

March 2, 1954

D. H. BELDEN

2,670,629

SAMPLING APPARATUS

Filed June 7, 1952

ATTORNEYS:

UNITED STATES PATENT OFFICE

2,670,629

SAMPLING APPARATUS

Donald H. Belden, North Riverside, Ill., assignor
to Universal Oil Products Company, Chicago,
Ill., a corporation of Delaware

Application June 7, 1952, Serial No. 292,301

4 Claims. (Cl. 73—421)

1

This invention relates to a sampling apparatus which is particularly suited to obtain a representative small portion or sample of a freely flowing solid material.

There are of course various methods and devices for effecting the sampling of solid materials which are not entirely homogeneous, including hand operated and automatic mechanical means. For example, grab sampling and coning and quartering are common hand methods for acquiring samples of a dry material, while different types of mechanically operated buckets, sampling tubes, and the like, have been devised to pass through material beds or streams. However, there are apparently relatively few devices in use, or available, which are adapted to continuously, or intermittently handle a stream of solid material and withdraw a representative sample, and particularly a predetermined fractional portion of the stream of material as the sample.

It is thus a principal object of the present invention to provide a multiple stage sampling device which may be constructed to accommodate a wide range of capacities.

It is a further feature of the present invention to provide an apparatus which may be utilized in a fixed position or may be portable and which can be constructed and designed within a given number of stages whereby to obtain a substantially predetermined fractional part of a material stream.

Briefly, the present sampling apparatus for accommodating a freely flowing solid material, comprises in combination, a vertically elongated chamber having a plurality of superimposed material dividing sections, each of these superimposed sections having a downwardly sloping bottom plate in which there is a plurality of elongated slots spaced equal distances from one another across a lower portion thereof and extending longitudinally with respect to the downward slope of the plate, substantially vertical baffle members are spaced across each plate of each section and project upwardly from the sides and lower edge of each of the elongated slots, and a downwardly sloping deflecting baffle connecting to the underside of each bottom plate along the lowermost ends of the elongated slots and extending downwardly at an angle substantially opposite to that of the bottom plate, whereby the portion of particulated solid material passing through the slots is deflected to the upper portion of the bottom plate of a next lower material dividing section, and material inlet means

2

connecting to the upper portion of the chamber and to the upper material dividing section, a sample outlet means extending from the lower portion of the chamber below the lowermost dividing section, and residual material outlet means from the chamber at the lower edge of each of the sloping bottom plates of each dividing section.

The apparatus may have any number of superimposed dividing sections so as to provide any desired small quantity or fractional part of the material fed through the apparatus. The device may be installed in a fixed position to accommodate the entire flow of a stream of solid materials. For example, a continuous stream of a finished product may be channeled to flow entirely through the device and a representative sample continuously withdrawn into a sample collecting container, while the main stream or bulk portion of the material may be discharged into a material receiving chamber or into drums or other containers suitable for shipping the material. Alternatively, a small portable sampling apparatus, as provided by this invention, may be temporarily positioned in any convenient location and any given packaged quantity of solid material, as in a drum or container, can be poured through the sampling device to obtain a representative sample of the packaged material. The sampling apparatus may be constructed of various dimensions and sizes, as well as have a varying number of stages. However, the size of the device should be correlated with the quantity of solid material in a stream thereof, or quantity to be poured from a particular container, so that the inlet portion of the device is maintained flooded with the material. Also, the spacing between vertical dividing baffles and the spaced slots must not be excessive, but must permit substantially equal splitting of the descending particle stream.

The construction and arrangement of the improved sampling apparatus may be better described and explained in connection with the accompanying drawing, while additional advantageous features and modifications may be noted in connection therewith.

Figure 1 of the drawing is a diagrammatic elevational view partially in section of one embodiment of the present invention.

Figure 2 of the drawing is a sectional view through the apparatus as indicated by the line 2—2.

Figure 3 of the drawing is a sectional plan view through the sampling apparatus, as indicated by the line 3—3.

3

Referring now to the drawing, there is indicated a vertical housing 1 which has an upper open material receiving section 2, a lower sample outlet 3, and a bulk outlet 4. The interior of the housing 1 has a plurality of superimposed material dividing sections which are constructed to pass along a divided portion of the descending stream of solid material to next lower sections and at the same time pass a portion of the descending stream of material into a chute section 5, as will be subsequently described in more detail.

The material inlet section 2 in the present embodiment has an open upper end adapted to receive a solid material to be sampled, as from a continuously flowing finished stream thereof or from an opened drum or container. This inlet section 2 is also indicated as having a flanged lower end 6 suitable to bolt or otherwise removably connect with an upper flange 7 on the housing 1. Spaced vertical partitions 16, a sloping plate 8 and a reversely sloping plate 17, within the inlet section 2 deflect approximately half of the charge material to the upper portion of the housing 1 and to the upper portion of the first material dividing section of the apparatus. The remaining half is diverted directly to the chute section 5.

Each material dividing section in the housing 1 comprises a downwardly sloping bottom plate 9 having a plurality of spaced elongated slotted openings 10, with each opening in turn having a three-sided baffle or partition member 11 projecting upwardly from its lower extremity and sides. As best indicated in Figures 2 and 3 of the drawing, the slots 10 and their respective baffle members 11 are spaced substantially uniformly across the entire width of the housing 1. However, the slots 10 and baffles 11 of a next lower or next adjacent material dividing section are staggered with respect to one another, whereby the descending stream of solid material is caused to be divided as it continues downward.

In operation, half of the particulated solid material from the feed section 2 passes to the upper portion of the uppermost plate 9 and is caused to be divided by the spaced slots 10 and baffles members 11, with the portion passing between baffles 11 and over the bottom plate 9 being discharged from the lower end of the latter through a slot or opening 12 in the partition 13 and into the chute section 5. On the other hand, the material passing through the slots 10, within the area bounded by each of the three sided baffle means 11, falls onto a continuous slanting baffle member 14. The latter extends across the entire interior of the housing 1 and is positioned at a reverse angle with respect to the bottom plate 9 so that all of the material received from the plurality of slots 10 is deflected and passed to the upper portion of a bottom plate 9 of the next lower material dividing section. Here again, the material flowing downwardly over the sloping bottom plate 9 is divided. The portion of the material passing between vertical baffle members 11 is discharged through an opening 12 in plate 13 and into the chute 5 where it passes with the material from the other dividing sections and subsequently is discharged from the apparatus by way of the main stream or bulk outlet 4. A divided portion passes through the plurality of elongated slots 10 and on to a lower sloping baffle 14 and subsequently to the upper portion of plate 9 of a still lower dividing section. In like manner, the material is divided at each subadjacent

4

section until a small fractional portion of the entire stream is withdrawn by way of outlet 3 at the lower end of the apparatus.

It is to be noted in connection with the present embodiment that slots 10 and vertical baffles 11 at the lower ends and sides thereof, are constructed to utilize approximately one-half of the entire width of sloping plate 9 and as a result approximately one-half of the material flowing downward through each section is permitted to fall through the slots 10 and pass to the next lower dividing section. Thus, where the material is divided approximately in one-half at each dividing section, the apparatus may be constructed to provide a predetermined portion of the material stream as a sample, the fractional portion depending upon the number of superimposed dividing stages. It is, of course, not intended to limit the present apparatus to any set number of superimposed stages or to any given number of slots and spacing. The width of slots 10 and the spaces therebetween need not be equal, as indicated, to provide substantially a one-half division of solid material at each stage, for it is within the scope of the present invention to vary this space and for example, have the slot width equal to about $\frac{1}{3}$, or some other fractional portion of the width of the sloping plate members 9 and the interior of the apparatus.

The angle of slope for each of the bottom plates 9 and reversing baffles 14 may vary somewhat in accordance with the characteristics of the solid material which is to be handled in the sample apparatus. However, in order to insure free and rapid flow of the solid particles downward through the apparatus, it is preferable to position the members in a manner having an angle of about 45° , or more, with respect to the horizontal.

The apparatus may be constructed of one or more sections which in turn may be bolted or otherwise attached to one another in effecting the assembly of a unit, whereby the latter may be more readily fabricated and packaged for shipping. The present drawings indicate that the portion of the housing forming the chute section 5 is a separately fabricated portion, as well as the upper inlet section 2. As shown, the housing 1 has the side walls thereof provided with offset edges 15 which are adapted to accommodate the walls of chute section 1'. The latter is in turn formed and constructed to have an inner vertical partition plate 13 extending thereacross. The side walls of the housing 1' for the chute section 5, are adapted to fit tightly into the offset portions 15 and maintain proper alignment. The partition plate 13 is further provided with the plurality of vertically spaced openings 12 which permit the material flowing downward over the plates 9 to pass into the chute zone 5 and reach the bulk outlet 4.

At the same time, the partitioning wall 13 is adapted to permit the lower ends of each of the bottom plates 9 to extend into the chute section 5 with the lip of the plate 9 hooking over the lower edge of the slot or opening 12.

Modifications may, of course, be made within the inlet section 2, which feeds material to the top dividing section in the housing 1. The present inlet section actually divides the charge, passing approximately one-half directly to the chute section 5. In any case, the inlet section 2 is maintained flooded, while the lower dividing sections are not, so that there is proper free flow and automatic dividing of material in these lower sections. If desired, the size of the openings 18

5

and 19, in the baffle members just above the lower ends of plates 8 and 17 respectively, may be adjusted to control the rate of the material flow down through the unit.

I claim as my invention:

1. A sampling apparatus for accommodating freely flowing solid materials and comprising in combination, a vertically elongated chamber having a plurality of superimposed material dividing sections, each of said sections having a downwardly sloping bottom plate, with each plate having a plurality of elongated slots spaced equal distances from one another across a lower portion thereof and extending longitudinally with the downward slope of the plate, substantially vertical baffle members spaced across said plate and projecting upwardly from the sides and lower edges of each of said elongated slots, and a particle deflecting baffle connecting to the underside of said bottom plate along the lower ends of said elongated slots and extending downwardly at an angle substantially opposite to that of said bottom plate, whereby the portion of particulated solid material passing through said slots is deflected to the upper portion of a bottom plate of the next lower material dividing section, and material inlet means connecting to the upper portion of said chamber and to the uppermost material dividing sections, a sample outlet means from the lower portion of said chamber below the lowermost dividing section, and residual material outlet means from said chamber at the lower edge of each of said sloping bottom plates of each dividing section.

2. The apparatus of claim 1 further characterized in that the elongated slots in said bottom plates and the baffle means projecting upwardly along the sides and lower edges thereof are positioned in a staggered arrangement with respect to the slots and baffle means of the bottom plates of the next adjacent upper and lower material dividing sections.

3. A sampling apparatus for accommodating freely flowing solid materials and comprising in combination, a vertically elongated chamber having a particle inlet at the upper end thereof, separate sample outlet means and residual material outlet means from the lower portion of said chamber, a plurality of superimposed material dividing sections within said chamber, a substantially unobstructed vertical chute section connecting with said residual material outlet means, each of said material dividing sections having a downwardly sloping bottom plate with a plu-

6

ality of elongated slots spaced equal distances from one another across the lower portion of said plate and extending longitudinally with the downslope thereof, substantially vertical three-sided baffle means spaced across said plate and projecting upwardly from the sides and lower edge of each of said elongated slots, and a downwardly sloping material deflecting baffle connecting to the underside of said bottom plate along the lower edges of said elongated slots, said baffle extending downwardly at an angle substantially opposite to that of said bottom plate whereby the portion of particulated solid material passing through said slots is deflected to the upper portion of the bottom plate of the next lower material dividing section, a vertical partition member across the interior of said vertical chamber and adjacent the lower ends of each of said downwardly sloping bottom plates of each of said material dividing sections, said partition member having a plurality of vertically spaced lateral openings thereacross, with one opening placed above the lower end of each of said downward sloping plates whereby the solid material separated from the plurality of dividing sections passes to said vertical chute section and to said residual material outlet at the lower portion of said chamber.

4. The apparatus of claim 3 further characterized in that a particle distributing inlet section connects with the upper end of said vertically elongated chamber, said inlet section having an open upper end and a plurality of vertical and parallel partition members spaced thereacross, sloping plates extending downwardly from opposing sides of the upper end of said inlet section and between said partition members, with said plates sloping at substantially reverse angles with respect to one another between adjacent partition members, whereby a divided portion of the solid material flows to the upper portion of the sloping bottom plate of the uppermost material dividing section and another divided portion passes directly to said chute section and to said residual material outlet.

DONALD H. BELDEN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
680,526	Haultain	Aug. 13, 1901
841,928	Buskett	Jan. 22, 1907
1,133,933	Colby	Mar. 30, 1915
2,498,601	Bylin et al.	Feb. 21, 1950