

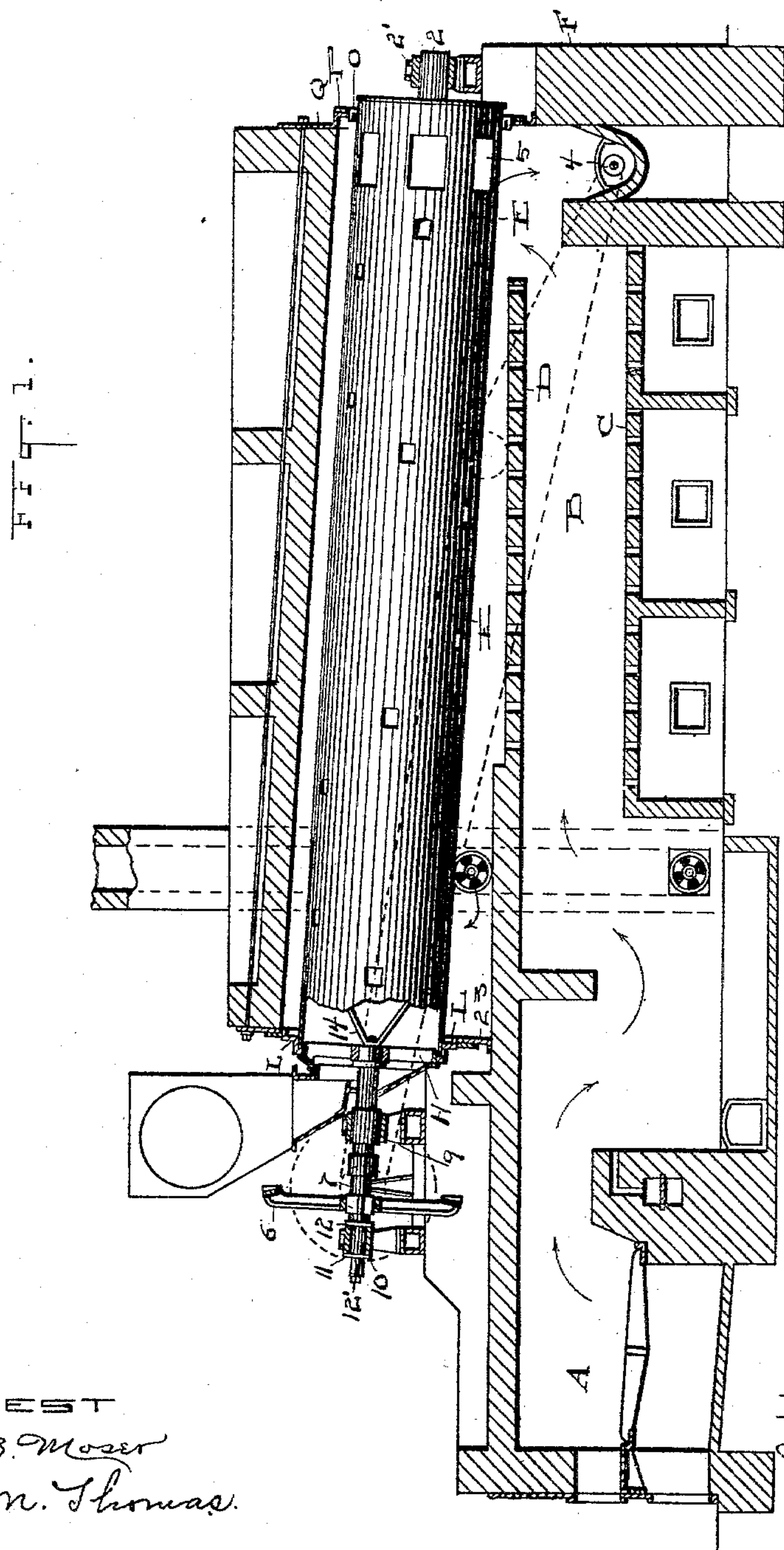
(No Model.)

5 Sheets—Sheet 1.

F. D. CUMMER.
DRIER.

No. 545,121.

Patented Aug. 27, 1895.



ATTEST

D. S. Moser

N. M. Thomas

INVENTOR

*Franklin Davis
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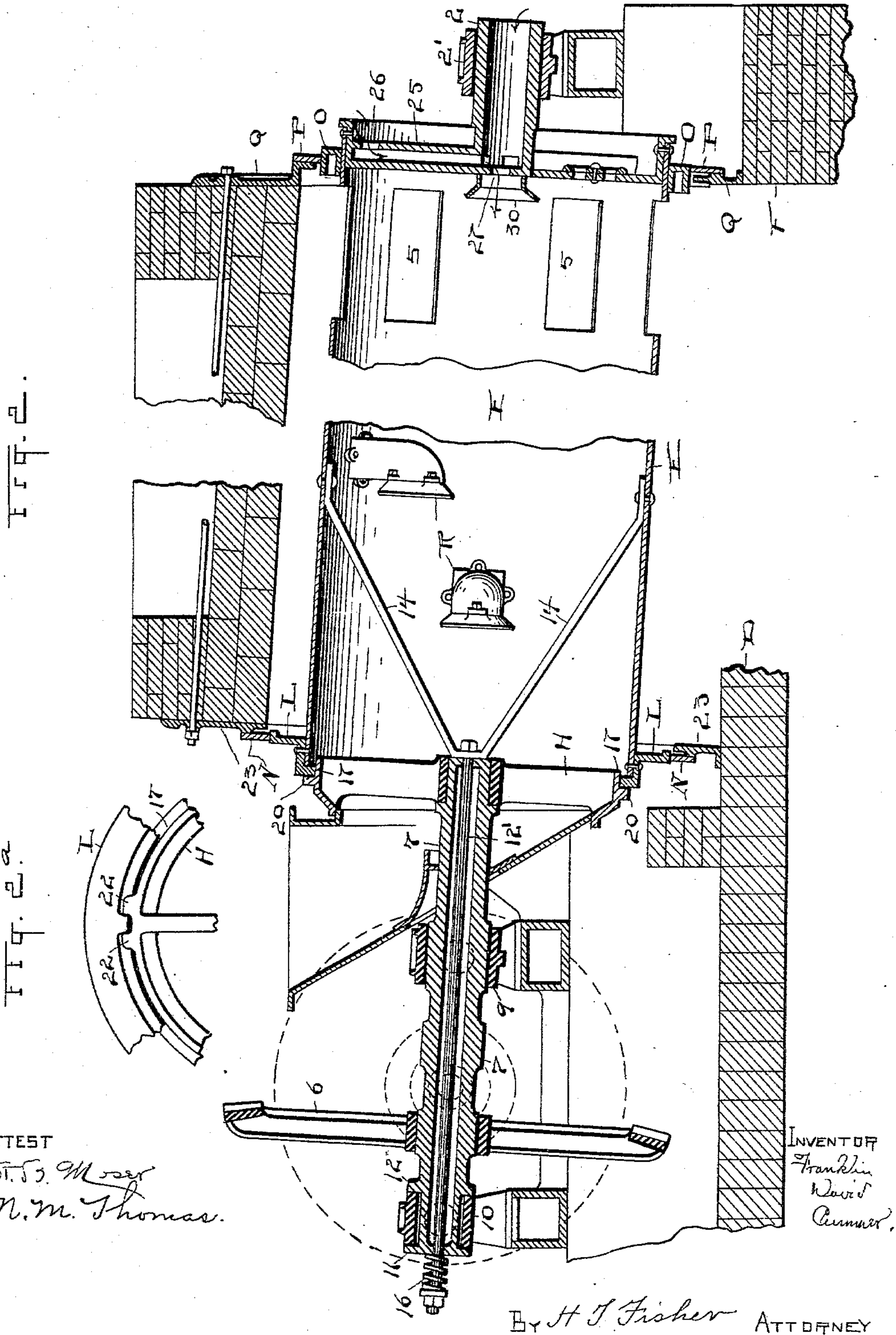
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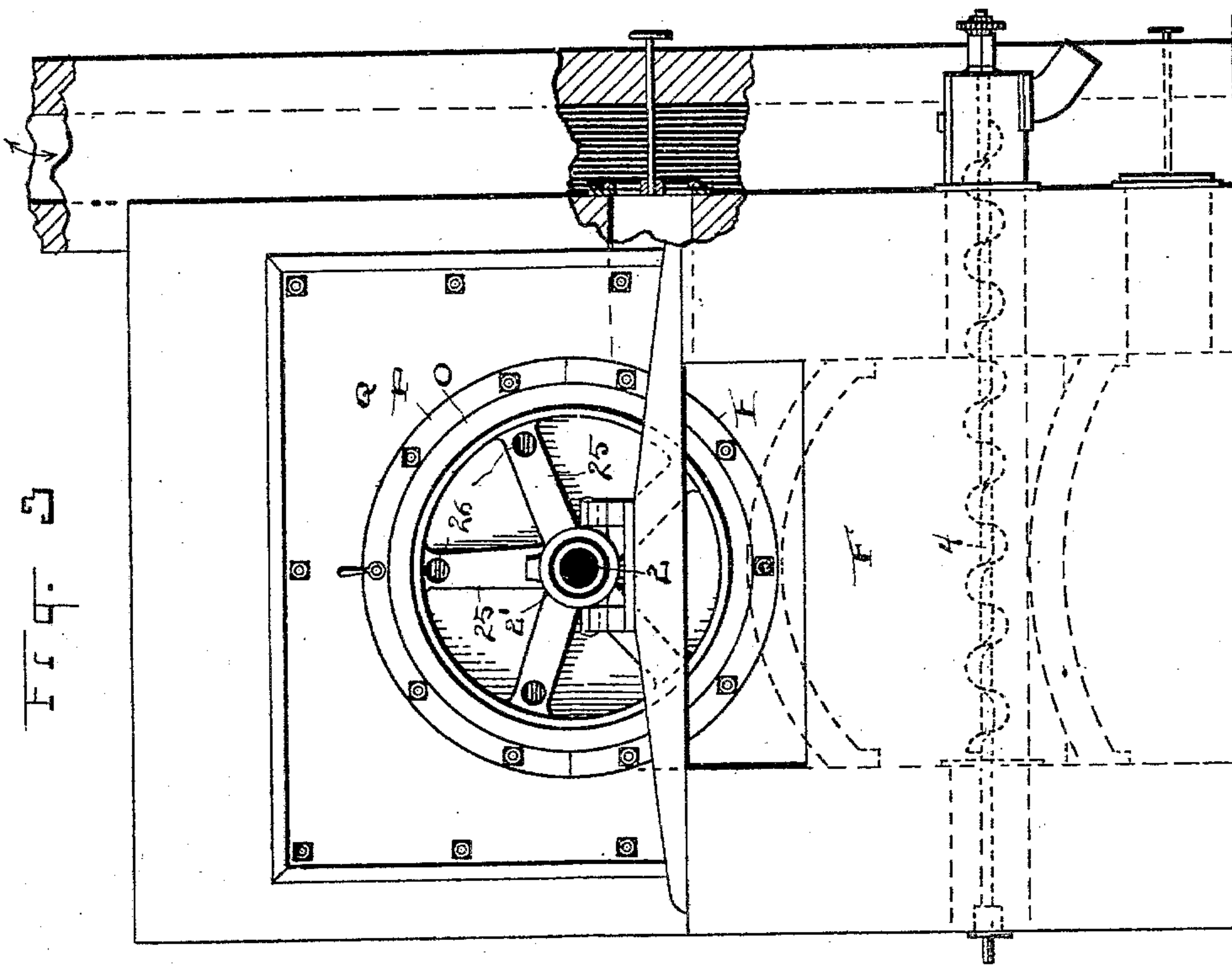
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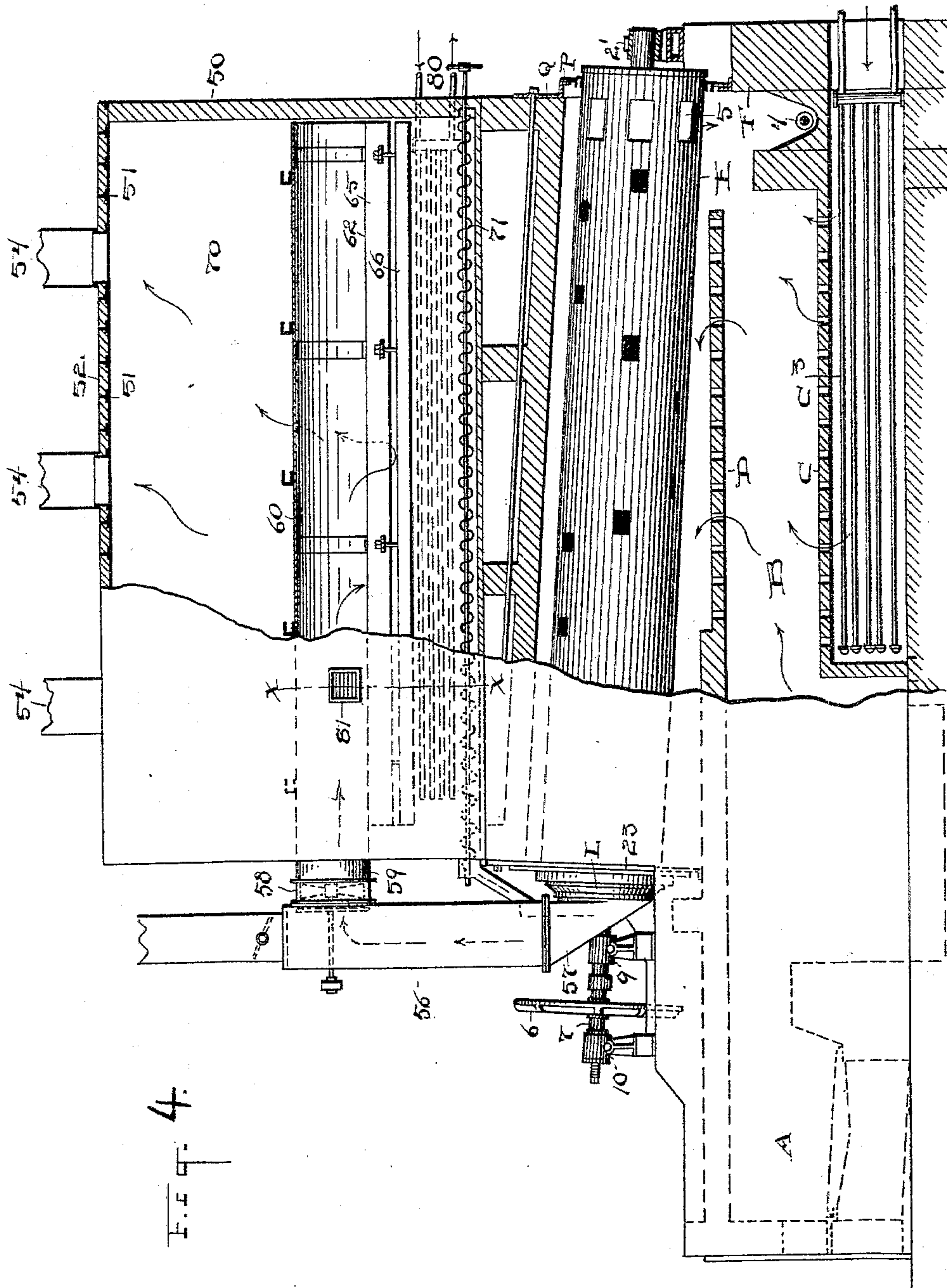
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No. 545,121.

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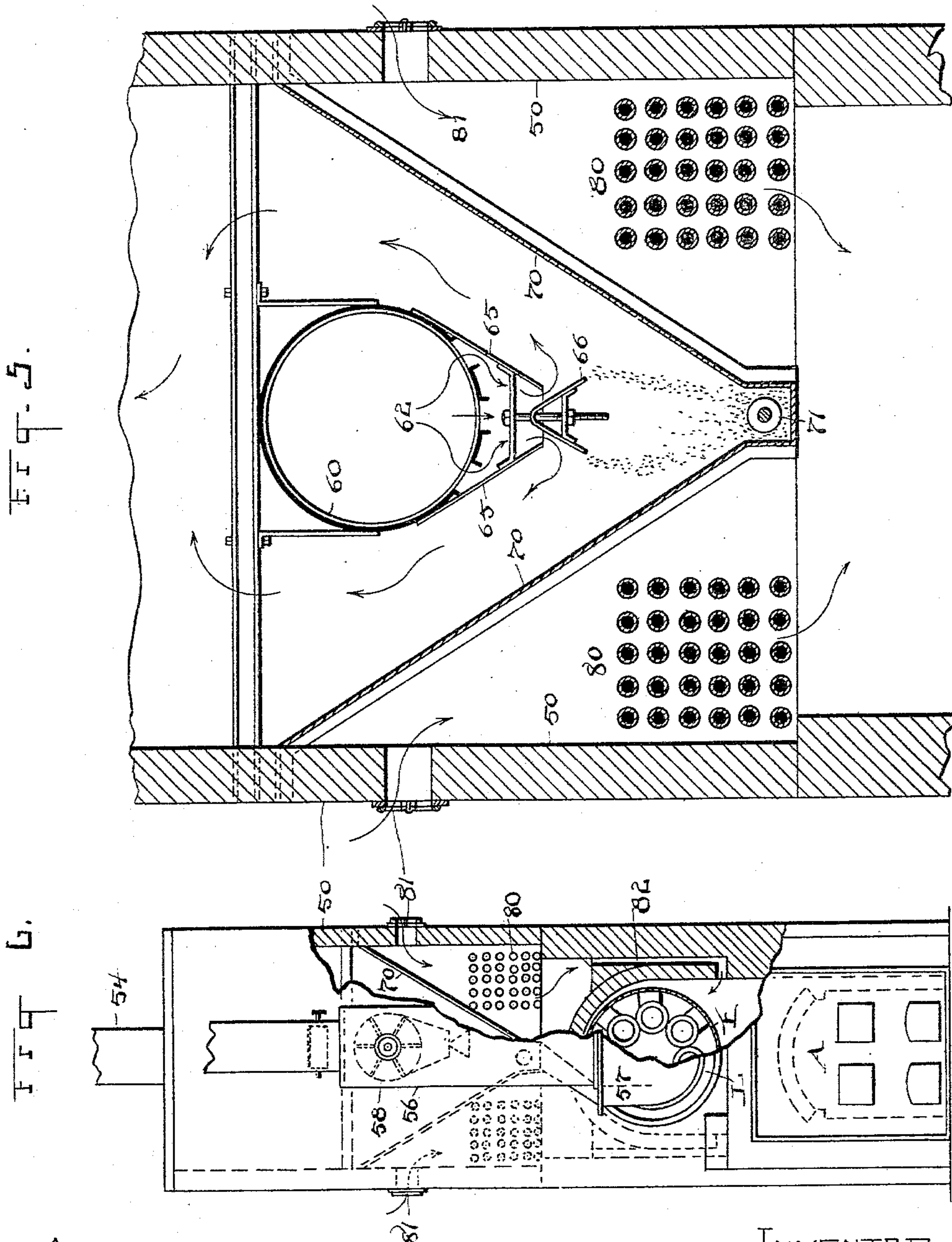
(No Model.)

5 Sheets—Sheet 5.

F. D. CUMMER.
DRIER.

No. 545,121.

Patented Aug. 27, 1895.



ATTEST

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UNITED STATES PATENT OFFICE.

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

DRIER.

SPECIFICATION forming part of Letters Patent No. 545,121, dated August 27, 1895.

Application filed April 16, 1895. Serial No. 545,846. (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 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 improvements in drying apparatus; and it consists in the construction of apparatus substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a drying apparatus constructed according to my invention and embodying one form thereof. Fig. 2 is a central longitudinal sectional elevation of a modified form of machine and apparatus as compared with Fig. 1 and enlarged relatively thereto and broken out in the center. Fig. 3 is a rear elevation of the machine as shown in Fig. 2. Fig. 4 is a side elevation of still a further modification of the invention, showing the larger part of the machine in section and disclosing a dust-chamber at the top, as hereinafter more fully described. Fig. 5 is a cross-section of the drier and associated parts on a line corresponding to *xx*, Fig. 4; and Fig. 6 is a front elevation of the apparatus shown in Fig. 4, with a part of the front wall and other portions broken away, so as to show the internal construction, as hereinafter more fully described. Fig. 2^a is an elevation of sections of the front spider-head and the encircling-ring over the same.

Referring first to the invention disclosed in Fig. 1, we have a furnace A, which may be constructed to burn coal, gas, vapor, or other fuel, and a flue or passage-way B for the products of combustion between the air-inlet floor C beneath said passage and the perforated arch D over the same and through which the products of combustion are admitted into the cylinder or drying-chamber above. This construction in any broad sense is not regarded as new in this case, it being shown in a previous application, Serial No. 540,582. Here-
tofore, however, I have shown the cylinder E

so arranged that the products of combustion entered the cylinder at its end and the dried material passed out of the cylinder at the same place, except as the hooded openings for the inlet of heat appear in the side of the cylinder in the above-mentioned application. The rear wall F in that instance was removed back sufficiently, and the trunnion or journal 2 of the cylinder was extended so as to make room for a draft and exit-passage at the rear of the cylinder. I have, however, found it desirable, for various reasons and purposes, to provide openings or holes 5 in the side at the rear end of cylinder E at intervals around the same, and so arranged that the dried material is discharged into the conveyer 4, and the products of combustion enter the cylinder E through said holes. In this case the end proper of the said cylinder may be entirely closed, or it may have valved air-inlets, so as to allow more or less air to enter, or none at all, according as may be found desirable in drying the material in hand. In this case the cylinder is driven by gearing arranged at the front of the apparatus, the gear-wheel 6 being shown on the shaft 7 and enlarged and shown more distinctly in Fig. 2. The shaft or elongated trunnion 7 is rigidly secured in the spider H by spline or otherwise, and is supported upon two bearings 9 and 10, and has flanges or stops 11 and 12 at either side of the outer bearing 10. These flanges or their equivalents might be employed with either or both of the said bearings, their object being to prevent any longitudinal movement whatever at this end of the machine on account of expansion and contraction of the parts by cold or heat. Such expansion or contraction is provided for by the rear journal 2, which is free to slide back and forth in its self-lubricating bearing 2'. A rod or bolt 12' extends longitudinally through hollow shaft or trunnion 7 and projects through beyond both ends thereof, and a yoke or brace 14 is connected with the rear end of the said rod, and has its ends fixed to the inside of the cylinder E. On the outer extremity of the said rod is a spring 16, secured thereon by nut and washer, and resting between said washer and the end of the said shaft 7. Two or more such yokes or braces

14 may be used. The nut and washer may be turned up, increasing the tension of spring 16 until it overcomes the sliding tendency of the cylinder rearward, and thereby keeping said parts in their proper working position. L is a reinforcing-ring of the peculiar shape shown and riveted on the front end of the cylinder E. This ring closely encircles the periphery 17 of the spider or head H, and is locked to turn therewith, as hereinafter fully described. This periphery 17 is turned down so as to be perfectly true, and has an annular flange or rib 20, likewise turned true on its inner side, so as to be at right angles to the shaft 7 and have a smooth wearing-surface for ring L. The said reinforcing-ring L likewise is turned true on its inner surface, so as to loosely fit upon the periphery of head H and to fit nicely about the flange 20. In the operation of the machine it is designed that the ring L should work in contact with the flange 20 and thus form a close-working connection at this point. By the foregoing construction it will at once become obvious if for any reason the shaft 7 should settle or otherwise get out of line with the cylinder E, because it would at once show by the separation of flange 20 and ring L. The spring 16 and rod 12 serve the further office of maintaining a free working union between the said ring and flange 20 and maintains a dust-tight joint. The periphery 17 of the spider has lugs 22 on its surface and a corresponding lug is made on the ring L to engage between said lugs, and one or more of these lugs may be used to form connection between said parts to rotate the cylinder, but should be so constructed that they will not interfere with a slight back and forth sliding movement between said parts as the machine may require and is best for all purposes. A suitable packing-ring N is arranged about the outer edge of the ring L, and the breeching 23 and the periphery and the spider H, the ring L, and the cylinder E, with the shaft 7, are all rotated together.

Referring again to the rear of the apparatus, Fig. 2, we see that the trunnion or journal 2 is hollow, and that the arms of the spider 25 likewise are hollow and have openings 26 for the admission of air, and an opening 27 is formed centrally in the spider to admit air directly through said journal into the cylinder E. These passages may have means for closing them, if desired. A rim O is rigidly secured to the cylinder about its surface near the periphery of the spider 25, in order to obtain a true circular surface to pack against with the packing-ring P, thereby making a close joint at this point. The said packing-ring in its turn is secured to the breeching Q, which is secured to the brickwork and to which the packing-ring P is fixed and adapted to the ring O. The cylinder E is provided with hoods R over the scattered openings through the side of the cylinder for the admission of heated air and the products of combustion

as described in the application hereinbefore mentioned. A small hood 30 is arranged about the inlet 27 from hollow journal 2 in the rear of the cylinder to prevent the material that is tossed about on the inside thereof from leaking out through the said hole. One very material advantage in this style of drier is the fact that it is practically impossible to over-fire and to burn out any part thereof. Hitherto, without the arch D and with the cylinder exposed to the direct contact of the full volume of heat from the furnace, there has been danger of burning out the cylinder at the point where the greatest heat would strike it, because it sometimes occurred that persons would purchase machines of a smaller size and with less capacity than their business demanded and then would try to make up for lack of size and working capacity by increased volume of heat sent through the machine. They would, therefore, in many instances fire excessively and burn out cylinders for that reason alone. I have, therefore, found it a very great advantage to use a perforated arch beneath the cylinder, as herein shown and described, and so constructed and arranged that the products of combustion are gradually admitted to the cylinder and are reduced in temperature by fresh air admitted and commingled therewith if desired, so that now there is no possibility of so-called "excessive firing" in a furnace of this description, and any amount of firing may be done and the heat can be taken care of and utilized and distributed so as to be effective for drying purposes and not entail injury upon the cylinder or other parts of the machine. In this way, we can, in fact, successfully employ two or three times as much heat as formerly with any given size of machine and not work injury to any part. The foregoing form of machine is therefore to be considered as one which is especially adapted to the use of very high and what might be considered excessive temperatures, and to be used where a large amount of work is to be done by crowding the machine, but with the understanding that the material handled in this way is not of a combustible or explosive nature.

Referring now to Fig. 4 and incidentally to Figs. 5 and 6, we find a form of drier corresponding in all respects to the drier shown in Fig. 1 and bearing the same references except as modified beneath the perforated floor C of the passage-way B. Here I have introduced a series of coiled pipes C³ for the purpose of utilizing waste steam to heat the air, which is admitted to the air-chamber beneath said floor, because it is sometimes desirable to have heated air at this point, and thus not only economize the otherwise waste heat of the exhaust-steam but also to contribute to the temperature in the furnace-chambers and passages. The main point of invention in this figure, however, is found in the dust-chamber, which is arranged over the furnace and cylinder. The walls of the drier-setting

terminate just above the cylinder-chamber, and are shown in the preceding figures, especially Fig. 1, but I have found it desirable to have a dust-room in which to trap the dust that may be discharged or drawn away with the products of combustion from the drying-cylinder, especially when such dusts are for any reason valuable, as often occurs. Thus it is not infrequent that the apparatus is used to dry materials that are very light and fine when dry and the dust of which is very valuable. I have therefore constructed a dust-room over the walls of the drier-chamber, because I find this both a convenient and desirable arrangement, although, of course, the dust-room might be located at any other convenient and desirable place. As here shown, I have erected walls 50 upon the sides and ends of the drying-chamber, which may be eight inches, more or less, in thickness and of any desirable height. The chamber thus formed is covered over in the manner shown with angle-irons 51 transversely thereof and the bricks 52 intermediate of said irons, so that the chamber when completed will be absolutely non-combustible, especially when inflammable or explosive materials are being dried. If non-combustible or non-explosive materials are dried, the chambers may, of course, be of combustible materials. One or more outlets 54, as may be required, are located at the top of the said chamber. At the front of the dust-chamber the passage way or flue 56 leads from the breeching 57 at the front of the drying-cylinder, and a blower or its equivalent 58 is located in the elbow or pipe 59, that extends from said flue 56 into the discharge-cylinder 60 in the said dust-chamber. This short pipe or elbow 59 may, indeed, be the outer extremity of cylinder 60, and the said cylinder extends lengthwise of the dust-chamber the full length thereof. It has either a single continuous opening lengthwise at its bottom or two or more openings the full length thereof, or their equivalent, at or near its bottom. I have shown in this instance three longitudinal openings 62, and the discharge from the furnace of all the products of combustion and heated air and whatever else may be carried away therewith is through the cylinder 60 and these openings 62. The part 60 is preferably shown as cylindrical, but it may have a different shape and serve the same purpose, and at its bottom and outside are longitudinal plates 65 arranged in V shape, converging from the sides of the cylinder downward, and at the bottom of these plates in reverse or inverted position is a V-shaped deflector 66, which conveys the dust laterally somewhat, while the products of combustion escape between said two sets of plates 65 and 66. Within the rectangular dust-chamber is an internal chamber, V shape in cross-section and formed by walls 70. At the bottom of this chamber is a longitudinal conveyer 71 for carrying the accumulated dust out through

the front end of the said chamber and back into the breeching at the front to be mingled with the fresh material to be dried; but it may be otherwise cared for. It will be noticed that the products of combustion disappear from this inner chamber 70 through the flues or inlets 54 at the top, and it will also be noticed that the discharge from cylinder 60 and the chutes beneath the same is constantly downward, so as to promote the depositing of the dust and prevent its being carried out through the flues 54. The advantage of this arrangement must be obvious, because while the products of combustion are considerable and the blower 58 is constantly at work the action of the blower is practically exhausted and lost in the cylinder 60, and there is no especial force or draft present in the dust-chamber to disturb the quiet settlement of the dust at the bottom thereof, especially since the parts 65 and 66 are so arranged as to prevent any disturbance of the dust at the bottom of the chamber 70 by the draft through the bottom of the cylinder 60. Between the outer wall of the dust-chamber and the inner walls 70 I place a series of steam-pipes 80 to heat air, which is taken to the cylinder-chamber E, Fig. 6, through the inlet-openings 81 and the downpassage 82 in the wall of the furnace into the said cylinder-chamber, thus utilizing the otherwise waste space in the dust-chamber and the exhaust-steam as well.

What I claim is—

1. In a drying apparatus, a drying cylinder, a spider in the end of the cylinder, a hollow trunnion for said spider, a spring pressed rod through said trunnion, and arms connected with the inner end of said rod and the inside of said cylinder back from the end thereof, substantially as set forth.

2. The drying cylinder and a ring fixed thereto at one end and a journaled spider encircled by said ring a rod through the journal of said spider and connecting arms from the inner end of said rod to the inside of the cylinder, said rod provided with a spring to yield longitudinally, substantially as set forth.

3. The construction described consisting of the cylinder and the ring about its front end, the hollow journaled spider having a ring shaped periphery overlapped by the ring on said cylinder and the said rings constructed to engage and rotate together whereby the cylinder is turned, a rod through said spider journal, a spring encircling the rod outside said journal and the yoke or arms connected with the inner end of said rod and the inside of the cylinder, substantially as set forth.

4. The cylinder and the ring fixed to the end thereof, in combination with a spider having its periphery overlapped by the said ring and having a projection on its periphery against which the said ring is adapted to bear, connections independent of said spider to hold said ring and spider in operative rela-

tion, said connections fixed to the said cylinder some distance from its end, substantially as set forth.

5 In a drying apparatus as described, a drying cylinder having hooded inlets between its ends for the passage of the products of combustion and heated air and openings at its rear and side for the further inlet of products of combustion and for the discharge of
10 the dried material, substantially as set forth.

6. The drying cylinder described, having a series of openings about its rear and side through which the dried material is discharged and the products of combustion are admitted
15 to said cylinder, and having a supporting spider and journal in its rear end outside said openings, substantially as set forth.

7. In a drying apparatus, a furnace and heating chamber and a rotating drying cylinder
20 in said chamber, in combination with a dust collecting chamber and a walled passage in said chamber constructed to promote deposition of the dust, a draft passage from said cylinder to said walled passage, and a blower
25 to promote artificial draft through said passages, substantially as described.

8. The apparatus comprising the furnace and heating chamber and a rotating cylinder in said chamber, in combination with a dust
30 collecting chamber over the said heating chamber, a draft passage from the cylinder to said chamber, and a blower in said passage, substantially as described.

9. The dust chamber described having an
35 inlet from the furnace and a blower connected therewith, and a passage way in said chamber provided with an opening along its bottom and closed about its sides and top and an outlet at the top of said chamber for the

escape of the products of combustion substantially as set forth. 40

10. In a drying apparatus, a dust collecting chamber provided with an inlet passage extending into the same and open along its bottom, and a deflector or guard along the sides
45 and bottom of the said passage to promote the deposit of the inflowing dust at the bottom of said chamber, substantially as set forth.

11. In a drying apparatus as described, a cylinder through which the products of combustion and the material dried pass in opposite directions, in combination with a dust
50 chamber, a flue from said cylinder into said dust chamber and a blower in said flue, said dust chamber provided with means to promote the depositing of the dust at the bottom
55 of said chamber, and the said chamber having sides converging toward the bottom thereof, substantially as set forth.

12. The dust chamber having an outside
60 inclosing wall and inside downwardly converging sides —70— and a conveyer at the bottom of said sides —70—, substantially as set forth.

13. The dust chamber having the converging
65 inner side walls and the conveyer at the bottom thereof, in combination with the dust inlet passage extending into said chamber and open along its bottom and an outlet at the top of said chamber, substantially as set
70 forth.

Witness my hand to the foregoing specification this 11th day of March, 1895.

FRANKLIN DAVID CUMMER.

Witnesses:

E. J. THOBABEN,
J. A. LYNCH.