Aug. 18, 1931. H. T. HUNTER 1,819,557

COATING APPARATUS

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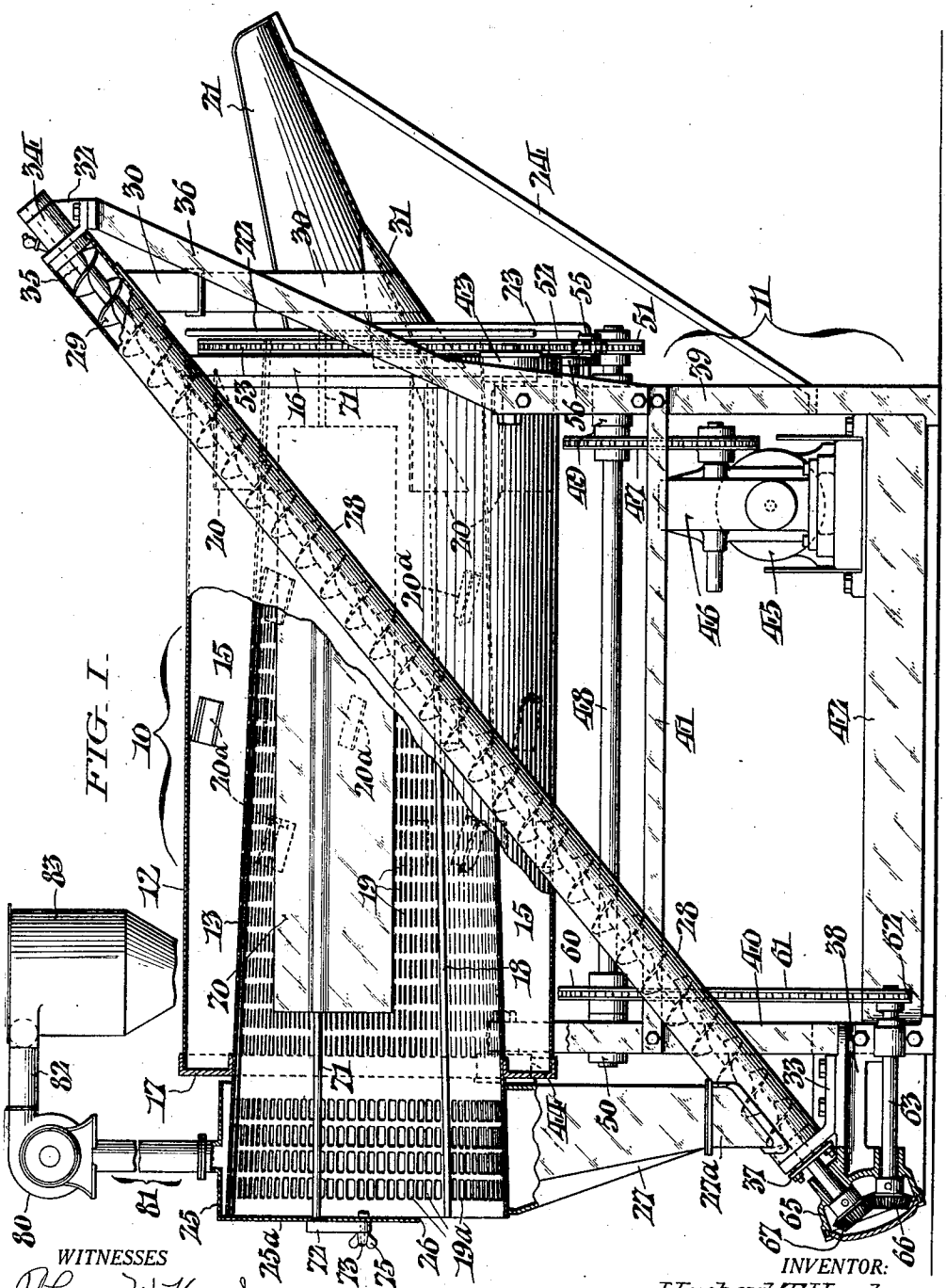


FIG. 1.

WITNESSES

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FIG. II.

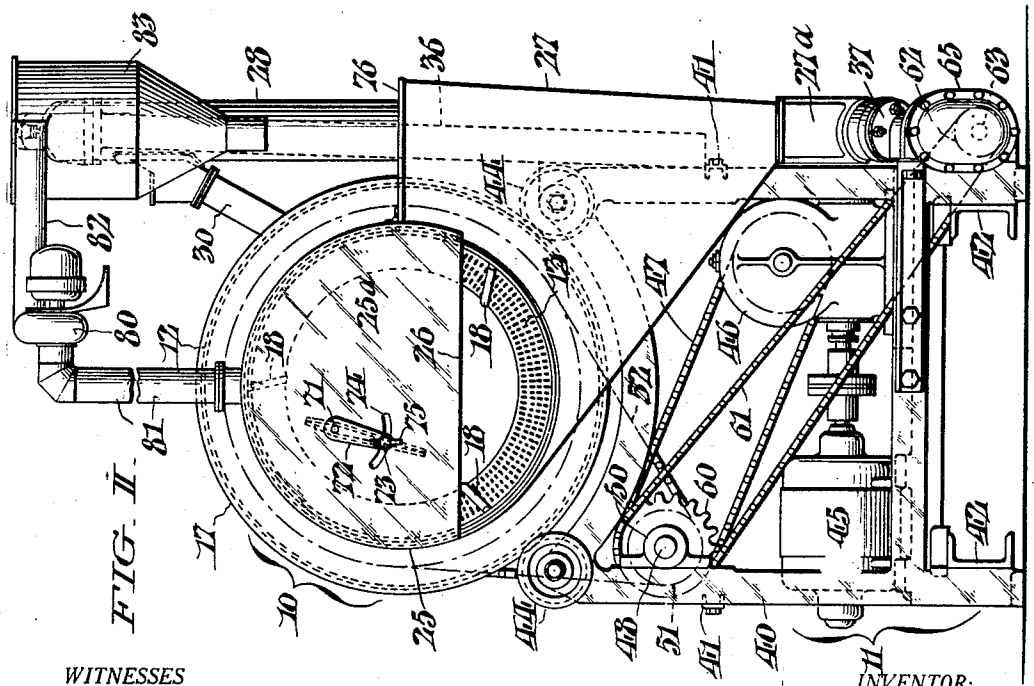
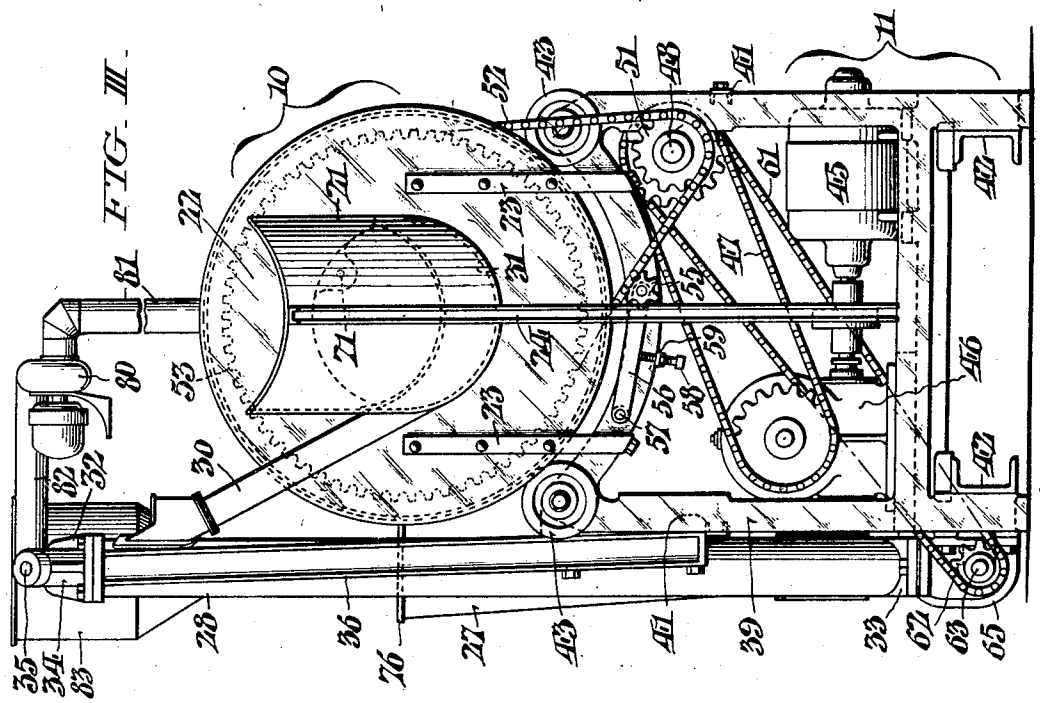


FIG. III.



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FIG. IV.

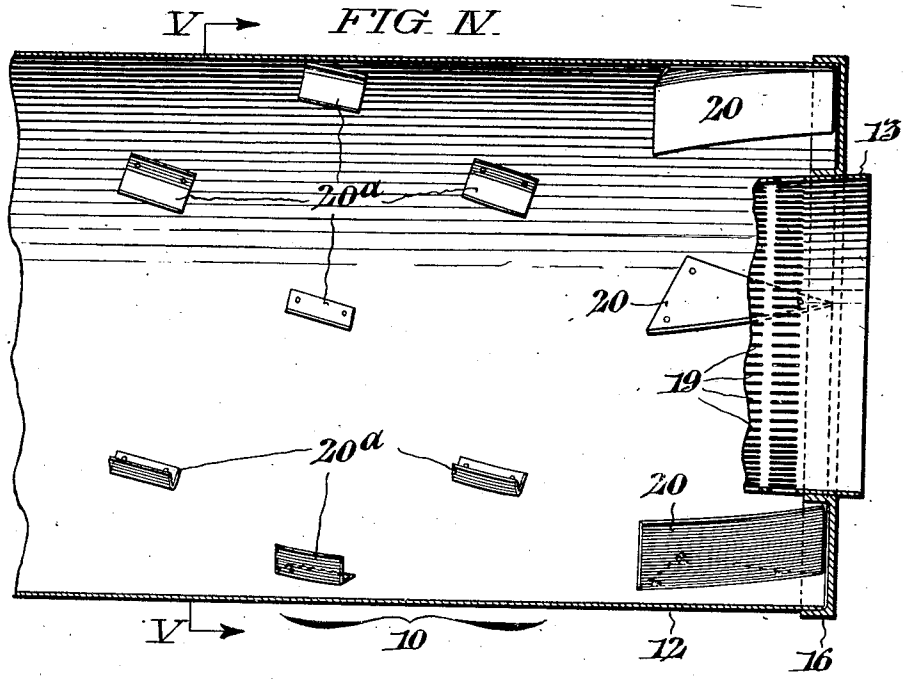
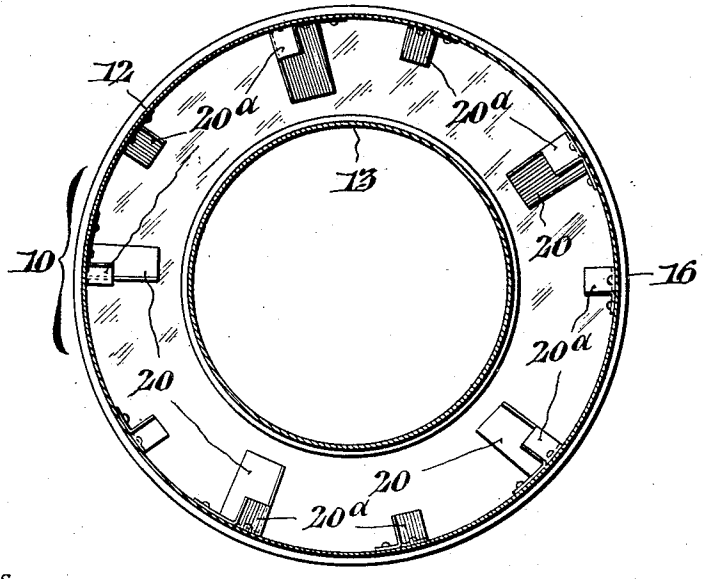


FIG. V.



WITNESSES

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Patented Aug. 18, 1931 1,819,557

UNITED STATES PATENT OFFICE

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COATING APPARATUS

Application filed November 3, 1928. Serial No. 317,079.

This invention relates to apparatus useful in coating articles such as doughnuts, cakes, etc. with sugar or like material either in granular or pulverized form.

The purpose of my invention is to enable rapid and continuous treatment of articles of the kind referred to in quantity without injury to them or attendant deformation, through provision of a simple, reliable and inexpensive apparatus capable of inducing gentle progression and rolling of the articles for exposure in constantly changing positions to a shower of coating material released from above them, thereby to insure a uniform covering over their entire surface.

A further aim of my invention is to provide, in connection with such apparatus, for continuous reclamation and reuse of all excess coating material so that a constant and effective shower is maintained to the avoidance of wastage of the coating.

Still other objects and attendant advantages will be manifest from the detailed description which follows of the typical embodiment shown in the drawings, wherein Fig. I is a side elevation of my improved coating apparatus with parts broken away and others in axial section to expose important details.

Fig. II is an elevation looking at the delivery end of the apparatus, or as viewed from the left of Fig. I.

Fig. III an elevation looking toward the receiving end of the apparatus, or as viewed from the right of Fig. I.

Fig. IV is a fragmentary sectional view, on a scale somewhat larger than the preceding illustrations, of a rotary drum constituting a part of my improved coating apparatus; and,

Fig. V shows a cross section of the drum, taken as indicated by the arrows V—V in Fig. IV.

As herein delineated, the coating apparatus of my invention comprises a horizontal drum 10 which is sustained for slow rotation as hereinafter more fully disclosed, by a substructure 11. As shown in Figs. I, IV and V, the drum 10 comprises an outer tube or shell 12 fashioned to cylindric configuration from sheet metal, and a coaxial inner shell 13—also of sheet metal—spaced relative to the first by a circumferential interval 15. The two shells 12, 13 are united in the relation described by end flange rings 16, 17 to which they may be secured in any convenient way, as by riveting or welding. The inner shell 13 serves as a treating chamber, and, as shown, is tapered somewhat so as to promote gravitational progression therethrough of the articles which are to be coated from its smaller or receiving end, at the right of Fig. I, to the larger or delivery end at the left, where said shell 13 projects somewhat beyond the outer tube 12. To counteract gravitational progression of the articles in part and thereby prevent too rapid traverse of the drum 10, I attach at the inside of the inner shell 13, longitudinally arranged spiralized ribs 18 which are pitched at a slight angle, in the proper direction, to bring about the described action. These ribs 18 function in still another capacity, i. e. as a means to induce gentle rolling of the articles incidental to rotation of the drum 10 so that their surfaces are exposed, in constantly changing positions, to a shower of granulated or pulverized coating released from above in a manner to be presently explained.

Still referring to Fig. I, it will be noted that the inner shell 13 of the drum 10 is reticulate, or in other words, provided with elongated apertures 19, the apertures 19*a* at the projecting delivery end of said shell being larger than those of the portion within the confines of the outer shell 12. As the drum 10 rotates, the coating within the circumferential interspace 15 is carried up the rising side of the outer shell 12 by spacedly-staggered angle flights 20, 20*a* attached to the inner surface of the latter. Upon being elevated by these flights 20, 20*a* above the longitudinal center of the drum 10, the coating will naturally fall off gradually and find its way through the interstices or apertures 19 at the top of the inner shell 13 and thus set up the showering effect previously mentioned, the coating falling afoul of the articles, or any excess released through continued rolling of the articles, eventually

dropping through the interstices or apertures 19 in the lower portion of said shell into the interspace 15 to be carried up again by the flights 20, 20*a* and reshowered. It is to be particularly noted that the larger flights 20 at the right hand end of the drum 10 are pitched slightly so as to discharge forwardly and thereby preclude loss of coating, through spillage, at that end of the apparatus. The other flights 20*a*, on the other hand, are pitched in the reverse direction so as to discharge rearwardly and thereby act to retain the coating material within the drum 10 in opposition to the tendency of the articles, as they traverse the inner shell 13, to carry it toward the delivery end of the apparatus. Thus by cooperation of the flights 20, 20*a*, the coating is maintained more or less at the center of the drum 10 with attainment of a highly efficient showering effect at that region.

The articles to be coated are introduced into the apparatus through an inclined chute 21 formed as a part of a stationary head 22 which closes the receiving end of the drum 10, said head being supported by metallic straps 23 from the substructure 11 beneath the drum, and the chute 21 braced by an angular strut 24 also reaching upward from said substructure. The outboard or delivery end of the inner shell 13 is surrounded by a stationary hood 25. As shown in Figs. I and II, the outer wall 25*a* of this hood 25 is interrupted as at 26 with formation of a segmental opening through which the coated articles are discharged from the drum 10. From Figs. I and II, it will be further noted that the hood 25 communicates with a flanking chute extension 27 serving as a receptacle for collecting all excess coating falling through the larger interstices 19*a* at the delivery end of the inner drum shell 13. The coating so collected gravitates toward the bottom outlet 27*a* of the receptacle and is discharged into a cylindric tube 28 inclined in a direction upwardly from the delivery (left hand) end of the apparatus to the receiving end (right hand) as shown in Fig. I. This tube 28 encloses a conveyor spiral 29 for elevating the coating, said tube discharging at the top into a connecting spout 30 which in turn delivers said coating into a subdivision 31 at the bottom of the chute 21. The tube 28 may be conveniently formed from sheet metal, and has its opposite ends telescoping embossments on upper and lower brackets 32, 33. As shown, the bracket 32 affords a bearing 34 for the upper end of the shaft 35 of the spiral 29, while it is bolted to a strut 36 reaching upward from the substructure 11. A gland 37 associated with the lower bracket 33 prevents loss of coating at that region; and said bracket is bolted to a bearing member 38 secured to the substructure 11.

Examining the substructure 11 in detail, it will be observed that the same comprises open end frames 39, 40, each with its upper edge concaved in conformity with the drum 10, said end frames being joined by upper and lower horizontals 41, 42. At the tops, the end frames 39, 40 are respectively provided with rollers 43 and 44, whereon the end rings 16, 17 of the drum 10 rest. Edge flanges on these rollers 43, 44 prevent axial shifting of the drum 10 on the substructure 11 incidental to rotation.

The driving means for the apparatus includes an electric motor 45 which is fixedly supported in the lower portion of the substructure 11 and communicates motion to a speed reduction gear device conventionally represented at 46. By means of a sprocket chain 47, power is transmitted from the speed reduction device 46 to a longitudinal jack shaft 48 journalled at opposite ends in bearings 49, 50, afforded respectively by the end frames 39, 40 of the substructure 11. To the protruding right hand end (Fig. I) of the jack shaft 48 is secured a sprocket pinion 51 which is coordinated, by a transmission chain 52 (Fig. III), with circumferential sprocket teeth 53 on the ring 16 at the receiving end of the drum 10. As a means to take up the slack of the transmission chain 52 I employ an idler pinion 55. This pinion 55 is carried at the end of an arm 56 fulcrumed at 57 on the end frame 39, said arm being capable of adjustment by a screw 58 taking through a boss 59 of said end frame. By virtue of this arrangement, the chain 52 not only serves as a means for rotating the drum 10, but also as a means for holding said drum against rising on its support. Within the confines of the substructure 11 adjacent the delivery end of the apparatus, the jack shaft 48 carries a second sprocket wheel 60 which is coordinated by a chain 61 with a sprocket pinion 62 on one end of a shaft 63 journalled in the bearing member 38 aforementioned, see Fig. I. As shown, the opposite end of the shaft 63 extends into a housing 65 integrally formed with the bracket member 38 for attachment of a bevel gear 66 in mesh with a similar bevel gear 67 at the lower end of the shaft 35 of the elevating spiral 29. Under such drive, the spiral 29 is continuously rotated at a suitable speed, relative to that of the drum 10, so that the collected coating from the receptacle 27 is elevated for re-use and thereby maintained in continuous circulation.

With rotation of the drum 10, the coating is carried up by the flights 20, 20*a* and eventually released to fall through the interstices 19 of the shell 13 onto the articles slowly traversing the latter, as already understood. As a consequence of the combined rolling and the lifting effect of the spiralized ribs 18, the articles will naturally hug the rising side

of the drum 10 notwithstanding their being tumbled about and tend to concentrate at a level considerably above the bottom of said drum. In order to direct the shower of coating so as to fall over the region of greatest concentration of the articles, I provide a deflecting vane 70. As shown, this deflecting vane 70 extends longitudinally of the drum 10 and is supported by an axis 71 having bearing at one end in the wall 25*a* of the hood 25, and at the other end in the head 22. As a consequence of such support, the vane 70 can be angularly adjusted as required to secure the most advantageous showering of the coating. To facilitate adjustment I secure to that end of the axis 71 protruding through the head of the hood 25, an arm 72 which, at its lower end, carries a headed clamp screw 73 reaching through a concentric arcuate slot 74 in said head. By means of a wing nut 75 associated with the screw 73, the deflecting vane 70 can be, obviously, fixed in any desired position of adjustment. For the purpose of enabling replenishment of the coating supply from time to time, the collecting receptacle 27 is provided with an upwardly swingable hinged cover, shown at 76 in Figs. II and III.

To minimize loss of the finer particles of the coating material set free as dust through turbulence in the drum 10, I equip the apparatus with an auxiliary recovery system including a rotary suction blower 80 which draws the dust through a pipe connection 81 into the top of the hood 25, and delivers through another pipe 82 leading tangentially into a centrifugal separator conventionally represented at 83. The accumulation in the separator 83 may be removed and reintroduced into the receptacle 27 and thus used over again. In operation and assuming a preliminary supply of coating material has been dumped into the chute 27, it will be readily understood that, when the motor 45 is initially started, said coating material is gradually elevated by the screw conveyor 29, to the spout 30, for discharge into the interspace 15 of the drum 10, through the subdivision 31, as herein previously set forth. When articles to be coated, are introduced by way of the inclined chute 21, as the drum 10 and inner shell 13 rotate, the angle flights 20, 20*a* elevate coating material over and above the top of said inner shell and, through the apertures 19 whereof it will be showered, onto the articles gravitating slowly, under rolling action, towards the delivery end of the apparatus. Un-used coating material will filter through the lower apertures 19 of the inner shell 13, into the interspace 15, to be again elevated by the angle flights 20, 20*a*, for re-distribution over said inner shell. Any excess coating material carried along by the articles falls through the larger apertures 19*a* at the delivery end of the apparatus, and gravitates via the chute 27 to the tube 28 for further elevation by the screw conveyor 29, and re-circulation through the apparatus, in the manner just described.

Having thus described my invention, I claim:

1. In coating apparatus of the character described, a rotating drum with an inner perforated shell having longitudinally-directed angularly-pitched progression-counteractive ribs, said shell being adapted to be traversed by the articles being coated by granular or pulverulent coating material showering from above upon the traversing articles, and a longitudinally extending vane in the shell to deflect the coating material laterally for distribution over the region of greatest concentration of the articles therein.

2. In coating apparatus of the character described, a rotating drum with an inner perforated shell having longitudinally-directed angularly-pitched progression-counteractive ribs, said shell being adapted to be traversed by the articles being coated by granular or pulverulent coating material showering from above upon the traversing articles, a longitudinally disposed vane in the shell to deflect the coating material laterally for distribution over the region of greatest concentration of the articles therein, and means at opposite ends of the apparatus to support the deflecting vane with capacity for angular adjustment.

3. In coating apparatus of the character described, a horizontal rotating drum with an inner perforated shell having longitudinally-directed angularly-pitched progression-counteractive ribs, said shell being adapted to be traversed by the articles being coated by granular or pulverulent coating material showering from above upon the traversing articles, a longitudinally extending vane in the shell to deflect the coating material laterally for distribution over the region of greatest concentration of the articles within the drum, stationary heads forming closures for the opposite ends of the drum and affording journal bearing for an axis supporting the deflecting vane aforesaid thereby to enable angular adjustment of the latter, and means whereby the vane may be fixed in adjusted positions.

4. In coating apparatus of the character described, a horizontal rotating drum with a perforated inner shell having longitudinally-directed angularly-pitched progression-counteractive ribs and constituting a treating chamber, said shell being tapered to promote gravitational progression therethrough of the articles which are to be coated and spaced from the drum by a circumferential interval accommodating a quantity of granular or pulverulent coating material; spacedly-staggered means for lifting the coating material within the circumferential interval and de-

flecting the same inwardly from opposite ends of the drum incidental to releasing it so as to fall through the perforations at the top of the inner shell and shower upon the traversing articles, and a longitudinally-extending member in said inner shell to deflect the coating material laterally for distribution over the region of greatest concentration of the articles therein.

5. In coating apparatus of the character described, a horizontal rotating drum with a perforated inner shell having longitudinally-directed angularly-pitched progression-counteractive ribs and constituting a treating chamber, said shell being tapered to promote gravitational progression therethrough of the articles which are to be coated and spaced from the drum by a circumferential interval accommodating a quantity of granular or pulverulent coating material; oppositely-pitched angle flights of differing size attached to the outer drum shell for lifting the coating material within the circumferential interval and deflecting the same inwardly from opposite ends of the drum incidental to releasing it so as to fall through the perforations at the top of the inner drum shell and shower upon the traversing articles, and a longitudinally-directed angularly-adjustable vane in said inner shell to deflect the coating material laterally for distribution over the region of greatest concentration of the articles therein.

In testimony whereof, I have hereunto signed my name at Ellicott City, Maryland this 22nd day of October, 1928.

HERBERT T. HUNTER.