

Sept. 23, 1952

M. VARCOE

2,611,486

APPARATUS FOR CLASSIFYING GRANULAR SUBSTANCES

Filed May 13, 1949

2 SHEETS—SHEET 1

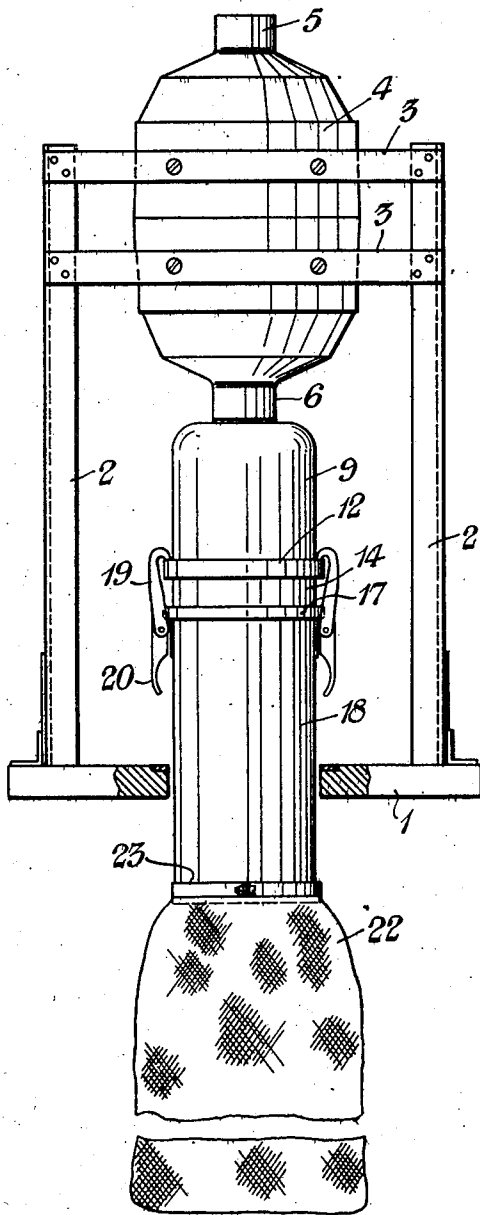


FIG. 1.

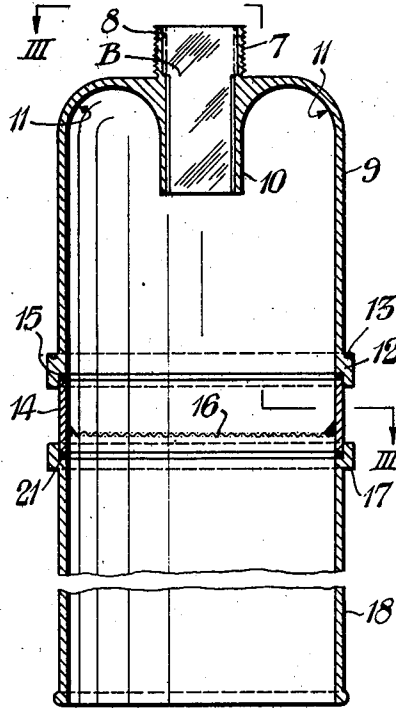


FIG. 2.

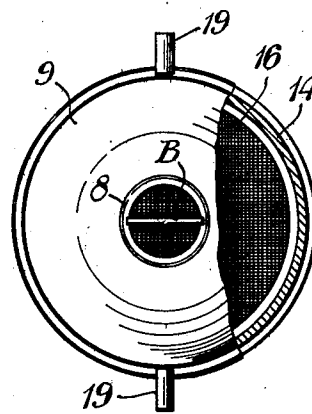


FIG. 3. INVENTOR:

MAURICE VARCOE

By: Haseltine, Lake &
AGENTS

Sept. 23, 1952

M. VARCOE

2,611,486

APPARATUS FOR CLASSIFYING GRANULAR SUBSTANCES

Filed May 13, 1949

2 SHEETS—SHEET 2

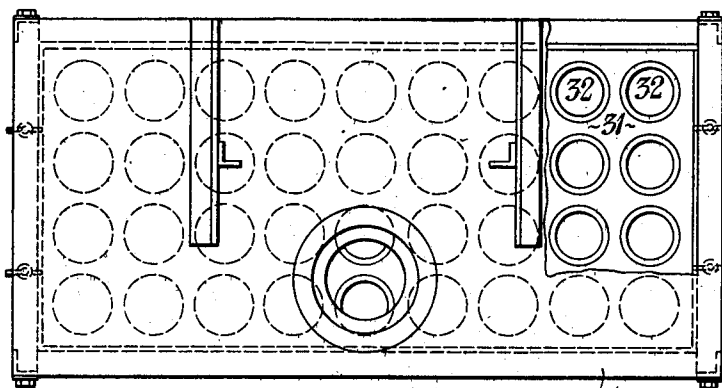


FIG. 4

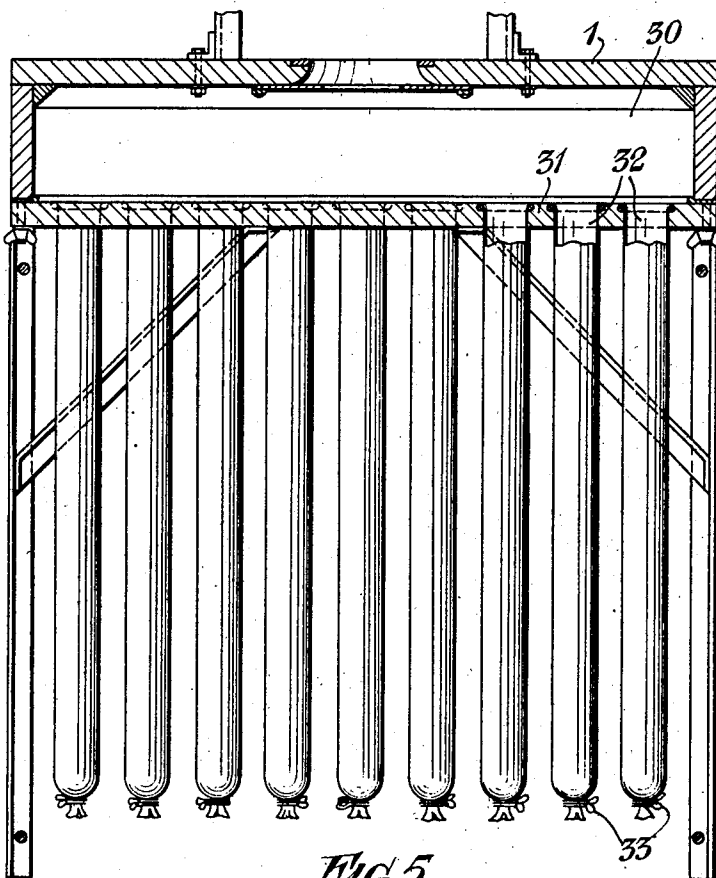


FIG. 5

INVENTOR:

MAURICE VARCOE

By: Haseltine, Lake & Co.
AGENTS

UNITED STATES PATENT OFFICE

2,611,486

APPARATUS FOR CLASSIFYING GRANULAR SUBSTANCES

Maurice Varcoe, Par Harbour, England, assignor
to Cornwall Mills Limited, Par Harbour, Eng-
land, a British company

Application May 13, 1949, Serial No. 93,002
In Great Britain May 14, 1948

3 Claims. (Cl. 209—237)

1

This invention relates to the classifying of granular materials, such as powders, aggregates, sands, grits and the like, according to particle size.

Up to the present apparatus of this character has usually consisted of a sieve through which the granular material is shaken by a vibratory or tapping action. Where apparatus of this character is not employed, a standard method of classifying simply consists of a hand treatment of the substance by brushing it through a sieve.

It is an object of the invention to devise improved apparatus for carrying out the classifying of granular material, according to particle size which apparatus will be simple in use and accurate in regard to the results obtained therewith. It is a more particular object of the invention to provide apparatus for classifying granular material comprising a chamber sieve gauze arranged to form part of the walls of said chamber, an air inlet port at the upper end of said chamber, and a pipe connected with said air inlet port and extending within such chamber being directed towards the lower end thereof, whereby the outlet end of said pipe lies below an upper zone of said chamber.

Further and other objects will become apparent from the description that follows and from the appended claims.

For a better understanding of the nature of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings in which:

Figure 1 is an elevation of an apparatus made in accordance with the invention,

Figure 2 is a longitudinal sectional view of one of the members forming part of the apparatus shown in Figure 1,

Figure 3 is a plan view of Figure 2 being a part section on the line III—III of Figure 2,

Figure 4 is a plan view of a dust collection unit that may be employed in conjunction with the apparatus shown in Figure 1, and,

Figure 5 is a sectional elevation of the dust collecting unit shown in Figure 4.

Referring first to the construction shown in Figures 1 to 3, it will be seen that there is a bench 1 having uprights 2 secured thereto. These uprights are joined by transverse members

2

3 both serving to support an electric motor 4. The latter is provided with a fan which causes air to be sucked in at an inlet mouth 5 and discharged at an outlet mouth 6. The mouth 6 is of annular shape and has internal screw-threading for engagement with external screw-threading 7 upon an annular inlet neck 8 (Fig. 2), the inlet neck 8 is formed integral with a pipe-like cylindrical chamber 9, the neck having an internally extending portion 10 lying axially within the chamber 9. The upper internal side walls of the chamber 9 are curved, as at 11, so that these walls appear in section as two semi-circles (see Fig. 2). Thus the upper portion of the chamber 9 above the outlet end of the pipe portion 10 has a zone which is internally shaped as a semi-toroid.

The lower periphery of the chamber 9 has an open mouth surrounded by a lip or flange 12. The upper side of the flange 12 has a groove 13 therein, whilst the lower side of the flange 12 is rebated to receive a ring 14. The ring 14 is of substantially the same diameter as the chamber 9 so that it appears to be in continuation thereof. A washer 15, made for example from rubber, is interposed between the upper edge of the ring 14 and the flange 12. The ring 14 forms a support for a sieve gauze 16 secured therein, and thus the ring and the gauze together constitute a sieve unit. The lower edge of the ring 14 is received in the rebate of a rebated flange 17, the latter being provided upon the upper end of a conduit 18. The conduit is of the same diameter as the ring 14 and the chamber 9, so that all these three separate members appear to be in general continuation when seen assembled.

The conduit 18 has toggle clips secured to it. Two of the toggle clips are seen in Figure 1 and it will be observed that each comprises principally a pivotal hook member 19 controlled by a finger-piece 20. The hook members are intended to engage in the groove 13 of the flange 12, whereby the toggle clips may jointly serve to hold the three members (consisting of the chamber 9, the sieve ring 14 and the conduit 18) closely attached to one another in superposed co-axial relation. There is a washer 21 disposed as between the lower edge of the ring 14 and the flange 17, so that together with the

washer 15, this washer 21 ensures that the members are jointed in air-tight relation.

The lower end of the conduit 18 has a separate bag or sleeve 22 of woven material secured thereto with the aid of a clamping collar 23.

In the use of the apparatus described above, material to be sifted or classified is placed upon the sieve gauze 16. This can be simply achieved by manipulation of the toggle clip fingerpieces 20 to free the hooks 19 from the flange 12. Thereafter the three main members 9, 14 and 18 can be separated for the purpose of introducing the material to be classified into the sieve ring 14. The members may now be reconnected so that the apparatus appears as shown in Figure 1. Upon starting the electric motor 4, air will be blown down the inlet neck 8 and through the internally extending pipe portion 10. A vortex will be set up in the chamber 9, and the air will encounter the material supported upon the sieve mesh 16. The vortex set up in the chamber 9 will cause the particles upon the sieve to be violently disturbed in such a manner as to allow the particles of small size (i. e. smaller than the openings of the sieve) to pass through the gauze mesh. It is particularly important that the chamber 9 should be conducive to the formation of a vortex, since if air were merely blown under pressure in a direction normal to the plane containing the sieve, the tendency would simply be to clog the sieve. The semi-toroidal shaping of the upper interior walls of the vortex chamber 9 considerably assists in the desired action.

The fabric sleeve 22 serves to retain the dust which is blown through the sieve gauze 16. It may sometimes be convenient to dispense with the sleeve 22 and to connect the conduit 18 with a large diameter pipe which simply opens at some convenient position into the atmosphere. Under certain circumstances if thought desirable, it is possible to enclose the fabric sleeve 22 by a container, which container could then be connected to a suction device which could for example be the air intake 5. Such an arrangement is not however preferred. In practice if dust collection is carried out, then the dust collector shown in Figures 4 and 5 is preferred. In these figures the bench 1 is shown, the bench being broken away at the top right-hand corner in Figure 4 for purposes merely of illustration. Beneath the bench 1 there is a compartment 30 having a lower wall 31 formed with thirty-six regularly disposed apertures. Each aperture is shaped to receive the mouth of a fabric sleeve 32. These sleeves 32 simply hang from the wall 31, and the lower end of each sleeve is closed by being tied as at 33. By untying the end of a sleeve 32 the latter may be emptied as and when required. It will be realised that with the dust collection apparatus of the kind indicated in Figures 4 and 5, there is comparatively little resistance to the outflow of air through the many sleeves 32. At the same time the sleeves efficiently serve to collect fine particles of dust.

The practical employment of the apparatus will require but little skill on the part of the operator. In order usefully to classify materials, it will be desirable to ensure that a certain standard quantity, for example 10 grams, of material is always placed in the sieve ring upon the sieve gauze. It will further be necessary to ensure that the electric motor is switched on for predetermined constant periods of time. By then measuring the

weight of the residue in the sieve, conclusions may be drawn as to the grade of the material that is under test. It may be found desirable to arrange the switch for the motor 4 so that after operation of such switch the motor continues to run only for a predetermined period. Any known suitable form of time switch may be employed.

It will be desirable to have several sizes of sieve gauze available in the use of the apparatus. It has been found that an apparatus such as described above is capable of classifying materials within a range corresponding to the use of a gauze having $\frac{1}{8}$ " mesh (i. e. a mesh having openings which are $\frac{1}{8}$ " square) down to a gauze of 325 mesh (i. e. 325 openings per linear inch).

With the employment of a fan for producing the flow of air into the chamber 9 there may be an undesired tendency for the incoming air to swirl with a considerable component of motion that is rotational about the axis of the chamber 9. It will be clear that the tendency to move particles rotationally in planes parallel to the plane of the sieve, will not in general, be desirable. This will tend merely to erode the sieve without giving effective classification. In practice therefore it is desirable to introduce a baffle B as shown in Figure 2. This baffle simply consists of a small plate fixed to lie in the diametral plane containing the axis of the pipe portion 10 and the collar 7. To obtain the maximum benefits of the invention it is necessary that the vortex should be of a nature such that the particles of granular material upon the sieve are disturbed by imparting thereto components of motion which are in directions normal to the plane of the sieve.

I claim:

1. Apparatus for classifying granular substances, comprising a chamber having an open mouth at its lower end, means for supporting a sieve gauze over said mouth, a port disposed at the upper end of said chamber and arranged for connection to a supply of compressed air, a pipe-like extension from said port through which the compressed air entering the port must pass, said pipe-like extension being directed towards the mouth of the chamber in order to leave an upper zone of the chamber behind and above the outlet end of said pipe-like extension, and semi-toroidal internal walls connecting the upper end of the internal walls of the chamber with the external walls of said pipe-like extension, said semi-toroidal walls lying in said upper zone of the chamber whereby a vortex is produced in the chamber when air is forced into the inlet port.

2. Apparatus for classifying granular substances, comprising a chamber having an open mouth at its lower end, a sieve holder, sieve gauze supported in said holder, a surface upon said sieve holder for close engagement with the mouth of said chamber, a conduit, a second surface upon said sieve holder for close engagement with said conduit, an air inlet port at the upper end of said chamber, a pipe-like extension from said port lying within said chamber and directed towards the said gauze, the outlet end of said pipe-like extension having above and behind it a zone of the chamber and semi-toroidal internal walls connecting the upper end of the internal walls of said chamber with the external walls of said pipe-like extension, said semi-toroidal walls lying in said zone of the chamber whereby a vortex is produced in the chamber when air is forced into the inlet port, the vortex serving to disturb granular substance that may be placed upon said sieve gauze thereby causing granular particles

5

smaller than the sieve mesh to pass therethrough into said conduit.

3. Apparatus as claimed in claim 2, and further comprising releasable gripping means arranged to hold the chamber, sieve holder and conduit in closely attached relation. 5

MAURICE VARCOE.

REFERENCES CITED

The following references are of record in the 10 file of this patent:

6

UNITED STATES PATENTS

Number	Name	Date
1,810,935	Wood	June 23, 1931
2,002,974	Bennett et al.	May 28, 1935
2,202,189	Cotton, Jr., et al.	May 28, 1940

OTHER REFERENCES

"An Apparatus for the Separation of Grit and Coarse Particles From Fine Powders," by Gallie and Porritt. W. Heffer and Sons Ltd., Cambridge, England, 1926 (reprinted from August issue of "I. R. I. Transactions").