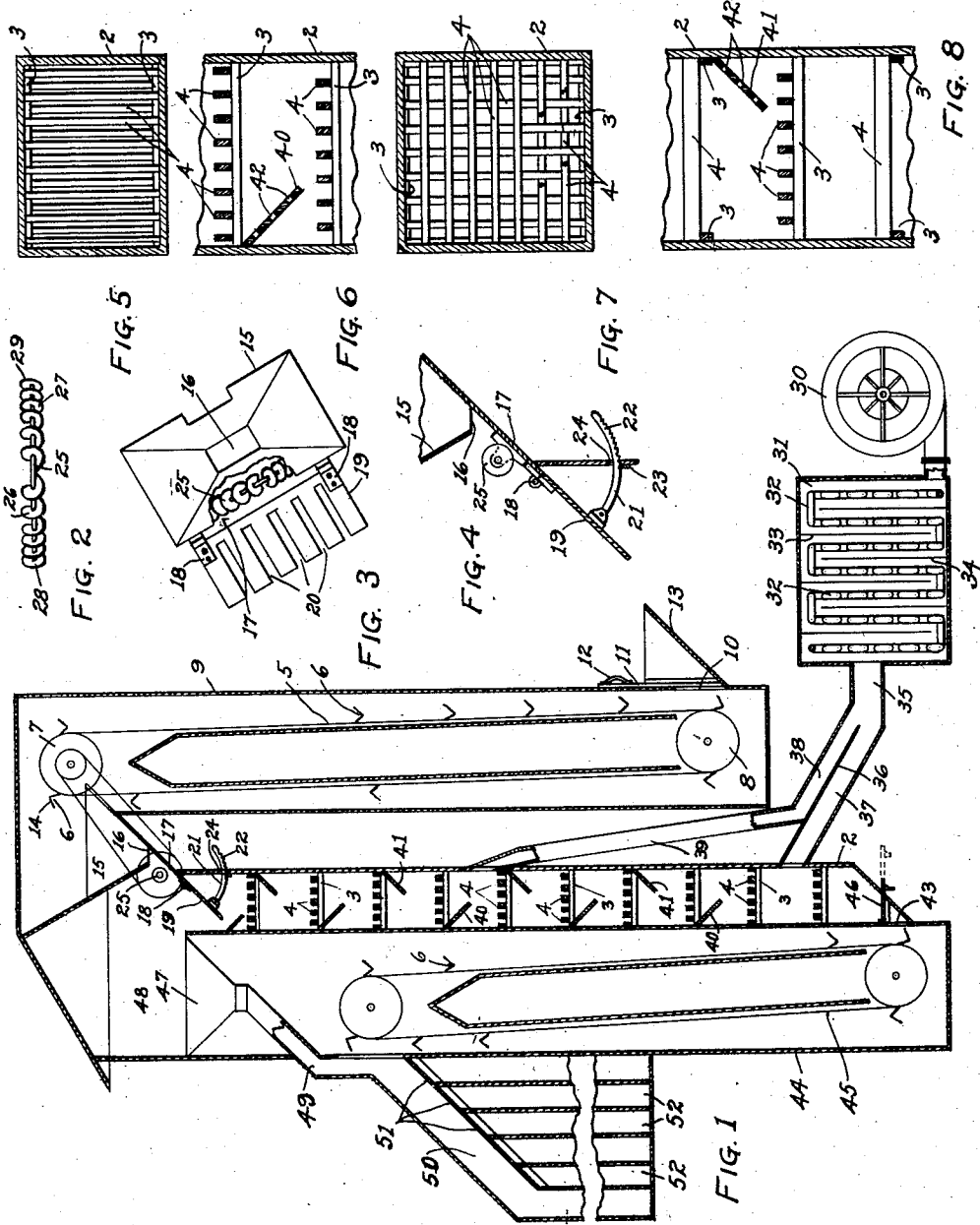


B. I. LARSEN.
SAND DRIER.

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BERTON I. LARSEN, OF OTTAWA, ILLINOIS.

SAND-DRIER.

1,009,422.

Specification of Letters Patent. Patented Nov. 21, 1911.

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To all whom it may concern:

Be it known that I, BERTON I. LARSEN, a citizen of the United States, residing at Ottawa, in the county of LaSalle and State of Illinois, have invented certain new and useful Improvements in Sand-Driers, of which the following is a specification.

My invention relates to an improved apparatus for drying sand, and has particular reference to machines adapted for drying the white sand used by glass manufacturers.

The object of the invention is to provide improvements in the air-drying types of machines, as distinguished from those which "steam" out the moisture from the sand by means of steam or heated pipes passing through a stationary mass in a hopper or other container.

The invention consists in the improvements in construction, combination and arrangement of parts, hereinafter described in detail, illustrated in the accompanying drawing and more particularly pointed out in the appended claim.

In the drawing—Figure 1 is a vertical section of a sand-drying apparatus embodying my invention. Fig. 2 is a view of the sand-spreading screw or worm. Fig. 3 is a plan view of the hopper into which the sand is dumped by the conveyer prior to the beginning of the drying process, and the table on which the sand is spread over the drying-chute. Fig. 4 is a vertical section, partly broken away, of said hopper and table. Fig. 5 is a plan view of the gratings in the drying-chute. Fig. 6 is a vertical section through a portion of the chute broken away. Figs. 7 and 8 show modifications of the parts shown in, respectively, Figs. 5 and 6.

In the several views 2 represents a vertical space or chute having four vertical side-walls and having therein a series of sand-mass breakers or gratings 3 composed of frames each of which has therein a series of parallel flat bars 4 standing on edge as shown in Figs. 6 and 8. In the former figure the bars on the successive gratings are staggered, so that the bars on each grate below are arranged in vertical planes passing between the bars of the grate above or below. In Figs. 5 and 6 the bars are shown running parallel through the series,

while in Figs. 7 and 8 the bars in one of adjacent grates or lump-breakers are arranged at right angles to the lump-breaker above or below. The sand to be dried is sifted through the drying-chute 2 through the openings made by said grate-formations, and is conveyed to the top of the chute through a conveyer 5 having buckets 6 of V-shaped formation. The conveyer is an endless chain or belt carrying the buckets and running over an upper and lower pulley labeled, respectively, 7 and 8. The conveyer is preferably contained within a housing 9 having an opening 10, at the lower end of the conveyer, controlled by an adjustable slide-door 11 provided with a handle 12. This slide-door may be mounted in any suitable manner in order to support it in any desired degree of open position, as, for instance, by frictional engagement with the usual slide-bearings or channels provided for such doors to move in. Opposite the opening 10 is a hopper 13 through which the sand is unloaded into the lower end of the housing 9 to be there taken up by the buckets, scoops or cups 6. The latter are made of the form shown for the purpose of facilitating the delivery of their contents and to prevent a portion of the sand sticking in them at the moment of unloading at the top of the chute.

In Fig. 1 the topmost bucket at the left of the conveyer is shown with its outer side labeled 14. It will be noticed that because this side of the bucket is straight instead of curved in the usual manner and the opposite side, which is substantially the bottom of the bucket at the moment that it dumps its contents, is flatly facing the direction in which the sand will be thrown by centrifugal force as the bucket is tipped or has rounded the upper part of the pulley 7. The straight or flat side 14 enables the wet or damp sand to easily glide off the bucket. From the conveyer 5 the sand is delivered into a hopper 15 having an opening 16 at its apex or bottom, and below said opening is a table 17 to which is hinged at 18 an adjustable table 19 having slots 20 therein through which the sand is permitted to escape into the chute or drying-chamber 2 below. The angular position of the table 19, with reference to the table 17, is ad-

justed by means of a notched quadrant 21, the notches 22 of which are engaged with a catch 23 on the lower edge of an opening 24 provided for the quadrant in the wall of the drying-chamber 2. Over the table 17 and immediately below the outlet opening 16 of the hopper 15 is mounted a spreading worm or screw 25 having spiral flanges 26 and 27 that are oppositely inclined or pitched so as to throw the sand dropped on the middle of the table 17 more evenly over the table 19. The end flanges or threads 28 and 29 of the screw or worm 25 have little or no pitch, the pitch being greatest nearest the middle part of the screw and gradually decreasing in both directions toward its ends, which insures a more even spreading of the sand, the mass being greatest at the middle or opposite the buckets of the conveyer, which requires a more rapid side-throw of the sand at the latter point.

During its passage through the drying-chamber 2 where the sand is broken up, sifted or spread out into its individual grains, it is subjected to an opposing or upward current of heated air supplied by means of a blower or fan 30, an air-heating chamber 31 into which the air is forced, and a series of steam-pipes, or other heating means, 32 arranged in usual radiator formation with a series of air deflecting walls or baffle-plates 33 and 34 extending, respectively, from the upper and lower walls of said chamber 31 which is inclosed on all sides except for the inlet opening from the blower 30 and an outlet passage 35. The latter is divided by a wall 36 to form a pair of passages, or a plurality of such walls and passages may be provided. As shown the dividing wall 36 forms two tubes 37 and 38, the former entering the lower end of the drying-chamber or chute 2, and the latter continuing upwardly in a pipe 39 which extends about half-way to the top of the chute. If the latter is made of considerable height the number of pipes or passages 39 will be increased accordingly. The object of the pipe 39 is to supply freshly heated air at a point where the air from the pipe 37 will be partially cooled during its upward passage against the stream of sand. In order to insure distribution of the air currents from the pipes 37 and 39, within the drying-chamber 2, the latter is provided with a series of perforated air-deflector plates 40 and 41 which project short distances from the inner sides of the chute at downward inclinations. As shown in Figs. 6 and 8 these plates have perforations 42 therethrough of any suitable form or lengths. At its bottom end the drying-chamber 2 has an outlet 43 leading into a housing 44 containing a conveyer 45 of substantially the same construction as the conveyer 5. The outlet 43 is controlled by a

slide-door 46, which slide-door is provided for the purpose of confining the opening for the outlet from the drying-chamber to the depth or thickness of flow from the latter and obviating a means of escape, other than through the upper end of the chamber 2, of the heated air, the latter being under more or less downward pressure owing to the resistance of the downward flow of sand. Provision is made for taking care of the lighter particles of sand that are blown out through the upper end of the chute or chamber 2, by means of a hopper 47 leading from an air-expansion chamber arranged over the chute 2 and housing 44. This expansion-chamber is designed to relieve the air-pressure and at the same time prevent escape of sand or dust from the apparatus. The hopper 47 is provided with an outlet pipe 49 leading into an inclined chute 50 having a floor or bottom composed of a series of sieves 51 of different mesh that grade the sand according to its coarseness, the finest sieve or sifter being nearest to the housing 44. Under the different sieves are chutes 52 which convey the graded sand to any suitable receptacles below (not shown).

The adjustability of the table 19 for the purpose of varying its steepness or inclination has for its object to cooperate with the screw 25 in spreading the sand from side to side over the drying chamber inlet or top. The screw or worm 25 spreads the sand toward two opposite sides of the chute while the table 19 is designed to spread the sand in the two opposite directions, or at right angles to the directions of spread by the screw. At a certain inclination of the adjustable table a small volume of sand would disappear through the slots 20 before it had passed half way over the table, and by increasing the inclination and therefore the speed of movement of the sand across the table the same volume of sand may be caused to spread out the whole width of the table from the hopper 15 to the wall of the chute 2 to the left in Fig. 1, before all of the sand has had time to escape through the slots, or other suitable openings in the adjustable table for the same purpose. In order to insure the rapid drying of the sand by means of this kind of an apparatus it is important to have the particles separated as much as possible at the very outset of its drop through the drying-chamber, otherwise some of the sand is apt to reach the bottom of the chute 2 without having been sufficiently acted upon, or dried, by the heated air current passing upwardly through said chute.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

A sand drying apparatus consisting of the drying-chute and means for conveying sand

and a current of air to said chute, means for spreading the sand prior to its entrance into the chute in opposite directions and in directions at right angles to each other, and
5 means for breaking up lumps or masses of sand within said chute.

In testimony whereof I have hereunto set

my hand in the presence of two subscribing witnesses.

BERTON I. LARSEN.

Witnesses:

GEORGE H. LARSEN,
MARK A. BENNETT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
