

No. 740,607.

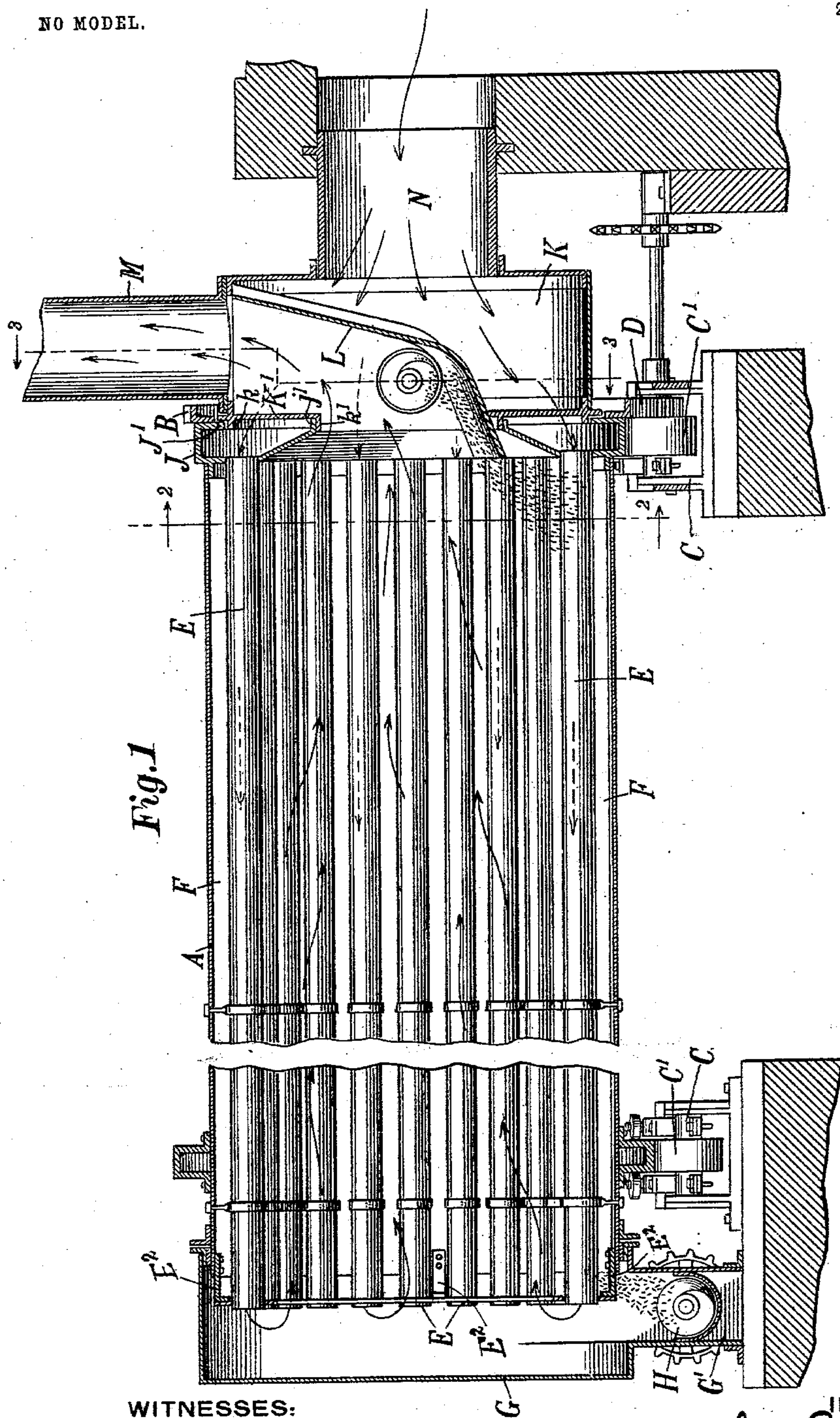
PATENTED OCT. 6, 1903.

J. E. TURNEY.
DRIER.

APPLICATION FILED JUNE 13, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES:

Fred G. Fischer
Edward T. Wray.

INVENTOR.

John E. Turney
BY
Burton Burton
his ATTORNEYS.

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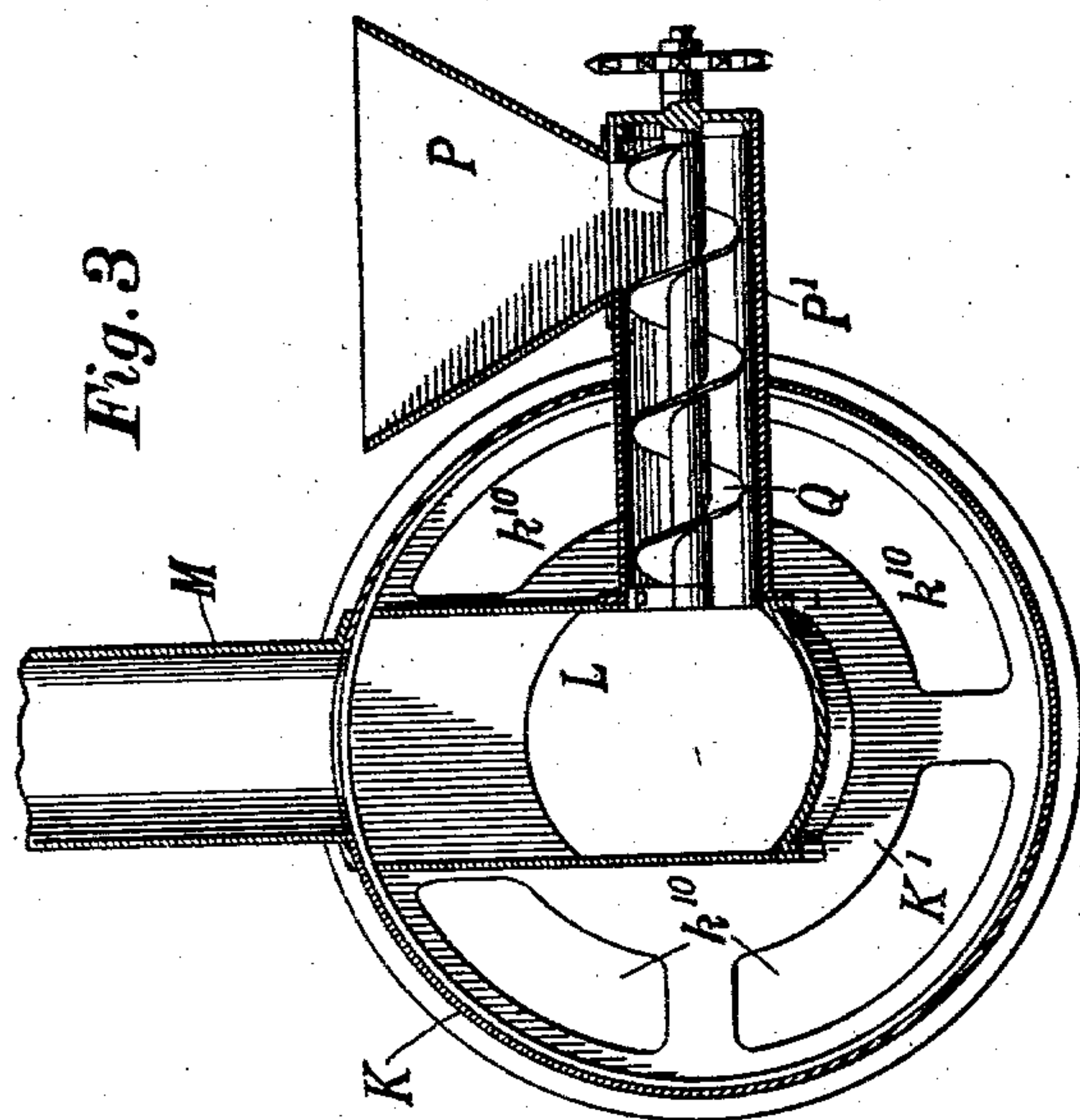
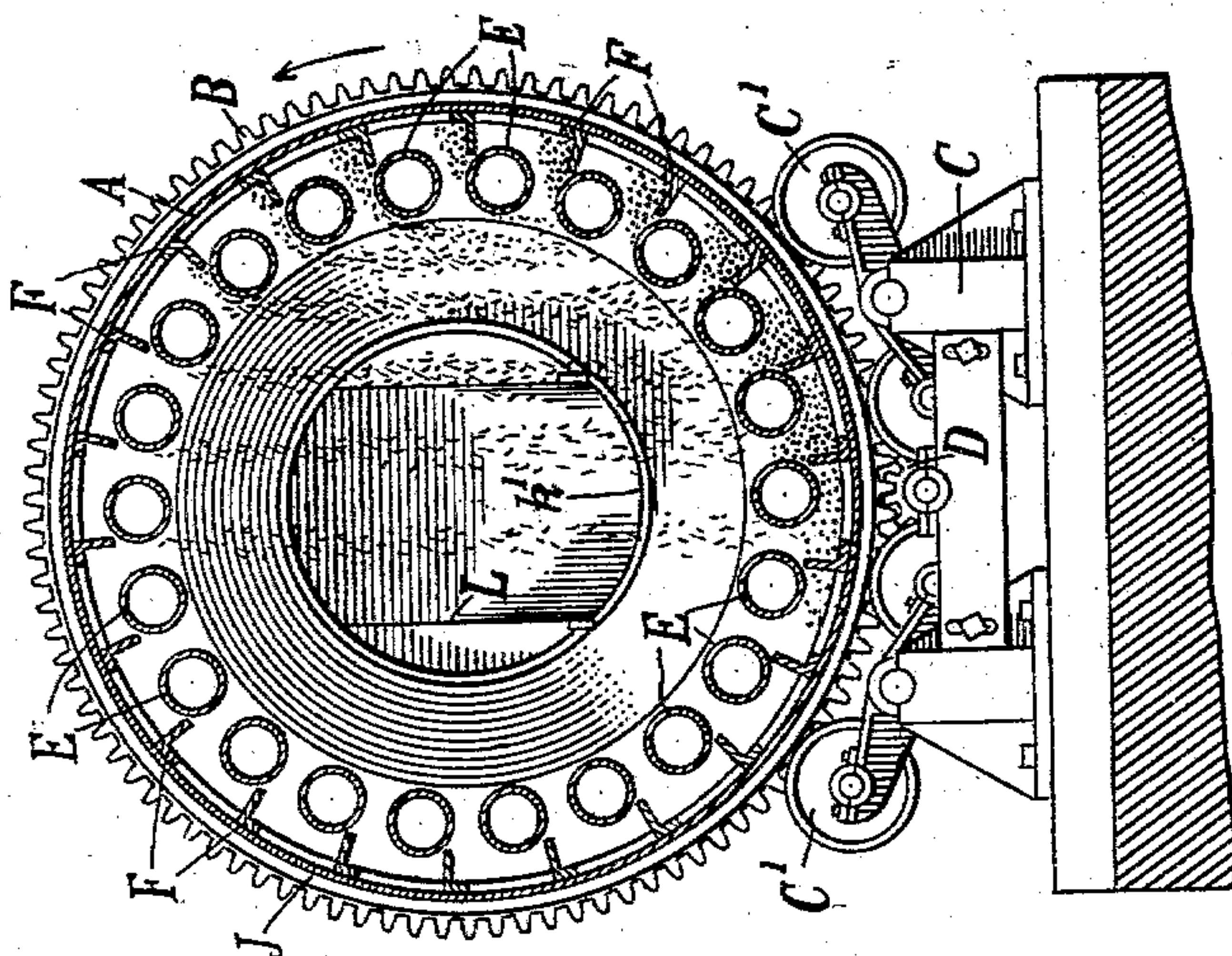


Fig. 2



WITNESSES:

Fred G. Fischer
Edward T. Wray

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John E. Turney
BY
Burton Burton
his ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN E. TURNEY, OF LOUISVILLE, KENTUCKY.

DRIER.

SPECIFICATION forming part of Letters Patent No. 740,607, dated October 6, 1903.

Application filed June 13, 1903. Serial No. 161,361. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. TURNEY, a subject of the King of Great Britain, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented new and useful Improvements in Driers, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The general purpose of this invention is to provide an improved drier for such material as may be delivered to the drier in such condition as to be handled conveniently—as, for example, in the condition of a wet or moist meal.

The specific purpose of the invention is to employ both direct and secondary heat—that is, to dry the material both by heat radiated from a surface heated by the products of combustion and also to expose the meal directly to the products of combustion for further drying—combining thereby the advantages of both “direct” and “indirect” drying, as these two means or methods of drying are commonly designated.

It consists in the structure and features of construction set out in the claims.

In the drawings, Figure 1 is an axial section of my improved drier. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a section at the line 3 3 on Fig. 1.

My improved drier comprises a cylinder A, which is encompassed by an annular gear B and supported in a cradle C on antifriction-rolls C' and provided with means for rotating it in such cradle, consisting of the pinion D, meshed with the annular gear B and provided with any suitable means for rotating them to thus roll the cylinder in its cradle. This cylinder has extending longitudinally from end to end within it a circular series of tubes E E E, &c., which are rigidly secured to the cylinder at short intervals throughout its circumference and constitute “lifts” or “flights”—i. e., means for lifting the pulverulent material which may be discharged into the cylinder for drying as the cylinder rotates, such material being delivered in a shower from the several tubes operating as lifts as they successively reach a sufficiently high point to cause the material to fall from them to the bottom of the cylinder. To pre-

vent such material from becoming lodged and retained between the tubes and the cylinder-wall at the back side of said tubes, I complete the lifts or ledges which the tubes constitute by means of angle-irons F F F, &c., bolted to the cylinder-wall just above and back of each tube, so that the horizontal or radially-extended lip of the angle-iron constitutes a shelf, which is continued in the upper carrying-surface of the tube to which such lip extends. The cylinder A at its opposite ends extends into two fixed heads, named for distinction, respectively, the “receiving-head” and the “discharge-head.” The discharge-head G consists merely of a rigid preferably cast-iron structure, having a suitable cavity with cylindrical opening at one side into which the discharge end of the cylinder protrudes for delivering the dried material which falls into the discharge-throat G', in which any suitable conveying means, as the screw H, may operate to carry away the dry material.

Preferably the tubes E are supported at the discharge end by a spacing-ring E', carried by flat iron straps or brackets E², which are bolted to the cylinder and extend off a short distance into the discharge-head for supporting the spacing-ring, as seen in Fig. 1.

The cylinder at the receiving end has rigid with it, so as to revolve with it, an annular diaphragm, which is in the form of a hollow annular head J, which constitutes a vestibule-chamber for the tubes E, whose ends are let through the inner wall of said annular head, so that they lead from its cavity. The outer wall of the annular head J has an annular opening J', which faces and registers with the annular apertured diaphragm K', which constitutes the inner wall of the stationary receiving-head K. A flange k on said diaphragm K' protrudes into the annular opening J' through the outer wall of the hollow head J to make a suitably-close joint at the outer circumference of said opening, and a flange k' at the inner circumference of said annular diaphragm K' telescopes with a corresponding flange j' at the inner circumference of the diaphragm or hollow annular head J.

Through the central opening of the annular diaphragm K' a funnel L from the central opening of the cylinder leads up to the top of the main cavity of the stationary head K and

there communicates with the vapor-discharge pipe M. The stationary head K is connected at the outer side, by means of a pipe N, with the discharge-passage of a furnace, which is not shown, but which should preferably be adapted for coal, coke, oil, or other fuel which may be perfectly consumed, so that the products of combustion constitute clear gas, such intensely-heated gas being conducted by way of the fixed head K around the funnel L, through the apertures k^{10} k^{10} k^{10} , &c., of the diaphragm K' into the annular hollow head J, and thence directly into the tubes E. The material to be dried is fed in from a hopper P through a horizontal feed-pipe P', which, crossing the main cavity of the head K, opens into the side of the funnel L, near the bottom of that funnel. A spiral screw conveyer Q operates in the pipe P' to conduct the material positively from the bottom of the hopper for discharge at the lower part of the funnel L, by which it is delivered into the cylinder through the central opening in the hollow head J.

The operation of this structure is such that as the material to be dried is fed in by the screw conveyer it falls upon the heated tubes E and is carried up by the rotation of the cylinder and showered down across the open central space in which the heated products of combustion, having first passed through the pipes B the whole length of the cylinder and heated said pipes, are, by the draft introduced to the final passage M, drawn back through said open central space to encounter the material which is being lifted and showered therethrough, as described. The gases of combustion having thus first heated the tubes E, so that they operate by radiation to heat the central portion of the cylinder and by direct conduction to heat and dry the material, which is constantly and repeatedly being lodged upon them as the cylinder revolves and showers it down, afterward operate directly in their return course through the open center of the cylinder upon the material showered therethrough to further effect the drying process.

It will be noticed that in this process the gaseous products of combustion from the furnace pass through the whole length of the cylinder within the pipes E, secluded from the moisture of the material which is to be dried, so that these products of combustion emerge from the pipes E at the discharge end of the cylinder in a dry condition, and there starting on their return course meet the material which is to be dried at its driest stage, because it has already passed through the whole length of the cylinder and is at the point of discharge. The driest gases thus meet the driest material and are in a condition to more completely dry that material because they have no moisture to give to it and may take some additional moisture from it. It is to be noticed also that the wet material, at its entrance into the cylinder, encounters the hot pipes P at their

hottest point, because at the point at which they are exposed to the gases of combustion just emerging from the furnace. The wettest material, therefore, is in condition best protected by its moisture from the danger of burning when it falls upon the very hot pipes, and these pipes by their extreme heat tend most rapidly to drive off the moisture, and the largest quantity of moisture is thus driven off at the very entrance to the final vapor-discharge pipe M, and so passes immediately out without the risk of encountering any material in condition to reabsorb it or any drier gaseous currents which might become moisture laden from it.

It will be further noticed that any very light and dry material which by reason of its extreme lightness and dryness may be carried up with the outgoing draft through the pipe M is in such position that it if may be arrested or held in suspension in its upward course until it can be precipitated it will fall back directly into the incoming current of wet material and be reabsorbed and intermingled therewith and carried on through the drying process and that thereby all loss which would otherwise occur by reason of such light material being carried off by the escaping gases is prevented.

It will be evident that it is merely convenient but not necessary that the annular diaphragm through which the tubes E lead toward the receiving-head should be in the form of an annular chambered head J, as illustrated, the purpose to be effected calling only for a means of confining the communication of the tubes E to the portion of the cavity of the fixed receiving-head K into which the products of combustion from the furnace are admitted and means of confining to the central portion of the cylinder within the circular group of tubes E the communication of the fixed duct, which leads to the vapor-discharge pipe M. Any mechanic would readily modify or transpose the elements of the structure so that the annular diaphragm in the cylinder which is penetrated by the receiving end of the tubes would not of itself present the form of a hollow annular head, and I do not limit myself to this specific form, though for certain purposes it is desirable and is made the subject of a specific claim.

I claim—

1. A drier comprising a horizontal cylinder having a circular series of tubes extending longitudinally through it in position to constitute "lifts" or "flights" for the material to be dried; fixed receiving and discharge heads with which such cylinder and said tubes communicate at the ends; means for supporting and rotating the cylinder, the receiving-head being partitioned to separate an annular portion from a central portion, the annular portion communicating with the tubes, and the central portion communicating with the cylinder within the series of tubes; an inlet for a heating medium leading into

said annular portion, and a vapor-discharge throat leading from said central portion across the annular portion, and a final vapor-discharge pipe communicating with such throat.

5 2. A drier comprising a horizontal cylinder having a circular series of tubes extending longitudinally and arranged circumferentially within it; fixed chambers with which the cylinder and its tubes communicate at
10 opposite ends, one being a receiving-chamber and the other a discharge-chamber for the material to be dried; means for supporting and rotating the cylinder with its ends in communication with said chambers respectively, the receiving-chamber being partitioned to form a passage leading from the
15 upper side and opening centrally toward the cylinder; a final vapor-discharge pipe leading from said passage at the upper side; an inlet
20 for a heating medium leading into said receiving-chamber; a partition or diaphragm extending from the margin of the central opening of said vapor-discharge passage to the tubes, whereby said heating medium is
25 directed into the tubes, and means for conducting the material to be dried across the outer portion of the cavity of said receiving-chamber into said discharge-passage.

30 3. A drier comprising a horizontal cylinder having a series of tubes extending longitudinally and arranged circumferentially within it; fixed heads comprising chambers with which the cylinder and its tubes communicate at the receiving and discharge ends respectively, the cylinder having at its receiving
35 end an annular chamber into which the tubes open, said chamber being open at the side toward the receiving-head, said head having partitioned off from the remainder of its cavity a passage registering with the inner circumference of said annular chamber and opening therethrough into the cylinder, such
40 passage extending from such central opening across the cavity of the receiving-head; a vapor-discharge pipe leading from such passage, and an inlet for a drying medium into the receiving-chamber outside said partitioned
45 passage, whereby such medium is directed through the annular chamber into the tubes.

50 4. A drier comprising a horizontal cylinder having a series of tubes extending longitudinally and arranged circumferentially within it; means for supporting and rotating the

cylinder; fixed heads having chambers with which the cylinder and its tubes communicate at the receiving and discharging ends
55 respectively, the cylinder having at the receiving end a hollow annular head through whose inner wall the ends of the tubes lead, and whose outer wall is open for communication with the fixed head, said head having a
60 diaphragm facing said annular head of the cylinder and apertured for communication with the cavity thereof, and having an annular flange which telescopes with the inner
65 margin of said annular head; a passage opening through said diaphragm within said flange and extending therefrom across the cavity of the head to the circumference thereof; a
70 vapor-discharge pipe communicating with it at the circumference, and an inlet into the fixed head for a drying medium outside said passage.

5. A drier comprising a horizontal cylinder having a series of tubes extending longitudinally and arranged circumferentially within
75 it; means for supporting and rotating the cylinder; fixed heads having chambers with which the cylinder and its tubes communicate at the receiving and discharge ends respectively; an annular diaphragm at the receiving
80 end of the cylinder through which the tubes lead; a passage partitioned in the fixed head leading from the inner margin of said annular diaphragm through the cavity
85 of the fixed head to the outside thereof, and a vapor-discharge pipe connecting with it; an inlet into the cavity of the fixed head outside said partitioned passage for a drying
90 medium, and a conduit leading from outside the head across the outer portion of its cavity into said partitioned passage; whereby the material to be dried may be introduced through
95 said passage into the cylinder within the circumferential series of tubes, and the drying medium may be introduced around said passage into the tubes.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Louisville, Kentucky, this 8th day of June, 100
A. D. 1903.

JOHN E. TURNEY.

In presence of—
IRVIN DUGAN,
C. W. LONG.