

F. J. HULL.
SAND DRIER.
APPLICATION FILED JULY 12, 1910.

1,004,029.

Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.

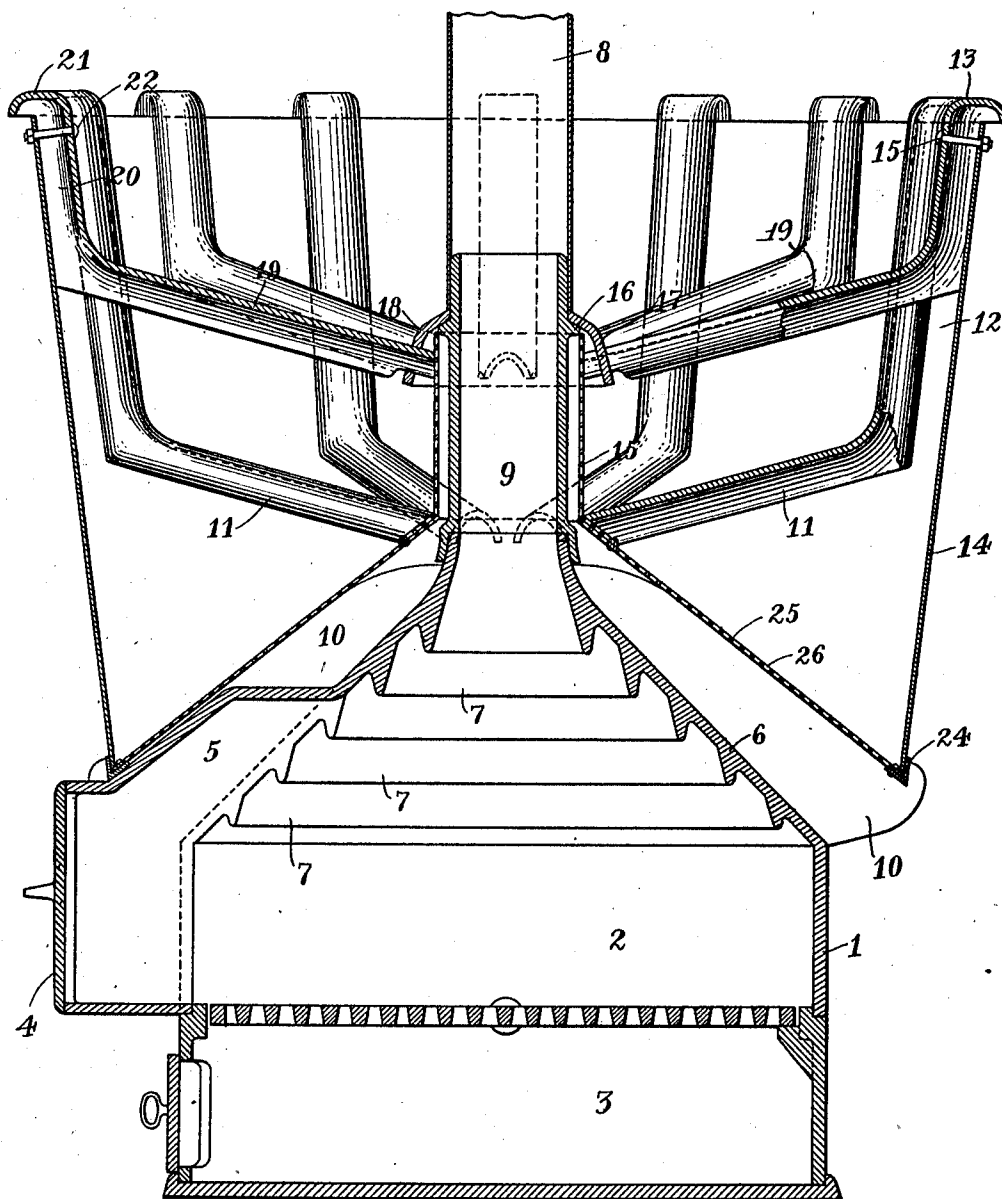


Fig. 1

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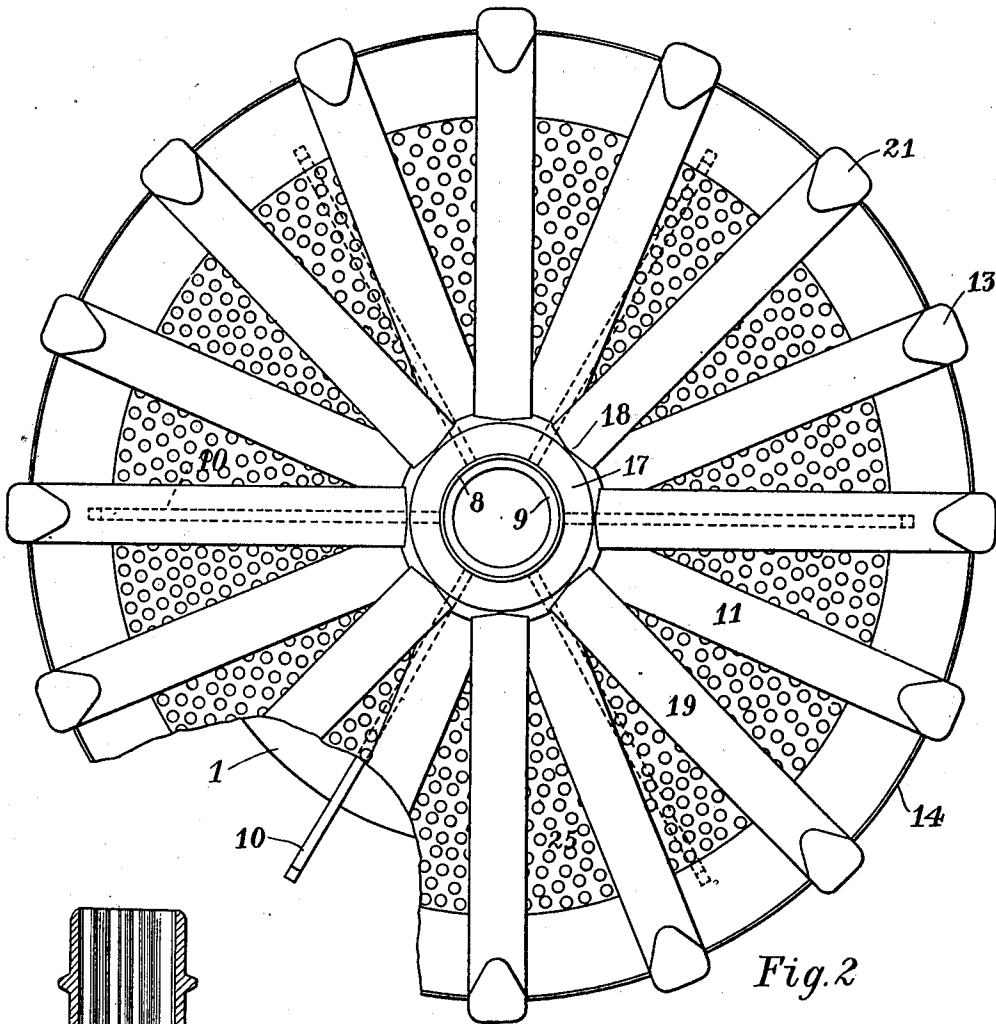


Fig. 2

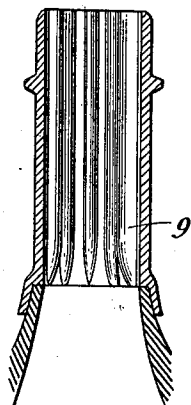


Fig. 4.

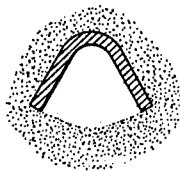


Fig. 3

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UNITED STATES PATENT OFFICE.

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SAND-DRIER.

1,004,029.

Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed July 12, 1910. Serial No. 571,610.

To all whom it may concern:

Be it known that I, FOSTER J. HULL, a citizen of the United States, residing in the borough of Brooklyn, city of New York, State of New York, have invented certain new and useful Improvements in Sand-Driers, of which the following is a specification.

My invention relates to driers. It more particularly relates to a device for drying materials, such as sand, that are divided into particles or for treating such materials with gases.

The invention has for its object to provide a means for rapidly drying material, particularly pulverized or granular, fine or coarse material, that is exceedingly efficient proportionate to its cost of manufacture and maintenance.

I will particularly describe my invention herein as employed for the drying of sand, but it must be understood that in so doing I do not limit myself to the use of the apparatus for the treatment of any particular material.

The invention consists in a novel structure wherein the material to be dried is supported on a suitable screen and is subjected to radiated heat and also to the heating action of hot air, means being provided for conducting away the moisture as liberated, the material treated falling through the perforations of the supporting screen as soon as such material becomes dry enough to pass through such perforations.

In the particular structure shown, heating means comprising, in this case, a stove, is provided. Above the heating means is a sand container consisting, in the construction shown, of a cone or cylindrical drum having an inclined perforate or screen bottom. Said bottom forms a sustaining member which holds the sand or other material above and around the heating means while it is damp or wet. Upon removal of the moisture from the sand it becomes easily movable upon comparative slight pressure produced by the weight of the sand. It then falls through the openings in the screen bottom. A space is provided between the containing means and the heating means which allows air to circulate and to conduct away the moisture. The sand drops upon an inclined surface when substantially dry and immediately is delivered from the ap-

paratus. The containing means holds the sand above and away from the heating means and prevents the burning of the sand. The sand drops upon the heater which completes or makes perfect the drying, as the downward moving sand on the heater is scrubbed by the upward moving air. The air is conducted between the heater and the containing means. In the device shown it is conducted through one or more conduits formed by radiating ribs, around which the sand passes, leaving a slight space beneath said ribs forming a passage through which air may pass and moisture from the sand may escape. The conduits also afford a means for heating the sand and its moisture. This causes the evaporation of the moisture as soon as the sand reaches the delivering means. The cross section of the conduits may be of any form, but I preferably make them of such section that a channel is provided in the under sides of said conduits or ribs, thereby enlarging the passage naturally left by the sand in falling in under the ribs. The inverted V-section shown in the drawings is one suitable section. The ribs are of such form, as hereinafter described, that these passages lead to the exterior of the sand container.

The hot air coming from the heating means will pass over the surface of the sand below the ribs and heat the sand directly and it will also conduct away the moisture of the sand. Means may be provided for increasing the efficiency of the heating means. In the device illustrated one of the means that I have provided also affords a means for conducting heat to the containing means and at the same time increases the heating surface of the heating means and it moreover maintains a space between the heating means and the containing means to permit the delivery of the sand and the upward passage of the air.

Referring to the illustrations, Figure 1 is a vertical sectional view of the apparatus embodying my invention. Fig. 2 is a top view of the apparatus having a part removed to show the heating means. Fig. 3 is a sectional view of one of the conduits. Fig. 4 is a detail sectional view of an alternative form of chimney.

1, in Fig. 1 is the heating means. In the device illustrated 2 is a fire box, 3 is the ash box, 4 is the door of the fire box. Behind

and above the door an upwardly extending chamber 5 is provided to assist in the operation of stoking or banking the fire. I find it preferable to make the top 6 of the heating means conical or conoidal. The wet sand may be maintained above the heater and yet when dry it may be delivered away from the heater. The interior of the top of the fire box may be provided with downwardly extending ridges 7 for the purpose of retaining the heat and to prevent it escaping through the chimney and also for increasing the heat surface of the top of the fire box and thereby increasing the efficiency of the heating means. A chimney 8 is connected to the top of the fire box. The lower part 9 of the chimney is preferably made of a firm material in order to support the sand which is deposited about the heating means.

A plurality of webs 10 are located on the top of the heating means which increase the radiating surface of the heating means and also space away therefrom the said container 14, permitting free movement of the material downward and of the air, upward. The bottom of the sand container 14 consists of a foraminous metal cone 25. This may be made of woven wire or punctured sheet metal. The openings 26 are of any size but they are preferably relatively large. The sand or other material is piled up on the cone and, by its own pressure, presses the material into the openings. This forms and presents a large surface of the material to the heating means and to the moving air. The sand is not only heated, but the upwardly moving air comes into contact with the large surface of the sand presented, which rapidly takes up the moisture from the sand and conducts it away. As soon as the moisture is removed the sand particles break away from the sand body and pass through the openings and drop downward on the heater from whence they quickly slide off to the ground or floor below. New sand is thus continuously presenting itself to the rapidly moving air and the heating means to be dried.

The space between the cone and the top of the heater is connected to the conduits 11 which may have any desired cross section as hereinbefore described. I have preferably made the cross section V-shape as shown in Fig. 3. The ribs or conduits 11 radiate from the top of the cone and are connected to the exterior of the sand through the upwardly extending portions 12. These portions extend along the outside of the body of the sand. The conduits terminate in cap-
 60 portions 13. They prevent any sand dropping into the conduits and stopping them up. The conduits receive heat from the heating means which heats them and they in turn transmit the heat throughout the body of the
 65 sand. In the form of the device that I have

shown the sand coöperates with the channels in the under sides of the ribs 11 to bound the space beneath said ribs. The hot air which rises through the annular space between the perforate bottom 25 and the top of the heater 6, passes into and up through the passages formed by the ribs 11, and by the sand itself in falling in under the ribs, and such hot air not only heats the sand thus presented to it in the passages but also takes up the moisture and carries it away in its upward current. It passes through the portions 12 and heats those portions which conduct the heat to the wet or moist material and the moisture is delivered as soon as the material reaches the bottom of the feeding hopper or receptacle. The hopper 14 is supported on the webs 10 and the ring 4 which is attached to the cone. The conduits 11 are supported on the walls of the feeding hopper or receptacle 14. They are secured to the top by means of the bolts 15 and, by their own weight and the weight of the sand, they are held in position. The lower ends of the conduits 11 merely make contact with the surface of the cone 25.

The top of the cone 25 is extended by a foraminous cylinder 15 which is made preferably of the same material and in the same way that the cone is made and like said cone 25 forms a sustaining member, being practically a part of cone 25. The cylinder 15 surrounds the chimney 8 and particularly the firmer portion 9 from whence it receives a large part of the heat. As the sand dries about the cylinder it is delivered through its openings in the same way that the sand is delivered from the cone. The sand presents through the openings of the cylinder a large drying surface and the moisture is conducted away by the air. It then falls downward between the cylinder and the chimney and between the cone and the heater.

The chimney is provided with a beading 16 which maintains the top of the cylinder 15 in position. A collar 17 fits around the chimney above the beading 16. The collar is provided with slots or openings 18 which are located around the top of the cylinder 15. Conduits 19 are supported in the openings 18 and extend from the top of the cylinder through the body of the sand or other material. They are provided with the upwardly extending portions 20 and are of a construction similar to the conduits 11. They are attached to the hopper 14 by means of the bolts 22. They are provided with the caps 21 as hereinbefore described. The interior of the conduits are connected with the space formed between the cylinder and the chimney and conduct the air upward from the top of the cylinder through the body of the sand whereby the hot air

heats the conduits which in turn conducts the heat to the sand and to the moisture contained therein which is evaporated at the first opportunity. The sand, then moving downward, forms an open space or channel beneath each such conduit 19 and presents a surface to the air moving underneath the conduits, whereby the moisture of the sand is conducted away.

10 If it is desired the chimney 9 may be provided, as indicated in Fig. 4, with webs of the character similar to that of the heater which will increase the heating surface presented to the upward moving air. Moreover
15 any number of conduits may be used. Connections between the spaces and means for supporting the parts may be greatly varied. The spaces beneath the conduits may be varied in shape by the use of different
20 shaped conduits. The structure may be greatly varied without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent is as follows—

25 1. A drier comprising in combination a container having a perforate sustaining member, an extended heating surface in proximity to but spaced away from said member and located on the discharge side thereof, and ribs extending through the interior space of the container and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air.

35 2. A drier comprising in combination a container having a perforate sustaining member, an extended heating surface located on the discharge side of said member, and ribs channeled on their under sides extending through the interior space of the container, the channels of said ribs forming passages for the carrying away of moisture.

40 3. A drier comprising in combination a container having a perforate sustaining member, an extended heating surface in proximity to but spaced away from said member and located on the discharge side thereof, and ribs extending from said sustaining member through the interior space of the container and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air.

45 4. A drier comprising in combination a container having a perforate sustaining member, an extended heating surface in proximity to but spaced away from said member and located on the discharge side thereof, and ribs extending from said sustaining member through the interior space of the container to the outside of said container, and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air.

50 5. A drier comprising in combination a container having a perforate sustaining

member, an extended heating surface located on the discharge side of said member, and ribs channeled on their under sides extending through the interior space of the container, to the outside of said container, the channels of said ribs forming passages for the carrying away of moisture.

6. A drier comprising in combination a container having within it an upwardly extending heating flue, a perforate sustaining member spaced away from said flue, and ribs extending from said sustaining member through the interior space of the container and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air from the space between said flue and sustaining member.

7. A drier comprising in combination a container having within it an upwardly extending heating flue, a perforate sustaining member spaced away from said flue, and ribs channeled on their under sides extending through the interior space of the container, the channels of said ribs forming passages for the flow of air from the space between said flue and sustaining member.

8. A drier comprising in combination a container having within it an upwardly extending heating flue, a perforate sustaining member spaced away from said flue, and ribs extending from said sustaining member through the interior space of the container and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air from the space between said flue and sustaining member, the said passages extending to the outside of the container.

9. A drier comprising in combination a container having within it an upwardly extending heating flue, a perforate sustaining member spaced away from said flue, and ribs channeled on their under sides extending through the interior space of the container, the channels of said ribs forming passages for the flow of air from the space between said flue and sustaining member, the said passages extending to the outside of the container.

10. A drier comprising in combination a container having an annular inclined perforate sustaining member, heating means within and spaced away from said sustaining member, and ribs extending from said sustaining member through the interior space of the container and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air.

11. A drier comprising in combination a container having an annular inclined perforate sustaining member, heating means within and spaced away from said sustaining member, and ribs channeled on their under sides, extending from said sustaining member through the container, the channels of

said ribs forming passages for the circulation of air.

12. A drier comprising in combination a container having an annular inclined perforate sustaining member, heating means within and extending up through said sustaining member and spaced away therefrom, and a plurality of sets of ribs at different levels extending from said sustaining member through the interior space of the container and adapted to form, between their lower sides, and the material to be dried, passages for the circulation of air.

13. A drier comprising in combination a container having an annular inclined perforate sustaining member, heating means within and spaced away from said sustaining member, and a plurality of sets of ribs, at different elevations, channeled on their under sides, and extending from said sustaining member through the container, the channels of said ribs forming passages for the circulation of air.

14. A drier comprising in combination a heater, a container thereabove having an annular inclined perforate sustaining member, and a plurality of radiating ribs, channeled on their under sides, forming passages for the flow of heated air from the space between said sustaining member and said heater.

15. A drier comprising in combination a heater, a container thereabove having an annular inclined perforate sustaining member above said heater, and conduits extending through said container from the space between said heater and sustaining member to the tops of said conduits.

16. A drier comprising in combination a heater, a container thereabove having an an-

nular inclined perforate sustaining member above said heater, and conduits extending through said container from the space between said heater and sustaining member to the top of the container, and caps covering the tips of said conduits.

17. A drier comprising in combination a heater having supporting and spacing webs, a container supported on said webs and thereby spaced away from said heater, and having a perforate sustaining member, and radiating conduits extending from said sustaining member through the container.

18. A drier comprising in combination a heater, a container above the same having a perforate sustaining member, and means extending through said container from said sustaining member, arranged to form, within a body of material within said container, open spaces extending from said sustaining member to the outer air.

19. A drier comprising in combination a heater having an inclined top, a container located above said heater and having a perforate sustaining surface located over and spaced away from said inclined top of said heater, and means within said container and extending from said perforate sustaining surface, arranged to form within a body of material within said container, open spaces extending from said sustaining member to the outer air.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FOSTER J. HULL.

Witnesses:

F. F. CRAMPTON,
M. A. BUTLER.