

O. S. SLEEPER.

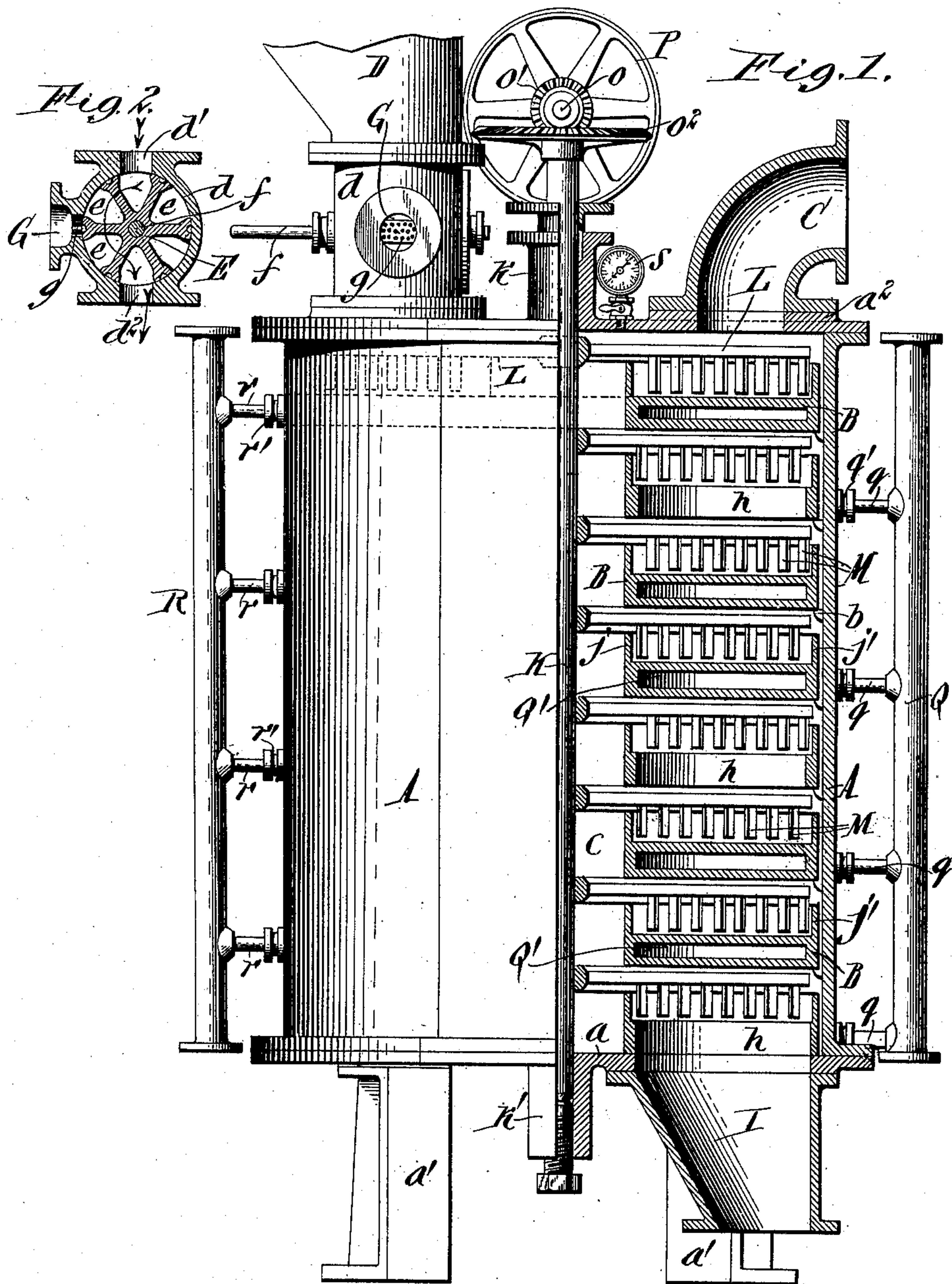
DRIER.

APPLICATION FILED SEPT. 3, 1909.

985,217.

Patented Feb. 28, 1911.

2 SHEETS—SHEET 1.



Witnesses:
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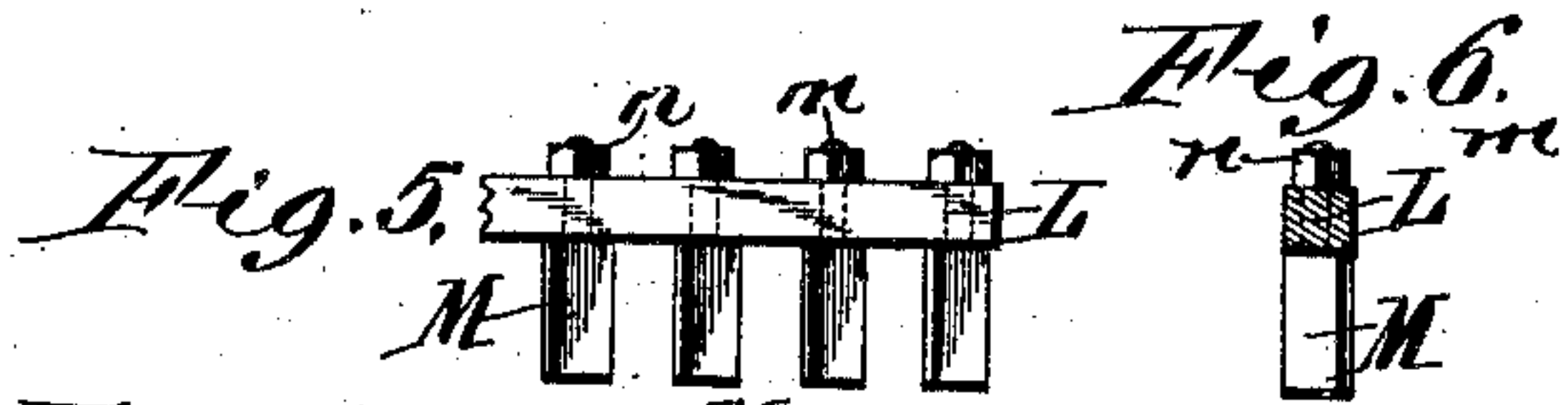
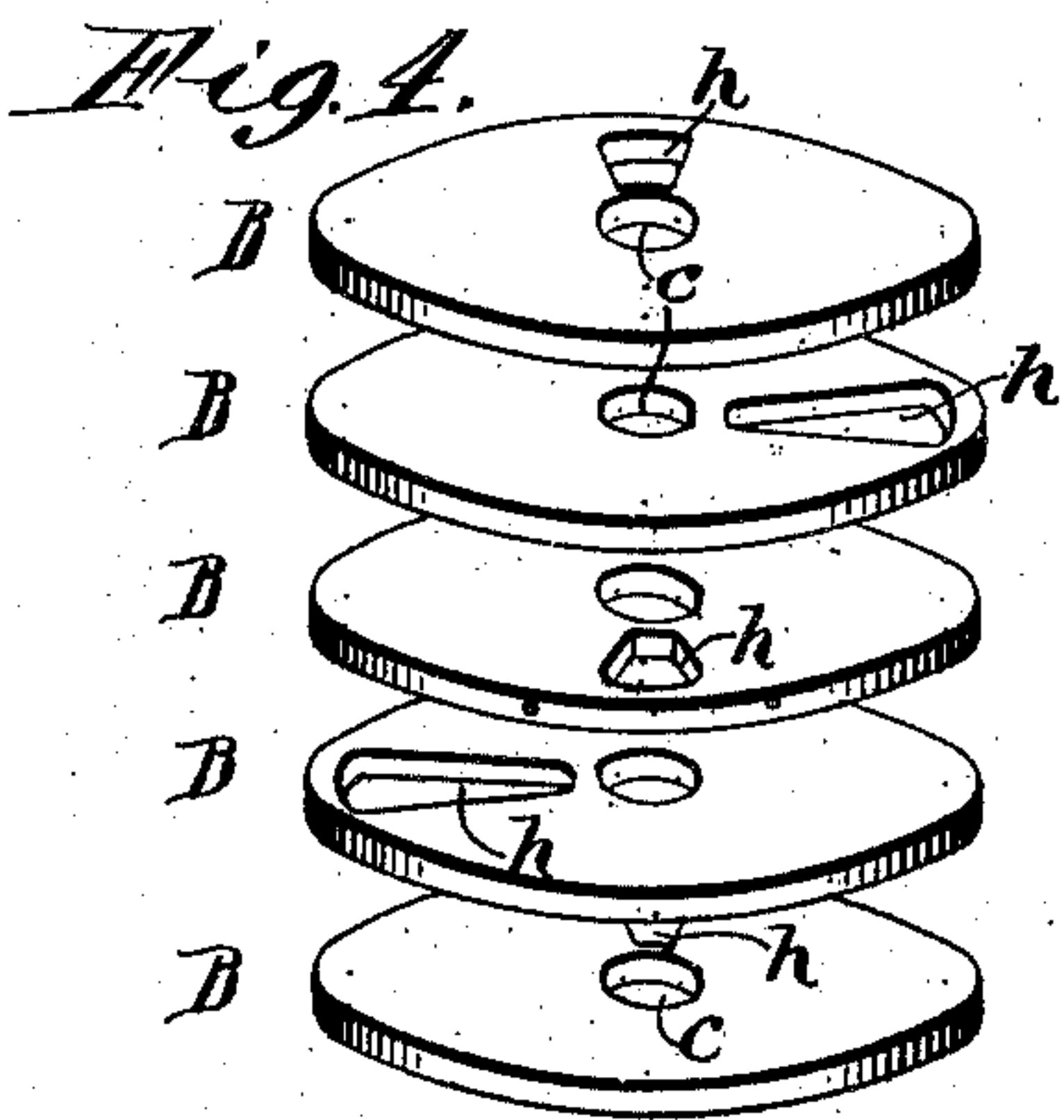
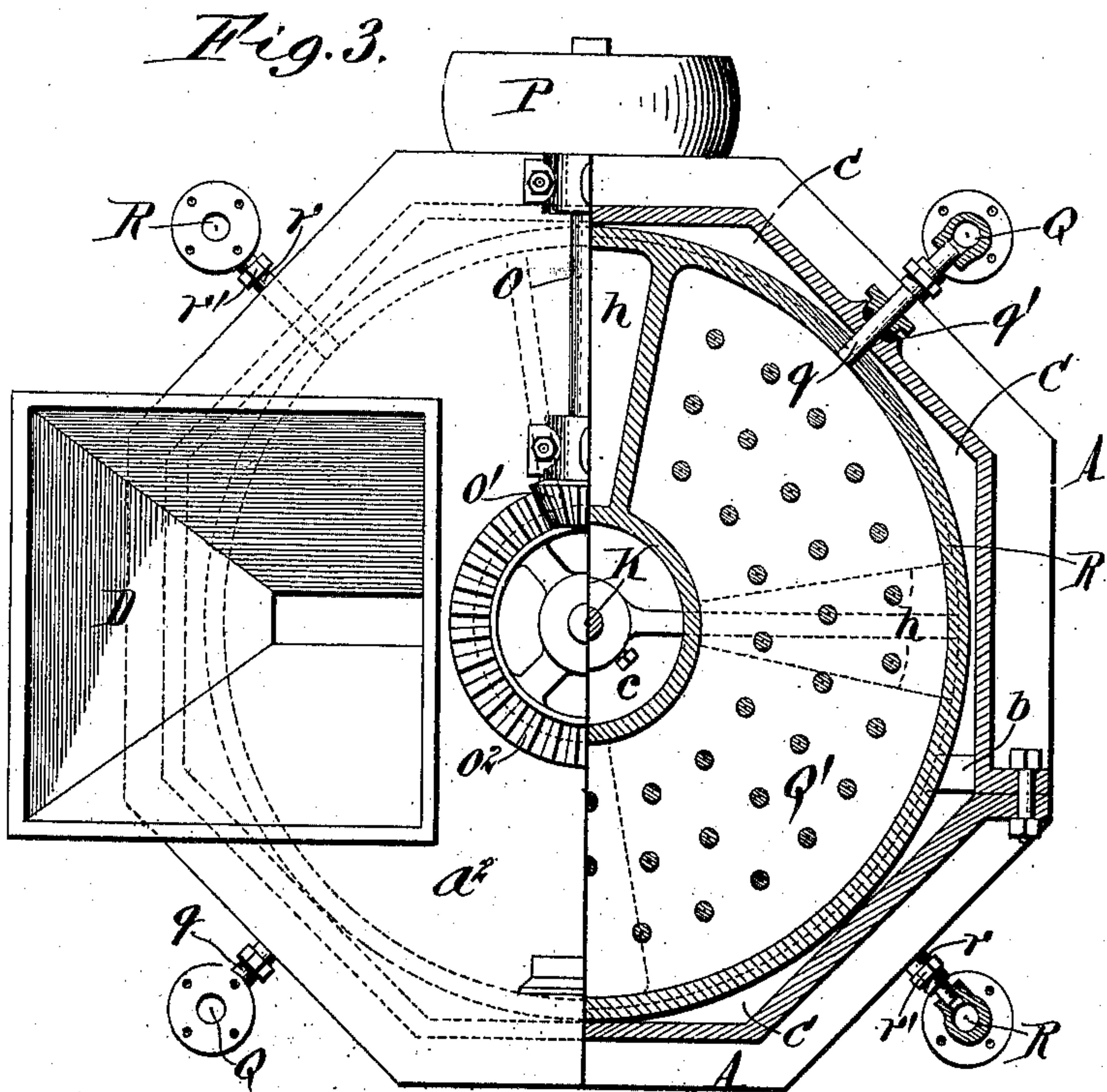
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UNITED STATES PATENT OFFICE.

OLIVER S. SLEEPER, OF BUFFALO, NEW YORK, ASSIGNOR TO BUFFALO FOUNDRY & MACHINE COMPANY, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

DRIER.

985,217.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed September 3, 1909. Serial No. 516,050.

To all whom it may concern:

Be it known that I, OLIVER S. SLEEPER, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Driers, of which the following is a specification.

This invention relates to a drier whereby grain, reclaimed rubber and other granular substances may be dried continuously *in vacuo* and has the object to produce a machine of this character whereby the drying of such substances may be effected thoroughly, expeditiously and economically.

In the accompanying drawings consisting of 2 sheets: Figure 1 is a side elevation, partly in section, of a continuous vacuum drier embodying my invention. Fig. 2 is a detached vertical section of a valve which may be used in connection with the drier for controlling the feed of material thereto and the delivery of material therefrom. Fig. 3 is a top plan view, partly in section, of my improved drier. Fig. 4 is a diagrammatic perspective view showing the relative position of the plurality of drying disks or shelves which are arranged within the housing of the machine and support the material to be dried. Fig. 5 is a fragmentary elevation of one of the stirrers whereby the material to be dried is agitated and propelled while being dried. Fig. 6 is a cross section of one of the stirrers. Figs. 7 and 8 are fragmentary bottom plan views showing the relative position of the blades on opposite arms of the same stirrers.

Similar letters of reference indicate corresponding parts throughout the several views.

The inclosing casing or housing of my improved drier preferably consists of two upright walls or body sections A, A, a bottom *a* applied to the lower end of the body sections and supported on legs *a*¹ and a top *a*² applied to the upper end of the body sections. The latter are preferably detachably connected with each other on diametrically opposite sides so as to permit one or the other of the same to be removed laterally and afford access to the interior of the drying chamber for inserting or removing parts therefrom without dismembering the entire machine. Within the drying chamber a plurality of horizontal drying disks, floors or shelves B are arranged one above the

other, the lowermost disk resting removably on the bottom of the casing while the upper disks are removably supported upon lugs *b* projecting inwardly from the side wall of the casing. These disks are separated from each other and the uppermost disk is separated from the top of the casing by intervening spaces so as to permit the material which is to be dried to be moved over each disk and also permit withdrawal of the vapors therefrom. The side wall of the casing is preferably made polygonal so as to form an annular series of vertical vapor flues *c* around the several disks. Each of the disks is provided with a central opening *c*¹, the openings of the several disks together forming a central vapor flue. The vapor or moisture laden air from the material being dried passes upwardly through the central and side flues *c*, *c*¹ and are drawn off through a discharge or vapor pipe C by means of a condenser, dry vacuum pump or other exhausting device connected with the vapor pipe.

The material to be dried is supplied from a hopper D and conducted by a trap valve or feeding device upon the upper side of the uppermost disk. This valve, as shown in Figs. 1 and 2, preferably comprises a casing *d* having an inlet *d*¹ at its upper end which communicates with the supply hopper and an outlet *d*² at its lower end which communicates with the upper end of the drying chamber, and a rotary plug E turning in a vertical plane within the valve casing and provided in its periphery with a plurality of pockets or buckets *e* each of which is successively brought into register with the inlet and outlet of the valve casing. As each pocket is presented to the inlet of the valve casing the same is filled with the material to be dried from the hopper and after moving downwardly into register with the discharge of the valve casing, the material in the respective pocket drops out of the same and on top of the uppermost drying disk. The plug E is rotated continuously by any suitable means applied to the spindle or shaft *f* of the same. Between the inlet and outlet of the supply valve its casing is provided with a plurality of small vent openings *g* which open into a nipple G connected with a vacuum pump or other exhausting device, whereby any vapor or air contained in the pockets of the valve plug upon passing the vent openings is with-

drawn therefrom and thus reduces the amount of work necessary for drying the material within the drying chamber. After the material to be dried is deposited upon the uppermost drying disk it is carried concentrically over the same until it reaches an opening h formed in the uppermost disk in advance of the position where the material is dropped upon the uppermost disk by the supply valve, which opening is preferably arranged three quarters of the way around from the supply valve. As the material drops through the delivery opening h of the upper disk it falls upon the second disk below the same and then is carried three quarters of a circle around on the latter and then drops through an opening h formed in the last mentioned or second disk and is received on the upper side of the third disk. The material is then carried in like manner around the third disk until it reaches a delivery opening h in the same, this operation being repeated for each drying disk, the delivery openings of the several disks being arranged out of register and on a spiral line relatively to each other. By this means the material is successively carried nearly over the entire area of each drying disk whereby the material is compelled to travel a path of considerable length through the machine during which time it is thoroughly dried. Upon reaching the discharge opening of the lowermost disk the dried material drops through the opening h of the same into a delivery spout I and is discharged from the latter by a trap delivery device or valve which may be constructed the same as the supply or feed valve shown in Fig. 2, so as to permit the escape of the dried material but prevent the entrance of the external atmosphere into the drying chamber at this point. As the material to be dried is carried around each disk the same is confined thereon and prevented from escaping over the inner and outer edges thereof by means of annular upright guard flanges or walls j, j^1 arranged at the inner and outer edges of each disk.

The material may be propelled over the disks and turned, tumbled or agitated at the same time by any suitable means but preferably by the means shown in the drawings which comprise an upright propeller or stirrer shaft K arranged centrally within the drying chamber and journaled at its upper and lower ends in bearings k, k^1 on the top and bottom of the casing, a plurality of pairs of radial arms L, L secured to the stirrer shaft, the members of each pair projecting in opposite directions from said shaft into the space above one of the drying disks, and a plurality of blades, teeth, paddles or projections M depending from the underside of each stirrer arm toward the upper side of the drying disk below the same. As the stirrer shaft rotates the blades of the sev-

eral stirrers move the material concentrically on the several disks from the receiving points to the delivery points thereof and at the same time agitate or stir up the material so as to expose all parts thereof to the drying action and facilitate evaporation of the moisture therein. This agitation of the material is further increased by making the blades flat sided and arranging the flat sides at an angle to the line of travel, the blades being preferably adjustable for changing the angular position thereof by providing each blade with a shank m which is rotatable in its respective stirrer arm and secured in place by a jam nut n . The blades on one stirrer arm are preferably so arranged that they travel between the paths of the blades on the other arm of the same stirrer so as to insure reaching all parts of the material to be dried. The blades on one arm of each stirrer are also arranged to trend in one direction while those of the companion arm trend in the opposite direction, as shown in Figs. 7 and 8, thereby causing the blades in moving concentrically around the disk to deflect the material radially inward and outward successively, thereby increasing the effectiveness of the stirrer and expediting the drying operation.

The stirrer shaft may be driven in any suitable manner, the means for this purpose shown in the drawings consisting of a horizontal driving shaft O journaled in bearings on the top of the casing and provided at one end with a bevel pinion o^1 which meshes with a bevel gear wheel o^2 on the upper end of the stirrer shaft and a driving pulley P arranged at the other end of the driving shaft.

For the purpose of facilitating the drying of the material each of the disks is made hollow so as to form a heating jacket or chamber Q^1 the interior of which is supplied with a heating medium such as steam, hot water or hot air. This heating medium is introduced into the interior or heating chambers of the disks on one side of the openings h therein by means of branch supply pipes q extending through the adjacent part of the casing side wall and stuffing boxes q^1 on the outer side of the casing. The spent heating medium is delivered from the heating space of the disks by means of delivery branch pipes r extending through the adjacent part of the casing side wall and stuffing boxes r^1 thereon. By this means the heating medium after entering the interior of a disk is compelled to take the longest course before escaping therefrom. The several branch pipes supplying the heating medium may be connected by any suitable means with the source of heat supply but preferably by dividing these branch pipes into two groups and connecting each of these groups by a manifold Q. The several delivery branch

pipes *r* are in like manner divided into two groups and each group connected by a discharge manifold *R*.

5 This machine is provided with the usual devices or attachments common to this type of a machine such as the vacuum gage *s* which in this case is arranged in the top of the casing.

I claim as my invention:

10 A drier comprising a casing, a plurality of superposed shelves arranged in said casing and each provided with a heating chamber, and an opening arranged vertically out of line with the opening in an adjacent shelf,

a live heating medium supply manifold conduit for a heating agent arranged outside of the casing and connected with each chamber on one side of the opening of the respective shelf, and a spent heating medium outlet manifold conduit also arranged outside of the casing and connected with each chamber on the opposite side of said opening. 15 20

Witness my hand this 28th day of August, 1909.

OLIVER S. SLEEPER.

Witnesses:

H. D. MILES,
P. J. KRENTZ.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
