(No Model.)

4 Sheets—Sheet 1.

# F. D. CUMMER.

## MECHANICAL DRIER.

No. 545,057. Patented Aug. 27, 1895.

Fig. 1.

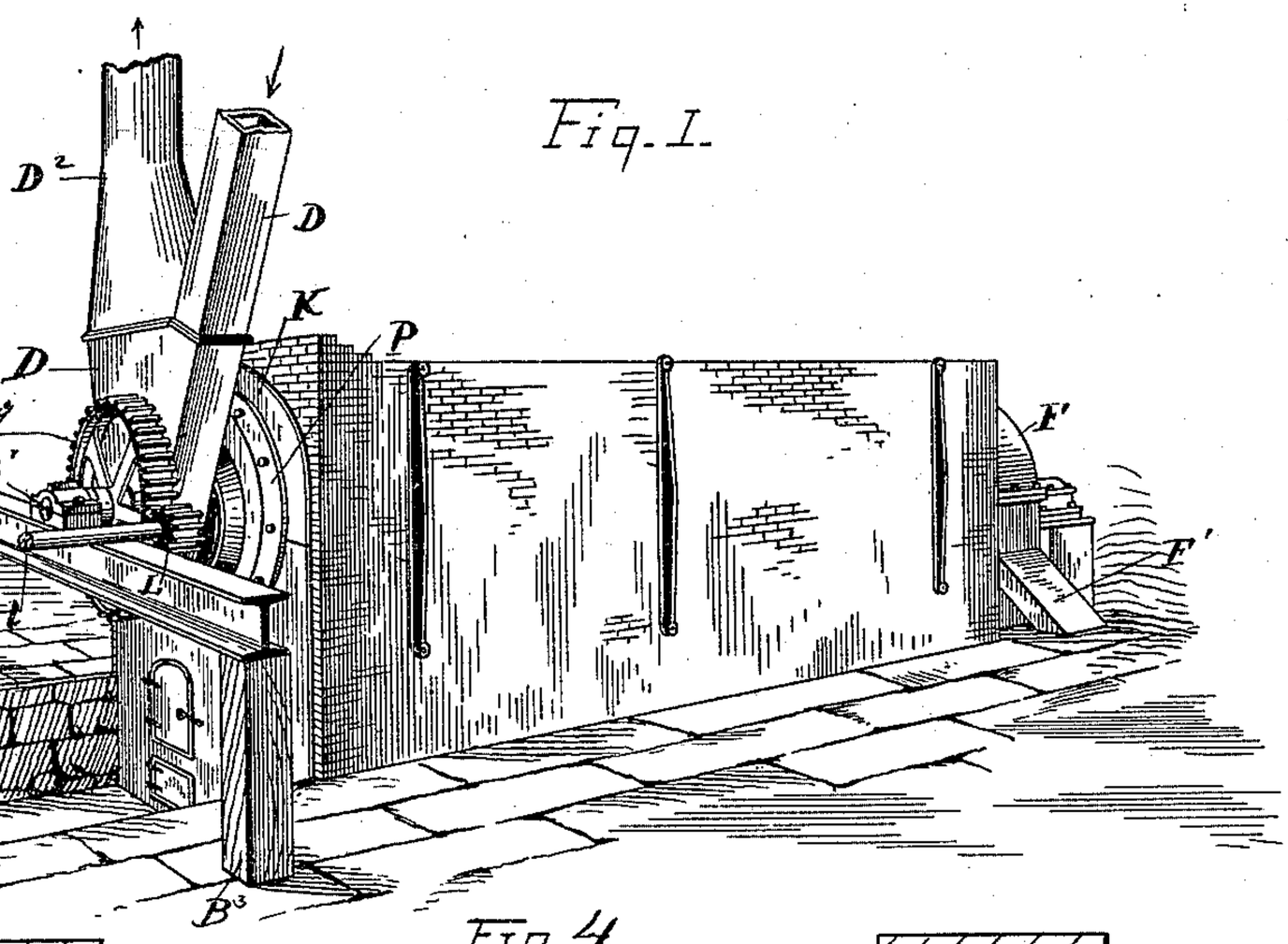
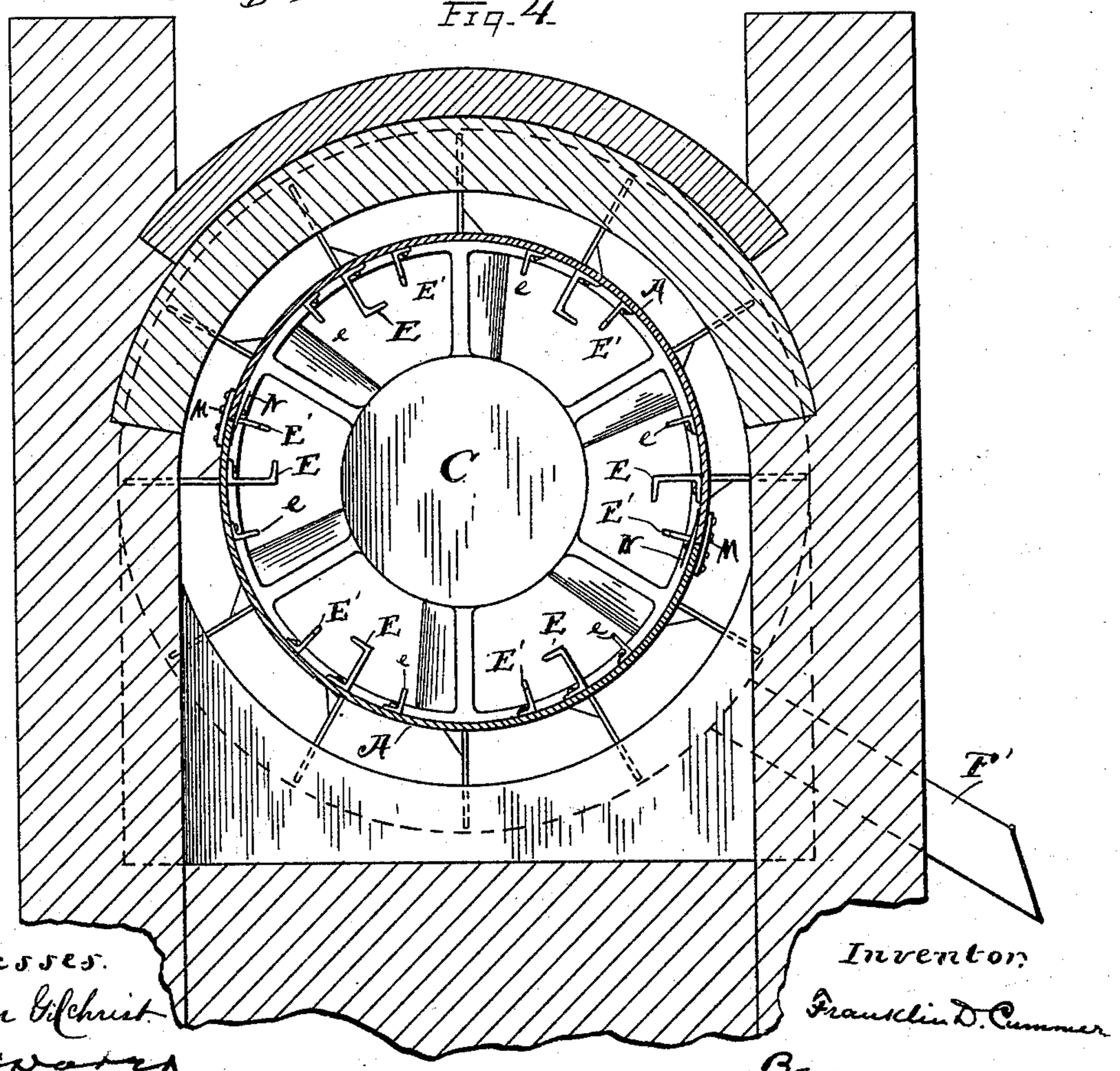



Fig. 4.

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(No Model.)

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## MECHANICAL DRIER.

No. 545,057.

Patented Aug. 27, 1895.

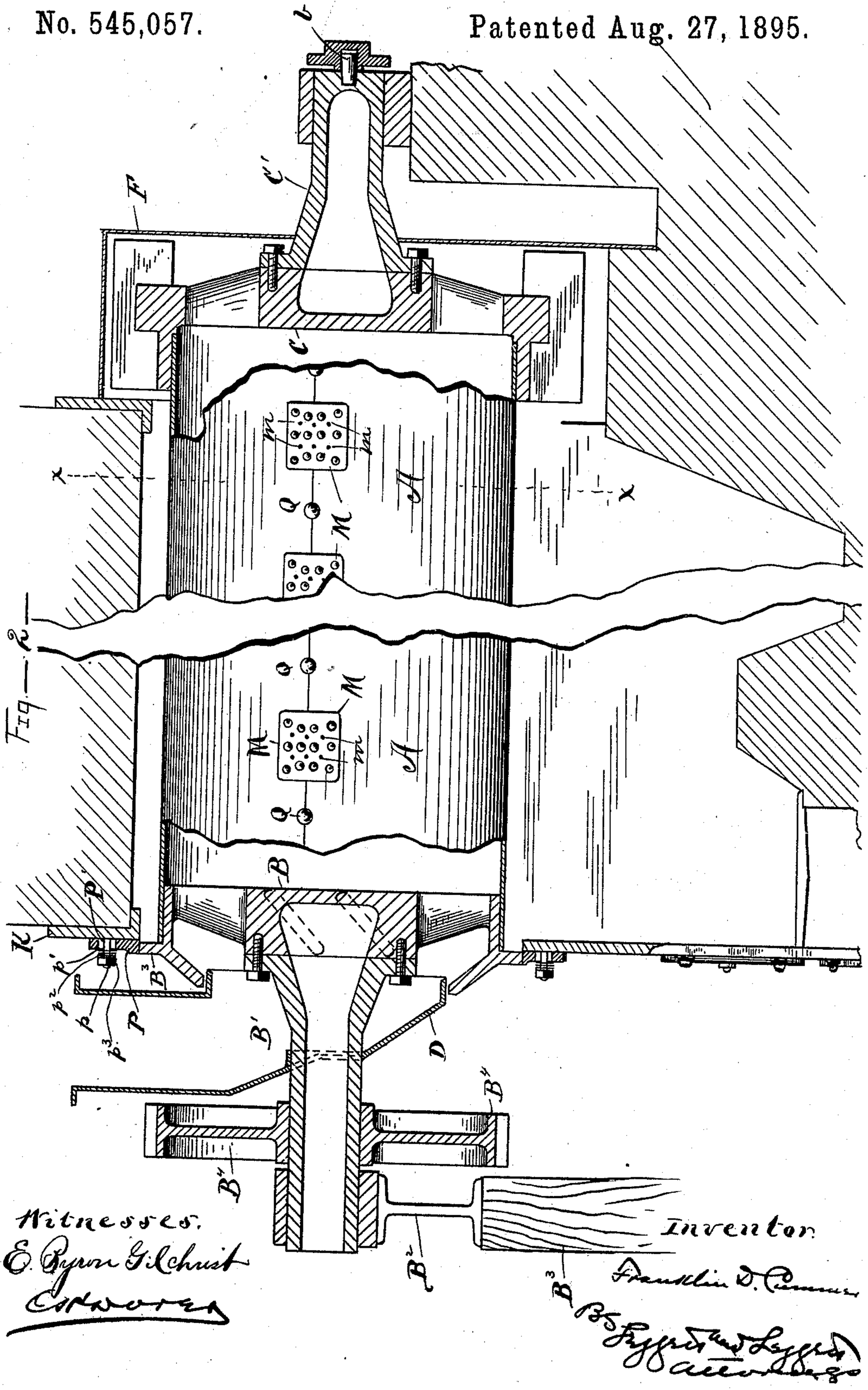


FIG. 2.

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# F. D. CUMMER.

## MECHANICAL DRIER.

No. 545,057. Patented Aug. 27, 1895.

Fig. 3.

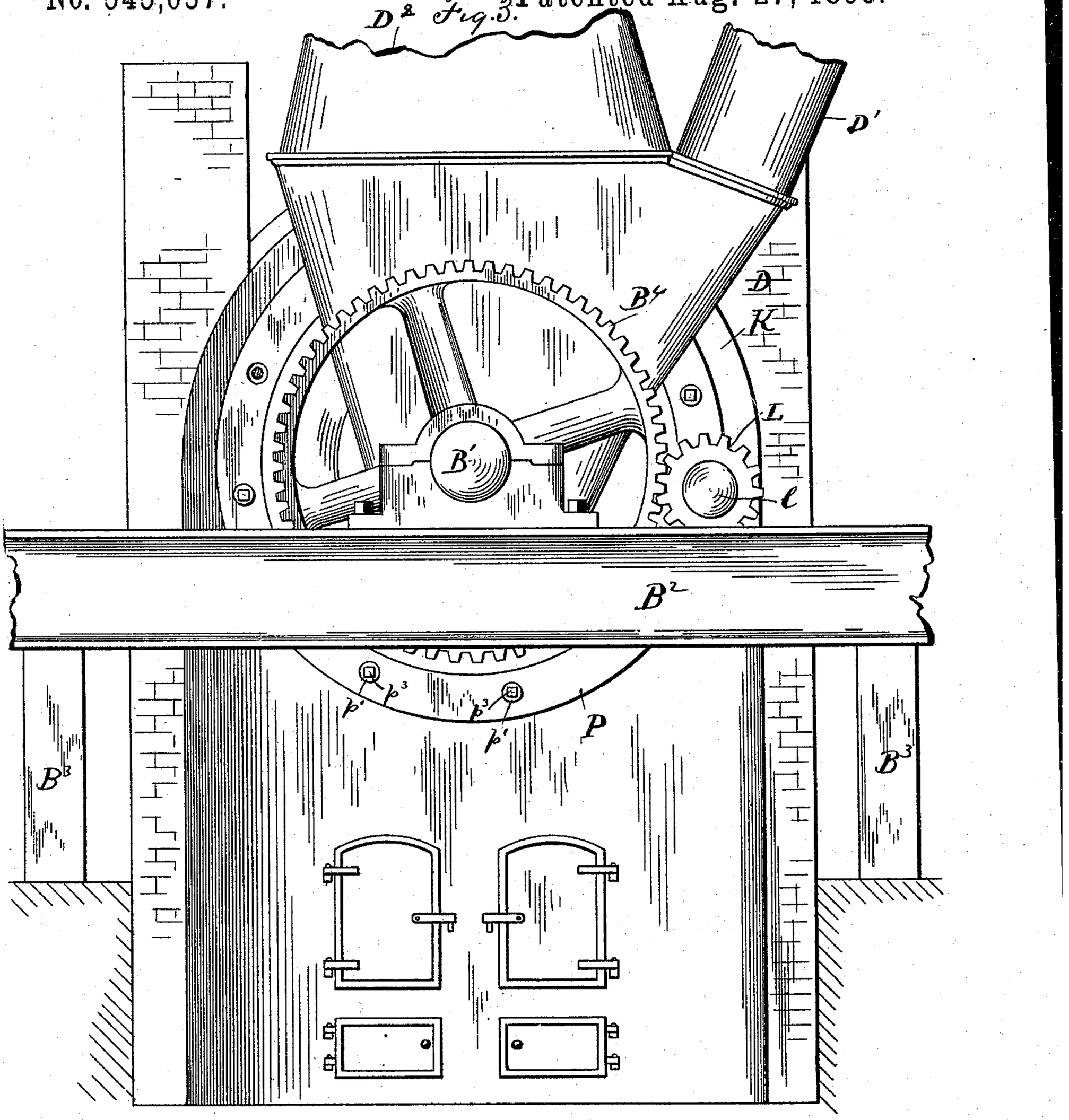
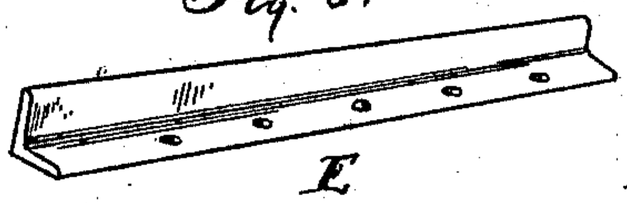




Fig. 6.

Fig. 5.

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(No Model.) 4 Sheets—Sheet 4.

# F. D. CUMMER.

## MECHANICAL DRIER.

No. 545,057. Patented Aug. 27, 1895.

Fig. 7.

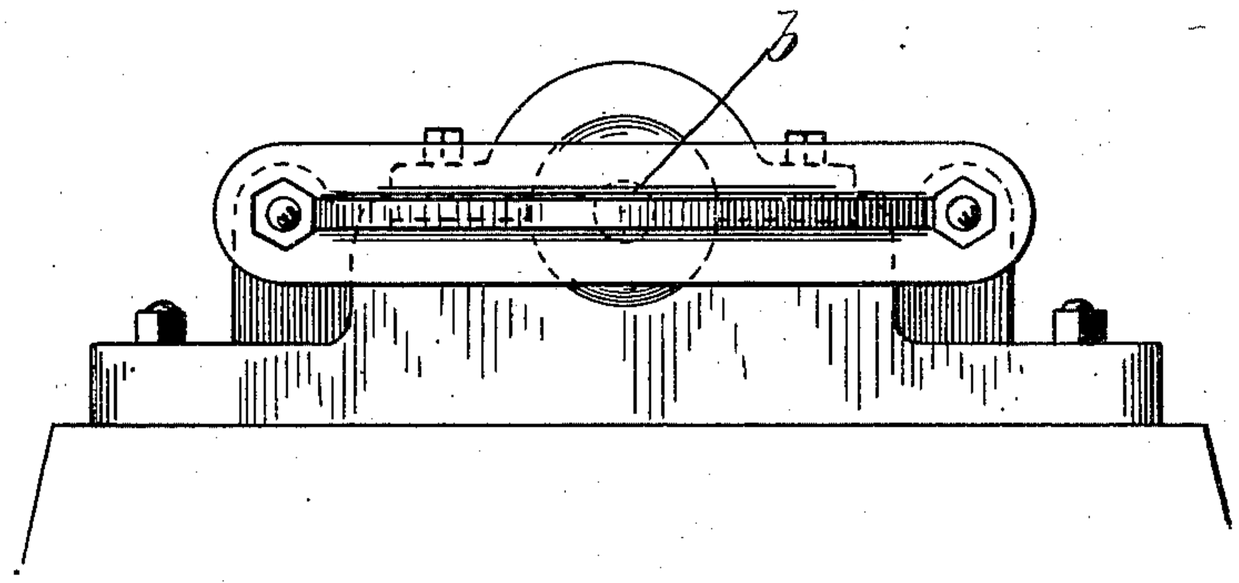
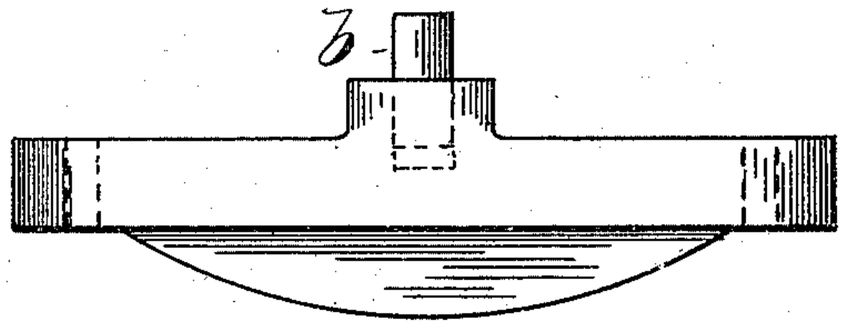



Fig. 8.

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# UNITED STATES PATENT OFFICE.

FRANKLIN D. CUMMER, OF CLEVELAND, OHIO, ASSIGNOR TO ELIZA E. CUMMER, OF SAME PLACE.

## MECHANICAL DRIER.

SPECIFICATION forming part of Letters Patent No. 545,057, dated August 27, 1895.

Application filed May 14, 1891. Serial No. 392,757. (No model.)

*To all whom it may concern:*

Be it known that I, FRANKLIN D. CUMMER, of 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 the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in rotary mechanical driers; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in perspective. Fig. 2 is a side elevation, partly in section, portions being broken away to reduce the size of the figure. Fig. 3 is a front end elevation. Fig. 4 is an elevation in transverse section on line *x x*, Fig. 2, looking rearward. Fig. 5 is a view in perspective in detail of one of the internal longitudinal ribs hereinafter mentioned. Fig. 6 is an enlarged section in detail, hereinafter described; and Figs. 7 and 8 are views of the stepping *b*.

A represents a metal cylinder constructed preferably of boiler-plate running lengthwise, the cylinder being mounted on spiders B and C, and these spiders having, respectively, trunnions B′ and C′, journaled in suitable boxes supported at the rear by the setting and at the front by a cross-beam $B^2$, the latter in turn being supported by two posts $B^3$, thus giving room below the beam and between the posts for firing at the front end, if so desired. The trunnions are preferably hollow for combining strength and lightness. The arms of spider B are set diagonally with the axis of the cylinder for feeding the material into the cylinder. The front end of the cylinder is provided with a hood or breeching D, having supply or feed pipe D′ and flueway or passage $D^2$. The material is fed to the cylinder through pipe D′ and the breeching D, and the products of combustion and vapor pass off together through flue $D^2$. The inner edge of the breeching D fits closely within the edge of the inclined projecting rim *b* of the spider B.

It will be noticed that the breeching D not only is provided with flue $D^2$, but that it is formed with a considerable swell or enlargement between the mouth thereof at the end of the cylinder A and the reduced broken-off portion of the flue above the said enlargement or chamber. The flue proper is of a size proportionate to the mouth of the breeching, but is materially less in cross-section area, as is also said mouth, than the enlargement or chamber between said points. Early in my experience with this class of driers I found that a draft which would promote healthy combustion would also draw off more or less of the dried material, and especially such materials as became flaky or were naturally light and more or less dusty. The invention herein was conceived to overcome this result, and hence the idea of a settling-chamber such as the enlargement of the breeching affords. In this chamber the suction of the draft is considerably reduced and the flying material has an opportunity to recover its gravity and largely settle about the walls of the chamber and work back into the cylinder with the raw material.

The cylinder A inclines more or less downward as it extends rearward, so that as the cylinder is revolved the material therein is fed rearward, and at the rear end the material passes out through the openings between the arms of spider C and discharges into a hood F. Spider C is provided with a series of wings C′, usually set radially, these wings carrying up the material accumulated in hood F and forcing the material out through an inclined discharging-spout F′. Some heating agent—such, for instance, as hot air or superheated steam—is introduced under the forward section of the cylinder, and from thence passes along rearward under the cylinder between the side walls of the setting and enters hood F, and thence returns through the interior of the cylinder and escapes through a pipe or chimney $D^2$ aforesaid, and if a purification is to be effected the heating agent, either by means of a tall chimney or a forced draft, has sufficient current imparted thereto to carry off the dust or other impurities that are to be disposed of. If hot air is to be used in the drying apparatus this may be had by constructing a fire-box under the forward sec-

tion of the cylinder, as with an ordinary steam-boiler, in which case a direct heat from the fire would be utilized; but it matters not where or how the heating agent is produced so long as it is applied as aforesaid. The cylinder on the inner surface thereof is provided with a series of longitudinal ribs, preferably of various widths and forms, for elevating the material, these ribs comprising preferably channel-bars E, broad angle-irons E′, and smaller angle-irons *e*, arranged approximately as shown, whereby the material is carried up with the ascending side of the cylinder and is sprayed or sprinkled down and distributed about equally across the diameter of the cylinder. The wet sand or other material entering the front end of the cylinder opposite to where the greatest heat is applied externally to the cylinder prevents the latter from becoming overheated, and hence the heating agent may be heated to a high degree without damaging the cylinder, and thereby, with safety, very much increasing the capacity and effectiveness of the apparatus. With such construction and practice it will be readily understood that the conditions are most favorable for quickly drying and, if need be, purifying the material passed through the cylinder. The one trunnion, usually trunnion B′, is provided with a gear $B^4$, that is engaged by a pinion L, mounted on the driving-shaft *l*, by means of which the cylinder is rotated. The rear trunnion is supposed to be held from moving endwise in its journal-box preferably by means of a setting *b*, which projects from a cross-bar inwardly into the end of one of the trunnions, as shown in Fig. 2. Hence the lengthening and shortening of the cylinder by expansion and contraction must be provided for at the front end, and hence the forward trunnion is long enough to slide endwise in the journal-bearing the necessary distance, and for insuring a tight joint around the front end of the cylinder the front spider B has a circumferential rim $B^3$, that is turned off at the periphery, and this rim fits nicely, but easily, in a flat ring P, the latter being secured to the front plate K. This ring has enlarged holes P′, through which the securing-bolts pass, and these bolts *p*, outside the ring, are provided with washers *p*′, spiral springs $p^2$, coiled around the bolts, and nuts $p^3$, and by tightening these nuts the springs are compressed and given such tension that they hold the weight of the ring—that is to say, the ring, by means of the springs, is pressed against plate K with such force that the ring is held by friction and at the same time the ring may move a limited distance up or down or laterally by means of the bolts passing through large holes, so that in case, for instance, the foundation should settle, the ring could accommodate itself to the flange, and thereby make a tight joint without undue friction or wear of the parts. Where the cylinder, like a steam-boiler, is constructed with overlapping sections riveted together, the double or riveted sections, by reason of their extra thickness, do not heat through so soon and cool down slower than the thinner sections, thus producing unequal expansion and contraction and causing the cylinder to buckle. To overcome this difficulty, I construct the cylinder preferably of two semi-cylindrical sections, the edges thereof abutting together, the two sections being connected and secured by overlapping patches or plates M, riveted to the two sections of the cylinder, and besides the rivet-holes therein there are numerous other holes *m*, as shown in Fig. 3, some of these holes extending only through the plates M and others extending through these plates and the cylinder, so that the different sections of the cylinder do not vary much in temperature. On the inside of the cylinder I provide strips of light sheet metal N, riveted along the one edge thereof to the cylinder, so that on the ascending side of the cylinder these strips will hang down past the splice and holes to prevent the escape of the material; also, the longitudinal ribs aforesaid are made in comparatively short sections, and, as shown in Fig. 5, the central rivet-hole is round, so that the rivet fills the hole. The other holes, as shown at *e*′, are elongated somewhat, so that the rivet fits loosely therein, but the inside rivet-head is supposed to be large enough to cover the hole. Hence these ribs may lengthen or shorten without buckling.

At suitable intervals along the joints of the cylinder are provided rivets Q, (see Fig. 6,) that hold the opposing plates from moving endwise relative to each other.

What I claim is—

1. In a drying apparatus, as described, the drying cylinder, the spider in the induction end of the cylinder and an annular inclined flange at the outer edge of said spider, and the breeching through which the material is fed to the cylinder extending within said flange and fitting closely about the edge thereof, substantially as set forth.

2. The cylinder described, and a series of parallel longitudinal lifting blades in said cylinder of different widths, substantially as set forth.

3. In drying apparatus, a furnace and drying cylinder, in combination with a breeching built about the front end of the cylinder and having its edge extending into the cylinder and fitting closely within the same all around, and a dust settling chamber in the line of draft above said breeching, substantially as described.

4. The apparatus described, comprising the furnace and the drying cylinder, said cylinder having a rimmed spider fixed in its front end and a trunnion on said spider, in combination with a breeching extending within the rim of said spider all around the edge thereof and a settling chamber above said breeching constructed to discharge into the breeching, substantially as described.

5. The furnace, the drying cylinder in the furnace and spiders and trunnions supporting said cylinder, the spider at the front end of the cylinder having an inclined rim forming the extremity of the cylinder, in combination with a breeching extending within said rim and fitting closely about the edge thereof, and a settling chamber above said breeching, substantially as described.

6. A mechanical drier comprising a rotating cylinder mounted on spiders with trunnions substantially as indicated, the arms of the spider at the induction end of the cylinder being set oblique to the axis of the cylinder, the other end of the cylinder discharging into a hood, wings connected with the cylinder and operating in such hood for discharging the material from the hood, substantially as set forth.

7. A mechanical drier comprising a revolving cylinder constructed in longitudinal sections, the sections being united at intervals by patches or plates secured to the two sections, holes through these plates and through the cylinder for equalizing the heat at the joints, wings connected with the interior of the cylinder and overlapping such holes and joints in the direction to deflect the material past such holes and joints on the ascending side of the cylinder, substantially as set forth.

8. The combined furnace or heating chamber, the drying cylinder set into said chamber and spiders for supporting said cylinder, the front spider having flat arms set oblique to the axis of the cylinder and an inclined annular flange outside said arms and a chute to feed the material into the cylinder arranged to deliver the material within said flange, substantially as set forth.

9. In a drying apparatus, a heating chamber, a drying cylinder in said chamber having a spider in one end provided with a ring on its outside and a right-angled flange about its periphery and an adjustable ring on the wall of said chamber encircling closely the said flange, thereby making a closed joint at that point, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 2d day of March, 1891.

FRANKLIN D. CUMMER.

Witnesses:
M. D. LEGGETT,
ALBERT E. LYNCH.