

Dec. 7, 1926.

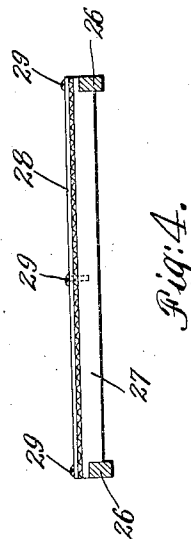
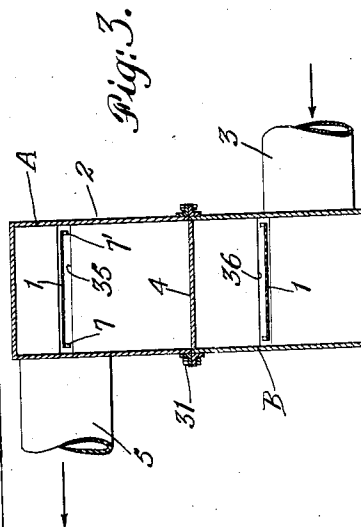
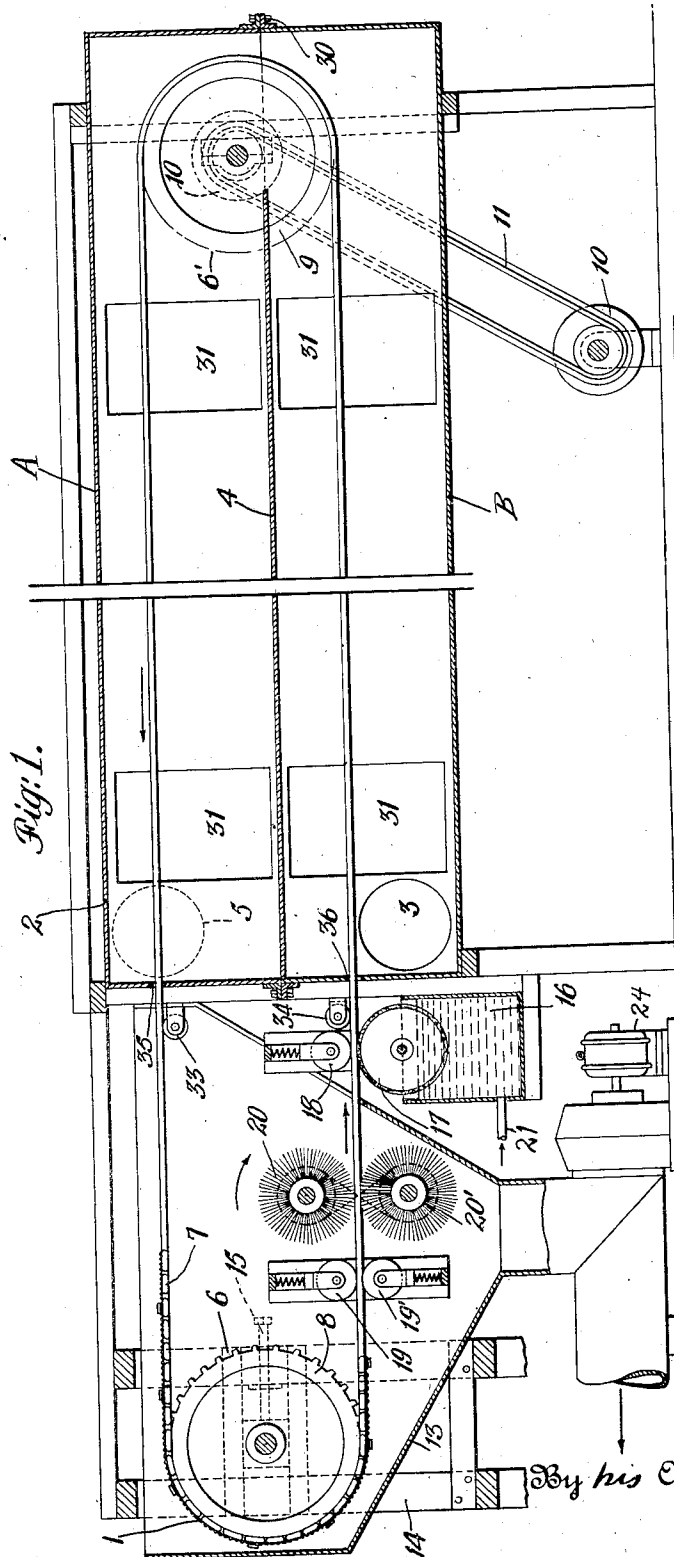
1,609,849

C. L. WAGNER

DRIER

Filed Sept. 18, 1923

2 Sheets-Sheet 1



Inventor
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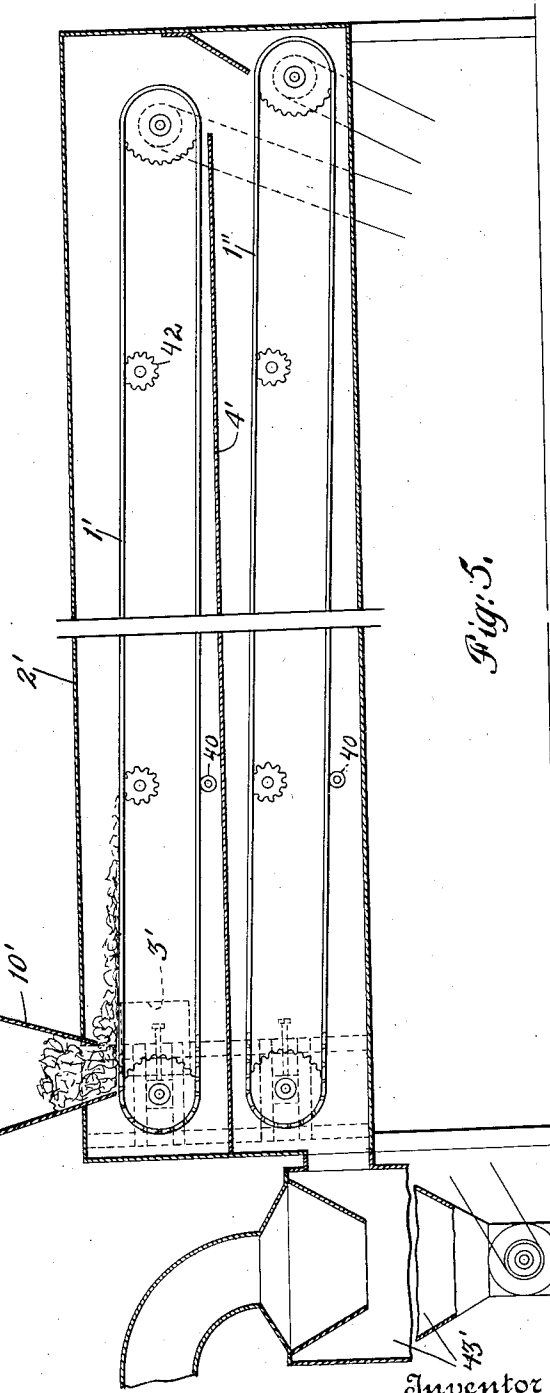
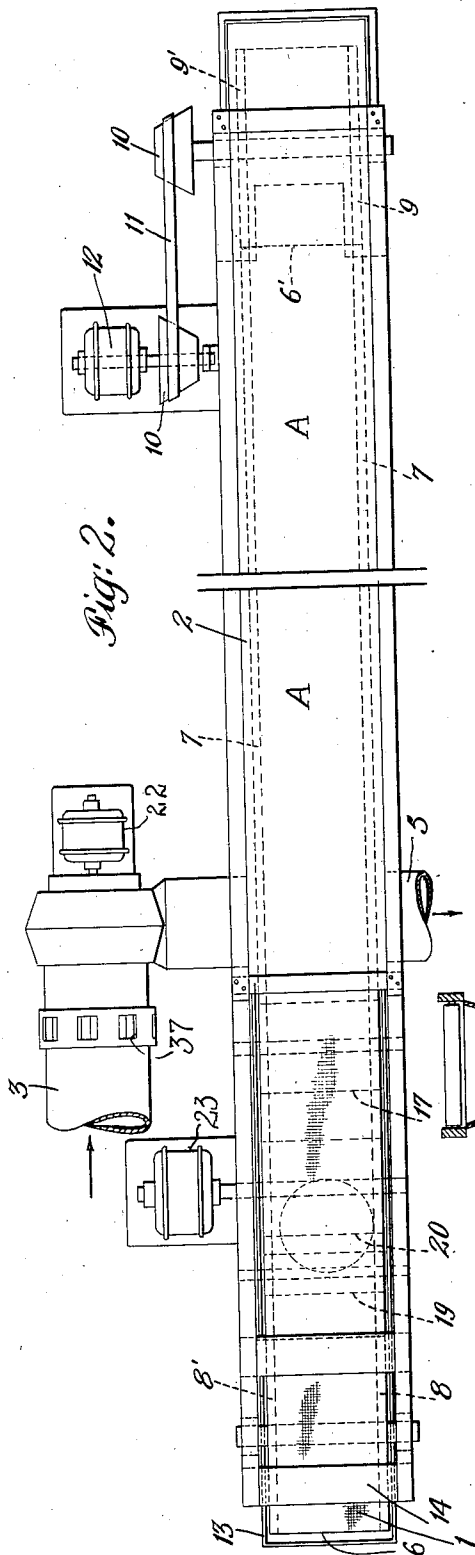
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

CHARLES L. WAGNER, OF BOONTON, NEW JERSEY.

DRIER.

Application filed September 18, 1923. Serial No. 663,395.

This invention relates to an apparatus for drying colloids, viscous liquids or solids having a high moisture content by means of waste heat.

5 Many waste products are available for fuel purposes provided their moisture content can be reduced by some cheap means. Some of such substances, however, have proven difficult to dry, either because of possibility of explosion from dust or because of the nature of the substance or liquid. For instance in sewage disposal, wastes or slimes cannot be handled in the usual rotary drier without concentration. In the case of lignone or wood extracts, under present methods, because of their high moisture content such substances require a considerable amount of heating in order to be dried and such heating increases the danger from explosion. Bagasse which is at present used for fuel upon sugar plantations contains approximately 50% water and necessitates additional fuel. Not only could the use of this additional fuel be avoided but the heat value of the bagasse would be very nearly doubled if the bagasse could be dried. Other substances such as molasses, because of their physical properties are extremely difficult to dry, since a high temperature is required and charring or burning cannot be avoided. In the case of colloids, such as dyewood extracts, chemicals, drug extracts and so forth, numerous difficulties in drying have been encountered and a cheap method of drying is necessary to enable these products as waste products to be made available for use.

One of the objects of this invention is to provide an apparatus that will permit of the drying to any degree of moisture content of colloidal substances, viscous liquids or solids. Another object of this invention is to dry colloidal substances, viscous liquids or solids cheaply by means of waste heat. Still another object of this invention is to dry substances otherwise difficult to bring to friable condition and to eliminate the use of steam or of heated liquids at high pressures and temperatures. Still another object of this invention is to provide means for drying substances that are readily ignitable or explosive without charring or burning or without the danger of explosion. Still other objects of this invention are to provide a simple, flexible apparatus having temperature control that may be cheaply op-

erated and used to dry different substances and which will deliver the dry product in a usable condition.

Referring to the drawings:

Figure 1 is a longitudinal section of a side elevation of a machine embodying the principles of my invention.

Figure 2 is a top view of the machine.

Figure 3 is a cross sectional view of the machine.

Figure 4 is a detail view of the cross rod supporting the screen.

Figure 5 is a longitudinal section of a machine embodying the principles of my invention.

I have found that when a thin layer of any material containing considerable moisture is suddenly submitted to a high temperature for a short time that the moisture produces a cellular or bubbled substance, which holds enough moisture to prevent carbonization or oxidation at that temperature and, then, by the submission of the cellular or bubbled substance to a lower temperature, the thin walls of the cellular or bubbled substance become dried out. In case the material is a solid of crystalline structure and powdered, fusion first takes place and then the bubbling takes place. This physical fact permits of the use of a higher initial temperature than would otherwise be possible and enables materials to be dried that would otherwise char or burn particularly when the treatment occurs in an atmosphere of gases free from oxygen such as breeching or flue gases.

In carrying out my invention, I propose to provide a travelling screen 1 of non-corrosive metal such as Monel metal enclosed through most of its length in a housing 2. Waste heat from the breeching enters the housing 2 at one side, through pipe 3, and passes the length of the housing 2 under baffle 4 and then back over baffle 4 and out pipe 5. The travelling screen 1 is supported and operated by two cylindrical drums 6, 6' having sprocket wheel ends. Two sprocket chains 7, 7' pass over the sprocket wheels 8, 8', 9, 9' and to which the travelling screen 1 is bolted. Cylindrical drum 6' is driven by motor 12 through cones 10 connected by belt 11. Cylindrical drum 6 is enclosed in hopper 13 and supported by shaft and supports 14 having a take up device to permit of a proper tension on the screen. Adjacent one end of the housing 2 is a sup-

ply tank 16, having any well known form of float valve, not shown, to control level of liquid. Within supply tank 16 is a cylindrical roller 17 of felt, bearing against screen 1. The friction of the travelling screen 1 rotates the felt roller to coat the screen. An idle roller 18, spring supported, regulates thickness of the coating. Within hopper 13 are idle rollers 19, 19' bearing and rolling upon screen 1. Beyond rollers 19, 19' are brushes 20, 20', motor driven through belting and gearing. Chains 7, 7' carry lugs 26, to which half round rods 27 are bolted underneath the screen and above which flat rods 28 are likewise bolted by the same bolts 29.

The housing 2, is made in upper and lower sections A and B and bolted together by bolts 30. Doors 31 permit of ready access for cleaning or repairs.

Idle sprocket wheels 33, 34 outside housing 2 take up slack in chains 7, 7' to permit of the chains more readily passing through slots 35, 36 of the housing.

The operation of the device is as follows:

The colloid is fed into supply tank 16 through supply pipe 21 may be controlled by any well known form of float valve. Motors 12, 22, 23 and 24 are started, motor 22 drives a turbine fan which sucks in the hot waste gases from the breaching of the furnace through pipe 3 and delivers it to the lower portion adjacent one end of housing 2. The correct temperature can be maintained by opening or shutting the openings 37 in the pipe 3 to the required amount to let in a supply of cold air.

Motor 12 driving through double cones 10 and belting 11 rotates cylinder 6' which in turn motivates the travelling screen 1. As screen 1 moves it causes felt roller 17 to rotate in the liquid through friction and thereby coating the screen 1. The openings of screen 1, through surface tension retain a thin coating of the liquid placed on screen 1 by roller 17. The coated screen 1 travels in the same direction as the current of heated inert gases and as the initial temperature is high the thin coating dries in the form of a bubbled substance. As the screen 1, moves towards the other end, the gases become cooler during the period after the screen has passed around cylinder 6' and over baffle 4, the gases have completely dried out the bubbles. The substance immediately upon emergence from the housing 2 becomes brittle and as the screen 1 passes over cylinder 6 a great deal of the dried substance breaks off screen 1 and falls into hopper 13. Idle rollers 19, 19' crush the remaining bubbles and brushes 20, 20' remove the remainder of the substance from the screen 1 permitting the dried powdered particles to fall into hopper 13. Motor 24 drives a turbine fan blower to deliver the dried substance to the storage bins.

The waste gases pass out of housing 2 through pipe 5 to the stack.

The apparatus may be arranged in series as shown in the modified form in Figure 5. This form is particularly adapted for the drying of solids. In the modified form within housing 2', I provide two sets of travelling screens 1', 1'', which screens are separated by a baffle wall 4'. The lower travelling screen extends at one end beyond the baffle and beyond the upper screen 1'. The upper travelling screen and the lower travelling screen are parallel but not horizontal and are slightly tilted so that the intake gases which enter through inlet pipe 3' below the top of the upper travelling screen in conjunction with the horizontal baffle forces the gases up through the solid material and the same action takes place on the under side of the baffle with respect to the lower travelling screen. The solid material is fed from hopper 10' and falls upon the upper surface of the upper travelling screen and as the screen is motivated the solid travels with the screen until it reaches the lower drum and the screen passes around it where it falls upon the lower travelling screen guided by baffle 4'. The material then travels with the lower screen to the other end and with heavy materials drops to the bottom of the housing. In order, however, to provide for all forms of solid materials and the proper delivery of the dried product from the housing, I have shown a cyclone collector or turbine suction fan 43'. Where the travelling screens are of any considerable length idle rollers 40 and idle sprockets 42 may be inserted to support the screen and chains.

Of course it is understood that not only can any number of travelling screens be placed one above the other as shown in the modified form to obtain sufficient drying action, but also the apparatus may be multiplied by setting them up in batteries. And the form shown in Figure 1 may be used in connection with the modified form in cases where it is found desirable.

It will thus be seen that I have shown an apparatus for drying colloids, viscous liquids or solids from waste heat in an efficient and economical manner and the products of which can be delivered easily and in usable condition.

I claim:

1. A drier comprising a traveling screen, a controllable means for driving said screen, a housing, said screen operating within said housing, means for covering said screen with a thin layer of material to be dried, means for delivering hot, inert gases upon said screen covered with material adjacent said covering means and means for directing the hot inert gases upon said covering in the direction of travel of said screen within said housing.

2. A drier comprising a traveling screen, controllable means for driving said screen, a housing, said screen operating within said housing, means for covering said screen with a thin layer of material to be dried, means for delivering said gases upon said screen covered with material adjacent said covering means and a baffle extending horizontally substantially the length of the housing to direct the travel of the gases in the direction of travel of said screen.

3. A drier comprising a traveling screen, controllable means for driving said screen, a housing, said screen operating in said housing during the drying of the material, means for covering said screen with a relatively thin layer of material to be dried, means for retaining said coating on said screen, and means for gradually reducing the temperature of the drying medium to the point of emergence of the dried product.

4. A drier comprising a travelling screen, means for motivating said screen, a housing,

said screen operating in said housing, during the drying of the material, means for covering said screen with a thin coating of material to be dried, means for heating the material adjacent the covering means to a high temperature and means for controlling the temperature of the heating medium.

5. A drier comprising a traveling carrier screen for the materials to be dried, means for driving said screen, a housing for said screen, said housing comprising upper and lower sections, doors in said housing for cleaning purposes and a horizontal baffle extending substantially the length of said housing to control the direction of travel of hot inert gases, said baffle extending to the side wall adjacent the entry of said carrier screen and point of immergence of hot gases from a source of supply.

Signed at New York in the county of New York and State of New York this 15 day of September A. D. 1923.

CHARLES L. WAGNER.