Sept. 10, 1929. C. E. TILLEY 1,727,843

METHOD OF CLEANING DRYERS AND APPARATUS THEREFOR

Filed Nov. 18, 1927 2 Sheets-Sheet 1

Fig. 1.

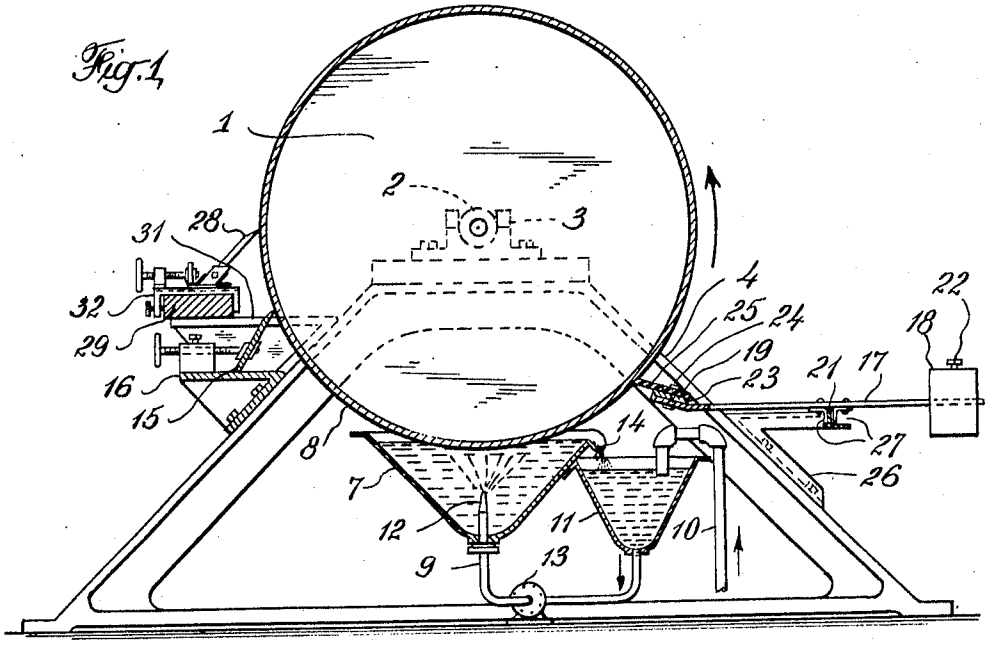


Fig. 3.

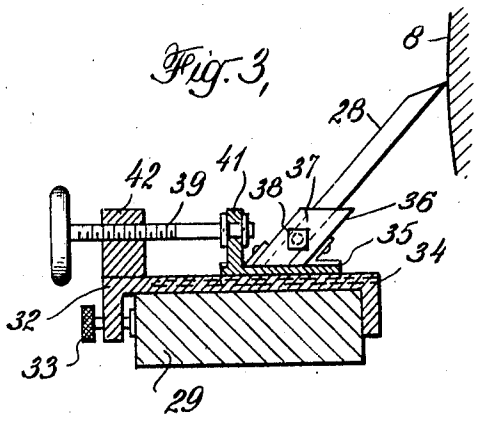
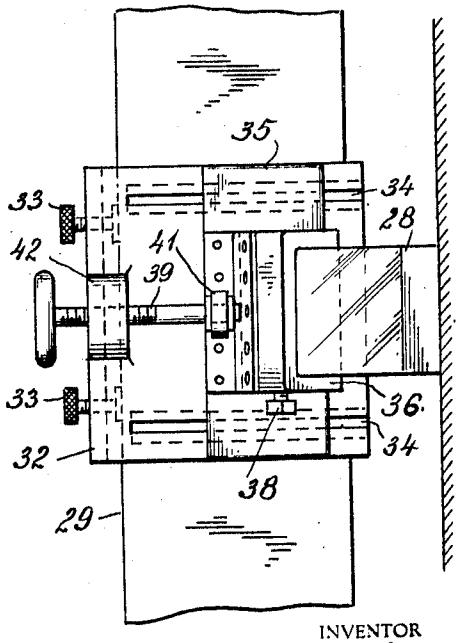


Fig. 4.



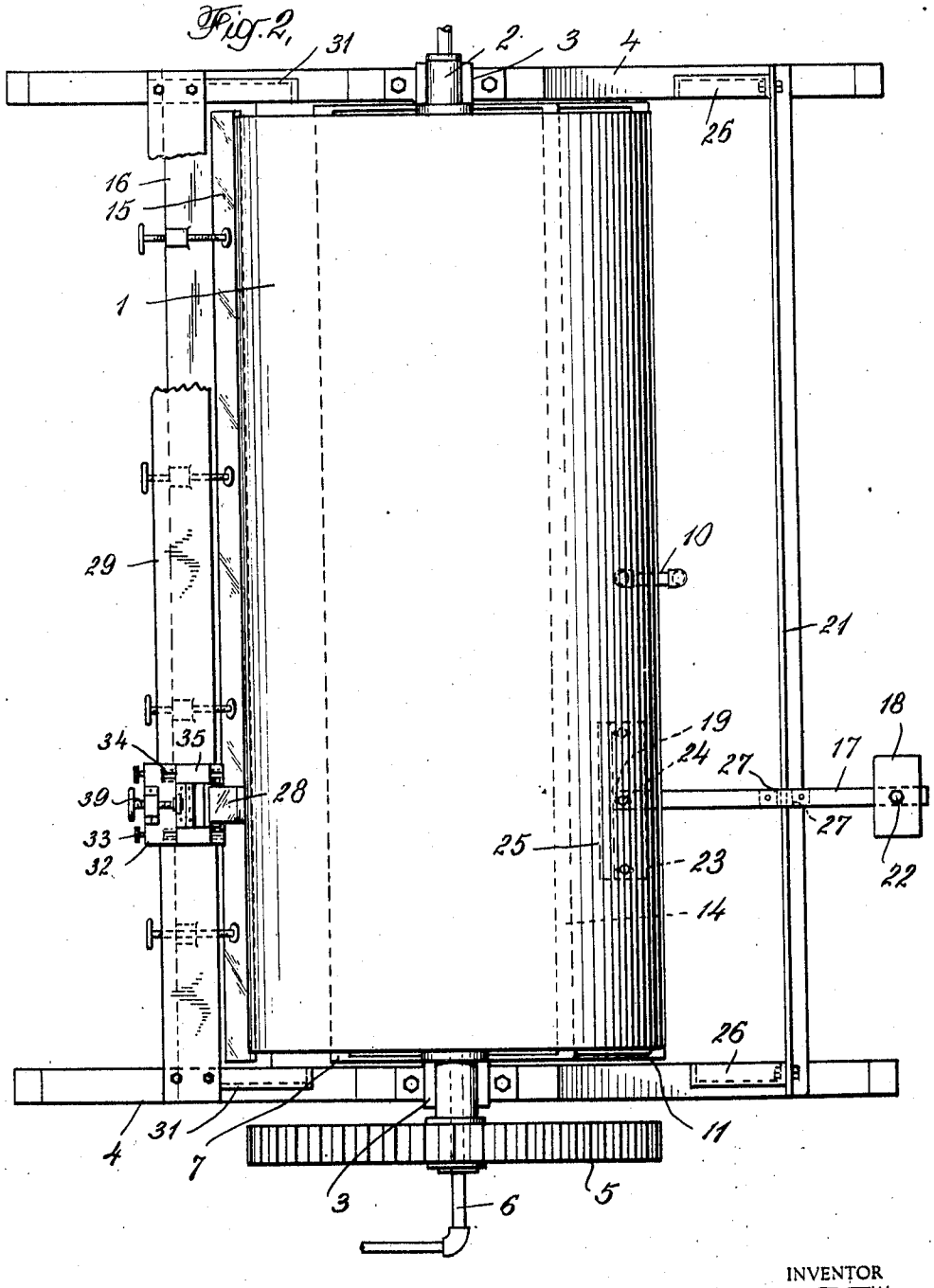
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METHOD OF CLEANING DRYERS AND APPARATUS THEREFOR

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Fig. 2.



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UNITED STATES PATENT OFFICE.

CLARENCE E. TILLEY, OF BALTIMORE, MARYLAND, ASSIGNOR TO GENERAL CHEMICAL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

METHOD OF CLEANING DRIERS AND APPARATUS THEREFOR.

Application filed November 18, 1927. Serial No. 234,173.

My invention relates to drying apparatus, and more particularly to a method of and means for cleaning such apparatus during operation.

In the manufacture of many materials there are obtained slurries, pastes, concentrated solutions and the like which must be dried out to secure the desired final product. Various types of drying apparatus are utilized for this purpose. For drying materials of the nature noted where low temperature drying is not essential, the well-known atmospheric rotary drum type of drier, for example, is commonly used. This drier consists of a rotating hollow cylinder presenting an extensive exposed outer surface upon which the slurry or the like is deposited, or to which it is caused to adhere by contact of the surface with a supply of said slurry, and is thereafter evaporated in the atmosphere to the dryness desired, the evaporation being accelerated by the introduction of steam into the interior of the cylinder to heat the outer shell.

The dried cake on the drum is thereafter removed by scraping, to which manner of removal the great proportion of the dried material responds readily. Not all of the dried material, however, is removed by the scraping operation, and the drum must be subjected to frequent cleanings to remove the tenacious scale which rapidly accumulates next the surface of the drum and retards its drying capacity. This scale may be removed by completely cutting off the supply of slurry to the drum and then washing the surface with caustic, or subjecting the surface to vigorous scraping with a chisel or similar means while the drum rotates, but such operations are objectionable in that they necessitate suspension of the drying operation. These delays for cleaning, moreover, are of sufficiently frequent occurrence to cause a very appreciable slowing up in production.

If removal of the scale from the drum surface by scraping is attempted without cutting off the supply of slurry to the drum, a profuse showering of the material being dried thereon will result, rendering such manner of removal impractical both from the standpoints of waste and working difficulties, a particularly pronounced objection from the latter standpoint arising, for example, when poisonous materials such as insecticides are being dried.

The object of my invention is to provide a novel and efficient method and means for cleaning the drying apparatus without necessitating any substantial suspension of the normal drying operation.

The manner in which I accomplish this consists in continuously applying a slurry or the like to a moving drying surface and continuously removing the dry product from said surface, diverting from a restricted portion of the drying surface material which would normally be fed thereto, and then cleaning that portion from which the material is diverted while permitting the remainder of the drying surface to function without interference, the same being carried out by novel and efficient means.

In the accompanying drawing I have shown a suitable embodiment of my invention in which

Fig. 1 is a sectional view in side elevation of an arrangement embodying my invention, a conventional drum drier and associated apparatus being shown diagrammatically in conjunction therewith:

Fig. 2 is a plan view of the same with parts broken away;

Fig. 3 is a side elevation of a construction for holding a scale scraper in contact with the drum surface; and

Fig. 4 is a plan view of the same.

Referring to the drawings and in particular to Figs. 1 and 2, reference numeral 1 designates a rotary drum drier of any well-known type provided with the usual shaft 2, which is mounted in suitable bearings 3 provided on a pair of supporting frames 4, one at each end of the drum. The drum is rotated by any suitable driving means connected with gear 5 on the shaft 2, and, as is the usual practice in the art, provision is made for the introduction of steam into the drum through shaft 2 by means of steam connection 6, for heating the outer shell of

the drum. Beneath the drum the usual elongated distributing trough 7 is provided which supplies the slurry, paste, or other material to be dried to the surface 8 of the rotating drum. The surface 8 contacts with the slurry in the trough 7, and to this surface some of the material adheres and is dried out in the subsequent travel of the surface 8.

A series of feed pipes 9 spaced longitudinally of the distributing trough 7 lead thereto from an intermediate feed trough 11, the trough 11 being fed from the main supply of slurry by means of a feed pipe 10. The pipes 9 are connected with a suitable pump 13 for pumping the slurry from the trough 11 to the distributing trough 7, and each pipe 9 terminates in the distributing trough in a jet or sprayer 12 by means of which the slurry is forcibly injected into the distributing trough, thereby agitating the slurry and causing it to surge up against the surface 8 passing in contact therewith. This agitation assures greater homogeneity in the slurry by preventing settling in the same. The trough 7 is also provided with an overflow 14 leading to the trough 11, and by means of this overflow arrangement, the connecting pipes 9 and the pump 13, a constant circulation of the slurry between the two troughs may be maintained.

The usual scraper 15, adjustably mounted in any well-known manner on a supporting frame 16, is provided at the side of the drum for removal of the dried material thereon.

For diverting the slurry from the surface 8 to clear a portion of the same for cleaning, a wiper construction is provided adjustable longitudinally of the drum. This construction comprises a beam 17, a counter-weight 18 adjustable on the beam and a wiper 19, the whole being mounted upon a fulcrum beam 21 in longitudinally adjustable relationship therewith. One end of the beam 17 extends through a slot in the counter-weight 18 which counter-weight is provided with a set screw 22 for securing said weight in the desired position of adjustment upon said beam. The opposite end of the beam 17 carries the wiper proper which comprises a flat reinforcing plate 23 of iron or other suitable material secured by means of rivets or the like to the end of the beam 17, and secured to this plate 23 by screws 24 is the wiping element 25, consisting of a heavy piece of multi-ply rubber, sheet gum, leather or other suitable material. The fulcrum beam 21 which may comprise a length of angle iron as shown, extends the entire length of the drum and is mounted at each end upon brackets 26 attached to the frames 4.

Substantially at the center and upon the underside of beam 17 (as shown in side elevation in Fig. 1 and in dotted lines in Fig. 2) a pair of parallel spaced lugs 27 are riveted thereto. These lugs define a channel between them for the accommodation of the fulcrum beam 21. Thus it will be seen that the entire wiper construction rests upon the beam 21 as a fulcrum and is free to rotate slightly thereabout, and in addition may be freely moved longitudinally of the fulcrum beam for wiping different portions of the drum surface 8.

The wiper construction is so mounted with respect to the rotary drum that the wiping element 25 will be maintained in contact with the moving drying surface 8 by means of the counter-weight 18 operating at the other side of the fulcrum beam 21. While the exact location of the point of contact of the wiping element with the drum surface is relatively immaterial, I prefer to locate the wiper within a short distance of the point where the drum surface emerges from the supply of slurry in trough 7 for the reason that by this arrangement the slurry is removed before it has had an opportunity to dry to an appreciable extent. A particularly advantageous location of the wiping element is immediately over the trough 11 as shown in Fig. 1. The moist slurry removed by the wiper falls into the trough 11 and is thus returned into the supply.

When the wiper construction is in operative position as noted, a very thorough cleaning off of slurry from the drying surface exposed to the action of said wiping construction is obtained. Over the area of contact of this construction a cleared portion of the drying surface will be made available around the greater portion of the drum for facilitating removal of the scale therefrom without hindrance to the normal operation of the uncleared portions of the drying surface.

For operation within the cleared portion, preferably on the side of the drum opposite the wiper construction and above the usual scraper 15 for taking off the dried material, a scale removing means such as a chisel 28 or other suitable instrument or means is provided which is held either manually or mechanically in close contact with the cleared portion of the drying surface to scrape away the thin film of adhering scale.

In the drawing, I have shown a means for mechanically holding the scale scraper 28 in adjustable relationship with the surface of the drum. A crossbeam 29 is supported at its ends upon brackets 31 attached to the end frames 4. A channel plate 32 capable of adjustment longitudinally of said cross-beam fits over said beam and is clamped thereto by thumb screws 33. In the top of the channel plate 32 a pair of inverted T-shaped grooves 34 are provided, said grooves opening at one side of the channel plate 32. The grooves 34 accommodate a pair of downwardly projecting inverted T-shaped tongues on a base plate 35, which tongues and grooves cooperate to retain said base plate 35 upon said channel plate 32 while permitting adjustment of the same

towards and away from the drum surface 8, transversely of said channel plate and said cross-beam 36.

Upon the base plate 35 a holder 36 for the chisel blade 28 is provided. The holder 36 is provided with a recess 37 for the accommodation of the blade 28, and retention of the blade within said holder is secured by a set screw 38. Adjustment of the holder and the blade transversely of the channel plate 32 towards and from the drum surface is obtained by means of a threaded rod 39 attached to a lug 41 on the base plate 35 and extending through a block 42 on the channel plate 32. Thus by means of the construction illustrated the chisel blade 28 may be moved longitudinally of the beam 29 into successive positions opposite the drum and then be brought up in contact with the drum surface 8 to thereby scrape off the thin adhering film of scale. It will be clear of course that the wiper construction will likewise be moved successively along the drum surface to clear that portion thereof which is being acted upon by the chisel blade 28.

From the foregoing description it will be seen that I have provided a very efficient and practical method of cleaning the drying surface of the drum with but slight interference with the normal drying operation, resulting in a considerable increase in production over that obtainable by known methods. It will be noted that the operative end of the wiping construction is of restricted length and is adapted to operate upon but a small portion of the surface of the drum. By such a construction it is possible to clean successive portions of the drum until the entire surface has had the scale removed therefrom, and except for the restricted portion being cleaned at a particular period the normal drying operation will proceed substantially unaffected.

The broad accomplishment of my invention is essentially the presentation for a cleaning operation of an uncoated portion of a surface normally coated with material to be dried or otherwise treated, without interfering substantially with the normal operation of the remainder of said surface. The particular construction of the drying apparatus in conjunction with which the wiping construction is shown and described is simply one in which the application of my invention results very effectively and advantageously, but it is obvious that my invention is not limited to that particular application nor to the particular wiping and scale scraping construction, and that other similar applications and embodiments may be made without departing from the spirit of my invention.

I claim:

1. The method of cleaning a drying surface which comprises, diverting the material to be dried from a portion of said drying surface while permitting said material to be supplied to other portions of said surface to be dried thereon, and then cleaning the portion from which the material is diverted.

2. The method of removing scale from a moving drying surface which comprises, diverting the material to be dried from a portion of said drying surface while permitting said material to be supplied to other portions of said surface, and then scraping said portion from which the material is diverted.

3. The method of cleaning a rotating cylindrical drying surface to which material to be dried is being supplied without substantially arresting the operation of said drying surface which comprises, impeding over a restricted portion of said surface the carrying of material to be dried thereon while permitting unhindered carrying of said material by other portions of said surface, and then cleaning the portion cleared by said impeding operation.

4. The method of removing scale from a rotating cylindrical drying surface to which a slurry or the like is being supplied which comprises, wiping from a restricted portion of said surface the slurry or the like supplied thereto for drying thereon, and then scraping the portion cleared by said wiping operation.

5. The method of removing scale from a rotating cylindrical drying surface to which moist material to be dried is being supplied without substantially arresting the operation of said drying surface which comprises clearing from successive annular portions of said surface the moist material supplied thereto for drying thereon, and scraping the scale from said portions respectively as successively cleared.

6. The method of removing scale from a moving drying surface to which a slurry or the like is being supplied for drying thereon which comprises, wiping from a restricted portion of said surface the slurry being supplied thereto, and then scraping the scale from said portion from which said slurry has been wiped, said wiping action being applied prior to any substantial drying of said slurry upon said surface.

7. The method of cleaning a drying surface to which a slurry or the like is being fed from a supply for drying upon said surface which comprises, diverting from a restricted portion of said surface the slurry fed to said surface and cleaning the portion of said surface from which the slurry is diverted, said slurry being diverted to the supply of said slurry being fed to said surface.

8. A method of cleaning a moving drying surface while maintaining substantially uninterrupted operation thereof which comprises continuously applying a slurry or the like to the moving drying surface and continuously removing the dry product from said surface, wiping the slurry before the

same has dried from a restricted portion of said surface, cleaning the scale from said portion from which said slurry has been wiped and continuing the wiping and cleaning action until said portion of the surface is freed from scale, then discontinuing said wiping and cleaning action with respect to the portion of the moving surface to which said operations have previously been applied, whereby said portion of said surface thereafter serves to receive and to dry slurry without interference, then applying the wiping and cleaning operations to another portion of the moving surface and repeating said operations until all portions of the entire moving surface have been treated for the removal of scale.

9. An apparatus of the character described comprising the combination with a moving drying surface adapted to carry material to be dried thereupon, of means for diverting the material to be dried from a portion only of said drying surface, and means for cleaning that portion of said surface from which said material has been diverted.

10. An apparatus of the character described comprising the combination with a moving drying surface adapted to carry material to be dried thereon, of means for wiping the material to be dried from a portion only of said drying surface, and means for scraping adhering scale from that portion of said surface from which said material has been wiped.

11. An apparatus of the character described comprising the combination with a rotary cylindrical drying surface adapted to carry material to be dried thereon, of means for wiping the material to be dried from a portion only of said surface, and means for scraping adhering scale from that portion of said surface from which said material has been wiped, said wiping means being constructed and arranged to operate upon said drying surface at a point upon said surface at which no appreciable drying of said material has taken place.

12. The method of cleaning a drying surface which is being supplied continuously with material to be dried, which comprises removing most of the material to be dried from a portion of said drying surface while permitting said material to be retained on other portions of said surface to be dried thereon, and then cleaning the portion from which the material has been removed.

In testimony whereof, I affix my signature.

CLARENCE E. TILLEY.