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## DEYING APPARATUS.

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This invention relates to drying apparatus, and more particularly to apparatus for drying material in a finely divided condition, such as sand. The general object of the invention is to provide an apparatus of this character which will enable the material to be dried quickly and efficiently and without danger of adhering to the walls of the drying conduit through which it is conducted to the place of storage. For convenience of description, the material to be dried will be referred to hereinafter as sand.

Further and more limited objects of the invention will appear hereinafter and will be realized in and through the construction and arrangement of parts shown in the drawing wherein Fig. 1 represents a sectional side elevation of a drying apparatus embodying my invention; Fig. 2 is a detail vertical section of a modified form of my invention; Fig. 3 is a detail in end elevation; and Fig. 4 is a detail in central sectional elevation of the drying end of the nozzle through which heated air is discharged into the drying conduit.

Describing the various parts by reference characters, 1 denotes a heating chamber, which may be of any approved construction, the chamber herein being provided with an opening 2 through which a combustible mixture is supplied from a burner 3. The burner in the installation shown herein is a burner of the injector burner type having a supply pipe 4 for oil and a pipe 5 for delivering air under pressure thereto. The burner in its details forms no part of my invention, it being sufficient for my purpose to utilize any one of the existing numerous types of injector burners employing oil or gas and air under pressure.

6 denotes a blower, supported on a suitable stand 7 and having the delivery pipe 8 extending across the chamber 1 and provided with a tapered or frusto-conical nozzle portion 9 projecting into a correspondingly-shaped opening 10 in the wall of the said chamber. From this opening, a conduit 11 extends to a storage tank 12 for the dried sand, the said tank being shown as provided with a gate-controlled outlet 13 which is adapted to discharge the sand, as desired, upon a conveyor 14.

The conduit 8 is provided with a hopper 12 which hopper is adapted to deliver into the conduit through a spout 13. The hopper is provided with a rotary sand-agitating

device 14 which is adapted to break up the caked, moist sand, the said device being provided with a pulley 15 by means of which it may be driven, if desired.

16 denotes a conveyor, the upper end of which extends around a sprocket 17 and which is provided with buckets, some of which are shown at 18 and which are adapted to deliver the wet or moist sand into the hopper.

The delivery end of the air conduit 8 and the nozzle are completed by an additional tapered or frusto-conical sleeve 19, which is fitted over the end of the nozzle part 9, the sleeve being provided with spiral blades 20 cast with, or otherwise secured at their outer ends to, the inner wall of the sleeve, the inner ends of the blades projecting from a central forwardly-flaring conical hub 21 having its apex extending inwardly or rearwardly.

With the parts constructed and arranged as described, the chamber 1 will be heated by the burner 3, the air for the burner being preferably taken from the conduit 8 by the pipe connection 5, said connection being provided with a valve 5<sup>a</sup>. The blower being driven from any suitable source of power, the air will operate to atomize the oil or other liquid fuel and deliver the mixture into the chamber 1, in the manner usual with injector burners, and the mixture will be burned in said chamber, the products being delivered into the conduit 11. Air heated by the products of combustion in the chamber 1, will be forced through the conduit 8 and, by reason of the construction of the nozzle 9, 19—21 will be thrown outwardly, with a whirling motion into the conduit 11. The sand to be dried will be delivered into the stream of air in the conduit 8 and will be thoroughly dried by the hot air and the products of combustion, and will be delivered by the blast into the conduit 11 and thence into the tank 12.

In Fig. 2 there is shown a slight modification in which the nozzle or conduit 8 is extended into the conduit 11, and the hopper 12 delivers the sand into the conduit 8 beyond the chamber 1.

It will be noted that the conduit 11 is of considerably greater cross-sectional area than is the conduit 8. This provides a relatively large area for the expansion of the blast of air and combustion gases and for the whirling of the sand thereby, and en-

abies the particles of wet sand to be separated and thoroughly dried, without adhering to the wall of the conduit 11.

The conduit 8 is provided with a sliding gate 8<sup>a</sup> by means of which the air blast therethrough may be regulated or shut off, as desired.

The apparatus shown herein has proven efficient in action, not only in preventing the caking of the sand and its adherence to the wall of the conduit 11, but also in effecting the complete and rapid drying of the sand.

Having thus described my invention, what I claim is:—

1. An apparatus of the character described comprising in combination a heating chamber, a conduit leading from said chamber, a conduit extending into said chamber and having its delivery end aligned with the adjacent end of the first mentioned conduit, means for delivering material to be dried into said second mentioned conduit, means forcing a drying fluid through said second mentioned conduit, and means for imparting a whirling motion to the fluid delivered from said second mentioned conduit into the first conduit and for throwing such fluid outwardly against the inner wall of said first mentioned conduit.

2. An apparatus of the character described comprising in combination a heating chamber, a conduit extending from one side of said chamber, a conduit extending across said chamber and having its delivery end aligned with the adjacent end of the first mentioned conduit, means for delivering material to be dried into said second mentioned conduit, means for forcing a drying fluid through the second conduit, and means for imparting a whirling motion to the fluid delivered from the second conduit and for throwing such fluid against the inner wall of the second conduit.

3. In an apparatus of the character described, the combination of a heating cham-

ber, a conduit communicating therewith and extending therefrom, a second conduit leading into said heating chamber and having its delivery end in alignment with the receiving end of said first mentioned conduit, means for delivering into said second conduit particles to be dried, the cross sectional area of the first conduit being greater than that of the second conduit, and means for supplying a drying fluid through said second conduit and means for delivering the same in an outwardly whirling direction into said first conduit.

4. In an apparatus of the character described, the combination of a heating chamber, a conduit communicating therewith and extending therefrom, a second conduit leading into said chamber and having a delivery end of smaller cross sectional area than that of the first conduit, the said delivery end being positioned in alignment with and closely adjacent to the receiving end of the first conduit, means for feeding into said second conduit material to be dried, means for forcing a drying fluid through said second conduit, a burner for heating said chamber and a connection between said burner and said second conduit for supplying fluid pressure to operate said burner.

5. An apparatus of the character described comprising in combination a heating chamber, a conduit communicating therewith and extending therefrom, a second conduit leading into said chamber and having its delivery end aligned with the adjacent end of said first mentioned conduit, the cross-sectional area of said first mentioned conduit being larger than that of the second mentioned conduit, means for delivering material to be dried into said second mentioned conduit and means for forcing a drying medium through said second mentioned conduit.

In testimony whereof, I hereunto affix my signature.

EDWARD C. READER.