

May 26, 1953

L. BURN ET AL

2,639,747

ROTARY GRANULATING MACHINE

Filed April 18, 1949

4 Sheets-Sheet 1

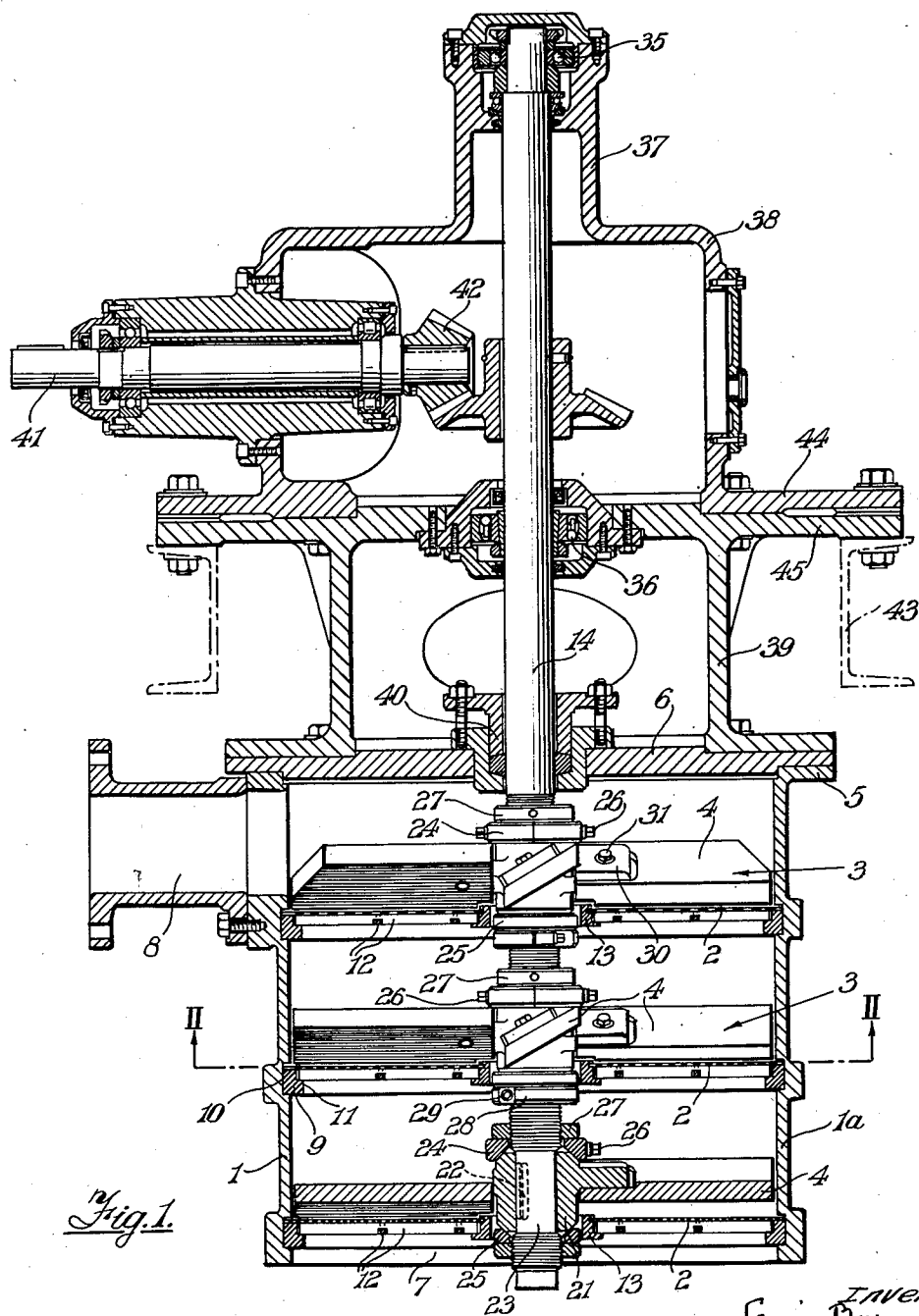


Fig. 1

INVENTORS
Lewin Burn
Marcel Todd and
John Oliver
By Messrs. & Patterson
ATTORNEYS

May 26, 1953

L. BURN ET AL
ROTARY GRANULATING MACHINE

2,639,747

Filed April 18, 1949

4 Sheets-Sheet 2

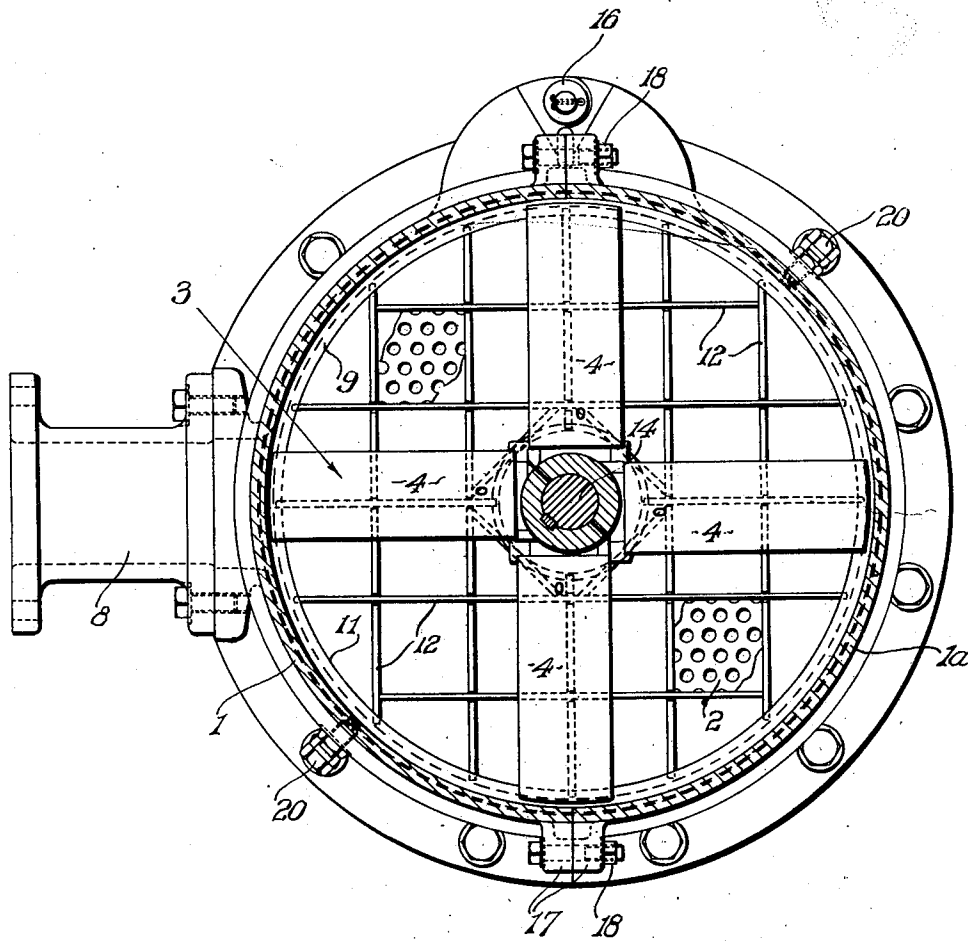


Fig. 2.

INVENTORS

Lewis Burn,
Morris Todd, and
John Oliver

By *Harold P. Peterson*
ATTORNEYS

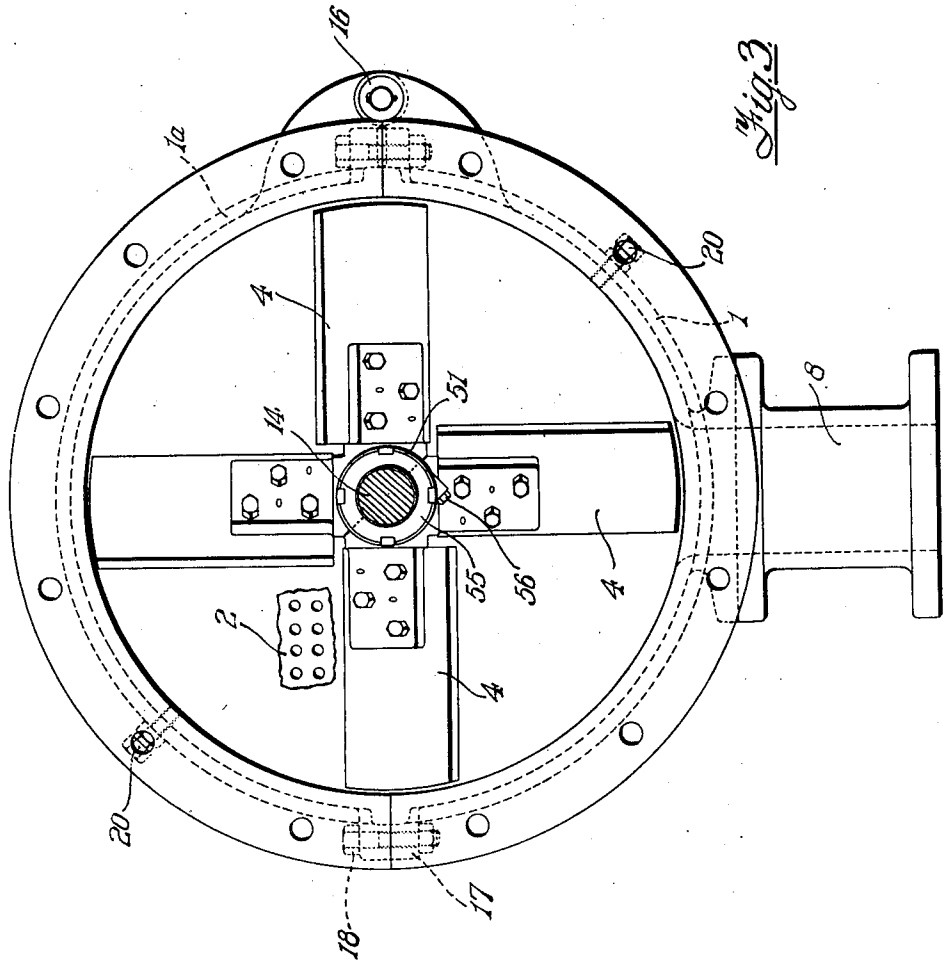
May 26, 1953

L. BURN ET AL
ROTARY GRANULATING MACHINE

2,639,747

Filed April 18, 1949

4 Sheets-Sheet 3



INVENTORS
Lewis Burn -
Marcel Todd and
John Oliver
By *Wm. L. Ottum*
ATTORNEYS

May 26, 1953

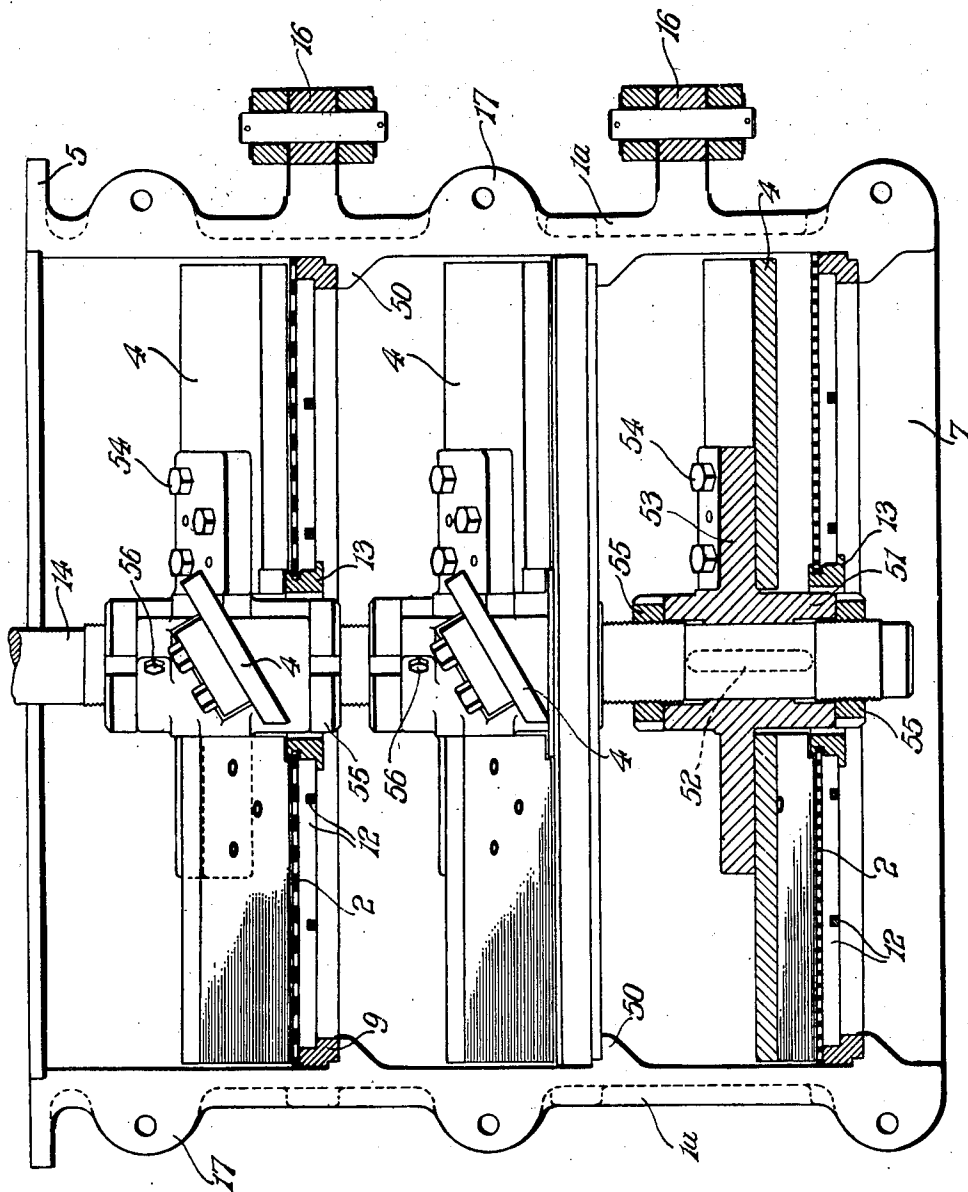
L. BURN ET AL

2,639,747

ROTARY GRANULATING MACHINE

Filed April 18, 1949

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,639,747

ROTARY GRANULATING MACHINE

Lewis Burn, London, England, Horace Todd,
Holywell, Wales, and John Oliver, Coventry,
England

Application April 18, 1949, Serial No. 88,207
In Great Britain April 15, 1948

3 Claims. (Cl. 146—175)

1

This invention relates to improvements in rotary granulating machines and finds particular application in the breaking down, from a large size to a smaller size, of materials of frail cohesion, such as coagulated crystals, pharmaceutical preparations, aggregated amorphous matter, solid-liquid mixtures such as viscose, food materials and the like, and is of the type wherein the material is fed to a rigid perforated entity, the said material being engaged by a rotary device or devices arranged in stages above said perforate rigid member or members.

The object of the present invention is to provide a granulating machine, the interior of which is readily accessible for adjustment, cleaning or replacement of the arrangements which determine the particle or granule size of the material treated.

A further object of the invention is to arrange for the rotary part of the said granulator to be located by bearings disposed external to and above the granulating compartment so as to avoid obstructing the passage of material during treatment and to provide an open base for the rapid ejection of treated granulated matter to a conveyor or suitable container.

According to the invention the improved granulating machine comprises in combination; a cylindrical vertically divided shell, one side of said shell being hingedly mobile and securable to a static side, a depending rotary power shaft driven by overhead gear mounted axially of said shell, the internal face of said shell being peripherally stepped to hold removable graduated sieve plates, each of said sieve plates resting on a removable support grill, said sieve plates being arranged in a series of tiers in a plane horizontal to the vertical axis and adapted to co-operate with a series of granulating arms fast with the axial shaft and adapted to rotate said series of sieve plates to granulate solid or semi-solid matter from a large particle size to a smaller particle size.

In order that the invention will be more readily understood preferred embodiments thereof will now be described with reference to the accompanying drawings wherein:

Fig. 1 is a vertical elevation partly in section of a preferred arrangement of the invention.

Fig. 2 is a horizontal sectional view on the line II—II of Figure 1 as viewed from below.

Fig. 3 is a plan view of the granulating compartment of an alternative embodiment of the apparatus according to the invention, and

Fig. 4 is a vertical part-sectional elevation of the apparatus shown in Figure 3.

In carrying the invention into effect and ac-

2

cording to a preferred form thereof as shown in Figures 1 and 2, the granulating apparatus is housed within a vertically disposed cylindrical shell 1 and consists in a series of perforate sieve plates 2 mounted in spaced relationship transversely of the said shell 1, a rotary bladed member 3 being provided above each of said sieve plates 2 and having a series of radially extending granulating arms 4 which skim the upper face thereof so as to thrust the material to be treated through the perforations of the said sieve plates. The uppermost end of the shell 1 is flanged as at 5 to support and locate a cover plate 6 whilst the lower end thereof is open as at 7 to provide for the outlet of the granulated material after treatment. The said material prior to treatment is introduced to the granulating machine through the opening 8 and is thereafter treated in progressive stages until, having reached the required granule or particle size, it is discharged through the open base 7 of the machine to a conveyor or suitable container (not shown). In order to provide for such progressive granulation of the material the perforations formed in the sieve plates 2 are graduated in size, the final stage, that is to say, the lowermost sieve plate, having the smallest perforations.

The perforate sieve plates 2 are each adapted to seat at their periphery upon an annular ring member 9 located within a recess 10 formed peripherally within the internal face of the shell 1. This ring member 9, in addition to providing peripheral support for the said sieve plate, is formed with an inwardly extending flange 11 upon which rests a support grill consisting of intersecting bearer rods 12, these latter serving to lend rigidity and support to the sieve plate 2 over its whole area. An annular bush 13 is provided centrally of each co-operating pair of sieve plates and support grills, the said bush having a central aperture of such dimensions as to permit the passage of a central rotary shaft 14 which depends into the granulating compartment through the cover plate 6 and upon which is secured at intervals there along the said rotary bladed members 3.

In order to provide easy access to the interior of the shell 1, the curved wall of this latter is diametrically divided, the one half thereof which constitutes a semicylindrical door 1a being capable of opening on a pair of hinges 16 (one of which is shown in Figure 2). The sieve plates 2, ring members 9 and support grills consisting of bearer rods 12 are each formed in two separate parts, being divided diametrically so as to permit their removal when the said semicylindrical door 1a is open. The screw-threaded bolts

3

20 disposed in the curved wall of the shell 1 adjacent the peripheral recesses 10 serve to engage and lock the said support ring members 9 in position when the door 1a is closed so as to prevent rotation of these members and the sieve plates 2 within the said recesses under the action of said rotary granulating arms 4. Wing members 17 projecting outwardly from the curved wall of the shell 1 and from the semi-cylindrical door 1a at the points of vertical division of these two parts are adapted to be clamped together by bolts or like securing means 18 when the said door is in its closed position.

Each said rotary bladed member 3 mounted upon the dependent shaft 14 comprises inter alia a dismountable diametrically divided boss 21 keyed to the said shaft 14 as at 22. The two semi-cylindrical parts of this boss are adapted, on assembly, to seat within the reduced portions 23 of the shaft and are clamped to and located upon the said shaft between bevelled faces of securing rings 24 and 25. The bevelled securing rings 24, which abut the upper bevelled edge of the divided boss 21 of each rotary bladed member 3, are also diametrically split to permit their removal or adjustment and are coupled and tightened around the said shaft 14 by tangentially disposed threaded bolts 26. Locknuts 27 in screw-threaded engagement upon the shaft 14 serve to retain the securing rings 24 in position. The securing rings 25, on the other hand, whose bevelled edges abut the lower bevelled edge of the divided boss 21 are preferably screw-threaded to the shaft 14 and are retained in position by a split ring member 28 provided with at least one clamping bolt 29 by which it is tightened to the said shaft.

The divided boss 21 is formed with radially extending lugs 30 to which the said granulating arms 4 are secured by bolts or like securing means 31. In order to provide for the necessary wedging action during the rotation of these arms so as to exert a certain pressure upon the material to be treated and force the latter through the perforations of the sieve plates 2, the forward edge of each granulating arm is tilted upwards away from its co-operating sieve plate whilst the trailing edge thereof skims with slight clearance the upper surface of the said sieve plate.

It will be understood that there is a great divergence between the physical qualities of the materials which require granulation for commercial use. Thus the manufacture of bread or rusk crumbs of graded size is a totally different proposition from the manufacture of uniform crystalline granules of bath salts, and each requires a separate setting of the granulating arms in relation to the perforated plates. The means provided by the present invention for permitting adjustment of the position of the granulating arms relative to that of the sieve plates consist in the securing rings 24 and 25 retained respectively by locknuts 27 and split ring clamping members 28.

The angled granulating arms which are radial to the shaft bosses 21 may be of varied section or design for special purposes, thus several may be of a spreading or smearing type, whilst one may be of brush, scraper or like character to ensure clearance of the friable material passing downward through the sieve plate perforations.

In order to avoid obstructions to the ejection of the granulated particles from the machine such as a spider member carrying a foot-step bearing for the rotary shaft 14, the latter is carried by thrust-bearings mounted in a structure disposed above the shell 1 of the granulator. As

4

shown by way of example in Figure 1, the vertical shaft 14 is mounted in bearings 35 and 36, the former being located within a projection 37 of a gear housing 38 whilst the latter is mounted in a lower housing 39 which is bolted upon the cover plate 6 and flange 5 of the shell 1. A stuffing box 40 disposed centrally within the cover plate 6 of the granulating compartment and around the rotary shaft 14 prevents leakage of lubricant and the like from the gear box and bearings into the said granulating compartment.

As illustrated the drive to the vertical rotary shaft 14 is preferably delivered from a horizontal take-off shaft 41 through a bevelled gear 42. The take-off shaft 41 is preferably electrically driven, suitable means being provided on the electric motor (not shown) for delivering a variable speed.

The whole apparatus as shown in Figure 1 may be supported conveniently upon structural frame work as shown at 43 by the extended flanges 44 and 45 on the gear housing 38 and lower housing 39 respectively.

In Figures 3 and 4, which illustrate an alternative form of construction with the granulating machine according to the invention, like component parts to those employed in the embodiment illustrated in Figures 1 and 2 have been denoted by like reference numerals.

This form of construction indicates an alternative method of locating the sieve plates 2, support ring members 9 and bearer rods 12, within the cylindrical shell 1, these removable parts being seated upon peripheral steps 50 formed on the inner face of the shell. When the semi-cylindrical door 1a of the shell has been closed and secured the bolts 20 are tightened to locate the said support ring members and prevent their rotation.

Also according to this form of construction the rotary bladed members are formed with a dismountable diametrically divided boss 51 keyed to the rotary shaft 14 as at 52. Lugs 53 extending radially outwards from this boss support the granulating arms 4 secured by bolts 54. Adjustable screw-threaded locking rings 55 are provided below and above the said divided boss 51 to permit adjustment of the position of the latter along the shaft 14 and relative to the sieve plates 2. Bolts 56 are provided for clamping together the divided parts of the boss 51 and securing these to the shaft 14 with the desired clearance between the trailing edge of the granulating arms and the sieve plates 2.

Either embodiment of the apparatus described above may be used in cascade, thus the outlet of the first machine may be fed to a second, and the product of the latter fed to a further granulator. Equally, the feed and granulating machine may constitute a closed circuit to volatile material retained in the friable raw material mass, the feed being delivered by any known type of starwheel or multi-bladed feeder.

By the means described above granulation of any friable material can be accomplished with an exact sieve size for the particles required. The apparatus will operate with dry material, powders and paste, the adjustments enabling the operator to control the grading of granulation as may be required. By adjusting the height of the granulating arms above the sieve plates, a granulation is obtained that is equal to the plate perforations, and a length of extension of material through the plate is obtainable depending, within

5

limits, upon the height of the granulating arms above the plates. Therefore, by adjusting the height of the granulating arms, a change in the volumetric factor of the granules is accomplished. If volatile substances be present in the raw material, heat in any convenient form may be applied to one or more stages and the top of the granulator shell may be provided with a vapour collector and condensing apparatus.

We claim:

1. A granulating machine having an operating shaft, a sieve associated therewith, said shaft having a reduced portion, a bush of less length than and surrounding the reduced portion, said bush having granulating arms rotatable above and co-acting with the surface of said sieve, and means screw-threaded to said shaft engaging said bush above and below and operable to adjust the position of the bush and arms axially along said shaft to vary the height of said arms above the surface of said sieve.

2. A granulating machine having an operating shaft, a sieve plate having an opening through which said shaft passes, said shaft having a reduced portion, a bush of less length than and surrounding the reduced portion of said shaft and extending through said opening in the sieve plate, said bush having granulating arms rotatable above and co-acting with the surface of said sieve plate, and screw means on the shaft above and below said sieve plate engaging the opposite ends of said bush and operable to adjust the position of the bush and arms axially along the shaft

6

to vary the height of said arms with respect to the surface of the sieve plate.

3. A granulating machine having an operating shaft, a sieve plate through which said shaft passes having a reduced portion, a bush of less length than and surrounding said reduced portion of the shaft, said bush having a bore of substantially the same diameter as said reduced portion of the shaft and having granulating arms thereon rotatable above the sieve plate, split rings around said shaft, one at each end of said bush, said split rings and bush engaging along beveled surfaces, and nuts threaded on said shaft and engaging the respective rings, the structure enabling adjustment of the bush and arms axially along the shaft to vary and fix the height of the granulating arms above the surface of the sieve plate.

LEWIS BURN.
HORACE TODD.
JOHN OLIVER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
482,576	Ingram	Sept. 13, 1892
482,982	Patroli	Sept. 20, 1892
600,575	Cross	Mar. 15, 1898
779,031	Drake	Jan. 3, 1905
1,953,266	Russell	Apr. 3, 1934
2,344,611	Harris	Mar. 21, 1944