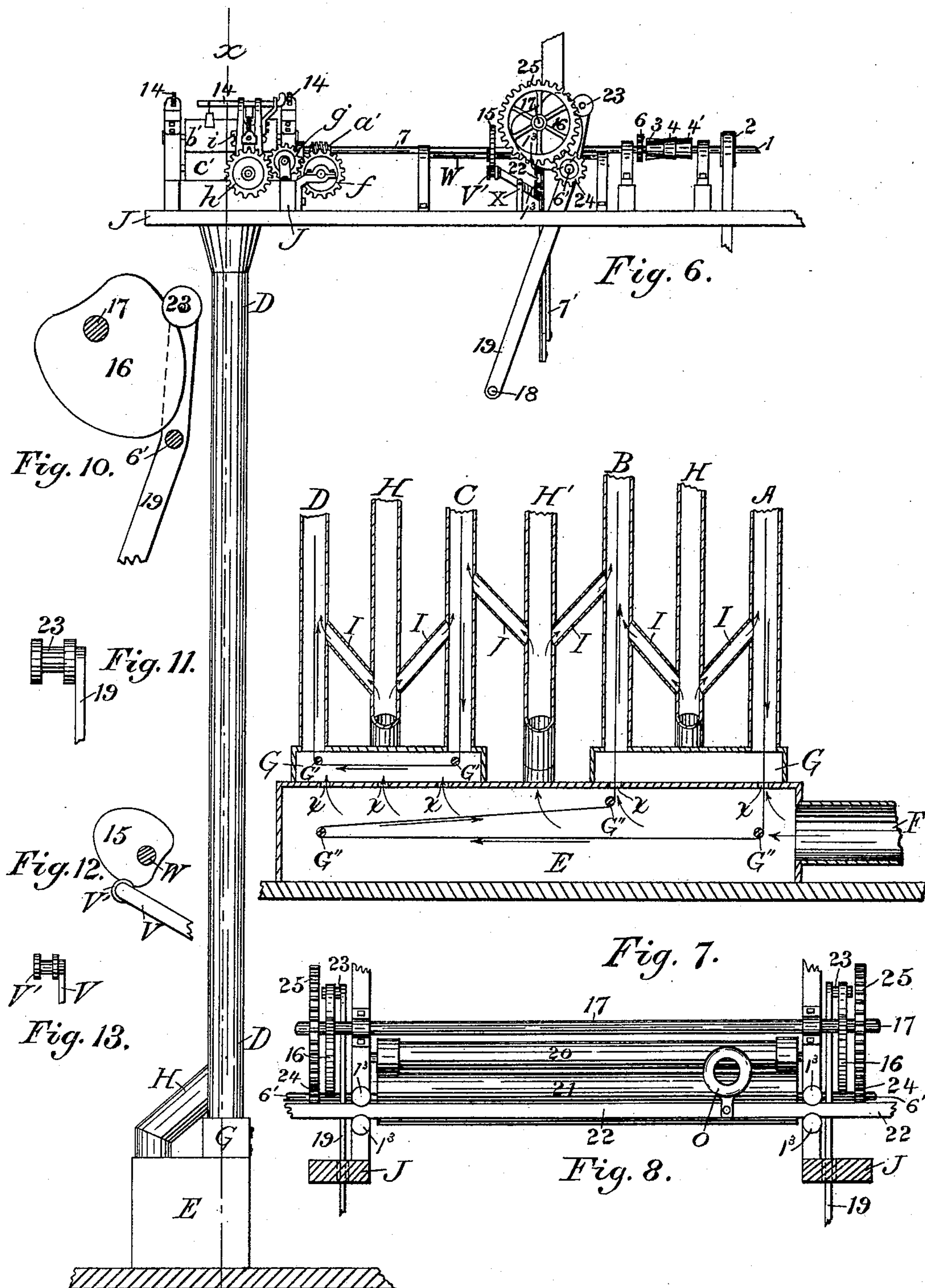
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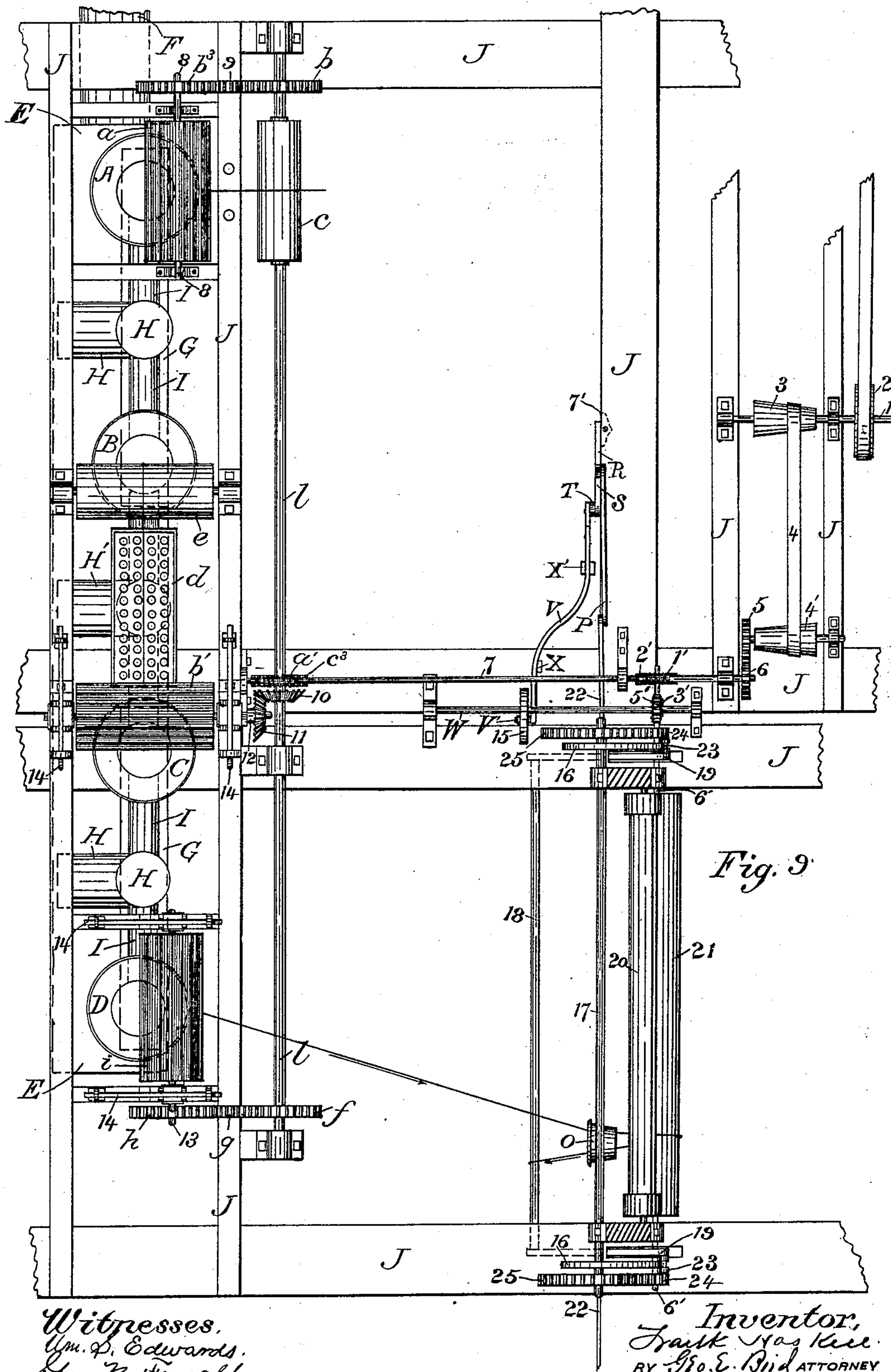
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UNITED STATES PATENT OFFICE.

FRANK HASKELL, OF WESTBROOK, MAINE.

MACHINE FOR DRYING WARPS, &c.

SPECIFICATION forming part of Letters Patent No. 390,963, dated October 9, 1888.

Application filed August 13, 1886. Serial No. 210,849. (No model.)

To all whom it may concern:

Be it known that I, FRANK HASKELL, of Westbrook, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Machines for Drying Warps, &c.; and I do hereby declare that the following is a full, clear, and exact description of the invention, that will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which--

Figure 1 is a side elevation of a machine embodying my invention; Fig. 2, a vertical section of the same through the line *xy* of Fig. 6. Fig. 3 is a side elevation, upon an enlarged scale, of the tops of the pipes and the mechanism for feeding the warps. Fig. 4 is a vertical section of the feeding device, which is located over the pipe A. Fig. 5 is a detail showing the top of the box *d*. Fig. 6 is a side elevation of the pipe D and feeding apparatus and the folding mechanism. Fig. 7 is a sectional detail showing an arrangement of rollers in the box E. Fig. 8 is a rear view of a portion of the folding device. Fig. 9 is a top plan of the machine. Fig. 10 is a detail of the cam 16 and lever 19. Fig. 11 is a detail showing the arm 19. Fig. 12 is a perspective of the cam 15 and lever V. Fig. 13 is a detail of the rod *v* and projection *v'*.

My invention relates to a machine for drying gray, bleached, or colored warps, or goods of cotton, wool, or silk, colored, bleached, or printed in the piece, in cotton, woolen, or silk mills immediately after they are colored, bleached, or printed, and to the mechanism employed in such process.

Hitherto warps and goods dyed, bleached, or printed in the piece have generally been dried by passing them over a succession of hollow metal cylinders heated by steam. This method has been found objectionable, in that the threads of the warp are stretched unevenly, and because the outer threads are subjected to a very high degree of heat, rendering them brittle, and in some instances changing the color. With piece-goods there is the same liability to change of color, while the fabric itself is stretched in and reduced in width.

It is the purpose of my invention to provide such a machine for drying warps and piece-

goods as shall avoid stretching and bringing them into direct contact with any heated metallic substance.

The invention consists of a succession of pipes or chambers connected with auxiliary pipes or chambers by lateral pipes, means for supplying said pipes or chambers with a continuous blast of heated air, and mechanism for propelling the warps or piece-goods through said pipes or chambers.

The invention, as illustrated in the drawings, is constructed as described below; and it consists in the arrangement of the chambers or pipes supplied with a hot-air blast, means for propelling the warp or goods through them, and, if desired, a device for folding the warps or goods after drying.

The heated air may be supplied by any well-known means. I prefer to employ a tubular boiler heated by steam, through which the air is forced by a powerful blower. The current of heated air thus provided is forced into the pipe F, through which it enters the chamber E. This is a rectangular box of ordinary construction, which may be surmounted at each side by the boxes G G, which are connected with the chamber E by the openings *xx*. Preferably these should be more numerous under the drying chamber or pipe into which the warps or goods first enter. The front of these boxes may be provided with the closely-fitting doors *yy*. From these boxes extend upward the chambers or pipes A B C D, respectively, the two former being connected with opposite sides of one box and the latter with opposite sides of the other, Figs. 1 and 2, and all having open tops, which, if desired, may be made somewhat flaring.

Beneath the center of each of the pipes A B C D is placed a roller, G', which rotates freely in the sides of the box G. Another arrangement of these rollers is shown in Fig. 7, (see G'' G''), which differs from that shown in Fig. 1 in the position and number of the rollers used in connection with the pipes A B. These rollers are placed in the box E, the first and third being placed beneath the pipes A and B, respectively, while the second is placed under the pipe D. The yarn passes under the first roller, around the second, and under the third.

Between the pipes A B and the pipes C D

respectively, are placed the pipes H H, each having a closed top and connected at the bottom with the box E, either directly or through the boxes G G. Between the pipes B C is placed the pipe H', which terminates at the upper end in the box d, having an open grated top, (see Figs. 2, 5, and 9,) and below is connected with the box or chamber E. All these pipes H H' H are connected with the adjacent pipes A B C D, respectively, by means of the smaller pipes I I. (See Figs. 1, 2, 3, and 7.)

Above the tops of the pipes A B, &c. is the frame J J, upon which is supported the mechanism for feeding the warps or goods and the device for folding them.

The feeding mechanism consists of grooved rollers placed above the pipes with suitable means for operating them. It is shown in Figs. 1, 2, 3, 4, 6, and 9.

1 is a shaft driven by a belt on the pulley 2. The cone 3 on the shaft 1 is connected by belt 4 with the cone 4' on the same shaft, with which is the gear 5, matching the gear 6 on the shaft 7, on which is also the worm a' . The worm a' matches with the gear c' on the shaft l , upon which is fixed the roller c (see Figs. 1, 3, 9) in front of the pipe A. At the end of the shaft l is fixed the gear b , matching the gear 9, which in turn matches the gear b' on the shaft 8, which carries the toothed roller a^2 . The roller a^2 is so located over the pipe A that its circumference at the back of the roller is tangent to the vertical plane of the diameter of the pipe A. Above the roller a^2 is the loose roller a . (See Figs. 1, 3, and 4.) Over the pipe B is the roller e , (at right angles to the axis of the shaft of the roller a^2), its circumference at the right side touching the vertical plane of the diameter of the pipe. Nearly opposite the pipe C on the shaft l is fixed the beveled gear 10, which matches the beveled gear 11 on the shaft 12, (see Figs. 3 and 9,) on which is the toothed roller c' , (parallel with the roller c , see Figs. 2 and 3,) located between the roller c and the vertical plane of the diameter of the pipe C, with which plane it is in contact. Above the roller c' is the roller b' .

Placed over the pipe D, in like manner as the roller a^2 over the pipe A, is the toothed roller k , above which is the roller i . The roller k is on the shaft 13, which has the gear h , which is connected through the gear g with the gear f on the shaft l . The journals of the rollers i and b' are movable and weighted by means of the levers 14. (See Figs. 1, 3, 6, and 9.) The rollers c' b' should be slightly smaller in diameter than the rollers a^2 a , respectively, and the rollers k and i are slightly smaller than the rollers c' and b' .

The folding apparatus is shown in Figs. 1, 6, 8, and 9. The shaft 6' has beneath and matching the worm 1' (on the shaft 7) the gear 2'. The shaft 6' has also the roller 21, just above which is the roller 20, which is journaled in the frame J J. Mounted loosely on the shaft 6', at either end, outside the rollers,

and depending through slots in the frame J, are the levers 19 19, connected at their lower ends by the rod 18. The upper ends of the levers 19 19 are provided with the grooved projections 23 23, respectively, which play upon the cam-wheels 16 16. The cams 16 16 are fixed upon the shaft 17, which also has the gears 25 25, matching the pinions 24 24, respectively. (See Figs. 8 and 9.) Held between the rollers 1³ 1³ is the rod 22, carrying the collar O. (See Figs. 8 and 9.) This rod 22 is pivoted to the rod P, which at the other end is pivoted to the right-angled lever R S, which at the angle is pivoted to the standard 7'. To the lower end of the lever R S is pivoted the rod T, which at the upper end is pivoted to the end of the lever V, the other end of which is provided with a grooved projection, V', which plays under the cam 15 on the shaft W, (said shaft W being driven from the shaft 6' by worm 5' and worm-wheel 3',) the lever having its fulcrum at X, Figs. 6 and 9, and being provided with the weight X'.

The warps or goods, after being printed, bleached, washed or sized or dyed, are drawn through the succession of upright pipes or chambers, and are therein subjected to the action of a strong blast of heated air, and at the same time to auxiliary lateral blasts. The effect of this blast on the warps is to separate the threads of the warps and to dry them evenly without subjecting one thread to more heat than another, allowing the contraction of the threads to take place without any strain upon them and without bringing them in contact with any heated surface. The elasticity of the yarn is thus preserved and the bloom of the color unaffected. In piece goods the drying is accomplished in a similar manner, the effect being to preserve the width of the goods and to prevent injury to colors and to light and delicate fabrics.

The operation of the mechanism above described is as follows: The heated air is forced through the connecting-pipe F and through the box G (when used) into the box E, whence it is driven into the pipes or chambers A B C D, both directly from the box E and through the pipes I I from the pipes H H H'. The warp is carried over the roller c , between the grooved rollers a^2 and a , by which it is carried down the pipe A against the force of the blast, under the rollers G' G', up the pipe B over the roller e and the box d between the grooved rollers c' b' , when it proceeds through the pipes C and D in like manner as through the pipes A B to the rollers k i . As stated, the rollers a^2 a , c' b' , and k i diminish slightly in size in order to compensate for the gradual shrinkage of the warps or goods as the process of drying advances. The amount of such decrease can only be determined by experiment for each machine. As the warps or goods issue from the rollers k i they are carried through the collar O on the rod 17 between the rollers 20 21, which should so rotate as to draw the warps or goods onward as fast as they leave the roll-

ers $k i$. It then passes downward over the rod 18 to the tray or box upon which it is folded, the folding being effected by the rod 18, which moves backward and forward under the action of the cams 16, and by the rod 17, which moves laterally under the action of the cam 15, which is communicated to the rod 17 by the lever R S and rods P T V.

The pipes or chambers A B C D may of course be increased to any number desired, accompanying the increase by corresponding means for propelling the warps or goods. A vertical position of the pipes or chambers is most advantageous, as otherwise the warps or goods in being carried through the chamber are liable to be stretched and become massed together, as in the case of the metallic heated cylinders. The liability to stretching when the chambers or pipes are horizontal is greater on account of the increased power required to propel the warps or goods.

What I claim is—

1. The combination of a series of pipes or chambers with means for propelling a continuous length of flexible material through them, and auxiliary pipes having lateral pipes connecting the latter with the first-named pipes, and a chamber or box with which all said pipes communicate, substantially as described.

2. The combination of the box E, pipes A B C D, connected therewith, the pins or roll-

ers $G' G'$, and the rollers $a^2 a$, $b' c'$, and $k i$, with means for actuating said rollers a^2 , b' , and i , substantially as described.

3. The combination of the pipe F, the box E, pipes A B C D, connected therewith, pipes H H H' and I I, rollers $G' G'$, shaft l , gears b , 9, and b^3 , toothed rollers $a^2 a$, beveled gears 10 and 11, rollers $c' b'$, gears $f g h$, and rollers $k i$, substantially as described.

4. The combination of the rollers 20 21, gears 24 25, cams 16 16, rod 18, levers 19 19, with projections 23 23, and shafts 6' and 17, substantially as described.

5. The combination of the rollers $1^3 1^3$, the rod 22, with collar O, lever R S, rods P T, lever V, with weight X' and projection V', and cam 15, substantially as described.

6. The combination of the rollers 20 21, gears 24 25, cams 16 16, rod 18, levers 19 19, with projections 23 23, rollers $1^3 1^3$, rod 22, with collar O, rods P T, lever R S, weighted lever V, cam 15, shafts 17 and 6' and W, worm 5', and worm-wheel 3', substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 24th day of July, 1886.

FRANK HASKELL.

Witnesses:

ARTHUR W. RICKER,
HENRY BLATCHFORD.