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R. S. KENT
DRIER AND GRANULATOR
Filed July 8, 1931

1,934,930

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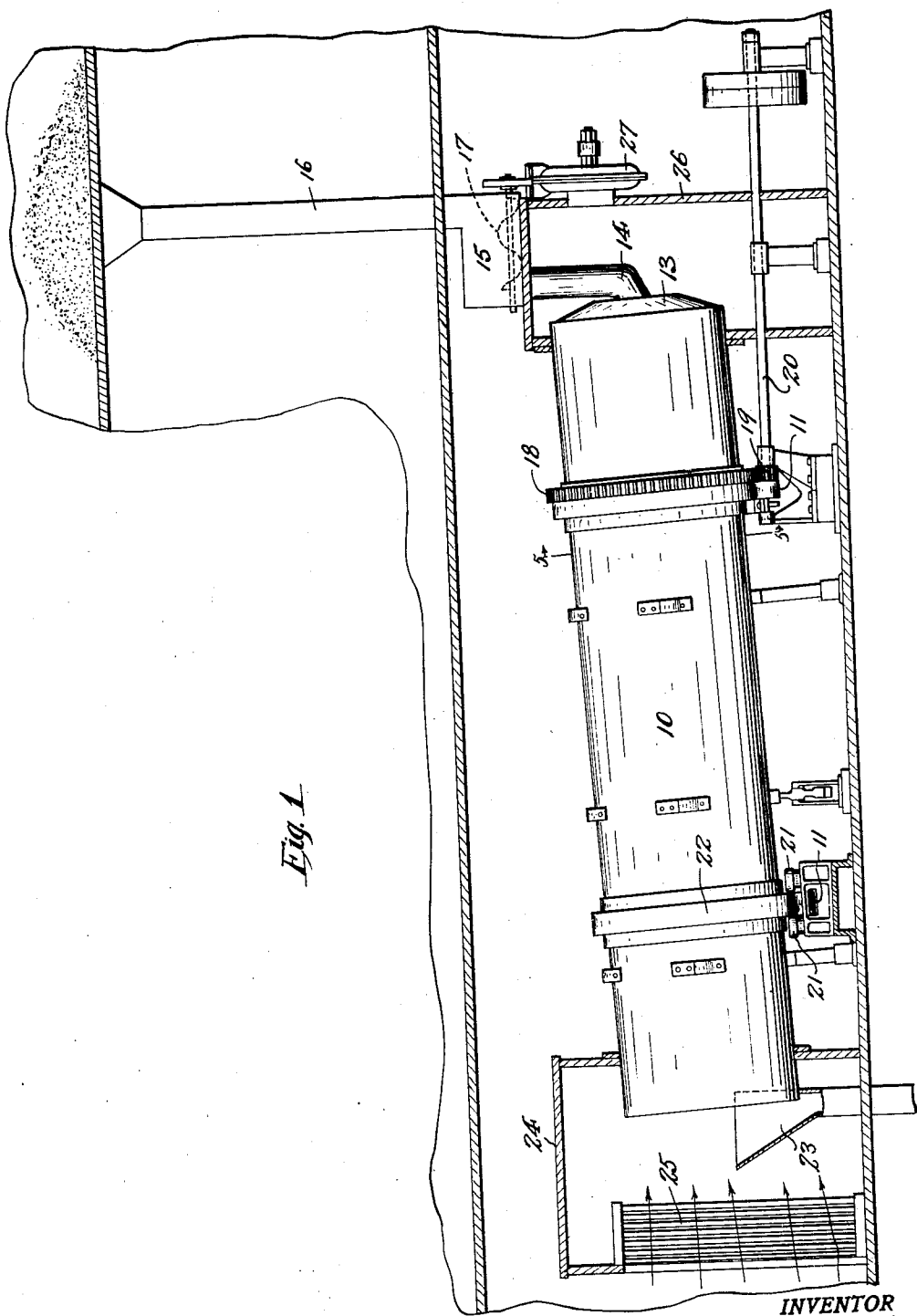


Fig. 1

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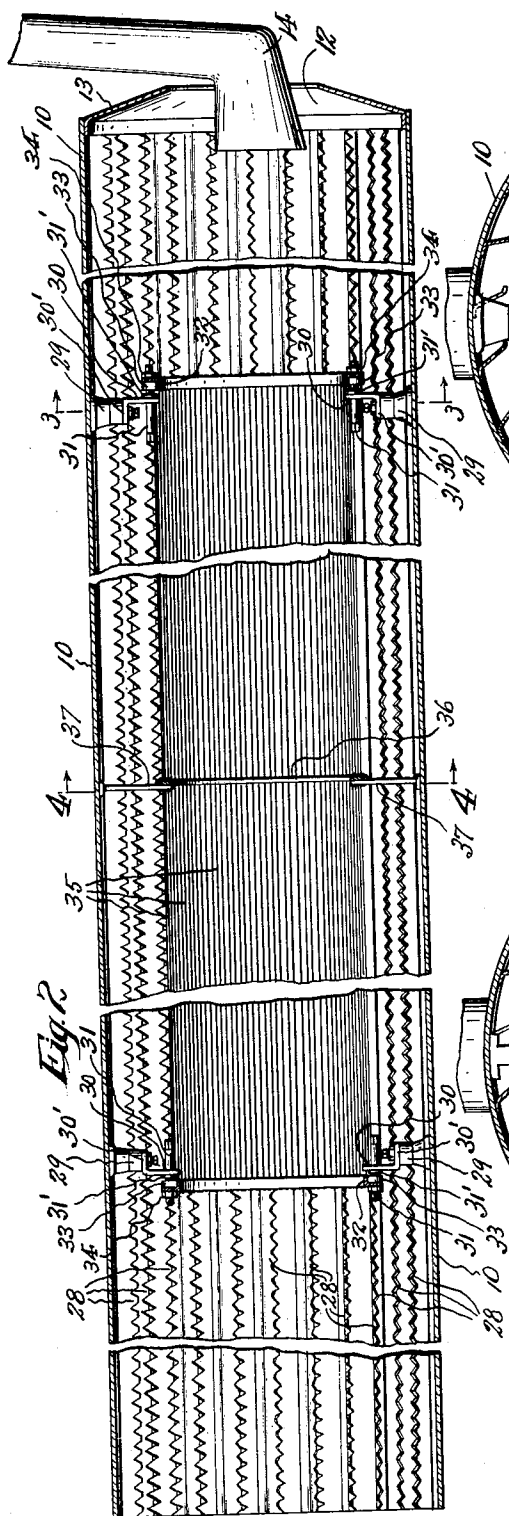
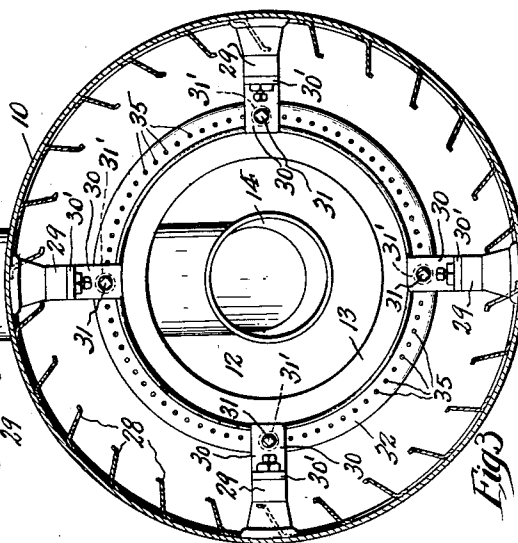
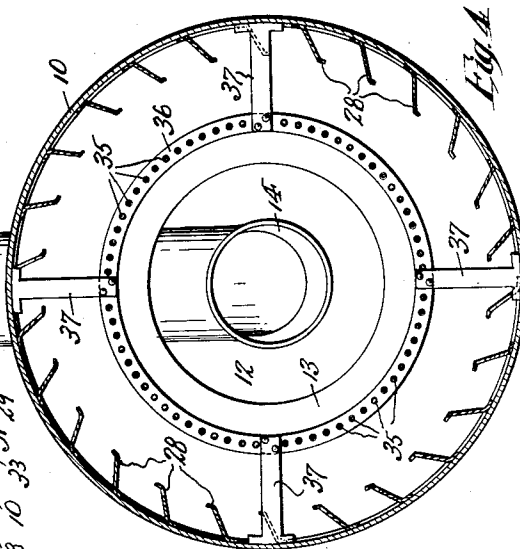
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DRIER AND GRANULATOR

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3 Sheets-Sheet 3

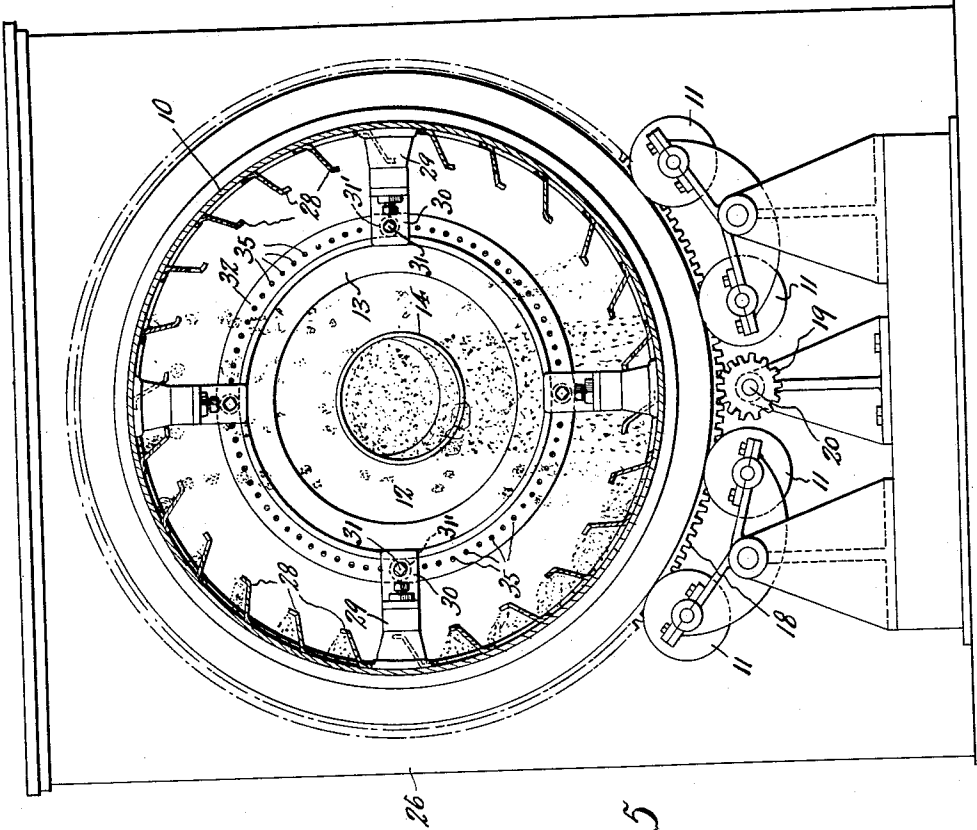


Fig. 5

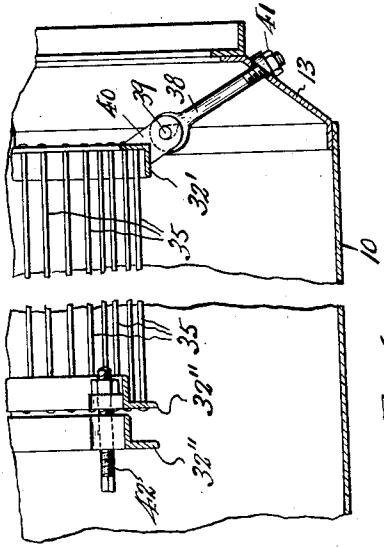


Fig. 6

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DRIER AND GRANULATOR

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Application July 8, 1931. Serial No. 549,397

3 Claims. (Cl. 34-6)

This invention relates, generally, to improvements in drying apparatus, and has reference, more especially, to an apparatus for drying moist granulated sugar and similar materials.

Driers have heretofore been used which comprise a cylindrical drum rotatable about an inclined axis and provided on its interior wall surfaces with flights to pick up and spill, through heated air currents flowing through the drum, the material to be dried. Drums of this character are not highly efficient, since the spilling or tumbling of the material frequently fails to entirely break up lumps of initially wet or moist material into the granular condition desired for the material discharged from the drum as dried.

This invention has for its principal object to provide, in combination with tumbling drier drums of the kind above referred to, means within the drum interior and cooperative with the spilling flights thereof for quickly and efficiently breaking up initially moist lumps of material undergoing drying treatment; to the end that a more rapid and thorough drying of the material, together with a more rapid reduction of the same to finished granular condition, may be attained, while at the same time the capacity of the drier drum is increased; i. e. the drum embodying the improvements of this invention is capable of treating larger quantities of material during a given time period than has heretofore been possible.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following description of the same.

Illustrative embodiments of this invention are shown in the accompanying drawings, in which:—

Fig. 1 is a sectional side elevation of a drying apparatus according to this invention, and adapted especially for the drying of granulated sugar; Fig. 2 is a fragmentary longitudinal vertical section through the rotatable drum of the drying apparatus, drawn on an enlarged scale; Fig. 3 is a transverse section, taken on line 3—3 in Fig. 2; Fig. 4 is a transverse section, taken on line 4—4 in Fig. 2; Fig. 5 is a transverse section, taken on line 5—5 in Fig. 1, but drawn on an enlarged scale; and Fig. 6 is a fragmentary sectional view, showing a modified form of internal breaker screen.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

In carrying out my present invention in practice, I may make use of any suitable drying ap-

paratus including a rotating drum, but prefer to employ one of substantially the type illustrated in the accompanying drawings; said drawings representing a well-known type of granulator for drying moist more or less finely divided sugar crystals.

Referring to the accompanying drawings, the reference character 10 indicates a cylindrical drum mounted to rotate about an inclined longitudinal axis pitched downwardly from its receiving end toward its discharge end. To this end said drum is supported, adjacent to each end, by roller bearings 11. At the receiving end of said drum is an intake opening 12, preferably of reduced diameter as provided by an annular end flange 13 with which said receiving end of the drum is provided. Into the intake opening 12 projects a delivery spout 14, through which moist sugar to be dried is delivered into the drum. This spout 14 connects with a chamber 15, which is connected in turn with a supply-pipe 16 leading from a storage floor or bin above the drying apparatus. Within the chamber 15 is a force-feed device, such as a screw-conveyer 17, to positively feed the moist sugar into the spout 14. Provision is made for continuously rotating the drum 10, the means shown for the purpose comprising an external ring gear 18 around the circumference of the drum, which is driven by a pinion 19 that is fixed upon and actuated by a drive shaft 20, operated in any suitable manner from a convenient source of power. Near the lower end of the drum provision is made for preventing endwise movement of said drum, rolls, such as 21, coacting with opposite sides of an external ring 22 for this purpose.

At the lower end of the drum, the dried material delivered therefrom passes into a discharge hopper 23, from which it may be delivered to the packing room or other place. The discharge end of the drum is surrounded by housing 24, through one wall of which the drum projects and in which it freely turns. Through this housing 24 the drying medium, usually hot air, is delivered into the drum to move there-through in a direction opposite to that in which the sugar tumbles through the drum. Suitable heating means, such as a steam radiator 25, is arranged across the air intake opening of said housing 24, whereby the air delivered into and passed through the drum is heated to the desired degree. At the opposite or receiving end of the drum is a similar housing 26 to surround the same. The heated air passed through the

drum discharges into said housing 26, and is thereupon exhausted therefrom by any suitable suction means, such as the exhaust fan 27.

Radially arranged about the internal cylindrical surface of the drum, so as to project radially inward therefrom, are a plurality of circumferentially spaced flights 28. These flights may possess straight free edges, or their free edges may be of irregular or saw-tooth form as shown.

The parts hereinabove thus far described are all well-known to the art to which this invention appertains.

In drying apparatus of the kind described, rapid breaking up of lumps of moist sugar or other material undergoing the drying treatment has not been efficiently attained by the spilling and tumbling of the material by the flights as the drum rotates, and consequently I have found that comparatively slow operation of the drum with reduced output capacity for given period of operation has been required to obtain the desired dry granulated condition of the material, free from lumps, at the discharge end of the drum. To avoid this drawback, I have provided an internal breaker screen within the drum interior through which the material must pass as it spills off of the flights; this screen functions to quickly break up or disintegrate lumps so that drying of the material may be both more thorough and more rapidly attained, and the output of the drier for a given period of operation substantially increased.

The novel breaker screen in one form comprises the following structure:—

Fixed to the inner surface of the drum wall are longitudinally spaced apart circumferentially spaced carrier posts 29, to the ends of which are secured, at their bases 30', inwardly and radially projecting perforate brackets 30. Rotatable in said brackets 30 are adjusting screws 31 having collars 31' fixed thereon to provide abutment shoulders to bear against said brackets. In the respective sets of brackets 30, the adjusting screws project outwardly toward the adjacent open ends of the drum. The reference character 32 indicates flanged anchor rings, the same having suitably affixed thereto, in proper locations, internally threaded nut blocks 33 to receive the threaded free ends of said adjusting screws 31, which also project outwardly through the flanges of said anchor rings. The anchor rings 32 are thus adjustably supported for movement axially of the drum. Lock nuts 34 are provided on the outer ends of the adjusting screws to secure the anchor rings in desired adjusted positions. Extending longitudinally between the anchor rings, and in circumferentially spaced apart relation, at suitably spaced intervals, are a plurality of screen wires or rods 35, the ends of which are respectively secured to the flanges of the anchor rings, either by riveting, by application of nuts threaded thereon, or in any other convenient manner.

The supported screen wires or rods 35 form a cylindrical breaker screen concentric to and spaced inwardly from the walls of the drum and the flights mounted thereon. By manipulating the adjusting screws 31, the anchor rings may be moved axially in relation one to the other to thereby tautly stretch the screen wires or rods 35 therebetween.

If desired the screen wires or rods 35 may be supported, at one or more points intermediate the anchor rings, by perforate annular supporting ring 36, through the perforations of which the

wires or rods are passed. The supporting ring 36 is in turn supported by supporting arms 37, which are suitably secured to and which project radially inward from the wall of the drum.

In the operation of the drier, the drum 10 is continuously rotated in one direction, and the sugar to be dried is continuously delivered into the receiving end of the drum through the intake opening 12. The sugar thus deposited in the drum, is picked up by the flights 28 and carried upwardly at one side of the drum interior, so as to be spilled off of the flights near the top side of the drum, whereupon the same falls in a shower downwardly through the drum interior to the bottom side thereof, being again picked up by the flights for repetition of the spilling and falling operations. Owing to the downward inclination of the drum, the repeated lifting, spilling and falling movements of the sugar gradually shifts the same toward the discharge end of the drum, during the course of which movement the sugar is repeatedly tumbled through the stream of heated air circulating through the drum interior, whereby the sugar crystals are thoroughly dried by the time they reach the discharge end of the drum for discharge therefrom. The initial moist condition of the sugar delivered into the drum tends to cause the crystals to adhere together and form lumps. These lumps unless thoroughly broken up impede the drying effects of the heated air. The function of the novel breaker screen of this invention is to aid in the more rapid and thorough disintegration of these lumps, so that the sugar crystals are more quickly separated and exposed to contact with the heated air. As the sugar progresses to the vicinity of the breaker screen and is picked up and spilled from the flights 28, it will fall upon the annularly spaced screen wires or rods, so that any lumps in the thus spilled sugar will strike the screen wires or rods so as to be split up and disintegrated thereby, the freed sugar crystals dropping between the screen wires or rods through the current of heated air, and being thus more easily and quickly dried by such air. The lump disintegrating effects of the breaker screen are so rapidly accomplished, that the drum may be safely rotated at higher speed and the sugar consequently handled and dried with such increased rapidity, that a drum equipped with the novel breaker screen has a considerably increased drying capacity over a given time period of operation, and a dry, finely divided granulated condition is assured by the time the sugar reaches the discharge end of the drum.

The position of the breaker screen within the drum interior is subject to more or less variation; it may be arranged to extend through the drum interior with its respective ends terminating short of the receiving and discharge ends of the drum; or it may be disposed with an end close to the receiving end of the drum. This latter arrangement is indicated in Fig. 6, wherein the anchor ring 32' is adjustably supported by eye-bolts 38, the eyes of the bolts engaging over a pin 39 carried by bifurcated ears 40 secured to the anchor ring 32'. The threaded shanks of said eye-bolts 38 extend through the end flange 13 of drum, and are adjustably secured by nuts 41 on the outwardly projecting ends of said eye-bolt shanks. It is also indicated in Fig. 6 that the breaker screen may be built in sections coupled end to end, adjacent anchor rings 32'' of which may be coupled together by screws 42, or in other convenient manner.

As many changes, other than those above indicated, could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof; it is intended, therefore, that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative, and not in a limiting sense.

10 I claim:—

1. In a drying apparatus, an inclined rotary cylindrical material conveying drum open from end to end and mounted to turn about its longitudinal axis, flights projecting from the inner surface of said drum to pick up, lift and spill material for gravitation across the drum interior, means to circulate heated air through said drum in contact with the spilled material, and a breaker screen within the interior of said drum interposed in the path of gravitation of the spilled material, said breaker screen comprising longitudinally spaced anchor rings, a plurality of circumferentially closely spaced screen rods fixed to and extending between said anchor rings, and means connected with the walls of said drum to adjustably support said anchor rings to tautly stretch said screen rods and to dispose the latter in inwardly spaced relation to the flights of said drum.
2. In a drying apparatus, a rotary cylindrical material conveying drum open from end to end and mounted to turn about an inclined longitudinal axis, said drum having on its inner surfaces flights to pick up, lift and spill material for gravitation across the drum interior, means to circulate heated air through said drum in contact with

the spilled material, a breaker screen concentric to said drum and extending lengthwise intermediate the ends thereof with its surfaces inwardly offset relative to the flights of said drum, said breaker screen comprising longitudinally spaced anchor rings, a plurality of circumferentially closely spaced screen rods fixed to and extending between said anchor rings, brackets connected with the walls of said drum and adjusting screws rotatably carried by said brackets to support said anchor rings, and to adjust the same to tautly stretch said screen rods.

3. In a drying apparatus, a rotary cylindrical material conveying drum open from end to end and mounted to turn about its longitudinal axis, flights projecting from the inner surface of said drum to pick up, lift and spill material for gravitation across the drum interior, means to circulate heated air through said drum in contact with the spilled material, and a breaker screen within the interior of said drum interposed in the path of gravitation of the spilled material, said breaker screen comprising longitudinally spaced anchor rings, a plurality of circumferentially closely spaced screen rods fixed to and extending between said anchor rings, brackets connected with the walls of said drum, adjusting screws rotatably carried by said brackets to support said anchor rings and to adjust the same to tautly stretch said screen rods, said screen rods being disposed in inwardly spaced relation to the flights of said drum, and means intermediate said anchor rings for supporting said screen rods against relative displacement.

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