(No Model.) 4 Sheets—Sheet 1.

F. HASKELL.

MACHINE FOR DRYING WARPS.

No. 485,694. Patented Nov. 8, 1892.

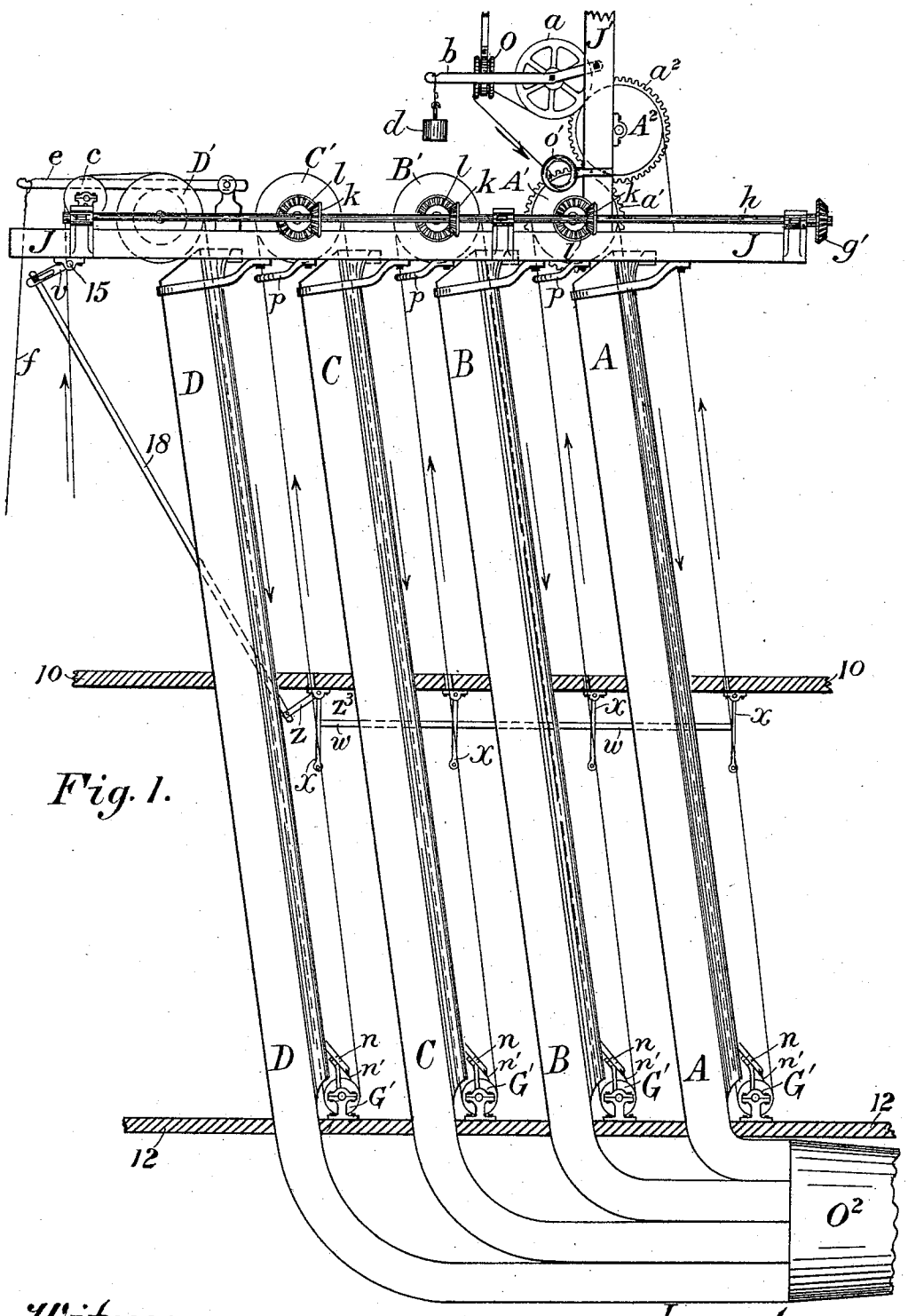


Fig. 1.

Witnesses
C. R. Duffee
Chas E. Doe

Inventor
Frank Haskell
BY F. R. Bird ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 2.

F. HASKELL.

MACHINE FOR DRYING WARPS.

No. 485,694. Patented Nov. 8, 1892.

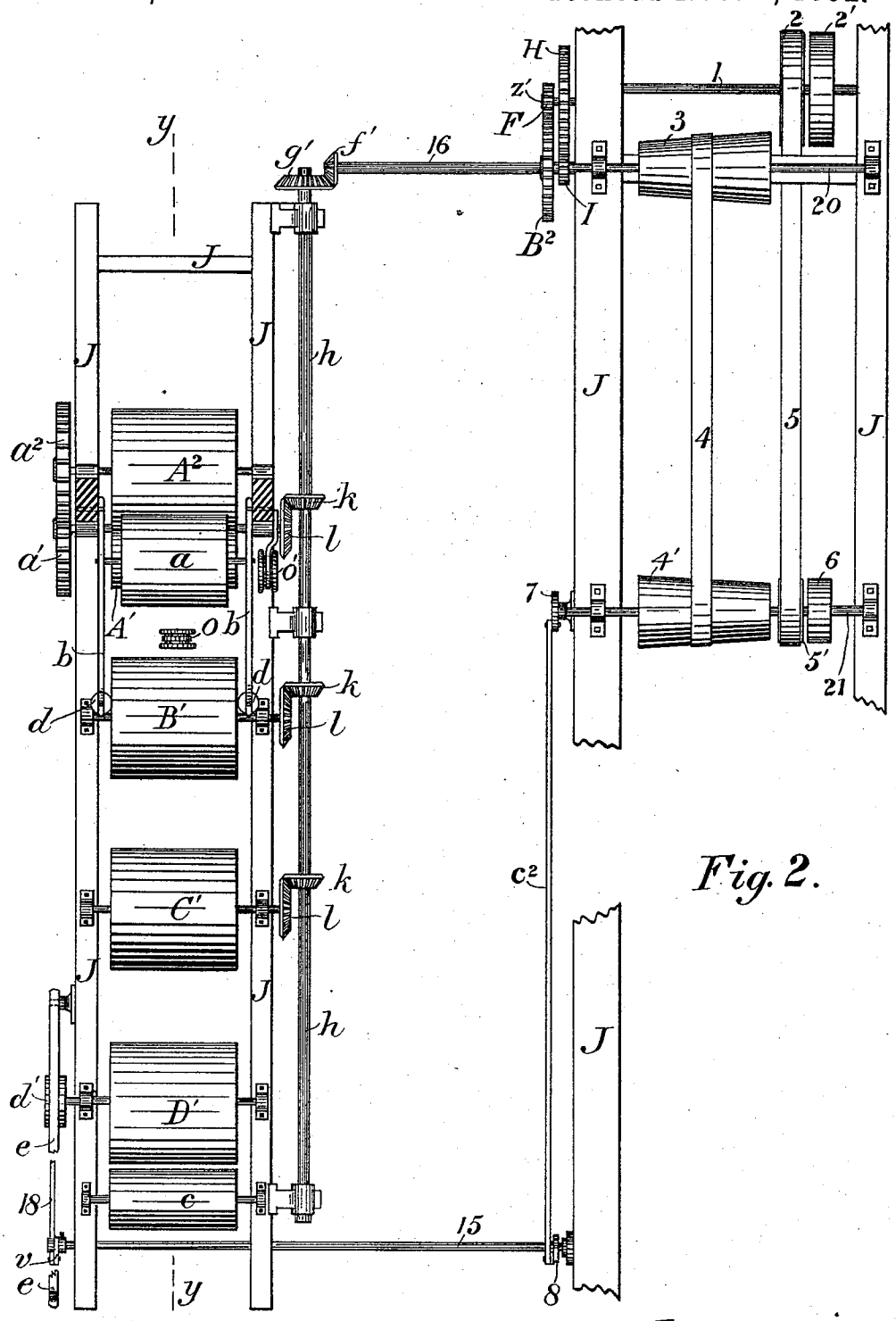


Fig. 2.

Witnesses
C. R. Duffett.
Chas. E. Doe.

Inventor
Frank Haskell
BY F. L. Bird. ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

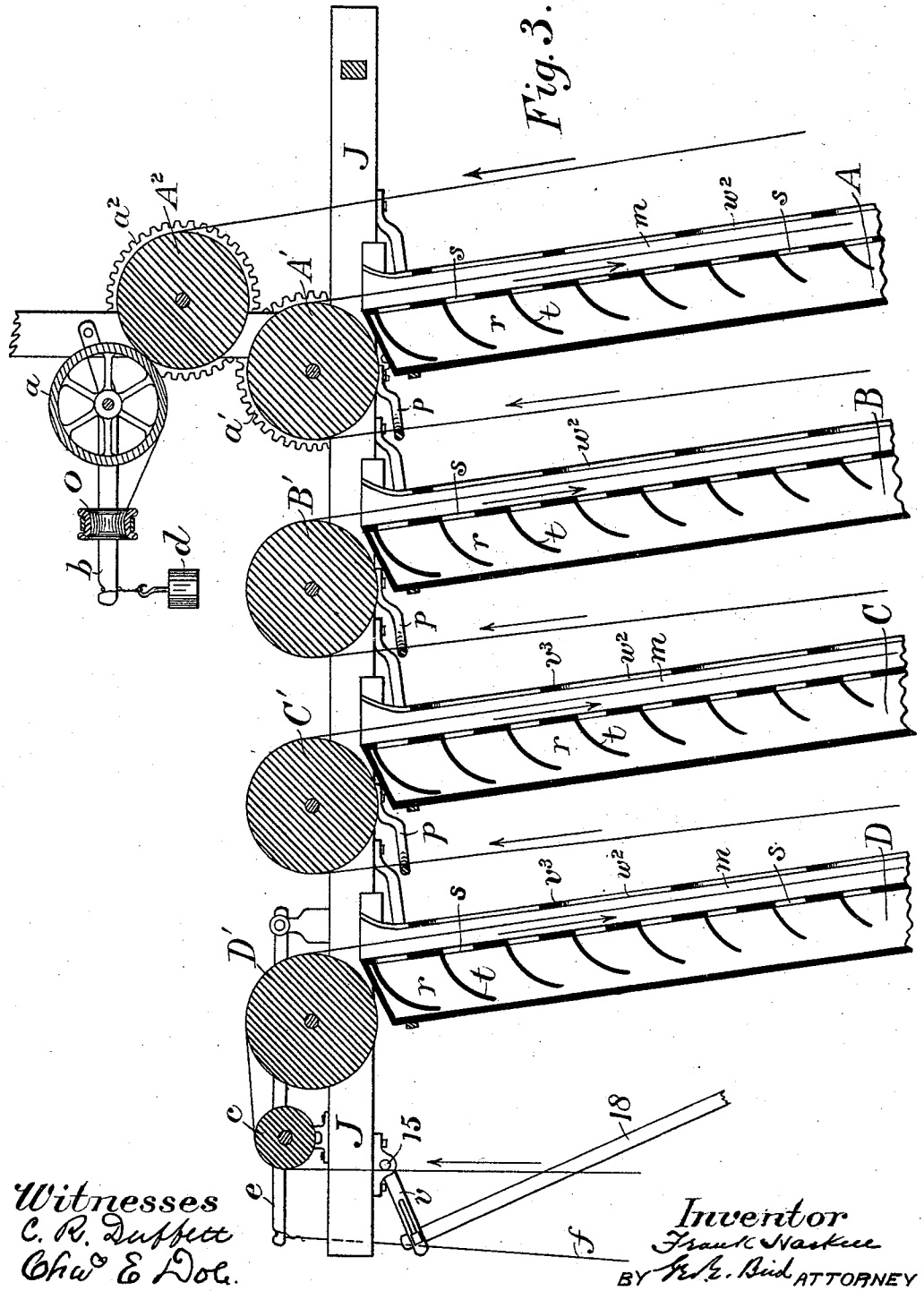
(No Model.) 4 Sheets—Sheet 3.

F. HASKELL.

MACHINE FOR DRYING WARPS.

No. 485,694. Patented Nov. 8, 1892.

Fig. 3.



Witnesses
C. R. Duffett
Chas E. Doe.

Inventor
Frank Haskell
BY F. E. Bird ATTORNEY

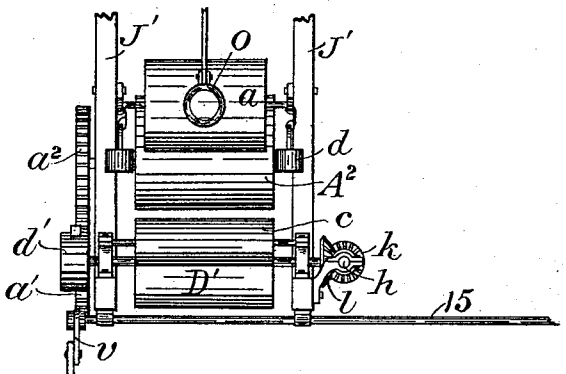
THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 4.

F. HASKELL.

MACHINE FOR DRYING WARPS.

No. 485,694. Patented Nov. 8, 1892.



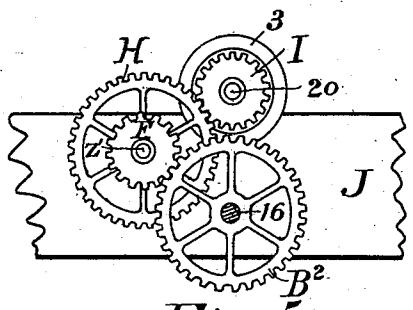


Fig. 5.

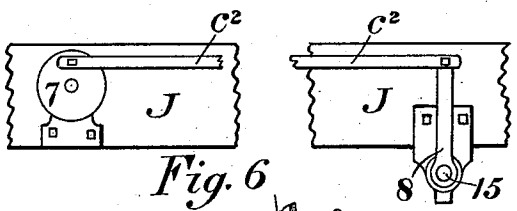


Fig. 6.

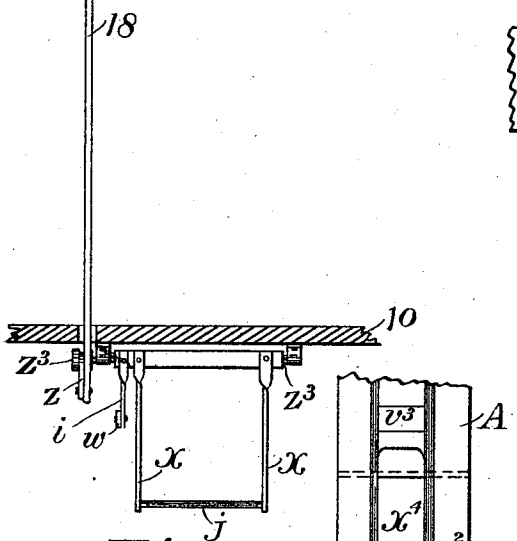


Fig. 4.

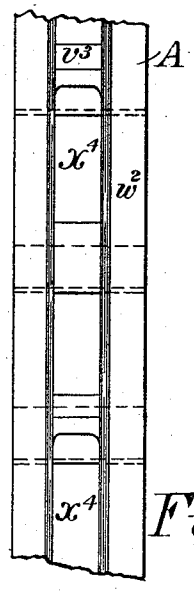


Fig. 8.

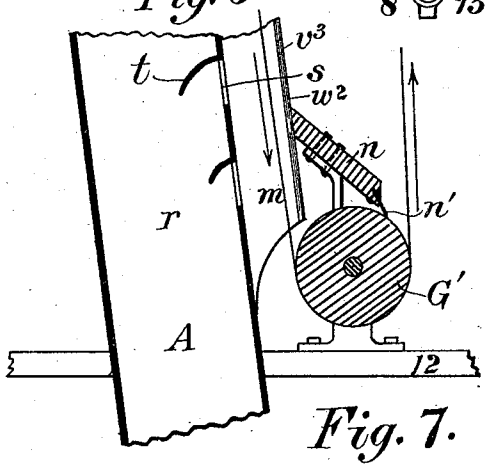


Fig. 7.

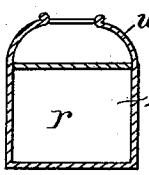


Fig. 9.

Witnesses
C. R. Duffett.
Chas. E. Dole

Inventor
Frank Haskell
BY Geo. P. Bird ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRANK HASKELL, OF WESTBROOK, MAINE.

MACHINE FOR DRYING WARPS.

SPECIFICATION forming part of Letters Patent No. 485,694, dated November 8, 1892.

Application filed March 2, 1891. Serial No. 383,419. (No model.)

To all whom it may concern:

Be it known that I, FRANK HASKELL, a citizen of the United States, residing at 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, which will enable others skilled in the art to which it appertains to make and use the same.

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.

The present invention is an improvement upon Letters Patent No. 390,963, granted to me October 9, 1888, for a machine for drying warps, &c., and No. 408,235, granted to me August 6, 1889, for a device for drying warps, piece goods, &c.

The invention is described below, reference being had to the drawings, in which—

Figure 1 is a side elevation of the drying pipes or cans. Fig. 2 is a top plan of the machine; Fig. 3, a vertical section through the line $y\ y$ of Fig. 2. Fig. 4 is a detail showing in side elevation the rollers for propelling the goods and the shaking device; Fig. 5, a detail of the gear B^2 and connecting-gears; Fig. 6, a detail of the connections of the rod c^2 of Fig. 2; Fig. 7, a detail of the bottom of the drying-can; Fig. 8, a plan of the open side of the can; Fig. 9, a cross-section of the can.

The heated air may be provided 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, however provided, is forced into the pipe O^2, through which it enters the drying pipes or cans, the ends of which make closely-fitting connections with the end of the pipe O^2. In order to give the goods the most favorable conditions of drying and afford the best facilities for operating the machine, I prefer to place the pipe O^2 beneath one floor of the mill and extend the drying pipes or cans upward through the next floor nearly to the floor above. (See Fig. 1, in which 12 and 10 represent the two lower floors.) I also prefer to surround the drying pipes or cans from the lower floor to their tops with a wooden partition or wall, so that little or none of the heated air may be dissipated through the operating-room. Those parts of the pipes or cans (represented in the drawings as A B C D) which are above the lower floor are vertical, or nearly so, and are constructed substantially as described in said Letters Patent No. 408,235, with the addition of a tunnel or conduit for the passage of the goods—that is, as in said Letters Patent, there is a box of rectangular or similar shape r, closed at the upper end, with transverse openings $s\ s$ upon one side, and wings $t\ t$ curving downward within from the upper edges of the respective openings and gradually increasing in length as they approach the upper end of the can. (See Figs. 3 and 6.)

The tunnel or conduit m for the goods is formed by surrounding the side of the box r having the openings $s\ s$ with a wall w^2, curved, as in Fig. 9, or rectangular, if preferred. This wall constitutes, with the side of the box r, a passage or tunnel m, open at both top and bottom. It should be provided with openings v^3 at regular intervals, which may be closed with slides x^4. (See Fig. 8.) At the bottom of each can, and so placed that one side thereof is directly under the portion of the can m last described, (see Figs. 1 and 7,) is a roller G′, the shafts of which are journaled in standards affixed to the floor 12. (See Figs. 1 and 7.) Above each of these pulleys G′ is a standard n, holding a scraper n' in contact with the periphery of the roller G′ at a line on its upper surface on the side most removed from the cans. (See Fig. 7.)

The remainder of the mechanism for propelling the goods is placed upon the frame J, which is erected about the tops of the pipes or cans A B C D. (See Figs. 1, 2, and 3.) Upon the frame J are the rollers or cylinders A′ B′ C′ D′, of equal diameter, above the cans A B C D, respectively, and so placed that the plane of the center of the passage is tangential to the circumference at the right side of the roller. The shaft of the roller D′ carries at the rear end, outside of the frame J, a small pulley d', upon the upper surface of which

rests the lever *e*, having at its free end the cord *f*. At the left side of the cylinder D′ is the roller *c*. (See Fig. 1.) The shafts of the cylinders C′ B′ A′ are provided at their front ends with the bevel-gears *l l l* of equal diameter, while the shaft of the cylinder A′ carries, also, upon its rear end the gear *a′*. Journaled upon the standards J′ J′, above and to the right of the roller A′, is a shaft carrying the roller or cylinder A^2 and at the rear the gear a^2, which meshes with the gear *a′*. Pivoted to the inner sides of the standards J′ J′ are the levers *b b*, having at their free ends the weights *d d* and carrying between them the loose roller *a*, which rests upon the roller A^2. (See Fig. 1.) Between the levers *b b* and at a point between weight *d* and the roller *a* is the collar O, which is supported by a rod extending upward and secured at the upper end either to the frame of the machine or to the ceiling of the room. A like collar O′ may be located near the end of the roller *a*, as seen in Fig. 2, being supported in a similar manner. Each of the bevel-gears *l l l* meshes with a bevel-gear K on the shaft *h*, which shaft is parallel with the frame J and has at its right-hand end the bevel-gear *g′*, which meshes with the bevel-gear *f′* on the end of the shaft 16. This shaft 16 is provided with the gear B^2, which meshes with the gear F on the shaft *z′*, which shaft also carries a larger gear H, meshing with the gear I on the shaft 20. On the shaft 20 is the cone 3, which is connected by belt 4 with the cone 4′ on the parallel shaft 21. In front of the cone 4′ the shaft 21 has the fixed and loose pulleys 5′ and 6, which are connected with similar pulleys 2 and 2′ on the main shaft 1, while the other end of the shaft 21 has a fixed pulley 7, to which is pivoted eccentrically the rod c^2. The rod c^2 is pivoted at the other end to the lever 8, which is rigidly fixed to the shaft 15, (see Fig. 5,) which has at its other end and rigidly affixed thereto the arm *v*, to which is pivoted the upper end of the rod 18. The lower end of the rod 18 is pivoted to one end of the arm Z, the other end of which is rigidly attached to the shaft z^3, which is located on a line about midway of the length of the pipes and between the pipes D and C, (see Figs. 1 and 4,) and may be secured to the under side of the floor 10. The shaft z^3 has rigidly connected with it the arm *i* and also the longer arms *x x*, connected at their lower ends by the rod *j*. Similar shafts, with like attachments, are placed in front of each of the pipes D C B A, (see Fig. 1,) the arms *i* being pivoted to the rod *w*.

In the use of the drying pipe or can the heated air is forced into the box *r*, whence it issues in the manner described in Letters Patent No. 408,235, the warp to be dried being propelled or carried by any means deemed desirable through the conduit or tunnel *m*, the slides X^4 closing the openings V^3. In this way the action of the air is utilized to the best purpose, where but one length of pipe is used. I prefer, however, to arrange the pipes or cans in a series, as shown and described, and to make use of mechanical means to propel the warps through the tunnels, the warp being carried through one tunnel and then between the tunnel and the next pipe and then into the next tunnel.

The operation of the mechanism described is as follows: The heated air is forced into the pipe O^2, whence it is distributed into the various pipes, as shown in Fig. 1. The warp is led up over the roller *c* and the roller *d*, down through the passage or tunnel *m* of the pipe D, thence under the roller G′ between the rod *j* and the shaft z^3, over the roller or cylinder C′ into the passage of the next pipe, and thus to the end of the series, when the warp is brought upward over the roller A^2 and under the roller *a*, through the collar O and other collars O′, &c., if desired, whence it is delivered to the folding device. Power is applied to the shaft 1 and transmitted through the cones and gears to the shaft *h*, by means of which the rollers C′, B′, A′, and A^2 are rotated, the friction of the rollers C′ B′ A′ upon the warp and the pressure of the roller *a* upon the warp as it passes over the roller A^2 being sufficient to carry the warp slowly along, the rate of speed being also regulated by the speed of the rollers *a* and A^2 and the degree of pressure exerted by the lever *e* upon the pulley *d′*. By means of the rod c^2 and connections a short backward and forward movement is given to the rod *j*, whereby the warp is shaken and the yarns separated after it passes from each pipe. Adhesion of the warps or yarns to the pulleys G′ is prevented by means of the scraper *n′*. (See Figs. 1 and 7.) The warp may be further guided in its progress by use of the guides P P, attached to the frame J beneath the rollers A′ B′, &c. (See Figs. 1 and 3.) The warp passes through the passage *m*, where it is exposed to the heated air as it is forced from the transverse openings beneath the wings and as it passes up between the passage *m*, and the next pipe is also exposed, while it is being agitated by the rod *j*, to the heated air escaping from the opening v^3 in the wall of the passage *m*, the size of the opening being regulated by the slide x^4. In the drying of the warps the best results are obtained by so arranging the currents that the air is blown through the warp and each yarn or thread is equally exposed to the current. This result is accomplished by means of the openings in the conduit or passage *m*, as thus the heated air is driven directly through the warp.

What I claim is—

1. A chamber or pipe closed at one end and open at the other, having in one of its sides narrow transverse openings, from the edges of which openings nearer the closed end of the chamber extend toward said open end and within the chamber curved pieces or wings which gradually increase in length as they approach said closed end, in combination with

a passage extending the entire length of the pipe and open at both ends, with which said passage said transverse openings directly connect, substantially as described.

2. A device for drying warps, &c., consisting of a chamber closed at one end and open at the other, having openings in one of its sides, and a conduit or passage, one side of which conduit is formed by the side of the chamber having the openings aforesaid, said conduit being open at both ends and having openings in its wall directly communicating with the space outside said wall and opposite the openings in said chamber, substantially as described.

3. The combination of a series of pipes united with a hot-air supply and having conduits connected by repeated openings with said pipe, said conduits also having openings communicating directly with the air external to said pipe on the side next the neighboring pipe, substantially as described.

4. In a machine for drying warps, &c., the combination of a series of pipes or chambers having between said pipes bars and a device for giving said bars a reciprocating motion, substantially as described.

5. The combination of a series of pipes or chambers, each having openings on the side opposite the pipe next succeeding it in the series and directly connected with a hot-air supply, with means for propelling a continuous length of flexible material through and between said pipes, whereby said material is subjected to the action of the air both within and as it issues from the sides of said pipes.

In testimony that I claim the foregoing as my invention I have hereunto set my hand this 27th day of February, A. D. 1891.

FRANK HASKELL.

In presence of—
WM. C. FARLEY,
C. W. DENNETT.