

Dec. 25, 1934.

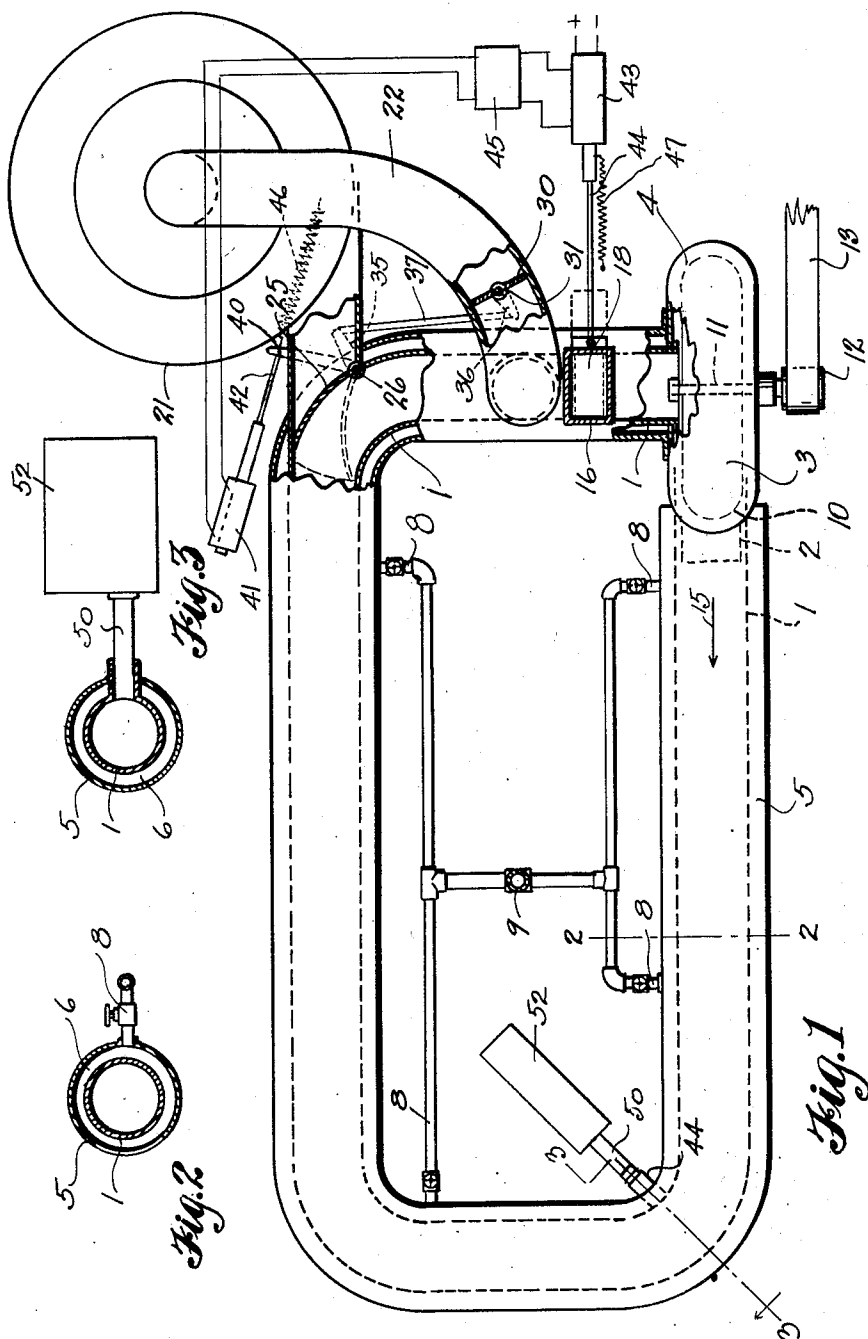
O. P. M. GOSS ET AL

1,985,250

MACHINE FOR DRYING AND POWDERING WOOD WASTE

Filed Dec. 20, 1933

2 Sheets-Sheet 1



OLIVER P. M. GOSS INVENTORS
WORTH C. GOSS
BY
Cook + Robinson
ATTORNEY

Dec. 25, 1934.

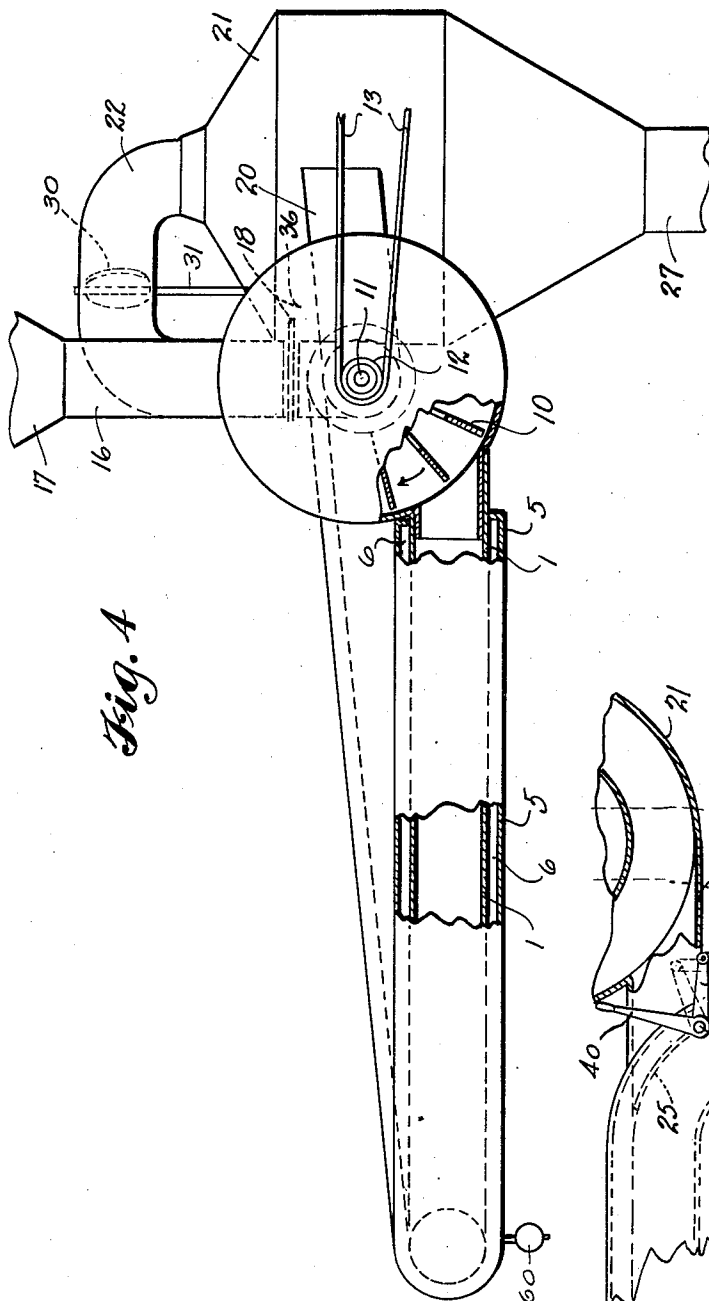
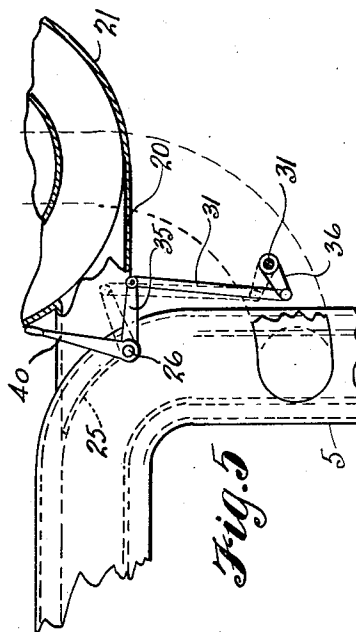
O. P. M. GOSS ET AL

1,985,250

MACHINE FOR DRYING AND POWDERING WOOD WASTE

Filed Dec. 20, 1933

2 Sheets-Sheet 2



INVENTORS
OLIVER P. M. GOSS
WORTH C. GOSS.

BY
Cook + Robinson
ATTORNEY

UNITED STATES PATENT OFFICE

1,985,250

MACHINE FOR DRYING AND POWDERING
WOOD WASTEOliver P. M. Goss and Worth C. Goss, Seattle,
Wash., assignors to Carlisle Lumber Company,
a corporation of Washington

Application December 20, 1933, Serial No. 703,224

4 Claims. (Cl. 34—34)

This invention relates to driers, and more particularly to a means for quick and effectively drying materials such as sawdust, shavings, chips and the like, which may be received therein in a soggy, wet condition and dried to a substantially moisture free condition suitable for the manufacture therefrom of fuel briquets made in accordance with disclosures of our co-pending application filed on July 12, 1933, under Serial No. 680,096.

Explanatory to this invention, it is believed well to mention herein that the present drier has been designed primarily for the drying of sawdust, chips and allied products which may be received from the lumber mill in a soggy, wet condition. The particular use to which the material is to be put requires that it be dried to practically "bone dry" condition in order that when compressed into briquets under a pressure of from fifteen to twenty tons per square inch, the heat of compression will not cause the generation of steam with a resultant disintegration of the briquet, nor will there be any retained moisture that will ultimately result in swelling and cracking of the briquet.

A further requisite to the manufacture of briquets in accordance with the disclosures of the above mentioned application is that there be an appreciable amount of wood powder as a filler for the body of coarser material. To manufacture such briquets on a satisfactory commercial scale requires also that means be provided for an economical and practical drying of many tons of material daily and that the dust or wood powder required be economically produced and also in an absolutely dry condition. Therefore, it has been the object of the present invention to provide a drier capable of quickly and satisfactorily drying sawdust, chips, shavings and like materials, in an economical, expeditious and practical manner; whereby the material is not required to be manually handled while in the drier; whereby the loading of charges into and their discharge from the drier is automatically accomplished; which is simple in its construction and mode of operation and is relatively inexpensive to operate.

It is also an object to provide a drier whereby an appreciable amount of the material will, during and by reason of the drying means, be converted into wood powder of the character required for the making of briquets according to the application mentioned.

More specifically, the present invention resides in the provision of a sawdust drier comprising a continuous, circuitous tube in which a blower is interposed as a means for creating and maintaining a cyclonic circulation of air therein and whereby the wet material delivered into the tube for drying is carried in suspension while being

dried; there also being a casing surrounding the tube throughout its length and forming an enclosing chamber in which high pressure steam is contained to furnish the drying heat. Also, there is means for automatic exhaustion of steam created in the drying tube during the drying out process and for an automatic ejection of the dried material.

Other objects of the invention reside in the details of construction of the various parts; in their combination and in the method followed in carrying out the drying operation as will hereinafter be fully described.

In accomplishing these objects, we have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Fig. 1 is a plan view of a drier embodied by the present invention; certain parts being broken away and in cross section for purpose of better illustration.

Fig. 2 is a cross section through the drying tube on line 2—2 in Fig. 1.

Fig. 3 is a cross section on line 3—3 in Fig. 1 showing the steam relief valve.

Fig. 4 is an elevation of the device.

Fig. 5 is a plan view showing the valve controls.

Referring more in detail to the drawings—

1 designates a tube connected with and extending from the delivery spout 2 of a blower housing 3 and forming a closed tubular passage of considerable extent; the tube being connected with and terminating at the inlet 4 of the blower housing thus, through the blower housing, forming a continuous circuitous passage. This tube 1, in a commercially practical device for the present intended purpose, is from twelve inches to twenty four inches in diameter and from fifty to a hundred feet in length. Surrounding the tube 1, throughout its length, is a tubular casing or jacket 5 forming an encircling chamber 6 about the tube 1 in which high pressure steam is delivered to an extent whereby the temperature within tube 1 is maintained at about two hundred eighty degrees to three hundred degrees Fahrenheit. The steam is admitted into the jacket at selected points through valved connections 8 with a steam supply pipe 9.

Within the blower housing 3 is a fan 10 having a driving shaft 11. The shaft is equipped with a pulley 12 over which a driving belt 13 is extended. The fan, in operation causes the air within the tube to be circulated in the direction of the arrow 15 in Fig. 1 in a cyclonic blast.

Adjacent the inlet side of the blower, a hopper tube 16 opens into pipe 1 for the admittance of sawdust, or other material to be dried, from a hopper 17. A slide valve 18 in tube 16 controls the passage to admit or cut off the flow of ma-

terial into the tube 1. At the outside of the hopper connection 16 is a discharge pipe 20. This is connected with the pipe 1 at an angular bend in the latter which permits the pipe 20 to extend therefrom in the same axial line of pipe 1 leading up to the point of connection. This pipe 20 leads tangentially into the housing 21 of a separating drum which at its top has a tubular connection 22 leading back into the pipe 1 at a point between the hopper connection and the point of connection of pipe 20 and the pipe 1.

At the junction of pipes 1 and 20 is a gate valve 25 fixed on a vertical control shaft 26. This gate valve, when positioned for closing the entrance to pipe 20, forms a smooth wall surface across which the material being dried is passed along the pipe 1 to the blower. When gate 25 is opened for admittance of dried material from pipe 1 to the separator 21, it is positioned across the passage in pipe 1 as seen in dotted lines in Fig. 1, and shuts off flow of material to the blower and causes all air and material to be diverted into the separator 21 wherein the air and material are separated; the dried material dropping through the drier discharge 27 and the air being returned into the pipe 1 through the pipe 22.

Located in pipe 22 is a valve 30 on a supporting and actuating shaft 31. Valve 30 is connected operatively with valve 25 so that the two will operate together and when valve 25 is positioned to close pipe 20, the valve 25 is swung inwardly to close across pipe 1, the valve 30 will be opened. To provide this action, a crank arm 35 is fixed on shaft 26 and an arm 36 is fixed on shaft 31, as seen in Fig. 5. These arms are connected by a link 37 and the arrangement is such that the above mentioned action of valve 30 takes place with the opening and closing of valve 25. Valve 25 in turn is actuated by a lever 40 fixed to shaft 26.

In order that the charging of the system and the exhaustion of dried material therefrom may be fully automatic, we have provided a solenoid 41 for actuating lever 40 through a connecting link 42. Likewise, a solenoid 43 is connected by link 44 with the gate 18 of the feed hopper. A timing device 45, electrically connected with a source of electricity and having circuit connections with the solenoids, is provided for timing the delivery of electric current to the solenoids 41 and 43 and the action is as follows:—When a charge of material has been dried for a predetermined period of time, the solenoid 41 is energized to open valve 25 for discharge of material to the separator. After a definite interval of time during which time charge has been discharged to the separator 21, the current to the solenoid 41 is cut off and the valve 25 is returned to closed position by pull of a spring 46 on lever 40. Then, the timer closes a circuit to solenoid 43 to open slide 18 and admit a charge to the system and when this charge has been admitted, the slide 18 is closed by a spring 47 that is attached under tension to the link 44.

During the drying of the water soaked material in the system, a considerable amount of steam will be created in tube 1 and this must necessarily be exhausted. In this instance the steam is exhausted through an outlet 50 located at the inside of a bend in the pipe 1, as seen in Fig. 1, and leading into a condenser 52 of a character whereby by-products distilled from the material with the steam may be recovered. The condenser is here only diagrammatically illustrated as it forms no particular part of the present in-

vention. Condensed water is drained from the casing 5 through a steam trap 60.

It is to be understood that the blower and separator herein used might be of any other character than those illustrated suitable for this purpose. Also, the arrangement of pipes and valves might be modified without departing from the spirit of the invention.

In using the device, with the blower fan in operation and with the device at proper drying heat obtained by admittance of high pressure steam into jacket 5 from pipe 9, a charge of sawdust, or other material to be dried, is admitted into pipe 1 adjacent the inlet side of blower 1, with the opening of valve 18 in hopper chute 16. This material, as it flows into the tube, is caught up by the cyclonic blast of hot air and is caused to be circulated in the tube. The blast of air carries the particles in suspension and drying is very quickly effected.

It also causes an impingement of the particles with the walls of the tube, with the fan blades and with each other whereby an appreciable amount of flour-like dust will be formed. If necessary, or desirable, pegs, baffles or the like may be introduced in the passage to increase the production of dust by reason of greater amount of impingement. Since the method above mentioned requires to a certain degree a proportioning of dust or powder and coarser material, the proportioning may be obtained by a proper period of drying; it being understood that the longer the material is retained in circulation, the more of it will be converted into dust.

Steam that is created in pipe 1 by the drying operation is exhausted through outlet to the condenser. When the drying period is completed, gate 25 is opened, to dotted line position in Fig. 1, by the action of solenoid 41 and the dry material is discharged into the separator 21. The hot air passes back into the system through pipe 22. When the material has been discharged, the valve 25 is closed, and this also closes valve 30 and circulation is again established entirely through pipe 1.

While we have described the device as a drier, it is operable also as a means of converting materials into charcoal. For this purpose it is only necessary to introduce a satisfactory heating medium, such as super-heated steam, hot fluid or liquid into the jacket to effect the charring of the material to the extent required.

Furthermore, the drier is applicable to the drying of various other materials so long as they can be reduced to a condition permitting it to be carried in suspension in the drying air. Therefore, it is not intended that the claims shall limit the use of the machine to the drying of any particular material.

Having thus described our invention, what we claim as new therein and desire to secure by Letters Patent is—

1. A drier for a finely divided material comprising a continuous passage confining a gaseous drying medium therein to the exclusion of outside air, means for maintaining the gaseous medium in the passage in circulation at a velocity sufficient to carry a material being dried in suspension therein about the passage, means for maintaining the drying medium at a temperature at which moisture derived from the material in the drying operation will be converted to a dry gaseous state, a separator having connections with the passage and means whereby the circulated stream of drying medium may be diverted

through the separator and returned to the passage; thereby to separate the dried material therefrom.

2. In a drier of the character described a continuous, closed passage for a gaseous drying medium, means interposed therein for maintaining the medium in circulation at high velocity, means for heating the medium in the passage to an effective drying temperature, an inlet for material to be dried and an outlet for the discharge of dried material; said passage having an angular bend therein and having an outlet at the inside of the bend for an automatic relief of pressure created in the drying medium.

3. In a drier of the character described, a continuous tubular passage, means for maintaining the air in said passage in circulation at high velocity, a separator for air and dried material, a connecting duct from the passage into the separator, a return air duct from the separator to the tubular passage, valves for controlling flow through the said ducts, a feed hopper opening into

the passage, a valve in said hopper connection, means for synchronously actuating the said valves between open and closed positions and an automatic timing means for controlling the actions of said means.

4. A method of drying a finely divided material comprising; admitting the material to be dried into a continuous passage confining a gaseous drying medium to the exclusion of outside air, applying heat to surfaces directly contacted by the gaseous medium to maintain the latter at a temperature whereby moisture derived from the drying of material therein will be converted to a dry gaseous state and causing the drying medium to be circulated in the passage at such velocity that the heat applied to the said surfaces will be dissipated to the drying medium at a maximum rate and the material being dried will be carried in suspension about the passage with the circulated medium.

OLIVER P. M. GOSS.
WORTH C. GOSS.