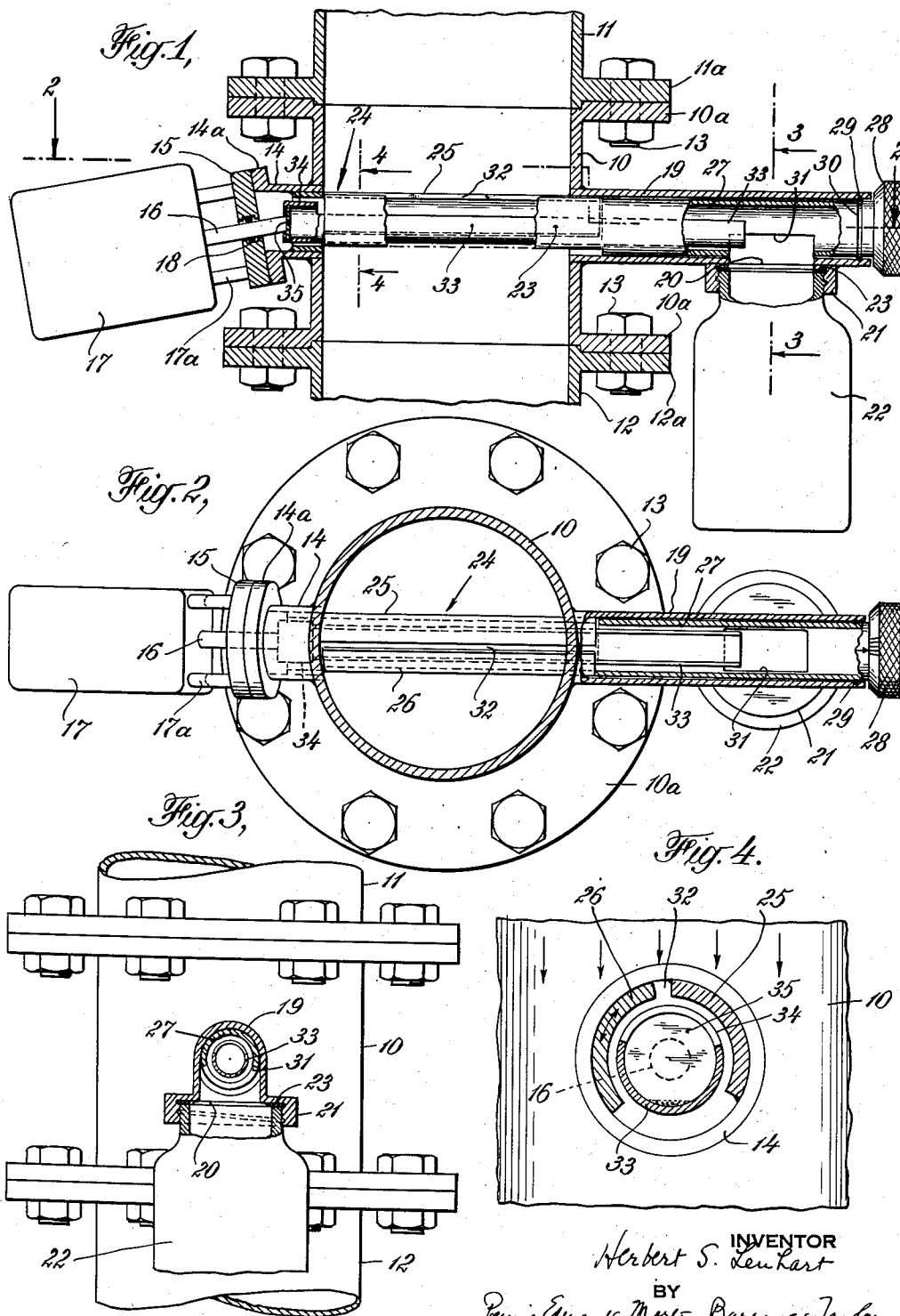


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SAMPLING APPARATUS

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SAMPLING APPARATUS

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This invention relates to devices for obtaining samples of pulverulent material flowing in a stream and is concerned more particularly with a novel sampling device, which provides samples made up of material withdrawn from a transverse section of the stream extending entirely across the latter. The new device is of simple construction, is easily adjusted and controlled, and requires little attention in use.

For many purposes, it is desirable to obtain samples of pulverulent material flowing as a stream, as, for example, from one stage of a process to another, which are fully representative in composition of the material throughout the stream. One sampling device heretofore proposed for the purpose takes the form of a small screw conveyor comprising a screw mounted in a trough, which extends across the stream and is open to the oncoming material. While this device functions properly to withdraw samples of material from the stream, it will be evident that, once the flights of the screw have been filled, additional material can enter the trough only at the intake end of the screw. Accordingly, after a short period of use, the samples supplied by the device are made up entirely of the material forming that part of the stream flowing past the intake end of the screw and, if there is stratification in the stream, the samples are not representative of the entire body of flowing material.

The present invention is directed to the provision of a device, by means of which samples made up of material taken from a transverse section extending entirely across a flowing stream of pulverulent material may be readily obtained. Analysis of such samples gives a fair indication of the composition of the entire stream and errors in analysis arising because of stratified flow are largely eliminated.

The new device is intended to be used in obtaining samples of material flowing downwardly in a substantially vertical stream and it includes a trough-like receiver mounted to extend across the stream and having a discharge end projecting out of the stream at one side of the latter. The receiver lies with its concave surface facing the oncoming material and it is reciprocable lengthwise with a movement, which causes material thereon to be conveyed stepwise toward its discharge end. In order to insure that the receiver will not be completely filled at any time, so that fully representative samples cannot be obtained, a shield is mounted in front of the receiver and it is formed with a port, through which the material passes into the trough. The port extends the full length of that part of the receiver lying within the stream and the shield is so constructed that the width of the port may be varied as desired. The discharge end of the receiver is mounted within a housing having a

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discharge opening, through which the sample is delivered into a suitable vessel.

For a better understanding of the invention, reference may be made to the accompanying drawings, in which

Fig. 1 is a view, partly in longitudinal section and partly in elevation, of the preferred form of the new sampling device;

Figs. 2 and 3 are sectional views on the lines 2-2 and 3-3, respectively, of Fig. 1; and

Fig. 4 is a sectional view on an enlarged scale on the line 4-4 of Fig. 1.

The sampling device illustrated in the drawings includes a section 10 of conduit, which is provided with end flanges 10a and is adapted to be installed between tubular members 11, 12 having respective end flanges 11a, 12a connected by bolts 13 to flanges 10a. Members 11, 12 may be parts of a main conduit, for example, or member 11 may be the spout at the bottom of the hopper of a bin. Conduit 10 is formed with diametrically disposed openings, in one of which is mounted a tubular housing 14 provided at its end with a flange 14a inclined to the axis of the tube. The end of the tube 14 is closed by a plate 15 secured in any convenient manner to flange 14a, and the plate has a central opening, through which extends the stem 16 of a vibrating device 17. The vibrator may be of any suitable type and it may be carried by a mounting 17a attached to plate 15. The opening in plate 15, through which stem 16 extends, is enlarged and the stem is enclosed within a packing 18 of the O-ring type lying within the enlargement.

A housing 19, which may conveniently be a length of tubing, is mounted in the opening opposite to that containing the end of tube 14 and housing 19 is provided at its lower side with an opening 20. An outlet fitting 21 is attached to housing 19 around opening 20 and the fitting is internally threaded to receive the threaded neck of a vessel, such as bottle 22. The end of the neck of the bottle bears against a gasket 23 seated on a shoulder within fitting 21.

A shield, generally designated 24, is mounted to extend across conduit section 10 with its ends lying within the aligned housings 14, 19. The shield is made of a pair of members of arcuate form concentric with the housings and one member 25 is rigidly secured in the housings and has a lengthwise upper edge lying in a vertical plane through the common axis of the housings. The other member 26 is integral with a tube 27 lying within housing 19 beyond the end of member 25. Tube 27 projects out of the end of housing 19 and, at its exposed end, carries a knurled disc 28. A packing 29 of the O-ring type is seated in a circumferential groove 30 in the outer surface of tube 27 and bears against the inner surface of housing 19. The tube 27 is provided

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with an opening 31 registering with the bottom opening 20 in housing 19. In the normal use of the device, the movable member 26 of the shield is so disposed that its top edge is spaced from the top edge of member 25 to form a port 32, through which material may pass.

A receiver in the form of a conveyor trough 33 extends across conduit 10, with its ends lying within housing 14 and tube 27. The end of the trough within tube 27 overlies openings 20 and 31, so that material discharged from this end of the trough may pass through the openings and into bottle 22. At its other end, the trough is integral with a cylindrical section 34 closed by a disc 35 rigidly attached to the end of the stem 16 of the vibrator. The trough and section 34 attached thereto are spaced from the inner walls of the shield including tube 27 and, when the vibrator is operated, the inclination of its stem 16 to the longitudinal axis of the trough causes the trough to be reciprocated in the direction of its length with a slight upward movement toward its discharge end. Material deposited on the trough is, accordingly, advanced along the latter.

In the operation of the sampling device, the movable member 26 of the shield is angularly adjusted relative to the fixed member to provide a port 32 of the appropriate width. As material flows through conduit 10, material taken from a transverse section of the stream extending entirely across the latter passes through the port and is caught by the receiver. The material is advanced lengthwise of the receiver by the action of the vibrator and ultimately leaves the discharge end of the receiver and drops into bottle 22. By adjusting the movable member of the shield, the port can be given a width such that the trough is not completely filled at any time. Accordingly, the collected sample contains material from all parts of a diametrical section of the stream and the sample is representative of the material in the stream, regardless of any stratification.

I claim:

1. A device for obtaining a sample of pulverulent material, which comprises a conduit disposed generally vertically and having diametrically disposed openings in its wall, a member rigidly mounted in the openings, a member movably mounted in the openings, the members having opposed edges defining a port extending across the conduit and the movable member having a part outside the conduit operable to move said member to vary the width of the port, a receiver independent of the members mounted movably in the openings and having a discharge end outside the conduit, the receiver lying beneath the members in position to catch material passing through the port, and means attached to the other end of the receiver for reciprocating it lengthwise to advance material thereon to the discharge end thereof.

2. A device for obtaining a sample pulverulent material, which comprises a vertical conduit having diametrically disposed openings through its wall, a housing attached to the conduit at one opening and having a bottom opening at a distance from the conduit, means on said housing for supporting a vessel to receive material issuing through said bottom opening, a conveyor trough extending across the conduit and

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through the openings in the wall thereof, the trough extending into the housing and having a discharge end overlying said bottom opening, means rigidly attached to the other end of the trough for supporting the trough free of the edges of the openings through the conduit wall and for reciprocating the trough lengthwise to convey material in the trough to the discharge end thereof, and a shield independent of and overlying the trough within the conduit and having a port for passage of material into the trough.

3. A device for obtaining a sample of pulverulent material, which comprises a vertical conduit having diametrically disposed openings through its wall, a housing attached to the conduit at one opening and having a bottom opening at a distance from the conduit, means on said housing for supporting a vessel to receive material issuing through said bottom opening, a conveyor trough extending across the conduit and through the openings in the wall thereof, the trough extending into the housing and having a discharge end overlying said bottom opening, means rigidly attached to the other end of the trough for supporting the trough free of the edges of the openings through the conduit wall and for reciprocating the trough lengthwise to convey material in the trough to the discharge end thereof, and a shield independent of and overlying the trough within the conduit and having a port for passage of material into the trough, said shield including a stationary member attached to the conduit and a movable member having a part lying within the housing, the members having lengthwise top edges defining the port and the movable member being angularly adjustable to vary the width of the port.

4. A device for obtaining a sample of pulverulent material, which comprises a conduit disposed generally vertically and having diametrically disposed openings in its wall, a pair of coaxial housings mounted on the outside of the conduit in alignment with the openings, a receiver of trough form mounted to extend across the conduit with its ends within the housings, means attached to one end of the receiver for reciprocating it lengthwise to advance material thereon toward the other end, a pair of members of arcuate section independent of the receiver and extending across the conduit above the receiver with their ends within the tubes, the members having spaced longitudinal edges defining a port through which material may enter the receiver, and one of the members being fixed in position and the other movable, and a tube attached to the movable member within one housing and projecting out of the housing, the tube being angularly movable to move its associated member to vary the size of said port.

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