No. 653,646. Patented July 10, 1900.

C. ANDERSEN & A. WOOLNER, Jr.

ROTARY DRIER.

(Application filed July 15, 1899.)

(No Model.)

Fig. 1.

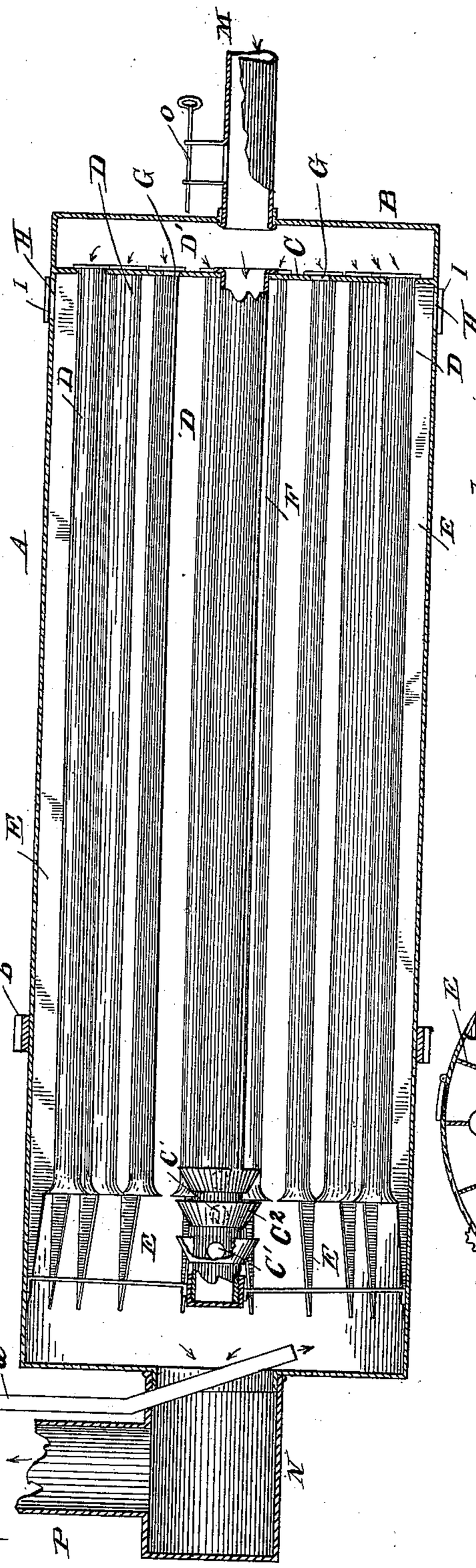


Fig. 2.

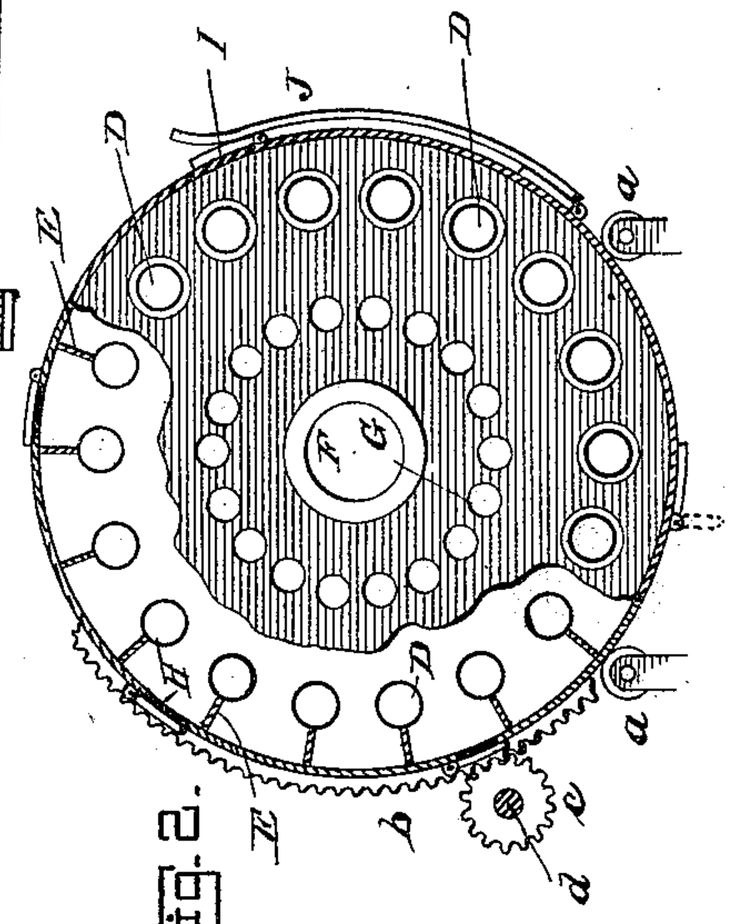


Fig. 3.

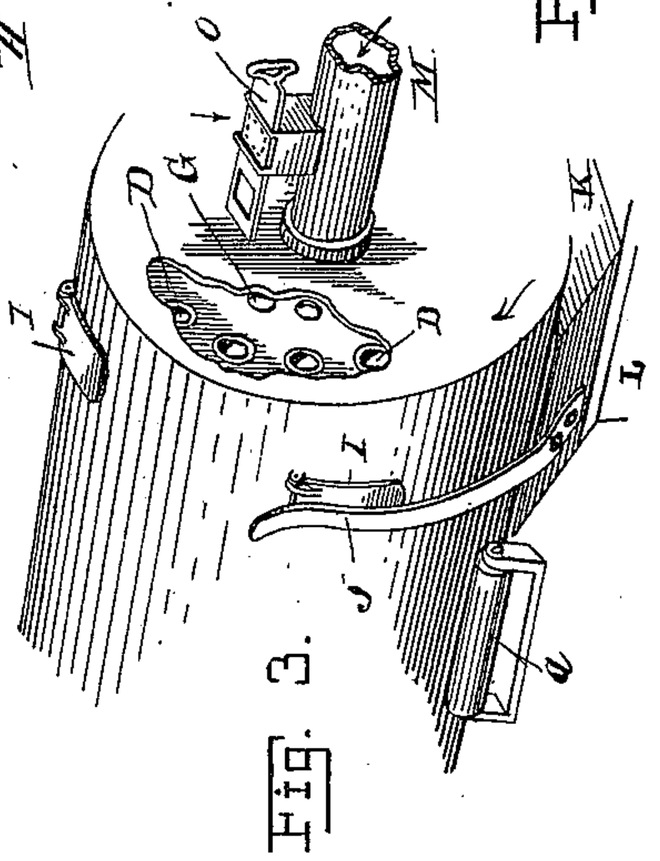
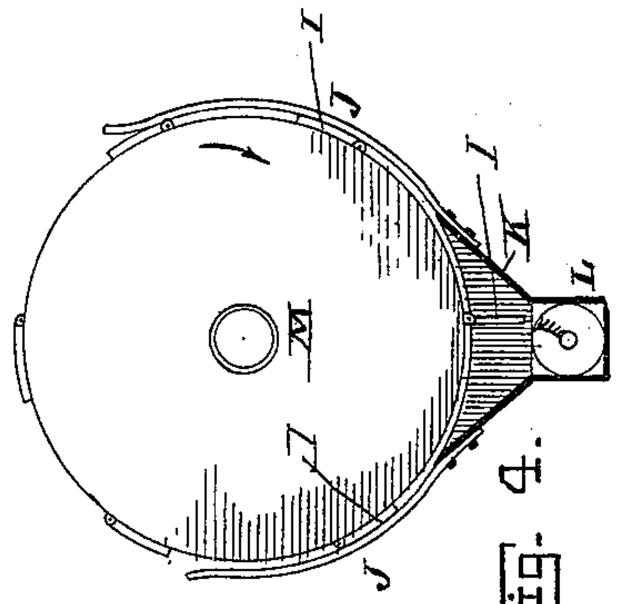


Fig. 4.



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CHRISTIAN ANDERSEN AND ADOLPH WOOLNER, JR., OF PEORIA, ILLINOIS.

ROTARY DRIER.

SPECIFICATION forming part of Letters Patent No. 653,646, dated July 10, 1900.

Application filed July 15, 1899. Serial No. 723,908. (No model.)

To all whom it may concern:

Be it known that we, CHRISTIAN ANDERSEN and ADOLPH WOOLNER, Jr., citizens of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Rotary Driers; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention pertains to that class of devices known as "rotary driers," and more particularly to hot-air driers for use in drying grain and feed.

One object of the invention is to construct a drier of the character described in such a way that the heat necessary for drying the material therein is as near as possible the same temperature in all parts of the interior, so that every portion of the grain or feed is uniformly heated.

A further and important object is to furnish a drier wherein the heat necessary for the drying process is of lower temperature than has been heretofore customary to employ, whereby all danger of burning the grain is avoided.

Furthermore, the object is to provide a drier having a series of receptacles or pockets, each being formed by heated walls into which the product to be dried comes in contact.

Formerly driers by the faulty construction of their interiors were unevenly heated, resulting in imperfectly drying the grain and sometimes scorching it. A low temperature had to be compensated for by raising the heat to a high degree in order to force it to the more remote portions of the drier. When heat is thus employed, the danger of burning the grain is imminent. We have, therefore, devised means whereby a safe degree of heat is used throughout the drier. A further disadvantage in the older forms is the fact that the actual heated surfaces for the grain is so small and of so little use that the high temperature is absolutely necessary to fill the loss of such heated surface. By the usual method the heat is carried as high as 800° or 900° Fahrenheit, while with ours 500° is ample for all work.

The details of construction and general arrangement of our drier may be readily understood by referring to the drawings herewith, in which—

Figure 1 is a longitudinal section of the drier as we prefer to construct it. Fig. 2 is a transverse section thereof, showing part broken away to show interior construction. Fig. 3 is a perspective view of one end of the drier, part being broken away to more clearly show the interior flues and openings. Fig. 4 is an end view of the drier, showing conveyer beneath and guides for keeping the grain-outlets closed.

In the various figures, A is the drier-body, of cylindrical form, closed at both ends and having one end lower than the other, as in common practice. The slant thus given causes the grain to gradually work toward the lowest end, where it finds an exit. The drier is supported on suitable rollers *a*, Figs. 2 and 3, several of which are disposed along the length of the cylinder at each side in order to properly support it. A cogged rack *b* surrounds the cylinder and is engaged and driven by a pinion *c* on the shaft *d*, all of which is old. Obviously motion imparted to the pinion revolves the drier on the rollers. The lowest end of the cylinder is provided with a hood B, which revolves therewith. More properly, it may be said that a secondary head or partition C is set in the cylinder near the end wall, thus forming a recess D'. Through such partition passes a number of flues or hot-air conduits I, as shown in Figs. 1, 2, and 3. The conduits are headed on the outside of the partition within the said recess I' and extend toward the opposite end of the drier, as shown in Fig. 1, and the ends thereof are flared or made bell-mouthed to prevent the entrance of grain thereto.

A partition E entirely fills the space between each flue and the annular wall of the drier, as shown, and the ends thereof near the flared extremities of the flues are extended and tapered to agitate and carry the material. The grain enters the pockets formed by these conduits and partitions and the drying process is materially aided. We know of no such construction in driers as regards the said pockets, and while the art discloses heating-pipes removed from the

drier-walls it also shows fillers which close the space between the said pipes and wall for the purpose of keeping the matter being dried from lodging. In our device we purposely form a pocket which will hold the grain for some time and keep it in contact with heated metal. The device referred to does not. A central heat-conduit F is held in the head C in similar manner to the flues D described. Its free end is closed, but has heat-outlets at C′, the latter being protected by hoods C^2, preventing the passage of the grain to such conduit. Openings G are cut through the head C, as shown in Figs. 2 and 3, for the passage of heat, as will be hereinafter more fully set forth. Openings H in the cylinder, back of the head C, are provided for the exit of the dried material and closed by hinged covers or doors I. These covers would be free to open when moving with the cylinder were it not for the guides J, (shown in Figs. 3 and 4,) which are concentric with the curve of the drier and sufficiently close to the latter to prevent the covers opening. It is only necessary to carry the guides up far enough at each side of the cylinder to meet the covers before they are at liberty to fall open by gravity. It is observed, however, that the guides do not extend below the drier, but terminate at and are secured to the sides of a chute K on the top of the conveyer L. As the cylinder revolves the cover of the exit nearest the conveyer falls after leaving the guide, thereby opening such exit, and the dried grain falls into said conveyer and is carried away.

Since the cylinder cannot revolve, it is evident that the stationary pipe connections must be loose. Consequently the inlet M and the vapor-outlet N are provided with suitable means for permitting free movement without loss of heat through the former. In the said pipe M is a cold-air duct, closed by a slide O, Fig. 3, whereby the temperature of the inflowing air can be regulated. The outlet N has an exit-flue P, which may terminate in a draft-flue, (not shown,) or a fan could be used to aid in drawing off the vapor from the grain and also increase and insure a steady inflow of hot air at the remote portion of the cylinder.

In operation the hot air from a suitable furnace enters through the pipe M to the recess D′, passes through the conduits D and pipe F to the far end of the drier, and simultaneously enters through the openings G in the head C. In so far as we are aware no drier has yet employed an equivalent of the openings G, whereby heat is admitted to both ends of the cylinder at once. Usually the heat is transmitted through suitable pipes—as, for instance, the pipes D—and the end of the cylinder into which the pipes open is overcharged with heat, while the opposite end is left to derive as much heat by radiation and expansion from the charged end as it may. By using the openings G herein described we are able to heat the entire cylinder uniformly, as is evident. However, we may employ the pipes D and the openings G separately, if we so desire, whereby the heat carried to the material being dried may be altered.

An advantage in our construction and one we value very highly is the matter of employing the partitions of flights E between each pipe D and the cylinder-wall forming the pockets described. Mention is again made of this to bring it clearly to mind. It is not absolutely necessary to employ all the partitions, and, in fact, if some are omittted the feed will be more thoroughly mixed and broken.

The several advantages of our drier are evident to those acquainted with such machines.

Evidently other means for controlling the outlet-covers I may be used. The intention is merely to keep the covers closed at all times, except when delivering at the bottom, in order to retain the heat within the cylinder. The hood B has usually been made to remain stationary while the drier revolved; but we find it expedient in constructing the device to have the hood and cylinder constructed so as to revolve together. We also find that the introduction and distribution of heat is more easily and perfectly accomplished by this method. We are aware that the fixed hood has been used on steam-driers; but it has not been employed in hot-air driers, and hence we consider the same new and of advantage when used with driers of the latter class. The center flue F may be dispensed with, if desired, since the flues D and openings G can be made capable of supplying sufficient heat for all purposes. The conduits can also be omitted, merely using the openings G. Good results are to be had by this method, as well as the others. We may otherwise alter the drier without sacrificing the spirit of our invention.

Having described our invention, we claim—

1. The combination with the cylinder A, having closed ends, a partition C near one end to form the recess D′, pipes D opening through said partition, and the central pipe F also opening therethrough, a series of openings G in the partition, the stationary pipe M opening into the recess D′, and an outlet N at the opposite end of the cylinder, all arranged substantially as set forth.

2. In a rotary grain and feed drier, a revoluble cylinder forming the drier-body, a heat-receptacle secured thereto and adapted to revolve therewith, such receiver being partitioned off from the drier-body, a series of apertures through the dividing-partition for the passing of heat into such drier-body, a series of heat-conduits in the body adapted to open at one end into the heat-receiver and at the other into the far end of the drier, substantially as and for the purposes set forth.

3. In a hot-air grain and feed drier, a revo-

luble cylinder, a heat-receptacle secured thereto and separated therefrom by a dividing-wall, a series of horizontal pipes held at one end in the said dividing-wall and opening into the said heat-receptacle, said pipes opening at their other ends into the far end of the cylinder, whereby the heat is conveyed from said heat-receptacle to the remote end of the cylinder for the purposes set forth.

4. In a rotary grain and feed drier, a cylinder, forming the drier-body, a hood revolving therewith, an inlet-pipe adapted to supply heat to such hood, a series of conduits communicating with the hood for conducting heat to the farther end of the drier, openings in the wall of the hood for communicating with the interior of the near end of the cylinder and an exhaust-flue at one end of such cylinder for withdrawing vapor and creating draft all substantially as and for the purposes described.

5. In a rotary grain and feed drier the combination of a cylinder, forming the drier-body, a hood attached thereto and adapted to revolve therewith, an inlet-pipe communicating with the hood, an adjustable cold-air inlet in such pipe, a series of conduits communicating with the hood for supplying heat to the cylinder, partitions between the pipes and the wall of the cylinder to form heating-recesses substantially as described, a central heat-conduit acting in the same capacity as the said flues, a series of openings from said hood to the cylinder for passage of heat into the latter, an outlet communicating with the cylinder for drawing off the vapors and inducing a draft through the drier, a supply-pipe at one end of the drier for introducing grain to the drier and openings in the opposite end for the escape of the grain substantially as set forth and for the purposes described.

6. In a rotary grain and feed drier, the combination of a cylinder, forming the drier-body, a hood attached thereto and adapted to revolve therewith, an inlet-pipe communicating with the hood, an adjustable cold-air-inlet pipe communicating with the hood, an adjustable cold-air inlet in such pipe, a series of conduits communicating with the hood for supplying heat to the cylinder, partitions between the pipes and the wall of the cylinder to form heating-recesses substantially as described, a central heat-conduit acting in the same capacity as the said flues, a series of openings from said hood to the cylinder for passage of heat into the latter, an outlet communicating with the cylinder for drawing off the vapors and inducing a draft through the drier, a supply-pipe at one end of the drier for introducing grain to the drier, openings in the opposite end for the escape of the grain and lids or covers for the said openings adapted to open and close at the bottom of the drier for the purposes set forth and described.

7. In a rotary grain and feed drier a cylinder A, forming the drier-body, a head C located near one end to form a hood B at that end, flues D communicating with such hood for conducting heat to the cylinder, a pipe F also communicating with the hood for the same purpose, openings G in the head C for the passage of heat into the end of the cylinder adjacent to such hood, a hot-air conduit entering the said hood, an outlet-pipe N for withdrawing vapor from the cylinder, an inlet Q for supplying the grain, openings or exits for the grain and automatically-operated covers or lids therefor substantially as and for the purposes specified.

8. In a rotary hot-air grain and feed drier, a revoluble cylinder, a series of heat-conduits arranged concentric with the wall thereof and removed therefrom, and a partition filling the space between each of the said pipes and the said cylinder-wall to form a pocket for receiving and retaining grain to be dried.

9. In a rotary grain and feed drier, comprising a cylinder receiving the grain and feed at one end, of a series of discharge-openings at the extreme end of the drying-cylinder, opposite the receiving end, and an automatically opening and closing lid, or cover for each opening adapted to open at the lowest position and close when leaving that position, substantially as and for the purposes set forth:

10. In a rotary feed-drier a cylinder having a series of grain outlets or exits, covers or lids for the same and guides for keeping the lids closed until they reach the lowest position such lids adapted to be closed after opening and delivery as and for the purposes set forth.

11. In a hot-air grain and feed drier, a drier-chamber to which is secured a heat-receiver, or hood having conduits combined therewith, opening therefrom into the farther end of the drying-chamber and adapted to receive heat from a suitable furnace and distribute it to the said far end of such drying-chamber, and a series of openings in the inner wall of said hood for carrying heat to the inner adjacent portion of said drying-chamber substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

CHRISTIAN ANDERSEN.
ADOLPH WOOLNER, Jr.

Witnesses:
F. T. CAHILL,
JOHN SHAWNAHAN, Jr.