No. 633,123. Patented Sept. 19, 1899.

F. D. CUMMER, Dec'd.

W. M. CUMMER, Administrator.

# MECHANICAL DRIER.

(No Model.) (Application filed Mar. 1, 1897.) 4 Sheets—Sheet 1.

Fig. 1.

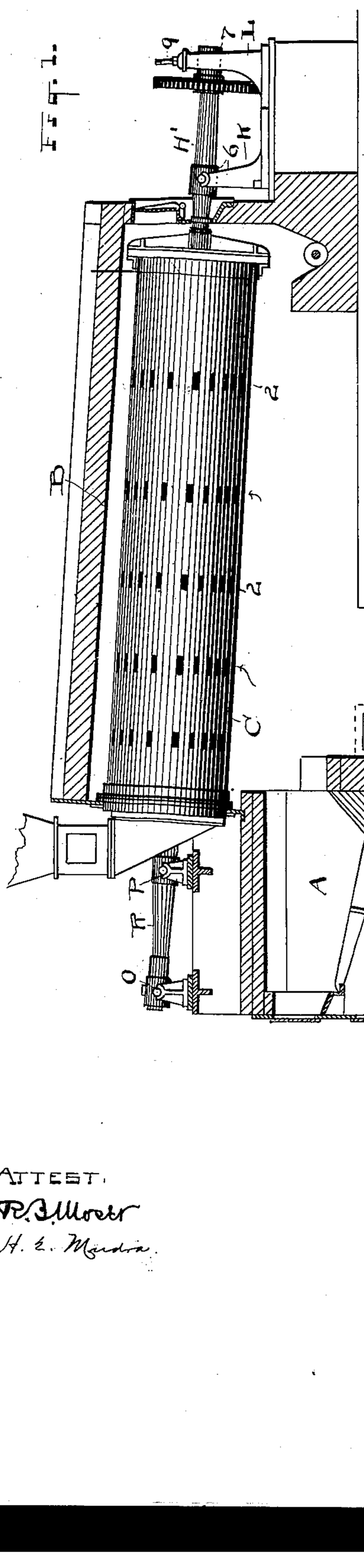



Fig. 4.

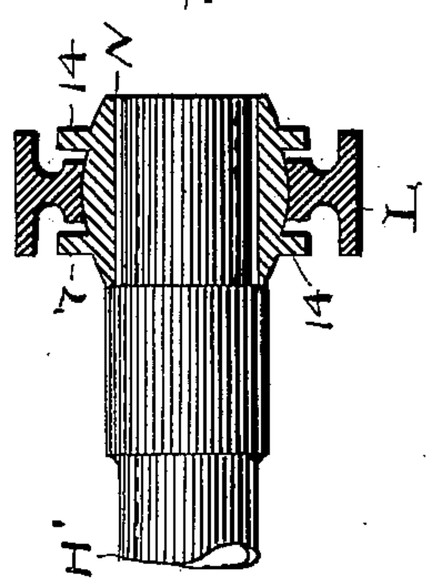
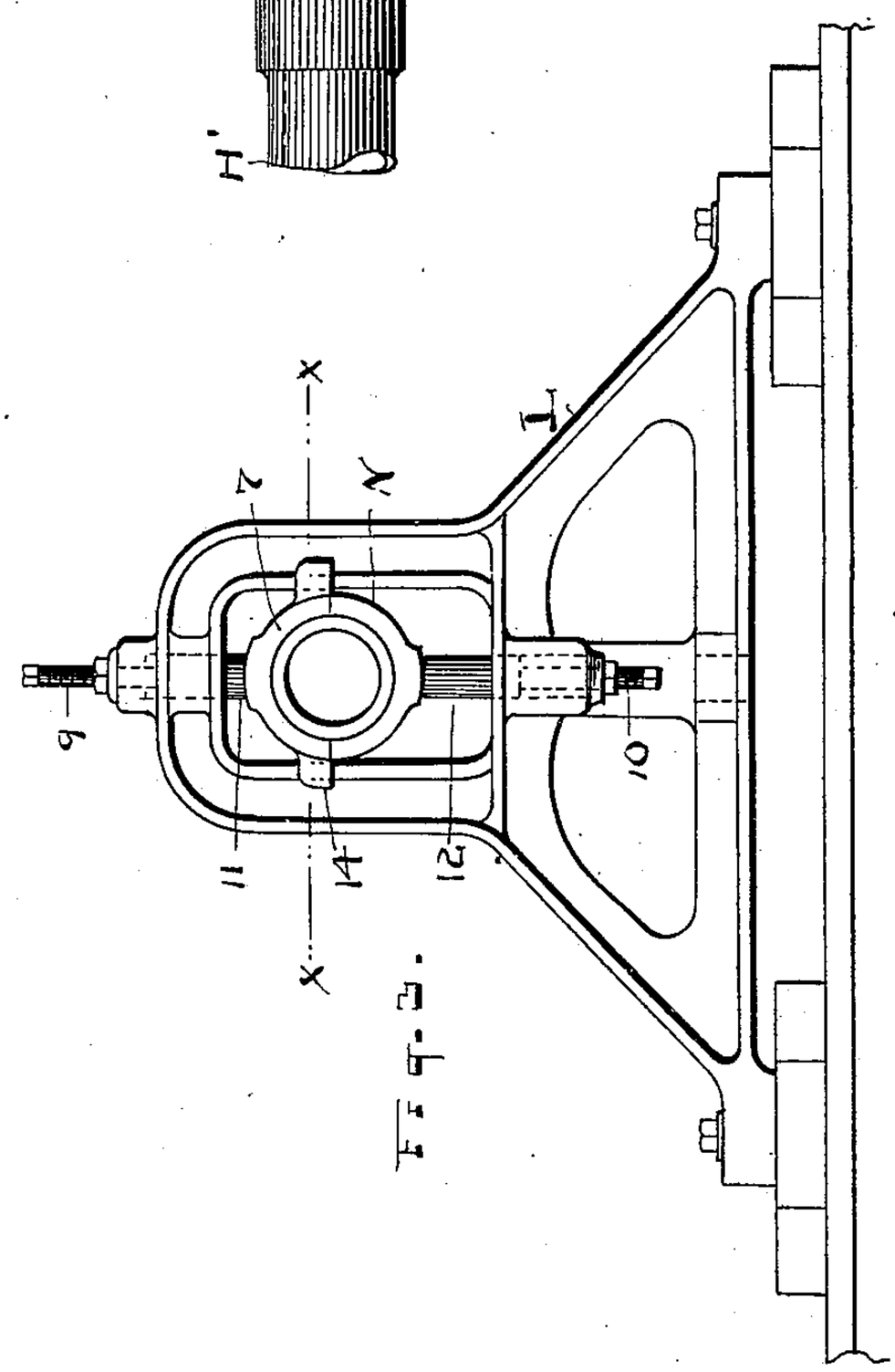



Fig. 2.




ATTEST:

R. B. Moore

H. E. Mundin.

INVENTOR.

Franklin Pierce Cummer

BY H. J. Fisher ATTY

No. 633,123. Patented Sept. 19, 1899.

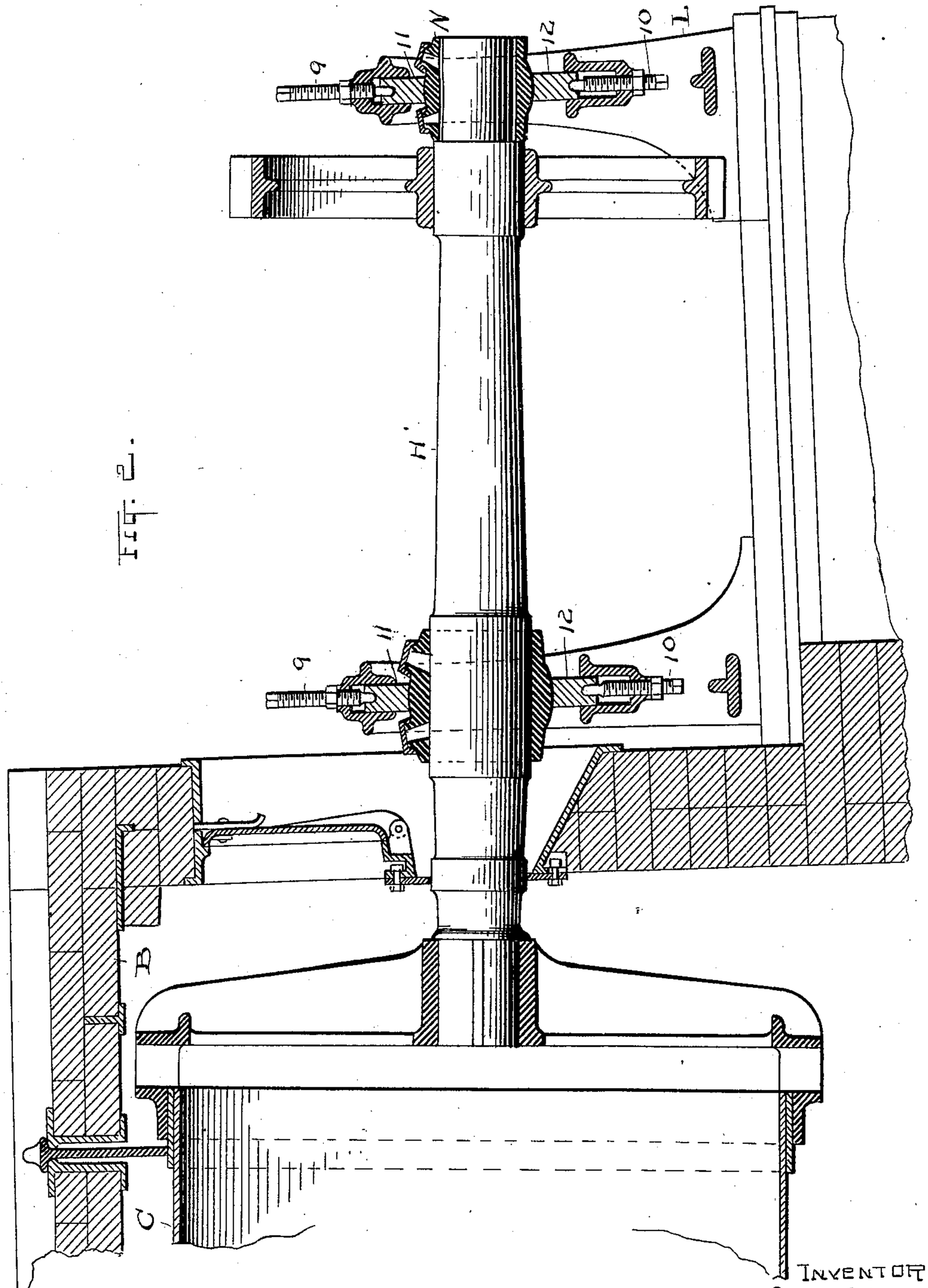
F. D. CUMMER, Dec'd.

W. M. CUMMER, Administrator.

# MECHANICAL DRIER.

(No Model.) (Application filed Mar. 1, 1897.) 4 Sheets—Sheet 2.

FIG. 2.




ATTEST

F. B. Moser

H. E. Mondrau.

INVENTOR

Franklin David Cummer

BY H. J. Fisher ATTY

No. 633,123. Patented Sept. 19, 1899.

# F. D. CUMMER, Dec'd.

W. M. CUMMER, Administrator.

## MECHANICAL DRIER.

(No Model.) (Application filed Mar. 1, 1897.) 4 Sheets—Sheet 3.

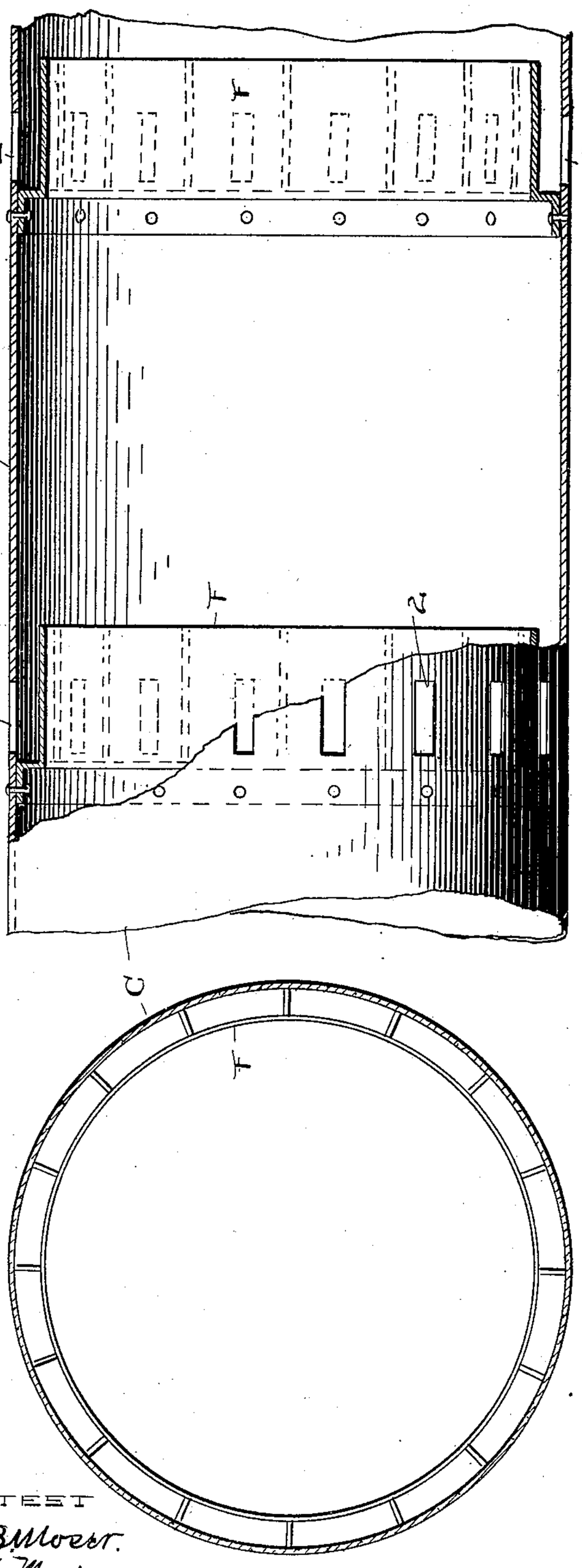



Fig. 5.

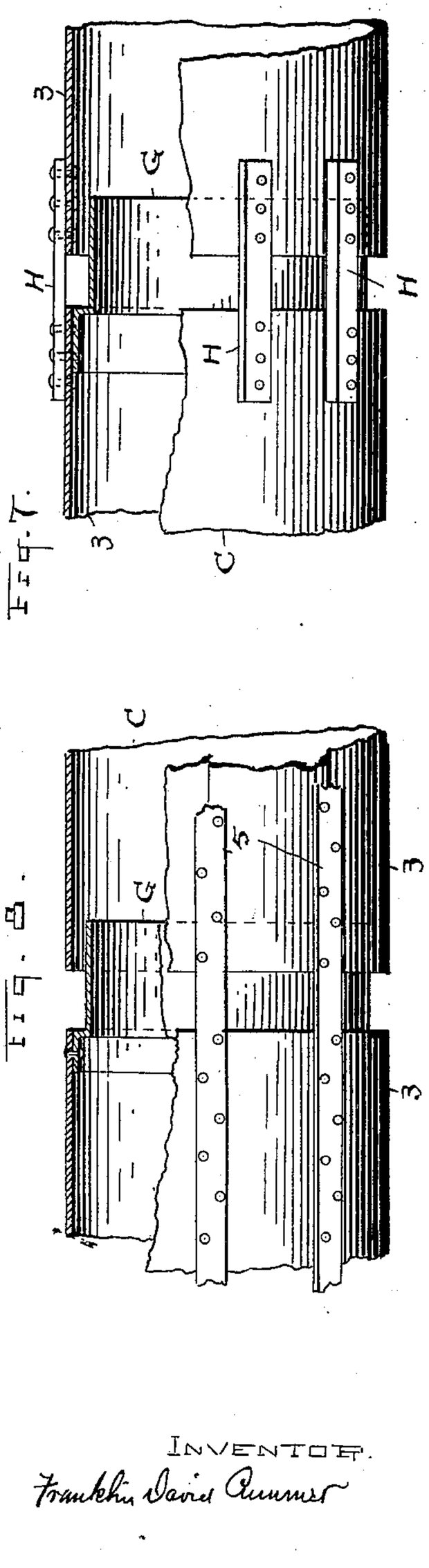



Fig. 6.




Fig. 8.

Witnesses:
R. B. Moore.
H. E. Mudra.

Inventor.
Franklin David Cummer

By H. J. Fisher Atty.

No. 633,123. Patented Sept. 19, 1899.

# F. D. CUMMER, Dec'd.

W. M. CUMMER, Administrator.

## MECHANICAL DRIER.

(No Model.) (Application filed Mar. 1, 1897.) 4 Sheets—Sheet 4.

Fig. 10.

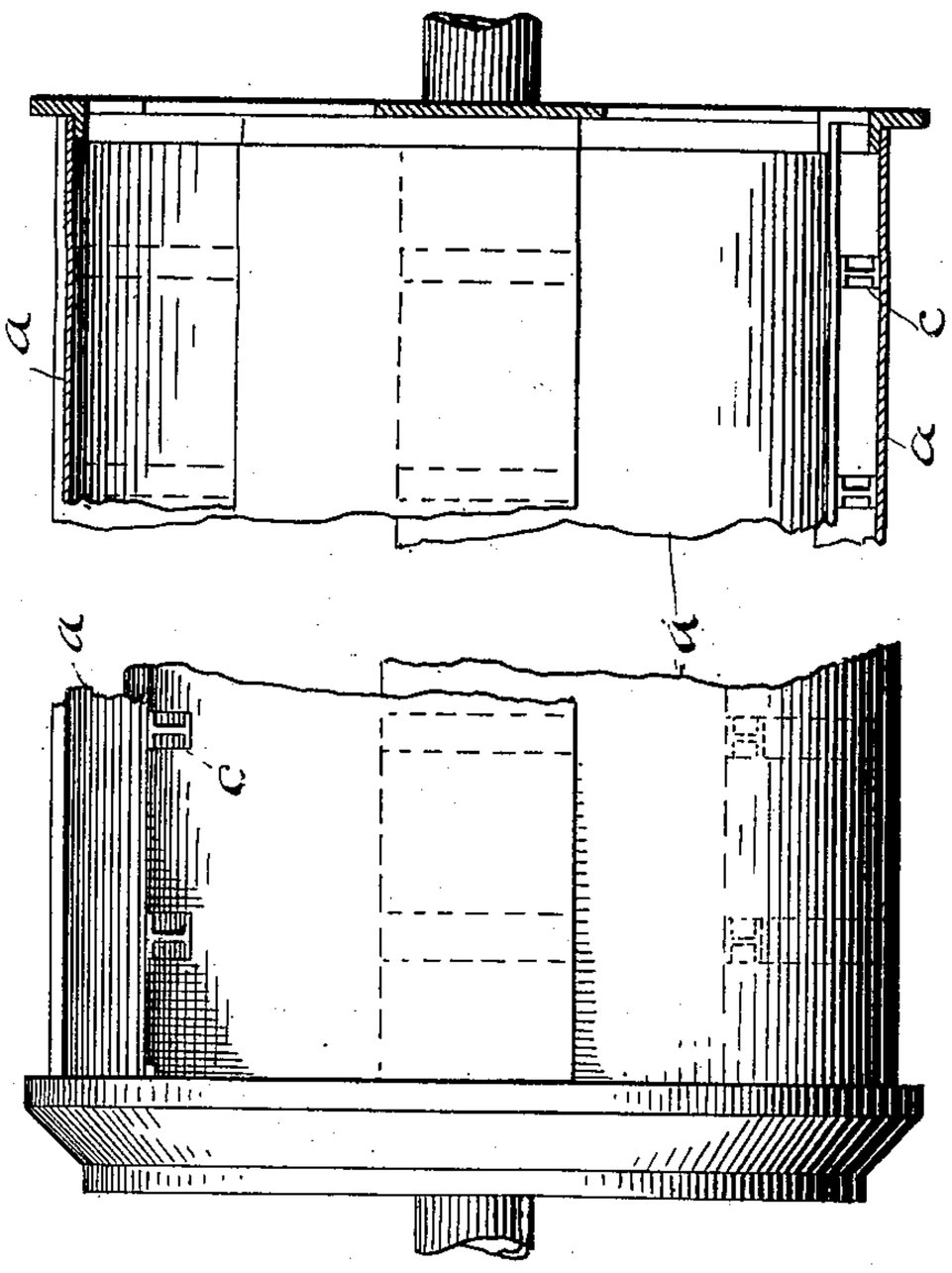
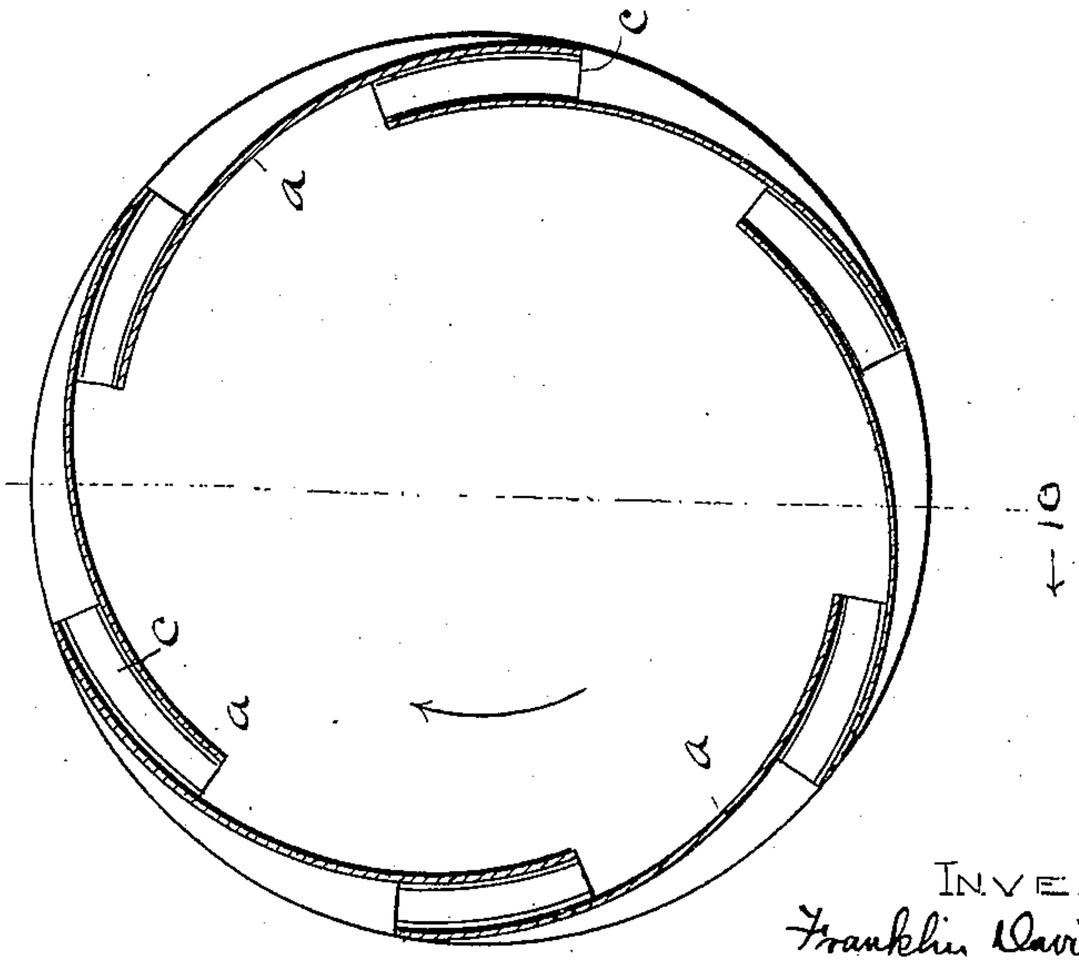



Fig. 11.




Attest
R. B. Moser
H. E. Mundra.

Inventor
Franklin David Cummer

By H. T. Fisher Atty

# UNITED STATES PATENT OFFICE.

FRANKLIN DAVID CUMMER, OF CLEVELAND, OHIO; WILLIAM M. CUMMER, ADMINISTRATOR OF SAID FRANKLIN DAVID CUMMER, DECEASED, ASSIGNOR TO THE F. D. CUMMER & SON COMPANY, OF SAME PLACE.

## MECHANICAL DRIER.

SPECIFICATION forming part of Letters Patent No. 633,123, dated September 19, 1899.

Application filed March 1, 1897. Serial No. 625,561. (No model.)

*To all whom it may concern:*

Be it known that I, FRANKLIN DAVID CUMMER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Mechanical Driers; 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 mechanical driers, and the invention consists in the construction, combination, and arrangement of parts, substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of a mechanical drier constructed according to one of my original conceptions of the invention of a drier with a revolving drying-cylinder. Fig. 2, Sheet 2, is an enlarged elevation of the rear end of the furnace and the drying-cylinder and showing especially the spindle of the shaft and two adjustable bearings, as hereinafter fully described. Fig. 3, Sheet 1, is an end elevation of the rear spindle and its rear adjustable bearing and support. Fig. 4 is a horizontal section on line $x$, $x$, Fig. 3, looking down. Fig. 5 is a cross-section of the drying-cylinder shown in Figs. 1 and 6. Fig. 6 is a longitudinal sectional elevation of a section of cylinder as seen in Fig. 1, enlarged. Figs. 7 and 8 are longitudinal elevations of modified forms of cylinder; and Figs. 9 and 10 are a cross-section and side elevation, respectively, of still another modification.

By the foregoing figures it will be seen that this invention belongs to the class of driers in which the material dried is carried in a stream or volume through the drying-cylinder, while the products of combustion from a furnace or other fire, or the fire-gases, pass through the cylinder in the opposite direction, and the material is agitated and exposed in the immediate presence of the drying agent. This distinguishes the drier from the class in which the material is shut up in the drying-cylinder until its treatment is completed and it is replaced by another charge or quantity to be dried in like manner and also from the class of driers wherein the heat is applied only to the outside of the cylinder or other receptacle and the fire-gases do not penetrate or touch the material during the entire operation. In this drier contact of the hot gases from the fire with the material is of the very essence of the invention, as is also the movement of the material in a stream or current, like a flowing stream of water, and the application of the drying agent to the stream across its path at successive stages and in more or less modified form, according to the nature of the material and its changing needs during the drying process. Of course a great variety of materials may be treated in a drier of this kind, as is now well known to those skilled in this art, and therefore an enumeration of such materials is not deemed necessary in this case.

Referring now to Fig. 1, we have a drying apparatus comprising a suitable furnace A or other source of heat, a walled-in cylinder-chamber B, and a drying-cylinder C, set into said chamber at more or less inclination, as usual. In drying most materials it is desirable to enter the cylinder C through its side rather than to traverse the cylinder its entire length with the drying agent, and to this end it is my practice to provide suitable openings at intervals through the shell or side of the cylinder—for example, as seen in Fig. 1—although, of course, just such openings as these or their equivalent might be made so as to be continuous from end to end of the cylinder, or more or less numerous, here and there, or of larger or smaller size, as might be deemed best, the nature of the material and its conduct under treatment helping to determine what is best in any given case. For present purposes a series of belts of openings 2 at somewhat varying intervals serve my purpose, and by admitting relatively more heat at what is here the front end of the cylinder, where the material has most moisture, I reduce the degree and the volume of heat which flows toward the rear end of the cylinder. In other cases I might want to reverse this arrangement and take the greater volume of the drying agent into the cylinder nearer its other end. I desire it to be understood, therefore, that the mere disposition or capacity of the

said openings or passages 2 is not material for the purposes of this presentation of the invention.

Referring to Fig. 6 it will be seen that the openings, holes, or passages 2 are formed by punching the shell or wall of the cylinder for this purpose, and the said holes 2 may be of any desired shape and size and number. In this instance these holes are oblong, running lengthwise of the cylinder, and are guarded or covered on the inside of the cylinder with circular plates or shields F. These plates or shields conform to the interior of the cylinder and are secured thereto by rivets, preferably, or other means, and are bent or fashioned in cross-section so as to have two diameters, one through which they are riveted in place and the other and smaller diameter, but wider portion in this instance, which stands apart from the surface of the cylinder relatively about as shown and covers or guards the openings 2. The said guards or shields F are purposely projected with their free edges toward the discharge of the cylinder, so that the material will pass over them and not feed or fall through the openings 2. Of course the fact that there is considerable draft or suction through openings 2 from the outside will contribute to keeping the material in the cylinder; but this is not enough, especially with heavy materials or where the material is excessively moist.

I have here shown one way of constructing and securing the shields F; but other ways are obvious and may be adopted and come within the present invention. So, also, may there be other ways of providing inlet or draft openings through the shell of the cylinder—as, for example, in Fig. 7. In this construction the shell of the cylinder is made in sections 3, separated at their ends more or less, as shown, and shields or guards G, like guards F in Fig. 6 in design, overlap or bridge the intervening space and serve to make the cylinder operate the same substantially as in Fig. 1. To make this construction practical I employ lap-strips H on the outside of the cylinder, riveted to the respective sections of the cylinder, and these strips are sufficient in number and strength and length to perfectly and rigidly connect the cylinder-sections. If desired, some of these strips might run the entire length of the cylinder, as in Fig. 8, where all the lap-strips 5 run the full length of the cylinder. The open spaces between said strips constitute the draft passages or openings into the cylinder in both Figs. 7 and 8.

Figs. 9 and 10 disclose a further modification, in which the drying-cylinder is shown as constructed in sections longitudinally, each of which inclines inwardly and overlaps the next adjoining section at each edge, first on the outside and then on the inside. This leaves a longitudinal inlet-passage for the hot gases and air between each two sections, and they overlap far enough on the inside and are wide enough to prevent the material being treated from dropping or working out through these passages. The cylinder is of course rotated in the direction of the arrows, Fig. 9, so as to keep the passages clear. These several sections *a* are united and firmly bound together into a perfectly rigid structure by I-shaped or flanged pieces *c*, which are more or less numerously arranged between the overlapping portions of said sections and firmly riveted thereto. Suitable heads form the ends of the cylinder thus constructed, and in all other respects the cylinder can be used, as are others of my invention.

These several different constructions are simply given as illustrations of the invention and not as conclusive thereof. Indeed a great number of additional modifications might be suggested which would serve the same purpose; but more are not deemed necessary at this time. I however prefer to make the shell or cylinder in continuous sheets, each sheet to be as long as the cylinder and the cylinder to have no seams or joinings except along the sheet-lines, and I prefer to join these sheets in cylindrical form, so as to form the cylinder by means of continuous lap-strips, as in Fig. 8. In that case there may be one continuous opening between the lap-strips 5, or there may be a series of openings, as in Fig. 1. This simply shows how much these minor constructions may be varied and come within the invention.

Referring now to the mountings of cylinder C, as seen in Fig. 1, H′ represents the spindle or shaft of the cylinder, having two bearings 6 and 7 in separate supports K and L. The inner bearing 6 has trunnions resting on or in the support K, on which there is a free rocking motion for the bearing, as the adjustments of the axle H′ may require, and the outer bearing 7 is vertically adjustable by means of set-screws 9 and 10 above and below, after the manner seen in Fig. 2, at the rear bearing therein, and these screws each engage the said bearing 7 indirectly through the bearing-pieces 11 and 12, engaged by said screws and engaging the bearing 7, substantially as shown. This or an equivalent construction of parts may he used to adjust and support bearing 7. It will be noticed that the immediate support for bearing 7 is an eye N, engaged by pieces 11 and 12 on somewhat rounded bearing and having ears 14 to guide it on the supporting-frame L. At the front of cylinder C are two other bearings O and P for shaft R. The adjustable bearing 7 at the rear of the machine may be used for sustaining the other three bearings of the cylinder C or any one of them. My custom has been to place under the sole-plates of each of these bearings a piece or pieces of wood or other suitable material, so that by these means I could give said bearings more or less elevation, according to the number or size of such pieces retained or removed, and thus I could elevate or lower each end of the machine and

give any desired angle to the shafts; but by means of the present construction I can adjust the shafts accurately so that the center line of each shaft will be in accurate alinement with the center line of the cylinder.

It will be noticed that the guards or shields F and G are so reduced in diameter as to leave space between them and the holes or openings for the draft which they cover, so that the draft can pass the guards or shields to the inside of the cylinder. The guards project, as here shown, in a plane substantially parallel to the axis of the cylinder and the shell, and in both the views an annular space is formed between them and the shell for the passage of the hot gases in which the cylinder forms the outer wall of the passage and the shield the inner wall. If the inlet holes or passages be in a belt, as herein shown, a single guard ring or shield suffices for all.

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

1. The drying-cylinder having inlet-openings between its ends for hot gases, and shields for said openings forming the inner wall of a draft-passage from said openings to the interior of the cylinder, substantially as described.

2. The drying-cylinder provided with a succession of openings through its side for the admission of hot gases, and passages from said openings to the inside of the cylinder having covers projected substantially parallel to the axis of the cylinder, substantially as described.

3. The cylinder substantially as described having inlet-openings between its ends and passages from said openings to the interior of the cylinder having the shell of the cylinder forming the outer wall thereof and inside coverings substantially parallel to said shell, forming the inner walls of said passages, substantially as described.

4. The drying-cylinder having one or more belts of inlet-openings through its side, and a single shield or cover inside the cylinder opposite each belt of openings, and substantially parallel to the shell of the cylinder, substantially as described.

5. In a rotary drying-cylinder a series of holes in the shell of said cylinder, and an overhanging flange above said holes open toward the discharge end, substantially as described.

Witness my hand to the foregoing specification this 16th day of February, 1897.

FRANKLIN DAVID CUMMER.

Witnesses:
H. T. FISHER,
H. E. MUDRA.