No. 778,063. PATENTED DEC. 20, 1904.

J. J. MURPHY.

DRIER.

APPLICATION FILED APR. 1, 1904.

NO MODEL.

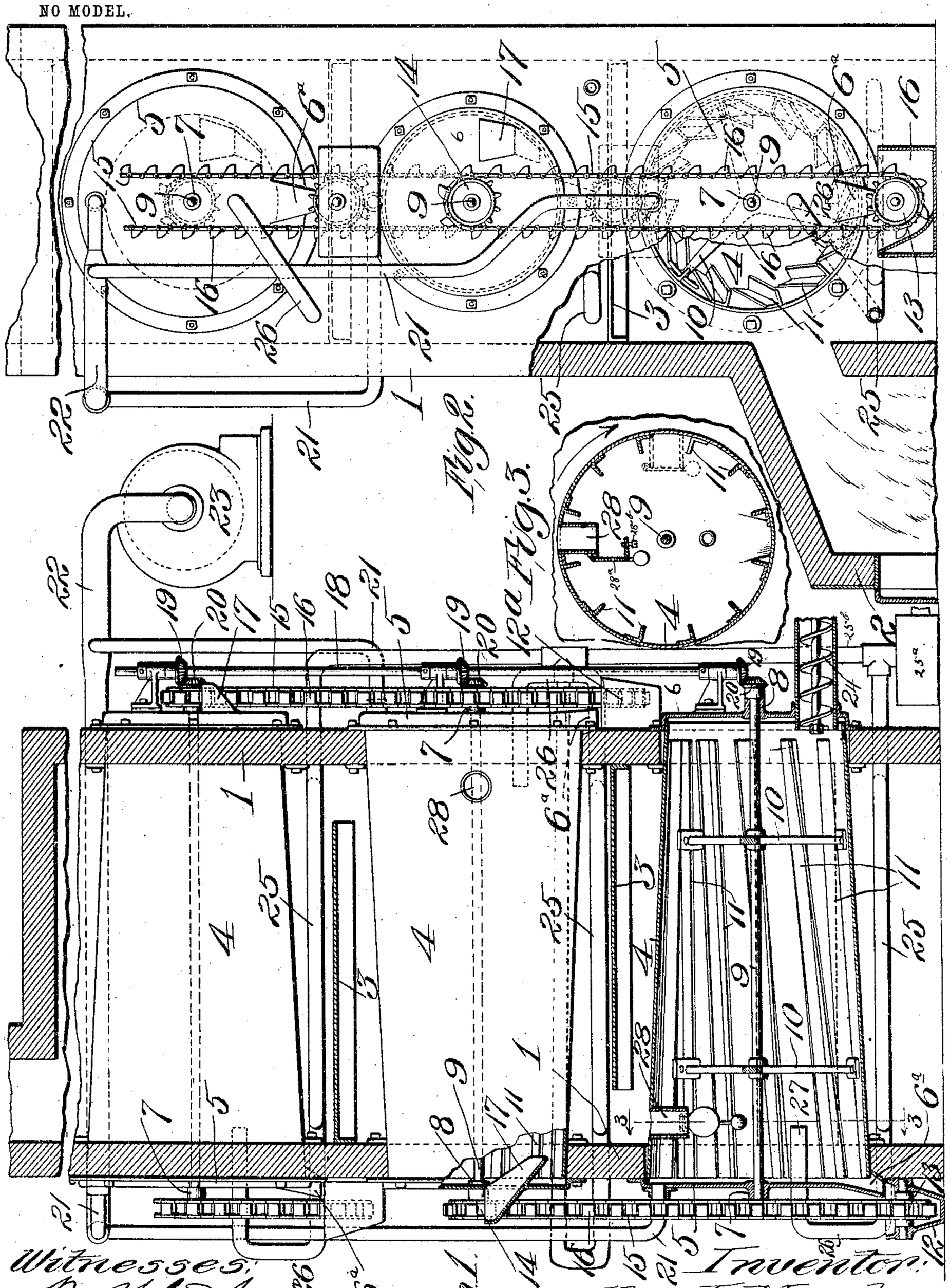

Fig. 2.

Fig. 3.

Fig. 1.

Witnesses:
Wm. H. Scott.
B. F. Funk

Inventor:
John J. Murphy,
by Bakewell & Cornwall
attys

No. 778,063. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

JOHN J. MURPHY, OF VINCENNES, INDIANA.

DRIER.

SPECIFICATION forming part of Letters Patent No. 778,063, dated December 20, 1904.

Application filed April 1, 1904. Serial No. 201,114.

To all whom it may concern:

Be it known that I, JOHN J. MURPHY, a citizen of the United States, residing at Vincennes, Indiana, have invented a certain new and useful Improvement in Driers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional view through a stack or flue in which my invention is applied. Fig. 2 is an end elevational view of the flue or stack, parts being broken away to show the interior construction and a part of the furnace; and Fig. 3 is a cross-sectional view through one of the drums on the line 3 3 of Fig. 1.

This invention relates to driers; and it is primarily intended for use in evaporating moisture from the mash which is the product of breweries and the like after the liquor has been abstracted therefrom. Usually this mash is put in presses and part of the moisture is expressed therefrom; but this pressure not being sufficient to expel all of the moisture it is necessary to subject it to the action of heat; and it is the purpose of this invention to receive the mash direct from the press and after thoroughly drying it to permit it to pass off into a suitable receptacle provided therefor.

This invention is so constructed that it is not only applicable for use in drying the mash, but is also of such construction as to efficiently prepare breakfast-foods in a most hygienic manner.

The invention may also be utilized for drying food for cattle and for other purposes which will be referred to hereinafter.

In the drawings illustrating the preferred embodiment of my invention, 1 designates a stack or flue in communication with a suitable furnace 2. Secured in the stack of flue 1 and attached to the opposite walls of the stack are a plurality of alternately-disposed baffle-plates 3, which are so arranged that the products of combustion passing through the stack from the furnace will pursue a tortuous passage, so as to evenly heat the walls of the cylinders or drums 4, rotatably secured in the stack. These drums or cylinders 4 are arranged intermediate pairs of the baffle-plates, so as to receive an equal distribution of heat over their imperforate walls, and each drum is approximately conical—that is to say, the walls of the respective drums gradually decrease in diameter from one end to the other. The ends of the respective cylinders or drums are closed by caps 5 and 6, respectively. The cap 5, being at the large or discharge end of the cylinder, is provided with a flared-out portion forming a discharge-nozzle 6^a, which empties into a hopper, as will be explained hereinafter. The respective caps are provided with journaled bearings 7 and 8, in which are journaled the shafts 9, fixed to the spiders 10, the arms of which are rigid to the interior of the drums 4, so that the rotation of one of the shafts 9 will impart a corresponding rotation to the drum. The respective caps 5 and 6 are fixed to the walls of the flue or stack by suitable fastening devices, and this flue or stack may consist of masonry or metal, as found convenient. The interior of each drum is provided with a plurality of agitating-ribs 11, which are in the form of angles, as clearly illustrated in Figs. 1 and 3, each angle having a slight longitudinal twist imparted thereto, so as to agitate the material and at the same time have a tendency to force it toward the larger end of the drum, whence it can be discharged through the discharge-nozzle 6^a into a hopper immediately beneath it.

Means are provided for delivering the material into the primary drum and also for delivering the material from the primary drum to a succession of superposed drums of substantially the same construction and which are disposed in the stack. Beneath the nozzle 6^a of the primary drum is a hopper 12, into which the partially-dried material passes from the primary drum. A sprocket 13 is mounted in suitable bearings in the hopper 12 and alines with a similar sprocket 14 on the driving-shaft of a second drum immediately above the primary drum. A sprocket-chain 15, which passes around the sprockets 13 and 14, carries buck-

ets or cups 16, thereby forming a conveyer for lifting the material from the hopper 12 up to a point adjacent the small end of the second drum, whence the material is discharged into a hopper 17, carried by the cap 6 and communicating with the small end of the drum. The opposite or large end of the drum is provided with a cap-plate of approximately the same construction as the cap-plate 5, (illustrated as applied to the primary drum,) said second cap-plate having a discharge-nozzle similar to the one designated as 6^a and discharging into a hopper 12^a, immediately beneath it, a third drum, similar to the ones heretofore described, being arranged in the stack. The same lifting or conveying mechanism can be employed for delivering the material from the hopper 12^a to the small end of the third drum as that described in connection with the hopper 12 and the small end of the second drum, and as this method of conveying the material from drum to drum will be the same throughout it is not deemed necessary to again specifically describe it. Suffice it to say that any number of drums can be employed, which number will be governed with reference to the particular material to be treated and the degree of dryness desired. The respective drums will be simultaneously rotated by suitable mechanism—as, for example, by a line-shaft 18, having miter-gears 19, which mesh with correspondingly-formed miter-gears 20 on the respective shafts 9 of the several drums—and as the conveyers are controlled by the shafts 9 the entire mechanism will be set in operation by the rotation of the shaft 18. In treating certain kinds of material it is essential that the moisture be removed as quickly as possible, and in order to obtain the best results it is desirable to efficiently remove all of the moisture, so as to facilitate the evaporation thereof from the material and leave it in a flaky dry condition. In order that the desired result may be expeditiously attained, I provide separate and independent exhaust-tubes 21, one for each drum, which exhaust-tubes are preferably connected to one of the fixed caps 5 or 6. Each of the exhaust-tubes communicates with a common exhaust-tube 22, in which a suction is formed by a fan 23. (Conventionally shown in Fig. 1.)

When the material is fed into the primary drum by a conveyer—as, for instance, one similar to that illustrated in Fig. 1 and designated by the reference-numeral 24—and all of the parts are set in operation, the products of combustion from the furnace 2 will pass up and around the imperforate drums, heating the walls thereof, so as to generate the moisture in the material being treated to steam or vapor. The suction caused by the fan 23 will exhaust this vapor or steam from the cylinder as fast as it is generated, so that any liability of condensation taking place will be avoided. A particular advantage resulting from the utilization of drums having imperforate walls is that the flames do not come in contact with the material being dried. If a perforate cylinder was employed, the carbon in the products of combustion would intermix with the material being treated and the smoke would cause the material to become stained or colored, thereby materially detracting from the appearance of the product after being finally treated. By having an imperforate drum with means for quickly exhausting the steam or vapor the resultant product is a flaky white substance, which particularly enhances the value of the dried material used as breakfast-food. Under certain conditions I have found it desirable to introduce heated air into the cylinder—that is, to provide a current of air independent of the air heated by the contact with the flame with the walls of the drum. In order to provide this current of heated air, I introduce a coil of pipes, as at 25, immediately beneath each drum, the receiving end of the coil being in communication with the outside atmosphere, or, if desired, a filter-box 25^a can be coupled thereto to filter the air before it enters the drum. Said box 25^a may be arranged to supply air to all of the driers through the pipes 25^b, or a separate box may be employed for each drum, if desired. The discharge end of the coil is bent up, as at 26, so that the nozzle 27 can project through the cap-plate contiguous thereto and discharge the air into the drum. This blast of heated air through the agitated flakes of material will have a tendency to quickly force the moisture therefrom and will materially assist in drying the same. The valve-openings 28, carried by the drum, may be entirely dispensed with, but are found to be convenient when treating the coarser products—as, for instance, food for cattle. However, these openings may be dispensed with in treating the finer grade of material, because the rotation of the cylinder successively opens and closes the valves 28^a by gravitation, as illustrated in Fig. 3, so that the flames may alternately be permitted to enter and be cut off from the cylinder. These valves may be closed against automatic actuation by means of the fastening devices 28^b. The entrance of the products of combustion into the cylinder would be a detriment to the material, as explained heretofore, particularly if the material was of the finer grade used as breakfast-food. For the coarser products, however, as used for cattle-feed, the objection would not be so pertinent. After the material has passed from drum to drum and has reached the last drying-drum it can be discharged through one of the discharge-nozzles 6^a into a chute or conveyer and then be deposited into a suitable receptacle provided therefor.

From the foregoing description, in connection with the drawings, it will be obvious that