(No Model.)

E. REYNOLDS.

DRIER.

No. 463,920. Patented Nov. 24, 1891.

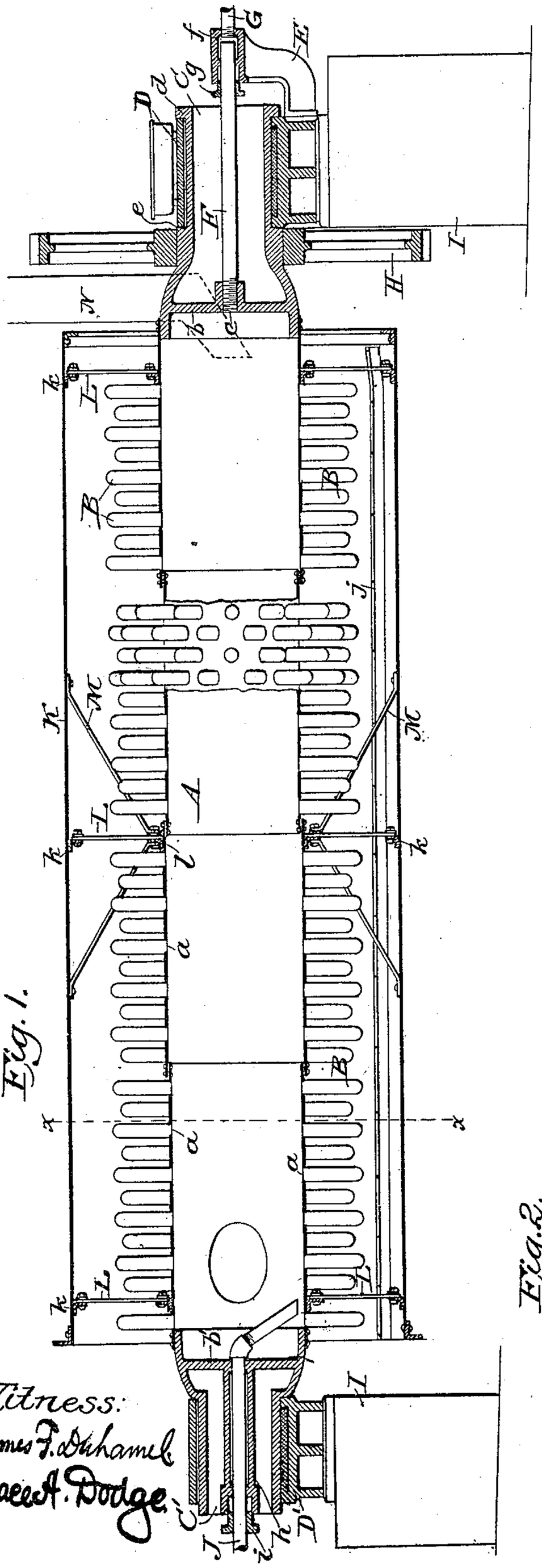

Fig. 1.

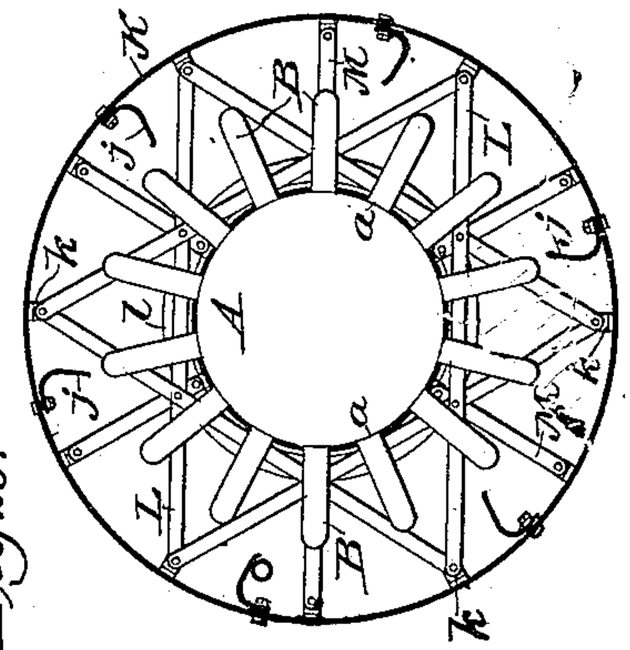

Fig. 2.

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UNITED STATES PATENT OFFICE.

EDWIN REYNOLDS, OF MILWAUKEE, WISCONSIN.

DRIER.

SPECIFICATION forming part of Letters Patent No. 463,920, dated November 24, 1891.

Application filed May 19, 1891. Serial No. 393,287. (No model.)

To all whom it may concern:

Be it known that I, EDWIN REYNOLDS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Driers, of which the following is a specification.

My invention relates to driers, and has reference more particularly to that class of driers in which the interior of the rotating cylinder or cylinders is heated by means of steam, though the invention is applicable to driers in which other heating agents are employed.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view through my improved drier, a portion of one of the cylinders being shown in side elevation; and Fig. 2, a vertical transverse sectional view on the line *x x* of Fig. 1.

A indicates the inner shell or cylinder of my drier, which is made up of such a number of sections riveted together as are necessary to give the desired length to the cylinder. This shell or cylinder A is provided with a series of openings *a*, into which are fitted the open inner ends of tubes B, which latter are closed at their outer ends, as clearly shown in both figures of the drawings.

At the receiving end of the machine the shell or cylinder A is attached to a large cast-iron hollow trunnion C, which is adapted to turn or rotate in a suitable journal box or bearing D, as clearly shown in Fig. 1. It will be noticed upon reference to this figure that the trunnion or journal C is made hollow, and while open at its outer end is closed at its inner end by a web *b*, which has a centrally located and threaded opening *c* in line with the axis of the shell or cylinder A. The trunnion or journal C is further provided at its outer end with a circumferential flange *d*, and at a point midway between its ends is a similar flange *e*, which, in conjunction with the journal box or bearing, effectually prevent any movement of the cylinder.

Projecting from the side of the journal box or bearing is an arm or bracket E, which extends upwardly in line with the axis of the shell or cylinder A, where it is provided with a chamber *f*, as clearly shown in Fig. 1. A pipe F, screwing at its inner end into the threaded opening *c* of the web *b* of trunnion C, is supported at its outer end by the bracket E, into the chamber *f* of which the said outer end of the pipe projects. A fixed steam-inlet pipe G screws into the opposite end of the chamber *f*, formed in the bracket E, and is adapted to deliver steam into the chamber *f*, from which the steam finds its way into the outer end of the pipe F. A packing-gland *g*, applied to the inner face of the bracket, effectually prevents the escape of steam from around the pipe F.

H indicates a gear-wheel, which is keyed or otherwise rigidly affixed to the journal or trunnion C just inside of the inner face of the box or bearing D, as shown in Fig. 1, said gear being adapted to receive motion from any suitable source of power, which I have not deemed it necessary to illustrate.

At the opposite end the shell or cylinder A is provided with a hollow trunnion or journal C′, which is adapted to work in a journal box or bearing D′, which, like the journal box or bearing D, is mounted upon suitable supports I, which are so arranged as to give the proper inclination to the drying-cylinders. This trunnion or journal is also hollow, and is provided with flange or shoulder *e′* to prevent endwise movement. In addition to the central perforated web *b′* this trunnion or journal is provided with a sleeve *h*, through which passes the outlet-pipe J, which, as shown in Fig. 1, has its inner end bent downwardly toward the inner face of the shell of cylinder A. This pipe J is, like the pipe G, firmly fixed in position, and to prevent the escape of steam through the hollow sleeve *h*, I provide the latter with a packing-gland *i*, as shown in Fig. 1.

Encircling the shell or cylinder A, but separated a distance therefrom, is a second shell or cylinder K, which is provided on its inner face with a series of curved blades or buckets *j*, which take hold of the material and raise it up and discharge it onto the top of the internal shell or cylinder A.

In order to keep the shells A and K the proper distance apart and to firmly unite them one to the other, so that they shall rotate in unison, I employ a series of braces or bars L, which are secured at opposite ends to flanged irons *k*, secured to the inner face of the outer shell or casing K. Upon reference

to Fig. 2 it will be observed that these bars are arranged in groups of six, so as to form star-shaped frames, the sides of which shall be approximately tangential to the inner shell or cylinder A. Upon reference to Fig. 1 it will be observed that there are shown only three series or sets of braces L; but it is obvious that a greater or less number of sets of bars may be employed as occasion may require. While the bars L are tangential, approximately, to the inner shell or cylinder A, they are arranged in contact with the side of an angle-iron *l*, secured to the periphery of the shell or cylinder A, and made in the form of a ring or band. The bars L are bolted or riveted to the circumferential flange of the band *l*, and thereby maintain the two shells at the proper distance apart. A series of bars or braces M extend from the inner face of the shell or cylinder K inwardly toward each other, where they are united to the circumferential flange of the band applied to the cylinder about its mid-length. These braces are also bolted to the bars L.

N indicates the inlet or feed spout of the machine, which projects into the upper open end of the cylinder K and delivers the material into the annular space between the shells or cylinders. The material fed into the machine will, owing to the inclination of the machine, travel from the upper to the lower end of the same, and as the shell or cylinders are turned or rotated the blades lift the material up and throw it onto the upper revolving face of the internal shell or cylinder A, thereby thoroughly breaking up particles, in order that the material may be thoroughly and effectually dried.

By the use of a series of radial tubes B, I obviate an objection which has been seriously urged against that class of machines in which a series of longitudinal steam-pipes is employed, for it is apparent that the expansion of the internal shell or casing in the present machine will not loosen the joints and permit the escape of steam from the said radial tubes.

Another great advantage in my construction lies in the fact that I am enabled to make the trunnions or journals of unusually large size, thereby distributing the wear over a large surface and lessening the liability of cutting out, as frequently happens in those driers in which the journal is made comparatively small. Furthermore, by making the journal open at its outer end there is less liability of its heating than there would be if it were made steam-tight and adapted to serve, also, the purpose of a steam-conveying pipe.

It will be observed, upon reference to Fig. 1, that there is no strain upon the steam-pipe F, and that, owing to the fact that there is only a small portion of the pipe which is subject to frictional contact, the liability of wear and leakage or escape of steam is materially avoided. The steam-discharge pipe has also a very small amount of its surface exposed to wear, and as there is no strain upon said pipe, except that due to its own weight, it will be seen that little or no wear will take place and that leakage or escape of steam is also prevented at the discharge end of the pipe.

While I have shown and described the shells A and K as being perfect cylinders, it is apparent that they may be made polygonal in cross-section without departing from the spirit of my invention; but the plan shown and described is preferred, because it is considerably less expensive than that suggested.

Having thus described my invention, what I claim is—

1. In a drier, the combination of an external shell, an internal shell, and the star-shaped frames composed of the bars L, connected at their ends with the external cylinder and at a point between their ends with the internal cylinder.

2. In a drier, the combination of an external shell, the star-shaped frames composed of the bars L, connected at their ends with the external shell and at a point between their ends with the internal shell, and the diagonal braces M, extending lengthwise of the machine and connecting the inner and outer shells.

In witness whereof I hereunto set my hand in the presence of two witnesses.

EDWIN REYNOLDS.

Witnesses:
F. A. LARKIN,
THEO. A. SCHROEDER.