Dec. 30, 1930. H. W. NAGEL 1,787,280

DRIER FOR SAND AND THE LIKE

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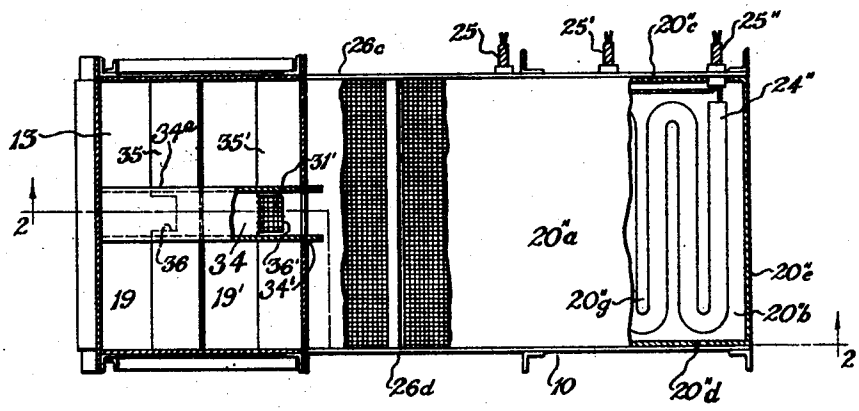


Fig. 1

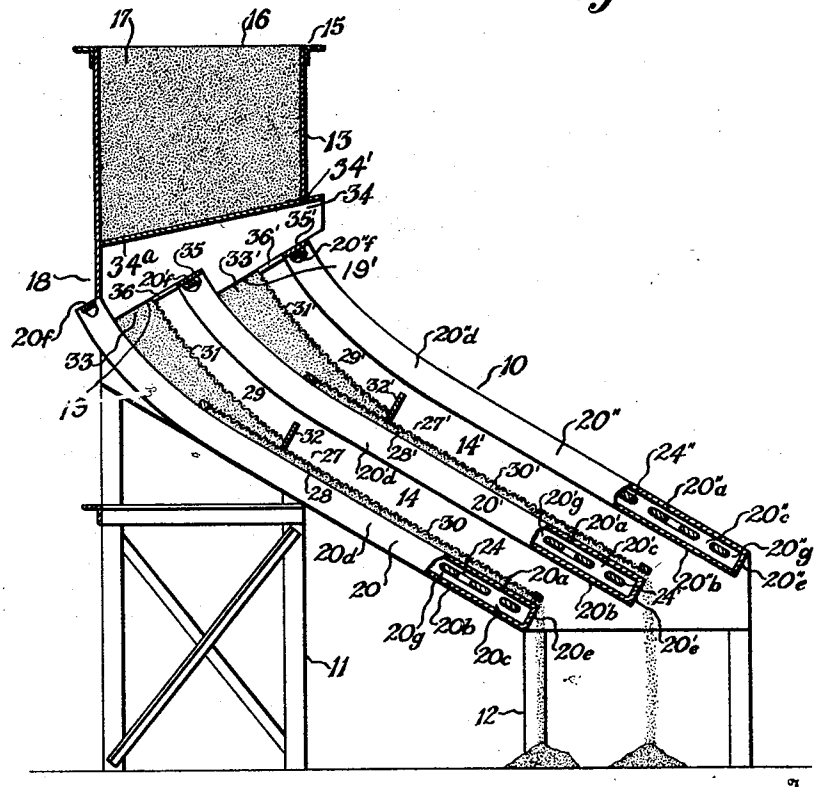


Fig. 2

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UNITED STATES PATENT OFFICE

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DRIER FOR SAND AND THE LIKE

Application filed January 9, 1930. Serial No. 419,549.

My invention relates to driers for sand and other similar materials and more particularly to improvements in driers of the general type set forth in my prior Patent No. 1,346,238, for Sand drying plant, issued July 13, 1920, and which includes spaced heating elements between and over which wet sand is adapted to pass after leaving a bin, and each of the heating elements having portions having different inclinations, and the inclinations being steepest where the sand first flows and is wettest, and being less steep at points over which the sand passes after being partially dried.

Such driers are used particularly for drying sand for spreading upon the rails of traction lines, railroads, and the like to aid in obtaining traction between the rails and the car or engine wheels during rainy or icy weather.

In the drier of my aforesaid patent, difficulty has been encountered in maintaining a flow of the sand in the passageways between the spaced heating elements, there being a tendency of the wet sand to clog the passageways.

The objects of the present improvements include the provision of a novel non-clogging drier for wet sand or like material, and also include the provision of a drier which is more economical to operate by reason of novel details of construction than driers heretofore in use.

These and other objects are attained by the present invention, as is hereinafter claimed, and the invention may be stated in general terms as including heated walls forming a duct or passageway through which flows the sand to be dried, the sand preferably flowing over a surface having the inclinations set forth in my aforesaid prior patent, and there being preferably heated walls forming ducts communicating with the sand flowing over the heated inclined surface, the communicating ducts being adapted for causing a flow of air or the like over the sand being dried for carrying away the moisture given off therefrom, and means which are preferably common with the means for forming the air ducts, and which serve to maintain a regular flow of sand through the drier.

A preferred embodiment of the improvements is illustrated in the accompanying drawing forming part hereof, in which

Figure 1 is a top plan view with portions broken away of a drier, including the present improvements; and

Fig. 2, an elevation thereof as in the direction of the arrows 2—2, Fig. 1, portions being broken away for more clearly illustrating the details of construction of the improved drier.

Similar numerals refer to similar parts throughout the several views.

The improved drier indicated generally at 10 is preferably supported at the upper ends of structural frames 11 and 12, and includes walls forming a bin 13 and a plurality of drying ducts 14 and 14′.

The upper end 15 of the bin has formed therein an inlet opening 16 through which wet sand 17 or like material to be dried is introduced into the bin, and the lower end 18 of the bin has formed therein discharge openings 19 and 19′ which communicate with the upper ends of the drying ducts 14 and 14′, whereby the sand from the bin flows into the drying ducts.

The walls forming the drying ducts 14 and 14′, preferably include a lower heat box 20, an intermediate heat box 20′ and an upper heat box 20″.

Each heat box is preferably made of sheet or plate material, and the heat box 20 includes an upper wall 20*a*, a lower wall 20*b*, side walls 20*c* and 20*d*, and end walls 20*e* and 20*f*, the heat box walls being joined with each other at their side edges as by welding or the like.

The walls of the heat box 20 form a heating compartment 20*g*, within which is located heating means which preferably comprise an electric resistance element 24 which is connected as by a cable 25 with a source of electric power.

Similarly the heat box 20′ includes an upper wall 20′*a*, a lower wall 20′*b*, side walls 20′*c* and 20′*d*, and end walls 20′*e* and 20′*f*, the heat box walls being joined with each other at their side edges as by welding or the like.

The walls of the heat box 20′ form a heating compartment 20′*g*, within which is located heating means which preferably comprise an electric resistance element 24′ which is connected as by a cable 25′ with a source of electric power.

Similarly the heat box 20″ includes an upper wall 20″*a*, a lower wall 20″*b*, side walls 20″*c* and 20″*d* and end walls 20″*e* and 20″*f*, the heat box walls being joined with each other at their side edges as by welding or the like.

The walls of the heat box 20″ form a heating compartment 20″*g*, within which is located heating means which preferably comprise an electric resistance element 24″ which is connected as by a cable 25″ with a source of electric power.

The intermediate heat box 20′ is spaced between the lower and upper heat boxes 20 and 20″, and the ducts 14 and 14′ are formed by the heat boxes and by side plates 26*c* and 26*d*, extending the length of the heat boxes and secured to the side walls thereof.

The duct 14 is formed by the upper wall 20*a* of the heat box 20, the lower wall 20′*b* of the heat box 20′, and the side plates 26*c* and 26*d*; and the duct 14′ is formed by the upper wall 20′*a* of the heat box 20′, the lower wall 20″*b* of the heat box 20″ and the side walls 26*c* and 26*d*.

The sand flows from the bin into the duct 14 through the opening 19, and into the bin 14′ through the opening 19′.

The duct walls 20*a* and 20′*a* over the upper surfaces of which the sand flows, are each variably inclined as illustrated, according to the disclosure of my aforesaid prior patent and the inclination of the upper surfaces of each is steepest at the upper ends of ducts where the sand first flows and is wettest, and the inclination of each decreases towards the lower end of the duct until the inclination is very little greater than the angle of repose of the sand; and this variable inclination of the duct flow surfaces tends to attain uniform flow of the sand through the ducts.

For further regulating the flow of sand through the ducts, and for simultaneously providing means for carrying away the moisture given off by the drying of the sand, in the duct 14 a longitudinally extending partition wall indicated generally at 27 is located and is spaced between the wall 20*a* and the wall 20′*b* and preferably extends between the ends of the duct and the side plates 26*c* and 26*d*.

The partition wall 27 forms a flow passageway 28 in the duct 14 between the underside of the partition wall 27 and the flow surface of the wall 20*a*, and the partition wall 27 forms a ventilating passageway 29 between the upper side of the partition wall 27 and the lower surface of the wall 20′*b*.

The partition wall 27 preferably has a plurality of openings formed therein for providing communication between the flow passageway 28 and the ventilating passageway 29, and for this purpose the partition wall 27 is preferably made of screen material as indicated.

The partition wall 27 preferably includes a lower screen member 30 which is supported preferably at a uniform distance across its entire surface above the upper flow surface of the heated wall 20*a*, and the distance of the screen member 30 above the flow surface is relatively small, so that the sand flowing at the lower end of the flow passageway 28 over the flow surface of the heated wall 20*a* and beneath the screen member 30 is relatively shallow in depth enabling easy and rapid rising of moisture from the sand through the screen openings of the member 30 into the ventilating passageway 29.

The partition wall 27 further includes an upper screen member 31 which is spaced between the wall 20*a* and the wall 20′*b*, and angularly thereto, and which extends between the side plates 26*c* and 26*d* and from the upper end of the duct 14, preferably at a position closer to the wall 20′*b* than to the wall 20*a*, angularly downwardly therefrom and overlapping the lower screen member 30 to a transversely extending gate member 32. The lower edge of the gate member 32 is preferably located at the level of the screen member 30, and the lower end of the upper screen member 31 is secured to the gate member 32 at a position preferably closer to the wall 20*a* than to the wall 20′*b*, whereby the upper end 33 of the flow passageway 28 is progressively reduced in cross-sectional area from the opening 19 to the gate member 32.

The sand in the upper end 33 of the flow passageway 28 is the wettest, and the drying of the sand commences as it flows through the upper enlarged end 33 of the flow passageway, and the moisture given off in the flow passageway upper end 33 passes through the openings of the screen member 31 into the ventilating passageway 29.

In a similar manner, a partition wall 27′ divides the duct 14′ into a flow passageway 28′ and a ventilating passageway 29′; and the partition wall 27′ includes a lower screen member 30′ arranged and functioning in a similar manner to that described for the screen member 30; and the partition wall 27′ also includes an upper angled screen member 31′ arranged and functioning in a manner similar to that described for the screen member 31; and the screen members 30′ and 31′ are associated with each other and with a transversely extending gate member 32′ similar in arrangement and function to the gate member 32.

An outlet duct 34 is formed in the lower end 18 of the bin 13, preferably by a downwardly opening channel member 34*a*, which

extends over the upper ends of the ducts 14 and 14', and one end of the channel member projects through the wall of the bin as at 34' to provide an outlet for the duct into the atmosphere.

For controlling the flow of sand from the bin into the drying ducts, bin gates 35 and 35' extend transversely beneath the outlet duct, and the bin gates preferably have formed therein respectively central notches 36 and 36' beneath the opening of the U outlet duct, for providing communicating openings of adequate area between the ventilating passageways and the outlet duct.

I claim:

1. A drier for drying material such as sand and the like, the drier including a heating member having a surface over which the material may flow, means for delivering the material upon the surface, walls forming a material flow duct, the inner surface of one of the duct walls including the heating member surface over which the material flows, and walls forming a ventilating duct adjacent to the flow duct.

2. A drier for drying material such as sand and the like, the drier including a heating member having an inclined surface over which the material may flow, means for delivering the material upon the surface, walls forming a material flow duct, the inner surface of one of the duct walls including the heating member surface over which the material flows, and walls forming a ventilating duct adjacent to the flow duct.

3. A drier for drying material such as sand and the like, the drier including a heating member having a variably inclined surface over which the material may flow, means for delivering the material upon the surface, walls forming a material flow duct, the inner surface of one of the duct walls including the heating member surface over which the material flows, and walls forming a ventilating duct adjacent to the flow duct.

4. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, another of the walls being a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in one of the drier walls and communicating between the flow passageway and the ventilating passageway.

5. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in the partition wall and communicating between the flow passageway and the ventilating passageway.

6. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being openings formed in the partition wall and communicating between the flow passageway and the ventilating passageway.

7. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, another of the walls being a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in one of the drier walls and communicating between the flow passageway and the ventilating passageway, walls forming an outlet duct, and the ventilating passageway communicating at its upper end with the outlet duct.

8. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in the partition wall and communicating between the flow passageway and the ventilating passageway, walls forming an outlet duct, and the ventilating passageway communicating at its upper end with the outlet duct.

9. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being openings formed in the partition wall and communicating between the flow passageway and the ventilating passageway, walls forming an outlet duct, and the ventilating passageway communicating at its upper end with the outlet duct.

10. A drier for drying material such as sand and the like, the drier including a heating member having a surface over which the material may flow, means for delivering the material upon the surface, walls forming a material flow duct, the inner surface of one of the duct walls including the heating member surface over which the material flows, walls forming a ventilating duct adjacent to the flow duct, and means controlling the rate of flow of material over the flow surface.

11. A drier for drying material such as sand and the like, the drier including a heating member having an inclined surface over which the material may flow, means for delivering the material upon the surface, walls forming a material flow duct, the inner surface of one of the duct walls including the heating member surface over which the material flows, walls forming a ventilating duct adjacent to the flow duct, and means controlling the rate of flow of material over the flow surface.

12. A drier for drying material such as sand and the like, the drier including a heating member having a variably inclined surface over which the material may flow, means for delivering the material upon the surface, walls forming a material flow duct, the inner surface of one of the duct walls including the heating member surface over which the material flows, walls forming a ventilating duct adjacent to the flow duct and means controlling the rate of flow of material over the flow surface.

13. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, another of the walls being a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in one of the drier walls and communicating between the flow passageway and the ventilating passageway, and means controlling the rate of flow of material over the flow surface.

14. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in the partition wall and communicating between the flow passageway and the ventilating passageway, and means controlling the rate of flow of material over the flow surface.

15. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being openings formed in the partition wall and communicating between the flow passageway and the ventilating passageway, and means controlling the rate of flow of material over the flow surface.

16. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, another of the walls being a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in one of the drier walls and communicating between the flow passageway and the ventilating passageway, walls forming an outlet duct, the ventilating passageway communicating at its upper end with the outlet duct, and means controlling the rate of flow of material over the flow surface.

17. A drier for drying material such as

sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being an opening formed in the partition wall and communicating between the flow passageway and the ventilating passageway, walls forming an outlet duct, the ventilating passageway communicating at its upper end with the outlet duct, and means controlling the rate of flow of material over the flow surface.

18. A drier for drying material such as sand and the like, the drier including a plurailty of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and an opposite wall, and there being formed a flow passageway between the heat wall and the partition wall and a ventilating passageway between the partition wall and the opposite wall, and there being openings formed in the partition wall and communicating between the flow passageway and the ventilating passageway, walls forming an outlet duct, the ventilating passageway communicating at its upper end with the outlet duct, and means controlling the rate of flow of material over the flow surface.

19. A drier for drying material such as sand and the like, the drier including a plurality of walls, one of the walls having a surface over which the material may flow, means for heating the flow surface wall, means for delivering the material upon the flow surface, a partition wall located and extending between the flow surface wall and and an opposite wall, a second partition wall angularly disposed to and overlapping the first partition wall, there being formed a flow passageway between the heat wall and the partition walls and a ventilating passageway between the partition walls and the opposite wall, and there being an opening formed in one partition wall and communicating between the flow passageway and the ventilating passageway.

In testimony that I claim the above, I have hereunto subscribed my name.

HENRY WILLIAM NAGEL.