

P. L. SIMPSON.  
DRIER.

APPLICATION FILED APR. 18, 1904.

2 SHEETS—SHEET 1.

Fig. 1

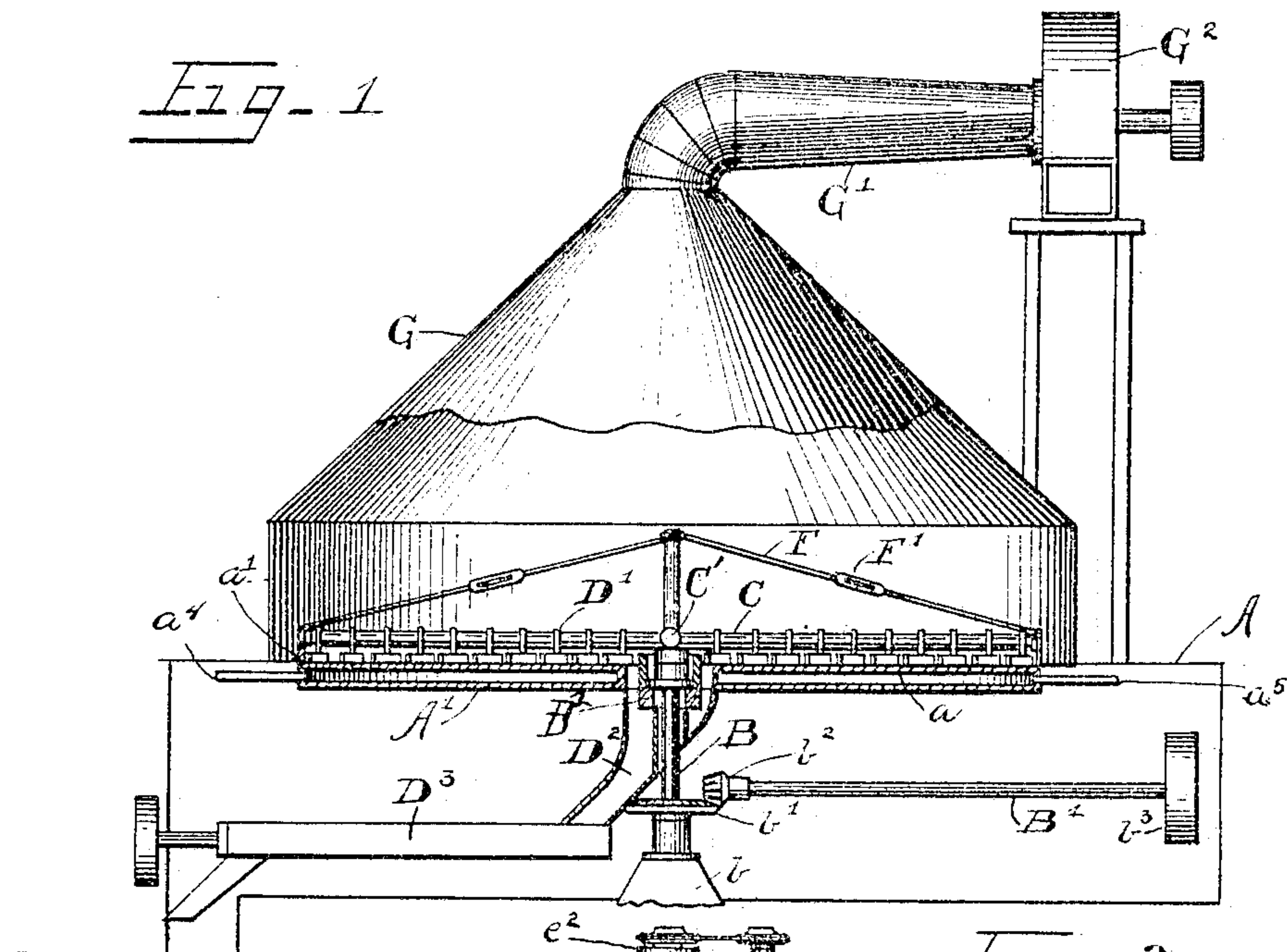
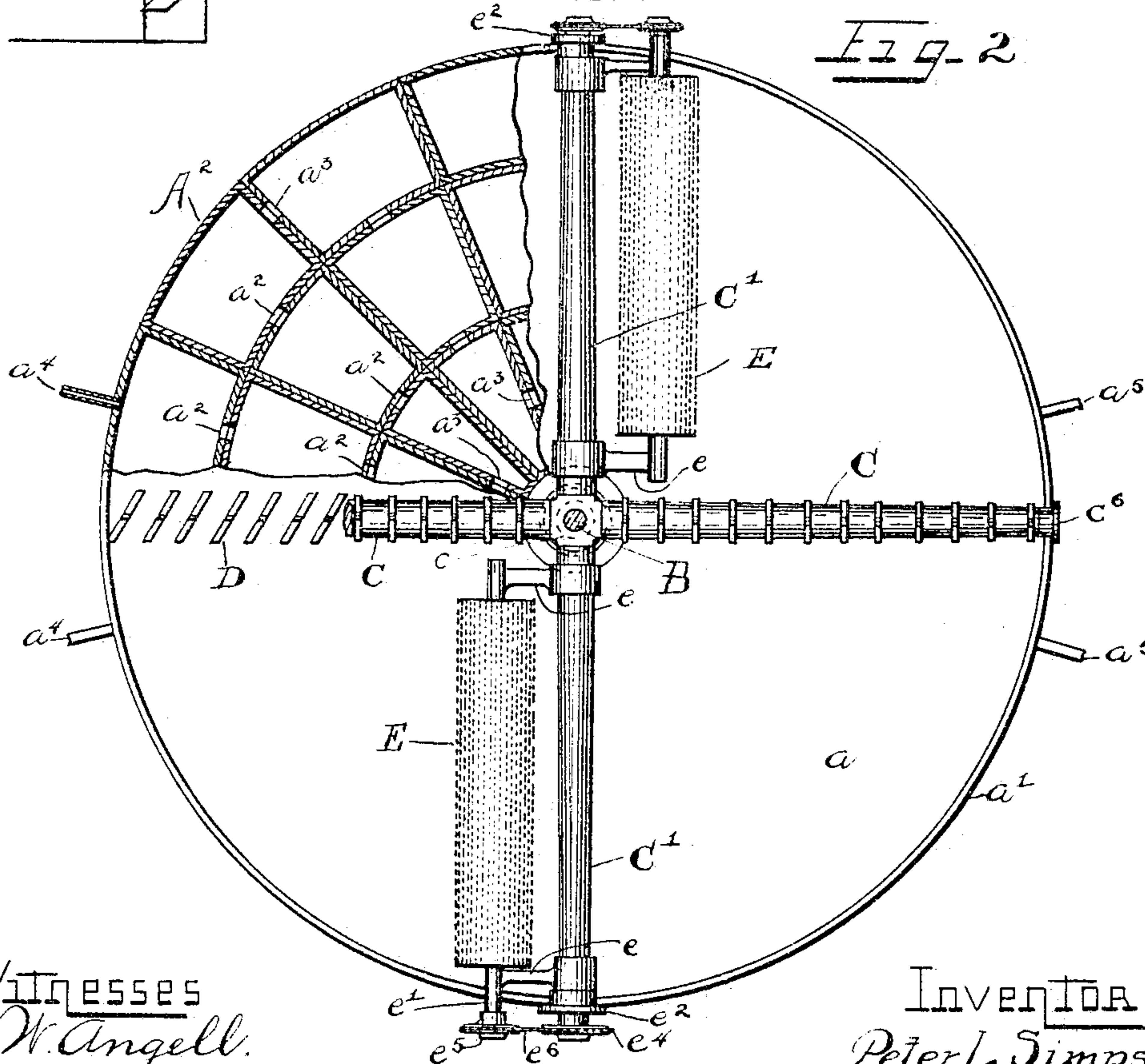


Fig. 2



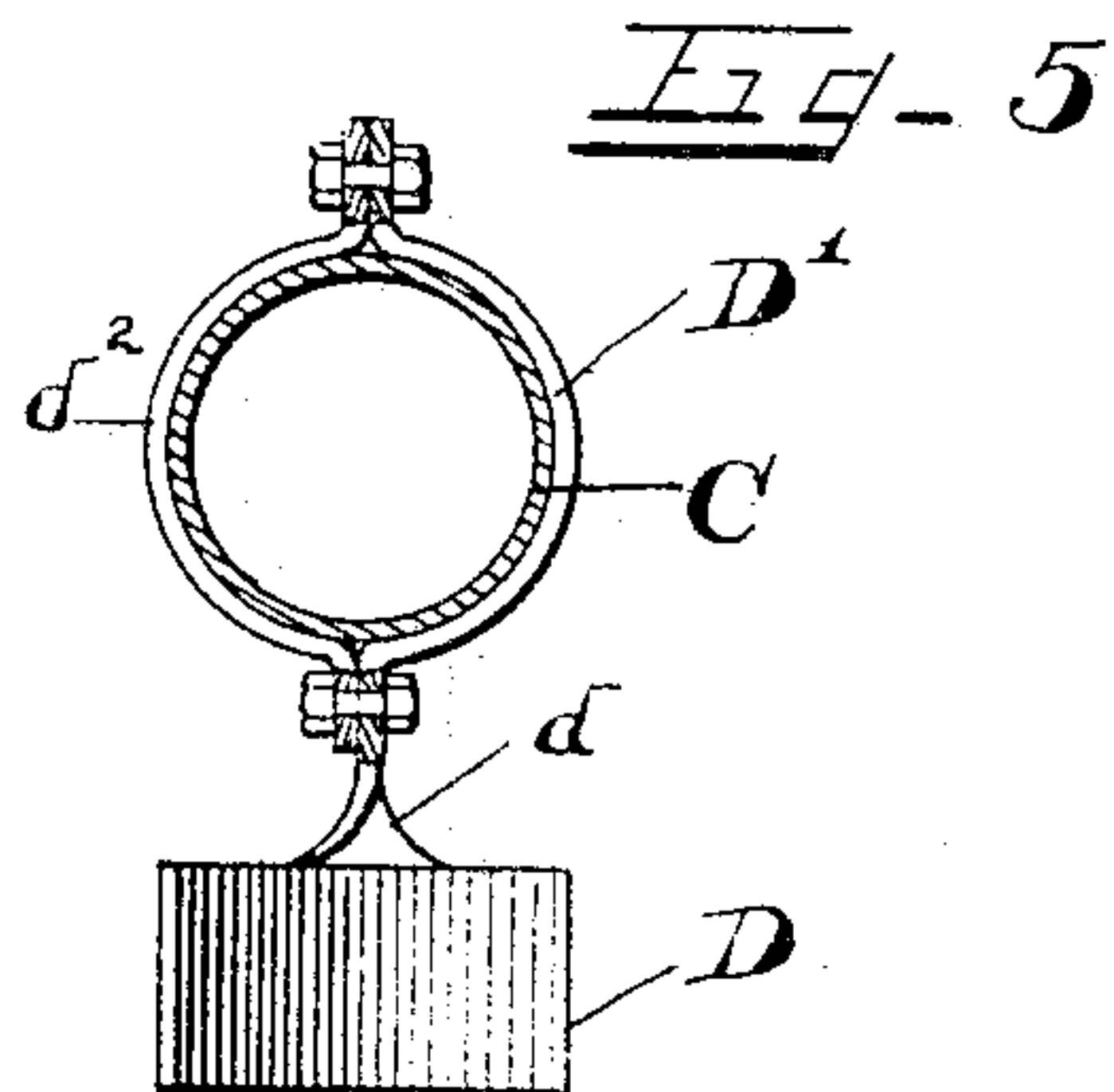
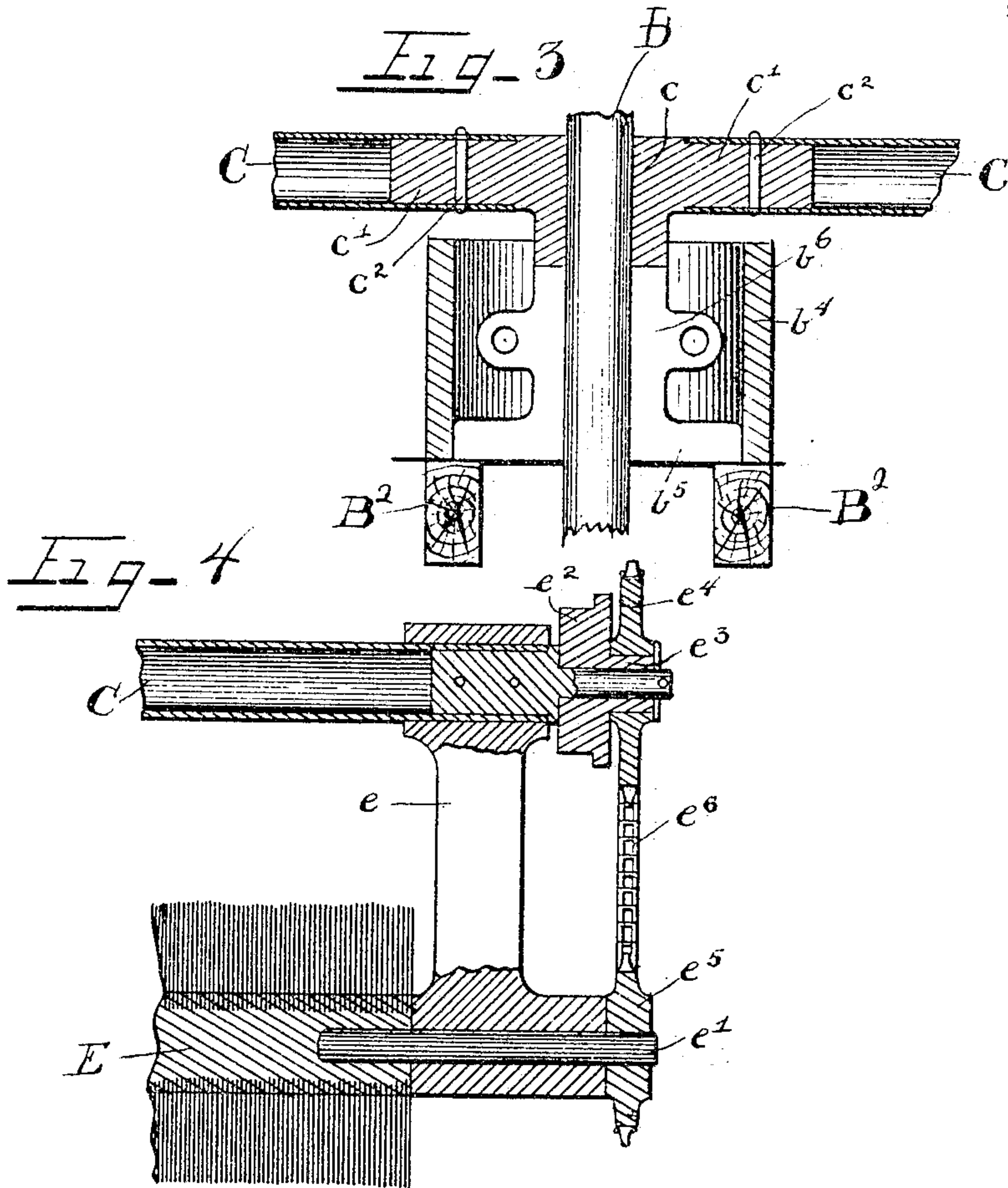
Witnesses  
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2 SHEETS—SHEET 2.



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## UNITED STATES PATENT OFFICE.

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## DRIER.

SPECIFICATION forming part of Letters Patent No. 782,282, dated February 14, 1905.

Application filed April 18, 1904. Serial No. 203,676.

*To all whom it may concern:*

Be it known that I, PETER L. SIMPSON, a citizen of the United States, and a resident of Willoughby, Lake county, 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 same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in driers and mixers, and more particularly to a drier and mixer adapted for use in drying material in a finely-divided or comminuted state—as, for instance, sand or materials which it is desirable to continuously stir or intermix during the drying in order to bring it equally in contact with the drying-surface to insure uniformity in drying.

The object of this invention is to provide a device capable of drying or mixing or both drying and mixing any material or materials in large quantities and at a very rapid rate.

It is also an object of the invention to provide a machine of simple construction and capable of use as a pulverizer as well as a mixer and drier.

The invention consists in the matters hereinafter described, and more fully pointed out and defined in the appended claims.

In the drawings, Figure 1 is a sectional elevation, partly broken, of a device embodying my invention. Fig. 2 is a plan view, partly in horizontal section, of the heating and agitating means. Fig. 3 is an enlarged sectional detail of the upper bearing for the mixer. Fig. 4 is an enlarged horizontal detail of the means for driving the brushes or roller. Fig. 5 is an enlarged transverse section of one of the mixer-arms, showing one of the blades and its attaching means in elevation.

As shown in said drawings, A indicates a raised platform or bed of any desired material and construction, beneath which, as shown, is provided sufficient space for the driving and discharge mechanism and, if preferred, the furnaces, boilers, or other suitable heating means, which for convenience are omitted

from the drawings, but which may be of any kind. Supported in any desired manner to afford a part of the top of said platform or bed is a hollow table or circular drum A' of any heat-conducting material. Said table is provided with a peripheral upwardly-extending flange a', and said table and flange afford a receptacle for the material while being operated upon. Said table is shown as constructed of a plurality of hollow segments A<sup>2</sup>, of cast-iron, tile, or other suitable material, the radial walls of which are shaped to coincide and afford radial vertical webs, through which and through the end walls of adjacent segments apertures are provided for the passage of the hot fluids used for heating purposes. Said hot fluid, if steam or hot water, is admitted through the pipes a<sup>1</sup> a<sup>1</sup>, and through the ports a<sup>2</sup> a<sup>2</sup>. Conveniently the segments may be arranged to provide a partition to divide the drum into non-communicating halves and on either side of which at one end of the partition are said inlet-pipes a<sup>1</sup> a<sup>1</sup>, which are connected with any suitable source of heat-supply, and at the opposite side of the drum, near the other end of said partition, are the outlet-pipes a<sup>3</sup> a<sup>3</sup> to carry off the exhaust. A central discharge-aperture is provided through said table, through which the material is delivered after treatment.

Extending upwardly through the central aperture of the table or drum is the vertical rotative shaft B, which is supported at its lower end on a suitable foundation and bearing b. A beveled gear b' is carried on said shaft and intermeshes with a beveled pinion b<sup>2</sup> on a driving-shaft B', provided with a pulley b<sup>3</sup>, adapted for connection with any suitable source of power. The upper end of said shaft B passes axially through said aperture in the table and is journaled in suitable bearings supported upon horizontal joists or frame members B<sup>2</sup> B<sup>2</sup>, as shown in Fig. 3. Said bearing comprises a casing adapted to rest on said joists B' and having a bottom b<sup>5</sup>, through which said shaft passes and which supports the two-part box b<sup>6</sup>, the upper end of which affords a partial support for the mixing mechanism.



Rigidly secured on the shaft B above the table are the radial arms C C and C' C', which carry the means for agitating and mixing the material while drying. Said arms may be of  
 5 any desired number or construction and may be secured upon the shaft in any desired manner. As shown, however, they are four in number and are arranged at right angles with each other and are metallic and tubular in  
 10 form, and rigidly secured on the shaft is the bearing-head *c*, having radial projections *c'* *c'* thereon, which fit closely and are secured in the ends of said arms by bolts *c<sup>2</sup>* *c<sup>2</sup>*, which pass therethrough. The arms C C are each pro-  
 15 vided at their outer ends with a friction-roller *c<sup>5</sup>* *c<sup>5</sup>*, which track on the flange *a'* and help to support said arms. Arranged obliquely with and spaced equidistantly beneath said arms and extending close to the drying-surface *a*  
 20 of the table are the mixing and conveying blades D D. Said blades are each provided with an upwardly-extending arm *d*, which, with its complemental member *d<sup>2</sup>*, forms an annular clamp D', which serves to hold said  
 25 blades rigidly on the arms. The blade-arms *d* are given a partial turn, so that the blades stand diagonally with the arms C C, the inclination being directed inwardly of the direction of rotation of said arms, so that the material  
 30 is passed inwardly by successive blades from the outer portion of said table to the inner, where it is discharged through the central aperture and delivered into and through the spout D<sup>3</sup> to the conveyer D<sup>3</sup>, which may be of  
 35 any desired construction.

For the purpose of retarding and also more thoroughly stirring the material and allowing all parts of it to come in contact with the heating-surface the arms C' C' are provided at  
 40 each end with a rearwardly-directed bracket *e*, in which cylindrical rotative brushes E E are journaled.

The outer ends of the arms C' C' are provided with flanged rollers *e<sup>2</sup>* *e<sup>2</sup>*, which track on  
 45 the flange *a'* and are provided with an outwardly-extending hub *e<sup>3</sup>*, on which is rigidly engaged a sprocket-wheel *e<sup>4</sup>*. The shaft *e'* of the brush is provided at its outer end with a rigidly-secured sprocket-wheel *e<sup>5</sup>*, which is  
 50 driven from the sprocket *e<sup>4</sup>* by the chain *e<sup>6</sup>*. Said brushes run close to the table, and said sprocket-wheels may be of any desired size relative to each other, so as to revolve the brushes with sufficient velocity as they pass over the  
 55 material to throw it back and spread it on the drying-surface.

Guy-rods F are connected with the upper end of the shaft B and with the outer ends of the radial arms C C' and are provided with  
 60 turnbuckles F' to give them the required tension. Said guys enable the outer ends of the arms to be supported above the flange *a'* when desired.

The table, as shown, is inclosed in a building or hood G, which is shown as conical and

may be of sheet metal or other desired material. Said hood rests on the platform A and entirely incloses the table and mixing and stirring mechanism and is provided in its top with an outlet-pipe G', which is operatively  
 70 connected with the suction-pump G<sup>2</sup> of any desired construction, which acts to draw the moist air from within the hood.

The operation of my device is as follows: When steam or other heat-conveying medium  
 75 enters the table from the inlet-pipes *a<sup>4</sup>*, it traverses each of the compartments of the table, thoroughly heating the same, and during its course through each half of the drum heats the entire surface *a*. The material is placed  
 80 upon the heating-surface at any convenient point near its periphery, and the conveyer-blades move it gradually forwardly and inwardly over the surface, giving it a spiral course from the starting-point until it reaches  
 85 the outlet at the center. The mixer-blades are followed by the rotative brushes, which retard its inward movement by throwing it outwardly and also spread and stir the material, bringing all parts of it in contact with  
 90 the heating-surface. Obviously the speed of rotation of the radial arms C and the drive of the brushes may be readily adjusted (the latter by changing the relative sizes of the sprocket-wheels) with respect to the time re-  
 95 quired for the material to dry, so that by the time it has reached the discharge-aperture it has reached the required state of dryness. Obviously a plurality of such devices may be  
 100 arranged one above another, and many details of construction may be varied without departing from the principles of my invention.

I claim as my invention—

1. In a device of the class described, the combination with a table adapted to be heated of  
 105 a plurality of radial arms rotatively carried above said table, means adapted to rotate said arms, revoluble agitating means journaled longitudinally of said arms and a plurality of  
 110 conveyer-blades adapted to move over the upper surface of said table.

2. In a device of the class described, a table adapted to be heated and to receive thereon material to be treated, means adapted to move  
 115 said material from the periphery centrally of the table and a rotative brush acting to agitate and to retard the central movement of the material.

3. In a device of the class described, a table, means for heating the same, a peripheral  
 120 flange adapted to retain material to be operated upon, rotative brushes adapted to mix said material, a plurality of conveyer-blades adapted to move said material toward the center of the table to operating means acting from the  
 125 center of the table.

4. In a drier, a hollow heating-table provided with an outlet and inlet for a heated fluid and comprising a plurality of communicating,  
 130 radially-disposed compartments, a peripheral



flange on said table, a radial arm journaled to sweep the table, a plurality of conveyer-blades carried on said arm and set obliquely therewith and acting to sweep material toward the center and an exhaust-hood inclosing said table.

5. A drier comprising a circular table having radial compartments therein adapted to be heated, one or more radial arms rotative above the same, a plurality of obliquely-set blades carried on each arm and acting to draw material to be treated from the periphery to a point of discharge at the center of the table.

6. A drier comprising a heating-table, heat-conveying inlet and outlet pipes communicating therewith, rotative arms carried above said table, conveyer-blades thereon adapted to move material centrally of the table and revolving brushes journaled on said arms adapted to mix said material.

7. In a device of the class described, a table adapted to receive material adjacent its periphery, means adapted to move said material circumferentially and centrally thereof, means for heating said material during its travel, rotative brushes extending radially of the table and a discharge adapted to convey the material from the table.

8. In a drier, a table provided with a peripheral flange, heat-containing compartments in the table, a plurality of radial arms carried above said table, a roller on the end of each arm adapted to track on said flange, mixing and conveying means on said table and a conveyer adapted to remove the treated material.

9. A drier comprising a circular table provided with a peripheral flange thereon, heating-compartments in the table, radial arms carried above said table, a roller on the end of each adapted to track on said flange and support the arm, conveyer-blades arranged diagonally with said arms and a clamp engaging about said arms and securing the blades thereon.

10. In a device of the class described, a rotative arm, a track adapted to support said arm in a plane of rotation, a blade arranged diagonally of said arm, an upwardly-extending shank thereon and a complementary part acting with said shank to clasp said blade upon the arm.

11. In a device of the class described, a heating-table comprising a heating-surface, a peripheral flange thereon, a plurality of intercommunicating compartments arranged radially of said table, inlet and outlet ports opening into said compartments and a discharge at the axis of said table.

12. In a device of the class described, the

combination with a circular hollow table adapted to receive material thereon, of a plurality of radial and transverse partitions therein, ports through said partitions, an inlet and an outlet pipe, a peripheral flange on the table, a plurality of arms extending and rotating radially of the table, rollers on their outer ends adapted to engage said flange, means for rotating said arms, a plurality of conveyer-blades extending diagonally of said arms, a cylindrical brush, a hood inclosing said table and a suction-fan connected therewith and discharging the air therefrom.

13. A table for the purpose specified comprising segmental hollow sections joined to afford a flat surface, a marginal flange on the outer side of the outer sections, said sections having a plurality of communicating passages through the walls affording inlet and outlet ports and inlet and outlet pipes opening into and communicating through said sections.

14. In a device of the class described, a centrally-apertured table having a plurality of communicating compartments therein, a peripheral flange thereon forming an upwardly-opening receptacle on the top thereof, a vertical shaft extending upwardly through said table, means adapted to rotate said shaft, a plurality of radial arms rigidly secured on the shaft, friction-rollers thereon adapted to engage on said flange, a plurality of conveyer-blades carried on a part of said arms and rotative brushes carried on the remainder, means adapted to rotate said brushes, a discharge-conveyer, a closed hood and a suction-fan connected therewith.

15. In a device of the class described, a circular heating-table having a central aperture therethrough and adapted to be connected with a source of heat, an upwardly-extending peripheral flange thereon adapted to form a receptacle on the upper side of said table, a rotative shaft extending through said aperture, radial arms rigidly engaged thereon and adapted to track on said flange, a plurality of conveyer-blades on said arms adapted to engage material in said receptacle and move it toward the central aperture, a cylindric brush, means adapted to rotate said brush, a closed hood and means adapted to carry off the moisture from said hood.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

PETER L. SIMPSON.

Witnesses:

W. W. WITHEBURY,  
HJALMAR S. RUDD.