

W. E. KOOP.

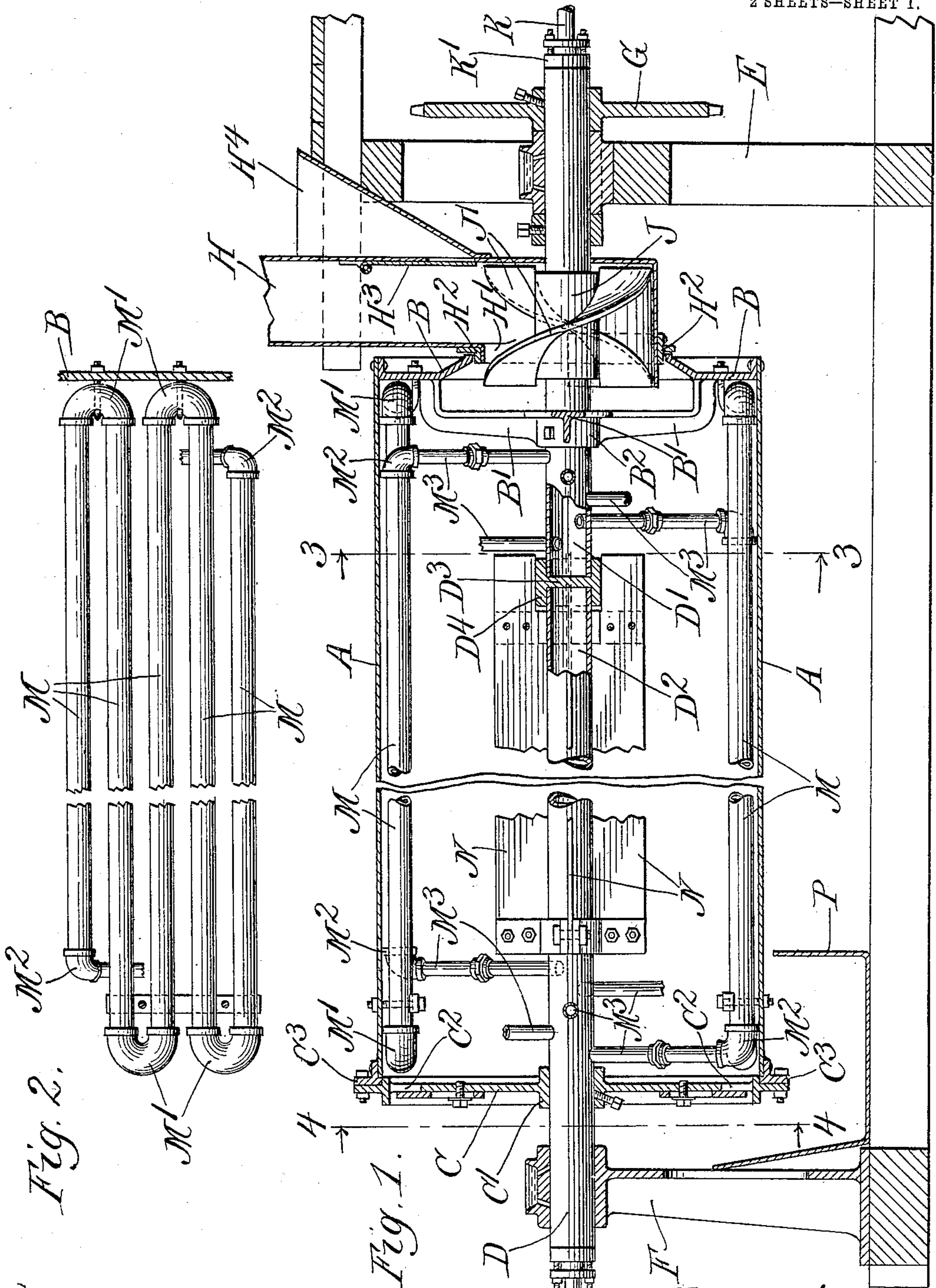
DRIER.

APPLICATION FILED JUNE 26, 1908.

931,695.

Patented Aug. 17, 1909.

2 SHEETS—SHEET 1.



Witnesses,
Edward T. Wray.
J. S. Abbott

Inventor.
William E. Koop.
by Burton & Burton
his Attys.

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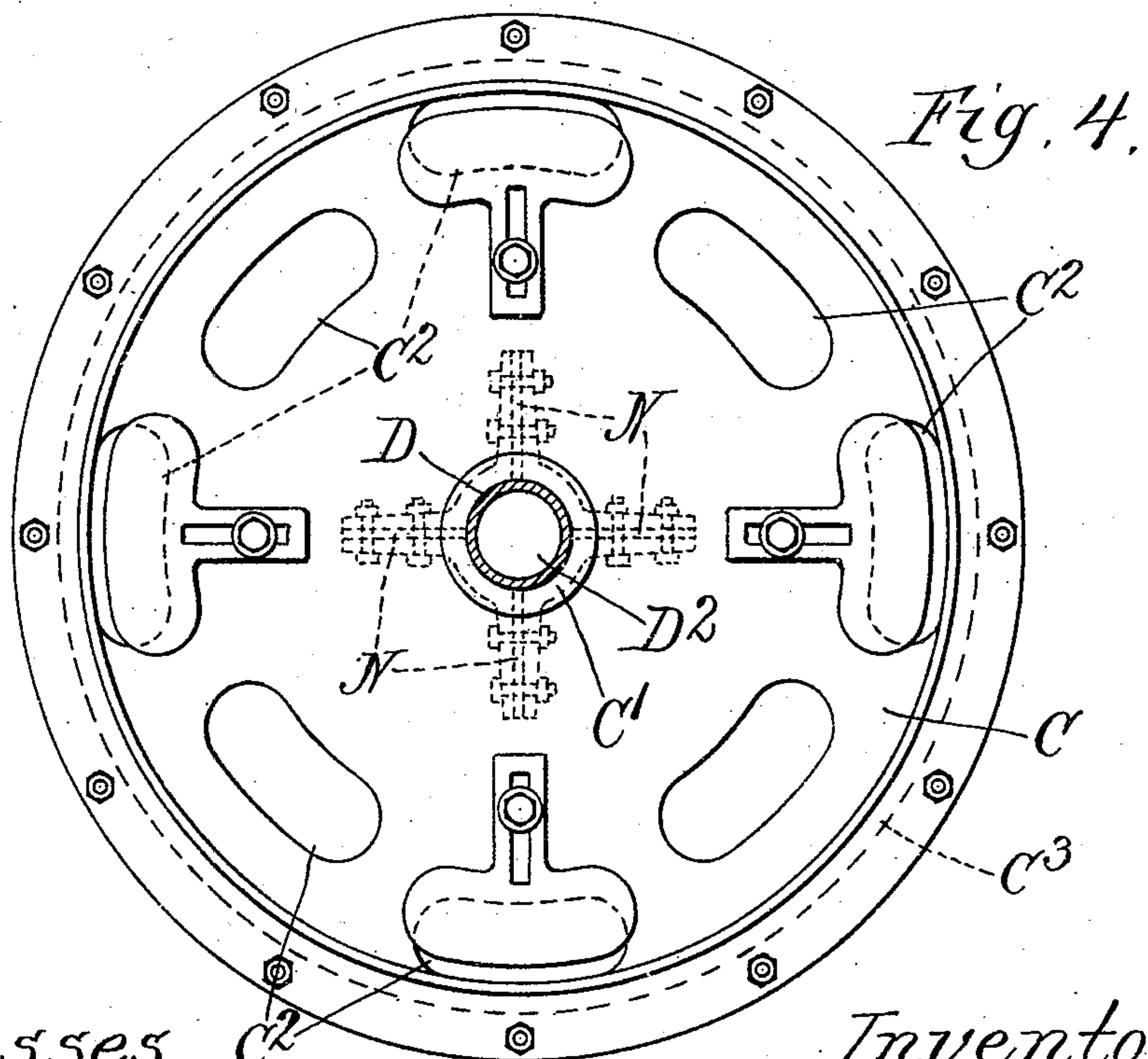
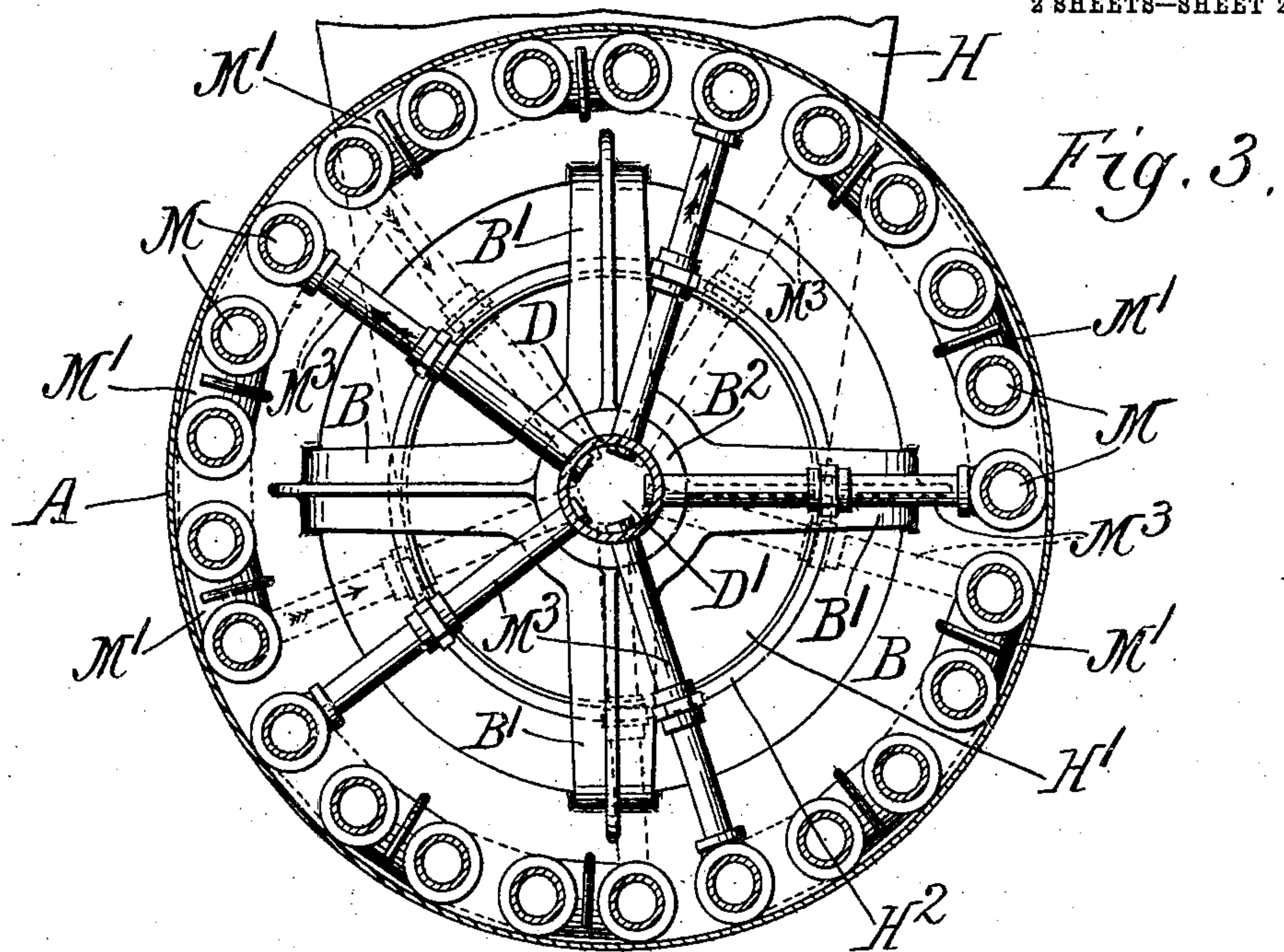
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UNITED STATES PATENT OFFICE.

WILLIAM E. KOOP, OF LOUISVILLE, KENTUCKY, ASSIGNOR OF ONE-THIRD TO CHARLES E. GEIGER AND ONE-THIRD TO G. W. FISKE, BOTH OF LOUISVILLE, KENTUCKY.

DRIER.

No. 931,695.

Specification of Letters Patent.

Patented Aug. 17, 1909.

Application filed June 26, 1908. Serial No. 440,436.

To all whom it may concern:

Be it known that I, WILLIAM E. KOOP, a citizen of the United States, 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 purpose of this invention is to provide an improved form of rotary, approximately horizontal, cylindrical drier for such material as sand cement, brewers' and maltsters' grains and the like which may be lighter and cheaper in construction than the driers of such horizontal cylindrical type hitherto in use.

It consists of the features of construction shown and described as indicated in the claims.

In the drawings:—Figure 1 is a vertical axial section of a drier embodying this invention. Fig. 2 is a plan view of one of the steam pipe circuits. Fig. 3 is a section at the line 3—3 on Fig. 1. Fig. 4 is a section at the line 4—4 showing the discharge end in elevation.

This drier comprises an approximately horizontal cylinder, A, having at the higher or receiving end an annular head, B, comprising integrally a spider consisting of inwardly offset radial arms, B¹, B¹, joining a central hub, B². The cylinder has at the discharge end a head, C, provided with a central hub, C¹, and a series of discharge apertures, C², disposed in circular order near the circumference of the head so as to open from the interior of the cylinder when the head is secured in place, such securement being effected by an angular annular band, C³, secured to the cylinder, A, exteriorly thereof at the end and adapted to afford a seat for the head, C, and means of bolting for the head, C, as seen clearly in Fig. 1. This cylinder has a shaft, D, which extends through the entire length of the cylinder, being secured in the hubs, B² and C¹, of the heads thereby made rigid with the cylinder and protruding from the opposite ends for bearing in the supports, E and F, at the receiving and discharge ends respectively which are located outside the cylinder. At the opposite side of the support, E, from the cylinder, the shaft, D, is provided with

which, as illustrated, consists of a sprocket wheel, G, mounted on the shaft.

Between the receiving end of the cylinder and the support, E, there is supported in fixed position a stack, H, having a circular opening, H¹, at the lower end of the side toward the cylinder, said opening being bounded by an angular annulus, H², whose horizontal flange fits within the central opening of the head, B.

On the shaft, D, there is a spiral feeder, consisting of a collar or coupling, J, forming a hub from which spring spiral feeding vanes, J¹, which rotate in the trough formed by the closed lower end of the stack, which, it will be understood, is conformed to the cylindrical path of the rotating spiral wings so as to adapt the latter to feed the material onward into the cylinder. The outer side of the stack is provided with a trap door, H³, hung at its upper edge for swinging inward, and upon said outer side of the stack there is mounted a hopper, H⁴, whose inclined lower side joins the lower edge of the aperture close by the trap door, H³, so that the material delivered into the hopper against the outer side of the trap door will operate to swing said door inward for admission of the material which is thus delivered on to the chute board, J, and thereby conducted for delivery within the cylinder.

The shaft, D, has axial cavities, D¹ and D², extending in from the receiving and discharge end respectively, but which are stopped off from each other within the cylinder by the diaphragm, D³, interposed between the two members of the shaft within the coupling, D⁴, which unites them. A steam-supply pipe, K, enters through a suitable stuffing-box, K¹, at the end of the shaft beyond the support, E, and a drainage or water discharge pipe, L, is connected to the opposite end of the shaft, B, beyond the support, F. Within the cylinder, there are provided several steam-pipe circuits, each consisting of an odd number of longitudinal runs of pipe, M, connected successively by return bends, M¹, the first run of said pipe being connected by an elbow, M², and radially-extending pipe members, M³, with the cavity, D¹, of the shaft; and the last run of each circuit is similarly connected with the cavity, D², so that there is established through each circuit a course of circulation for steam from the cavity, D¹, to the cavity,

D², and from the latter, the water of condensation will pass out through the water-drainage pipe, L, any familiar form of trap (not shown) being interposed to prevent the escape of steam. The several runs of pipe, M, in all the steam-pipe circuits are lodged as closely as the fittings will permit against the inner surface of the cylinder and may thereby operate as flights for carrying up and dropping the material to be dried as the cylinder rotates. To further effect the same purpose of constant distribution of the material for the purpose of exposing it in the air for drying, there may be mounted on the shaft, D, radial flights or vanes, N, extending longitudinally within the cylinder for as great a portion of the length thereof as can conveniently be arranged in view of the radial connections from the cavities of the shaft to the steam-pipe circuits described.

It will be understood that the material to be dried, being delivered into the hopper, H⁴, passing thence by way of the trap door, H³, across the stack on the chute board, J, is delivered into the rotating cylinder below the center, and lodging between the steam pipe runs, M, is lifted by the latter as by flights as the cylinder revolves, and dropping therefrom is again lifted, or being received by the radial vanes, N, is carried over and in turn dropped by them again to the lower side of the cylinder where it is picked up by the steam pipes and so carried gradually by a spiral course on toward the discharge end of the cylinder, escaping finally through the discharge apertures, C², into a receiving trough, P, in which may operate any form of conveyer for conducting it away to a place of final discharge or storage.

Obviously, for the mere purpose of supporting and rotating the cylinder and affording the steam inlet and water outlet connections, the two shaft members need not be connected together as a continuous shaft, as illustrated; but this construction dispenses with necessity for any means for staying or bracing the shaft which would otherwise be needed within the cylinder particularly in view of the bracing afforded by fittings, M², on the radial pipes, M³, of which the fittings bear against the inner surface of the cylinder; and such continuous shaft construction also affords a convenient element for carrying the radial vanes or central flights, as described. The continuity of the shaft from end to end of the cylinder within the same is therefore a specifically preferred construction, but I do not limit my invention thereto.

I claim:—

1. A drier comprising an approximately horizontal cylinder having rigid shaft members projecting from its opposite ends and extending within it; bearings in which such

projecting shaft members are journaled for supporting and rotating the cylinder, said shaft members having cavities extending into them from their outer ends respectively and stopped off from each other within the cylinder; a steam pipe leading into the cavity at one end; a drainage connection leading from the cavity at the other end, and a plurality of steam circuits within the cylinder leading from one cavity and discharging into the other, the higher end of the cylinder being provided with a centrally apertured head; a ventilating flue or stack connected with said aperture; a hopper mounted on the outer side of the stack; a trap door in said outer side for controlling communication of the hopper with the interior of the stack; means for receiving the material within the stack and delivering it across the stack from the point below the trap door into the central opening of the cylinder head, the cylinder being provided at the opposite end with apertures for escape of the material.

2. A drier comprising an approximately horizontal cylinder having a continuous shaft rigid with it and extending through it, and bearings in which such shaft is journaled outside the cylinder for supporting and rotating the latter, said shaft having cavities extending into it from both ends, and stopped off from each other within the cylinder; a steam pipe leading into the cavity at one end; a drainage connection leading from the cavity at the other end; a plurality of steam circuits within the cylinder leading from one cavity and discharging into the other, said steam circuits comprising each a multiplicity of longitudinal runs of pipe disposed about the circumference of the cylinder adjacent to its inner wall for lifting and dropping the material as the cylinder rotates, the shaft being provided with a plurality of radial blades or vanes for additionally catching and dropping such material in said rotation.

3. A drier comprising an approximately horizontal cylinder having a rigid shaft member extending within it and projecting through one of its heads, a bearing in which such shaft member is journaled for supporting and rotating the cylinder; the head of the cylinder being centrally apertured about said shaft member; a hub rigid with said shaft member at a position inwardly offset from the apertured head, and rigid connections from such hub to the cylinder for communicating rotation thereto from the shaft; said shaft member having an axial cavity for admitting a heating medium leading from its outer end to a point within the cylinder beyond the hub; a heat-distributing pipe system within the cylinder connected with said cavity, and means for delivering the material to be treated through the cen-

tral opening of the head into the interval between said head and hub.

4. A drier comprising an approximately horizontal cylinder having a rigid shaft member extending within it and projecting through one of its heads, a bearing in which such shaft member is journaled for supporting and rotating the cylinder; the head of the cylinder being centrally apertured about said shaft member; a hub rigid with said shaft member at a position inwardly offset from the apertured head, and rigid connections from such hub to the cylinder for communicating rotation thereto from the shaft; said shaft member having an axial cavity constituting a steam passage leading from its outer end to a point within the cylinder beyond the hub; a circulatory system within the cylinder connected with said cavity, and means for delivering the material to be treated through the central opening of the head into the interval between said head and hub.

5. A drier comprising an approximately horizontal cylinder having a shaft extending axially therethrough and projecting from opposite ends thereof; bearings in which the projecting portions of said shaft are journaled for supporting and rotating the cylinder; said shaft having cavities extending into it from its outer ends respectively and stopped off from each other within said cylinder; a steam pipe leading into the cavity at one end; a drainage connection leading from the cavity at the other end; a plurality of pipes radiating from the portion of the shaft having the steam cavity; a corresponding plurality of pipes radiating from the portion of the shaft having the drainage cavity and a corresponding plurality of circumferentially distributed circulatory systems each connected at each end with one of said radial pipes and bearing against the inner surface of the cylinder for bracing the shaft to the cylinder in the various directions of said radial pipes.

6. A drier comprising an approximately horizontal cylinder having a shaft extending axially therethrough and projecting from opposite ends thereof; bearings in which the projecting portions of said shaft are journaled for supporting and rotating the cylinder; said shaft having cavities extending into it from its outer ends respectively and stopped off from each other within said cylinder; a steam-pipe leading into the cavity at one end; a drainage connection leading from the cavity at the other end; a plurality of steam circuits circumferentially distributed about the inner surface of the

cylinder, so that each occupies a sectoral portion thereof, each extending longitudinally throughout the length of the cylinder connected at one end with the steam cavity and at the other end with the drainage cavity.

7. A drier comprising an approximately horizontal cylinder having rigid shaft members projecting from its opposite ends and extending within it; bearings in which such projecting shaft members are journaled for supporting and rotating the cylinder, said shaft members having cavities extending into them from their outer ends respectively and stopped off from each other within the cylinder; a steam pipe leading into the cavity at one end; a drainage connection leading from the cavity at the other end; a plurality of pipes radiating from the member having the steam cavity; a corresponding plurality of pipes radiating from member having the drainage cavity and a corresponding plurality of circumferentially distributed circulatory systems each connected at each end with one of said radial pipes and bearing against the inner surface of the cylinder for bracing the shaft members to the cylinder in the various directions of said radial pipes.

8. A drier comprising an approximately horizontal cylinder having rigid shaft members projecting from its opposite ends and extending within it; bearings in which such projecting shaft members are journaled for supporting and rotating the cylinder, said shaft members having cavities extending into them from their outer ends respectively and stopped off from each other within the cylinder; a steam pipe leading into the cavity at one end; a drainage connection leading from the cavity at the other end; a plurality of steam circuits within the cylinder leading from one cavity and discharging into the other; a centrally apertured cylinder head encompassing the member having the steam cavity; a ventilating stack communicating with the central aperture of said cylinder head; means for delivering the material to be treated through said central aperture into the cylinder, the cylinder being provided at the opposite end with apertures for the escape of material.

In testimony whereof, I have hereunto set my hand at Louisville, Kentucky, this 23rd day of June, 1908.

WILLIAM E. KOOP.

Witnesses:

C. A. FISKE, Jr.,
MINNIE VAN DYKE.