Nov. 8, 1949 R. PLOTNER 2,487,369

DEHYDRATOR

Filed Aug. 30, 1946 2 Sheets-Sheet 1

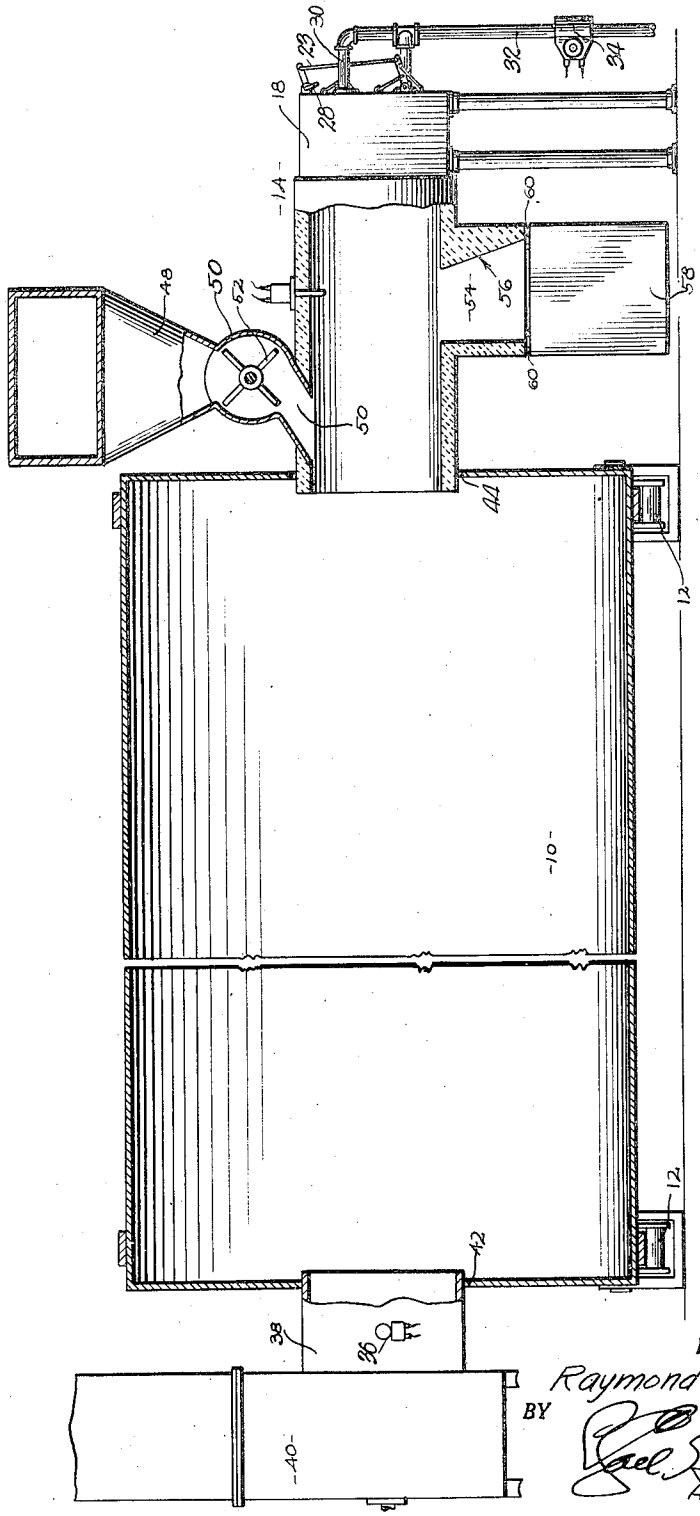

Fig. 1.

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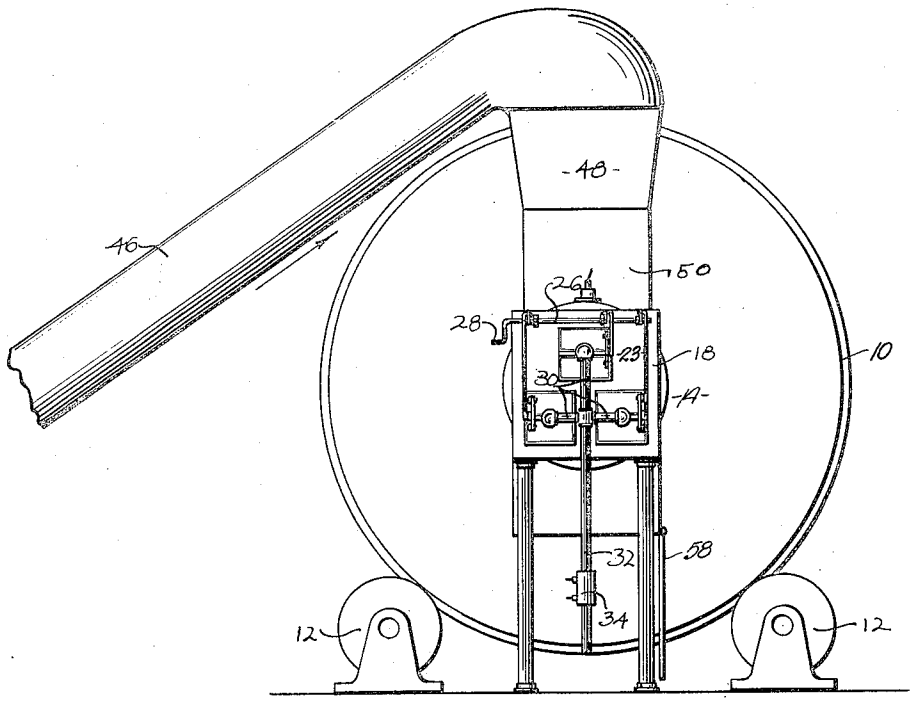

Fig. 2.

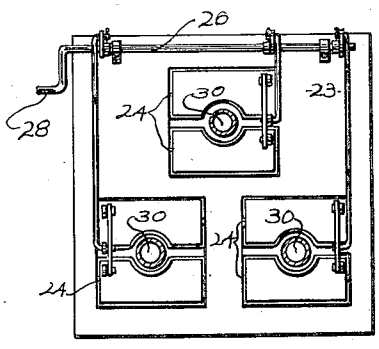

Fig. 3.

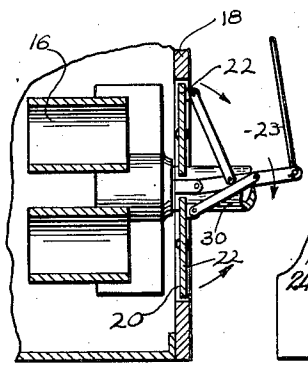

Fig. 5.

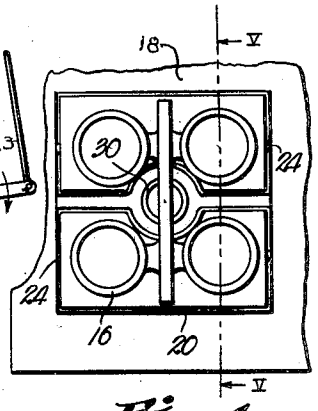

Fig. 4.

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Patented Nov. 8, 1949 2,487,369

UNITED STATES PATENT OFFICE

2,487,369

DEHYDRATOR

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Application August 30, 1946, Serial No. 693,961

1 Claim. (Cl. 263—33)

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This invention relates to dehydrators of the character wherein the product to be freed of moisture is directly associated with products of combustion as the same are drawn through a closed chamber and the primary aim of the invention is to provide such a dehydrator wherein the material feeding an auxiliary air intake port is disposed at points on a furnace immediately adjacent to the rotating drum where the material and said products of combustion are thoroughly intermingled prior to their withdrawal.

One of the important aims of this invention is to provide a dehydrator of the aforementioned character wherein is included a rotatable, hollow drum and a specially designed furnace, the latter being in communication with the drum at its one end and having material feeding means and an air intake port, both of which are so positioned with respect to the burners of the furnace that temperature regulation and rate of material feeding is relatively simple and the throughput per unit of time is increased over that experienced with dehydrators heretofore employed.

Other aims of the invention including the precise disposition of the parts embodying the invention and the manner of operation will appear during the course of the following specification, referring to the accompanying drawings, wherein:

Fig. 1 is a condensed fragmentary longitudinal central sectional view through a dehydrator made in accordance with the present invention.

Fig. 2 is an end elevational view thereof.

Fig. 3 is an enlarged face elevational view of one end of the furnace showing the manner of disposing the several burners.

Fig. 4 is an elevational view of the inner end of one of the burners; and

Fig. 5 is a sectional view taken on line V—V of Fig. 4.

Heretofore dehydrators designed to remove moisture from crops such as alfalfa have had the fuel burners thereof disposed relatively close to the end of the rotating drum and in many instances the burners are directly within the drum at one end thereof, while air in excess of that required to support complete combustion is sometimes drawn into openings in the drum to one or more sides of the burners where the unheated air so introduced, mingles with the material being treated after it has been brought under the influence of the temperature of the products of combustion within the drum.

When dehydrators of the type just mentioned are employed, it is possible to evaporate some

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6,000 pounds of moisture per hour when the regulator at the outlet opening of the drum is set to maintain a temperature within the range of from 1600 to 2,000° F. Through actual commercial practice, the above result of removing some 6,000 pounds of moisture per hour at the temperature specified, has proven to be consistent throughout long runs of several days duration. The throughput, when employing the types of dehydrators where the flame is generated directly in the drum by the burners and where additional air is introduced through openings around or adjacent to the burners, is not even and so far as it has been able to determine, the uneven flow of material through the dehydrators heretofore employed is due at least in part to a "bunching" or "packing" of the material within the drum and a breaking up of this packed material at a point adjacent to the outlet opening where the regulator for the fuel intake is influenced adversely.

To the end that a more even flow of material may be obtained and that the dried substance may have a more uniform consistency, the furnace structure about to be described has been developed and actually employed in the field with advantageous results with particular regard to an even consistent flow of material at a relatively high rate of speed. It is well known in the art that a so-called "Powers" regulator is employed within the outlet duct of such dehydrators as constitute the subject matter of this invention and that this type of regulator controls the flow of gas or other fuel to the burners generating hot products of combustion that are directed into the dehydrating chamber. Heretofore the regulator has been set to maintain a temperature of from 1,800° to 2,000° F. and any higher setting has usually resulted in an objectionable burning of the material. Due to the high speed of the material through the dehydrator made as illustrated in the accompanying drawings, this regulator is set to maintain a temperature at the outlet port of from 2,500° to 2,750° F. Under such setting and with structure about to be specified, the moisture removed from material amounts to at least 11,000 pounds per hour indicating an increase of some 5,000 pounds of moisture per hour with no appreciable increase in fuel consumption, all of which is due to the manner of introducing the material, the way in which air in addition to that in support of combustion is fed into the furnace and then to the dehydrating chamber and the disposition of the burners and furnace of which they form a part.

In the form of the invention chosen for illustration and actually employed in the field, the numeral 10 designates a conventional drum, the length whereof should be approximately 25 feet, while the diameter is 8 feet.

This drum is mounted with its axis in a horizontal position and means for rotating the drum about the axis is provided in the usual fashion. The supporting rollers 12 for drum 10 maintain the same in a position where it will cooperate with the furnace broadly designated by the numeral 14 and having a plurality of burners 16. The burners are positioned some 54 inches from the end of drum 10 and are housed in a case 18 through which air supporting combustion is taken by openings 20, one of which is disposed adjacent to each of said burners 16. Three burners have been employed with success when they are disposed as shown in Figs. 2 and 3 and when such number of burners 16 are used, a common draft actuating apparatus is mounted directly upon case 18. Each opening 20 in case 18 has a pair of valve plates 22 swingably mounted on pintles 24 for movement to and from a closed position to restrict the associated opening 20. The valve plates are interconnected by linkage generally designated by the numeral 24 and this linkage is in turn connected to a common operating shaft 26 having crank 28 thereon through the medium whereof the operator may adjust the valve plates 22 to a position where the desired amount of air is introduced.

Each burner 16 has a fuel supply pipe 30 extending to a common source of fuel by way of conduit 32 wherein a regulating valve 34 is positioned. This regulating valve 34 is electrically connected to the regulator 36 located in pipe 38 forming a part of a blower assembly 40 into which the dehydrated material is drawn by a conventional fan within said blower 40.

The manner of interconnecting regulator 36 and valve 34 is well known in the art and the construction of blower 40 and the manner in which it is joined to an elevated separator is likewise well understood in the art of dehydrating through the employment of apparatus such as that here being described.

Pipe 38 extends through outlet opening 42 formed in one end of drum 10 and furnace 14 extends through inlet opening 44 formed in the opposite end of drum 10.

That portion of furnace 14 between case 18 and drum 10 is lined with refractory material in the nature of fire brick. The inside diameter of this portion of furnace 14 is substantially 25 inches when the inside diameter of drum 10 is approximately 8 feet. The feeding means comprises a conveyor 46, a hopper 48 and a chute 50 communicating with hopper 48 and having a power driven agitator 52 therein to insure an even flow of material from hopper 48 into chute 50. As clearly illustrated in Fig. 1, chute 50 is inclined downwardly and inwardly toward drum 10 and the material passing through chute 50 is emptied into furnace 14 adjacent to its zone of connection with drum 10. The material is introduced as it moves in a direction the same as that being traveled by the products of combustion from the several burners 16. The width of chute 50 is substantially the same as the inside diameter of furnace 14 and, therefore, an even curtain of material is constantly dropped into the furnace as the products of combustion are passing through furnace 14 and into drum 10 under the influence of blower 40.

As above mentioned, outside air in support of combustion is drawn into openings 20 in case 18 and the burners 16 are thereby supplied with enough air and fuel to cause an efficient flame to be produced within furnace 14. The hottest portion of the flame is disposed within drum 10 due to the draft and time required for intermingling and complete combustion to occur.

An air intake port 54 in furnace 14 is positioned diametrically opposite and to one side of chute 50. In other words, the air intake port 54 is in furnace 14 at a point between chute 50 and burners 16. The face 56 of one wall of intake port 54 is inclined upwardly and forwardly from burners 16 to insure that the incoming atmospheric air will not intersect paths of travel of the products of combustion or fuel and intermixed air to such a degree as to deflect the same toward the furnace sides.

A door 58 swings upon hinges 60 and may be moved toward and from the open position shown in Figs. 1 and 2 for the purpose of controlling the volume of fresh air introduced into the furnace through intake port 54. It has been found that this air intake port when disposed as shown and described, permits a more even flow of the material through the drum and thereby allows a faster throughput without burning, yet permitting the employment of the relatively high temperature at regulator 36, all as above set down.

The width of air intake port 54 at its narrowest point is substantially 14 inches and the length of this port is the same as the inside diameter of furnace 14. The length of chute 50 and the length of port 54, therefore, are the same and an even curtain of air is drawn in through port 54 prior to the introduction of an even curtain of material which passes into furnace 14 through inclined chute 50.

A dehydrator constructed as just described is exceptionally easy to operate, will not burn or scorch the material and will remove the desired quantity of moisture from the substance being treated at an exceptionally high rate of speed. A constant inflow of material through chute 50 may be maintained and while door 58 is usually left open to introduce the full amount of air that will pass through port 54, this door may be shifted to alter the volume of air to suit moisture content conditions. The material is struck by the fuel and air as it enters furnace 14, then carried into drum 10 where it is quickly dispersed to remain until the moisture content has been reduced to a point where the specific gravity of the material allows its entrainment in the currents of air passing through outlet pipe 38 to blower 40.

The revolving of drum 10 performs the same function as has heretofore been known in that the heavier particles will ride up along the inner surface of drum 10 and be dropped into the currents of gases until the material reaches a flocculent stage where it is suspended in the currents and withdrawn through pipe 38.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

In a dehydrator of the kind described, a rotatable drum having its axis disposed horizontally and provided with an inlet and an outlet opening through the ends respectively thereof; an elongated tubular furnace having one end thereof extending coaxially into the drum through the inlet opening; fuel burners at the opposite

end of the furnace for creating hot products of combustion in the furnace and disposed to direct said products longitudinally through the furnace for discharge into the drum toward the outlet opening; means for feeding material to be dehydrated into the furnace and toward the drum interior at a point adjacent to its connection with the drum; and an air intake port provided in the furnace wall between the means for feeding material into the furnace and the said burners, said air intake having a length thereof extending radially outwardly from the major axis of the furnace and formed to direct air into the products of combustion in their direction of travel, said air intake having a width in one direction transversely to said axis of the furnace substantially equal to the furnace diameter.

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