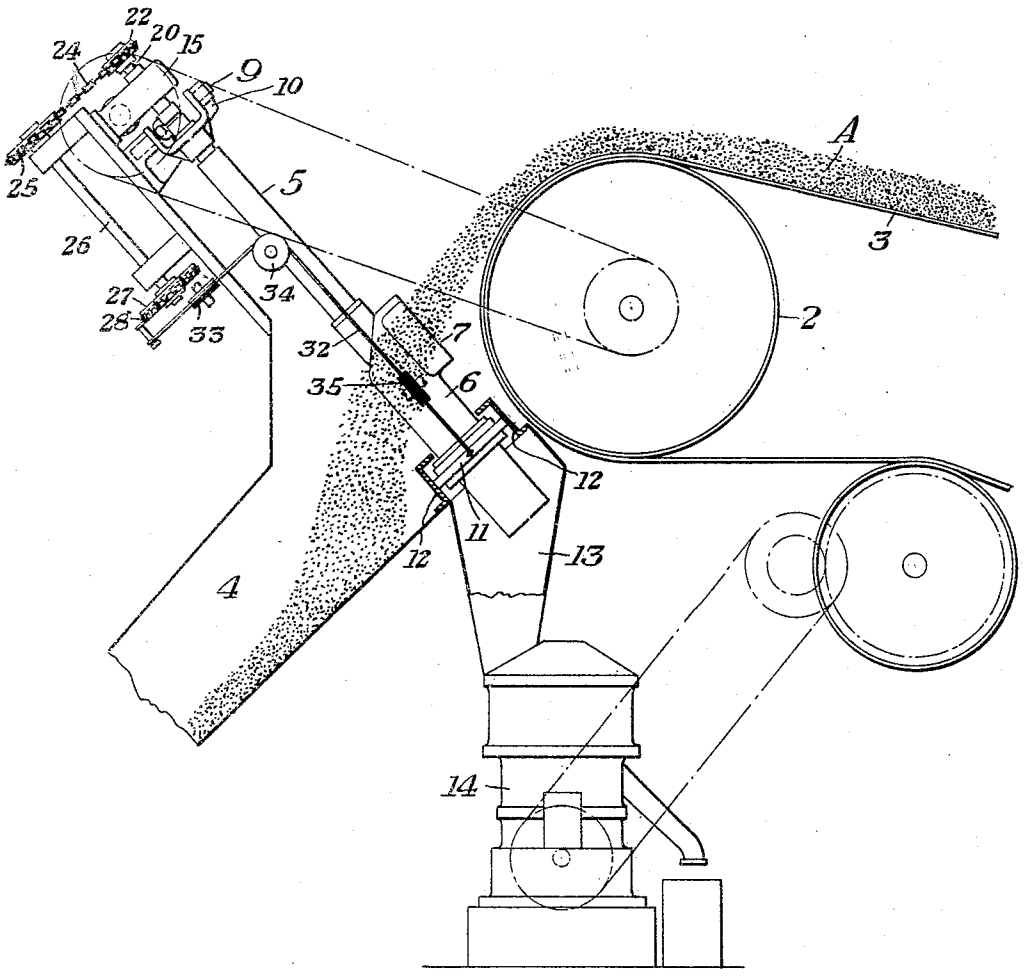
Dec. 6, 1932. T. THORSTEN 1,890,199

METHOD AND APPARATUS FOR SAMPLING MATERIAL

Filed March 1, 1926 3 Sheets-Sheet 1

Fig. 1.



INVENTOR

Thorleif Thorsten

by his attorneys

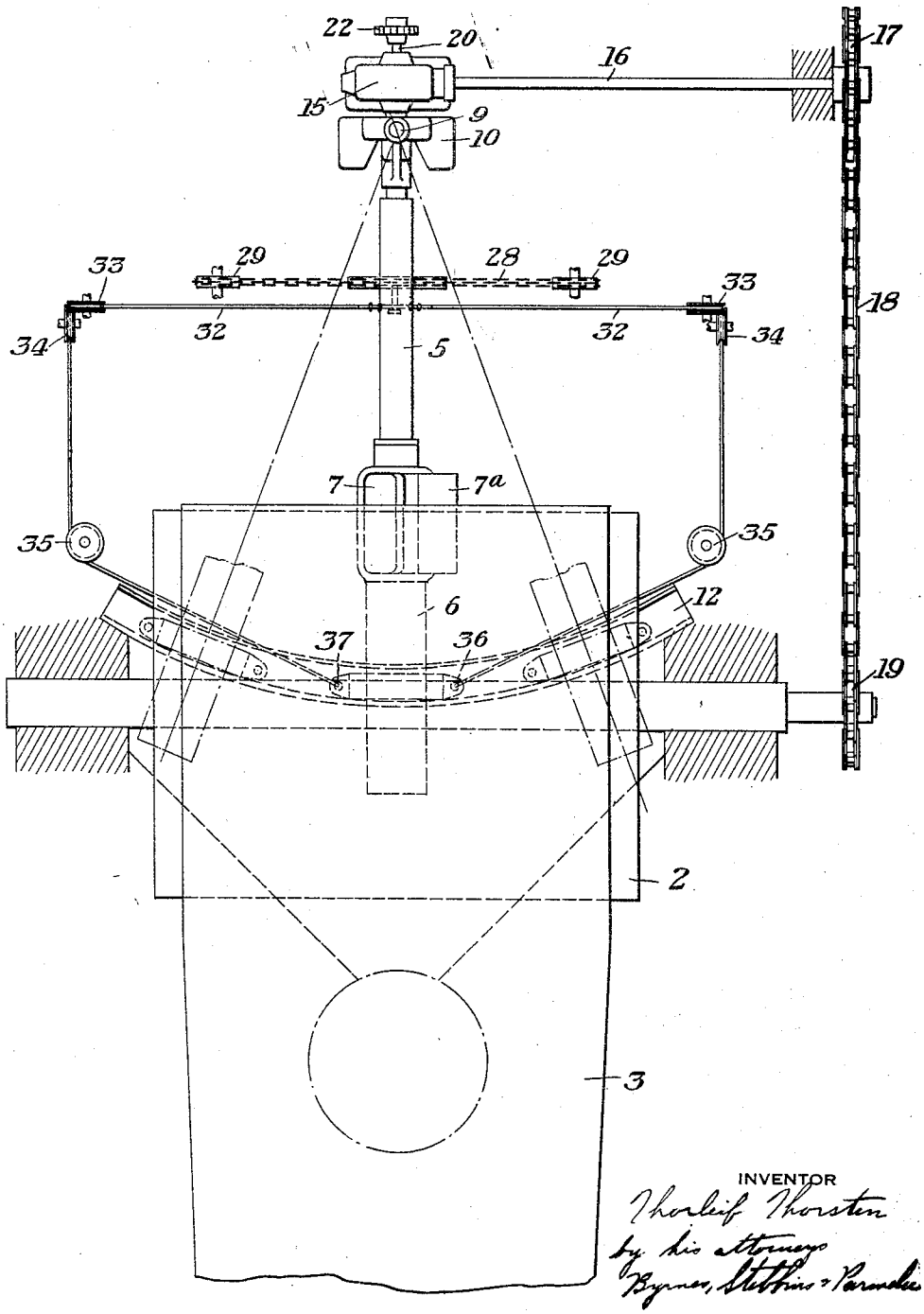
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METHOD AND APPARATUS FOR SAMPLING MATERIAL

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Fig. 2.



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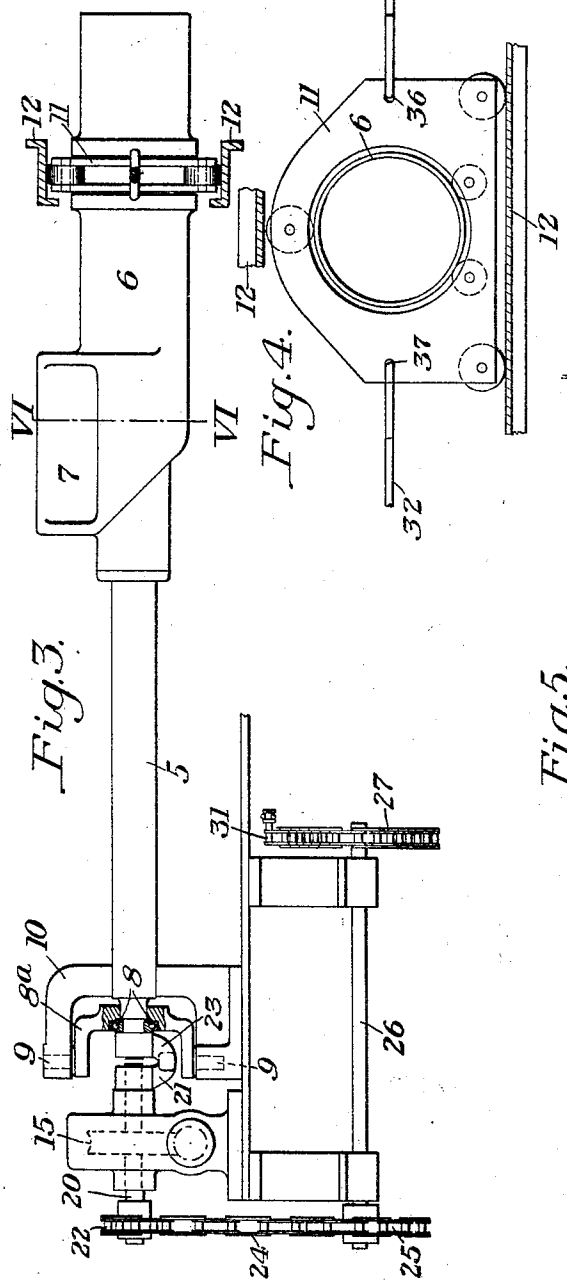


Fig. 3.

Fig. 4.

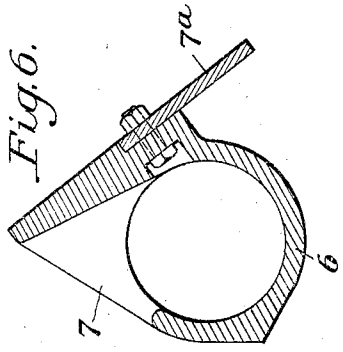


Fig. 6.

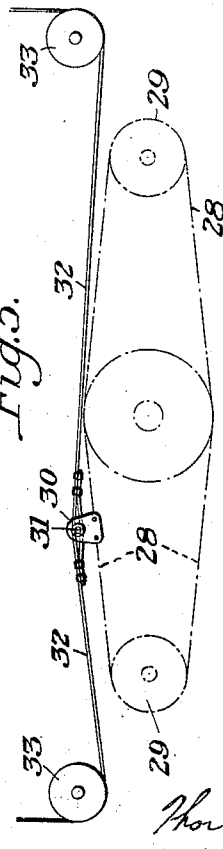


Fig. 5.

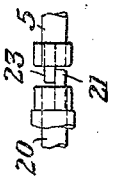


Fig. 7.

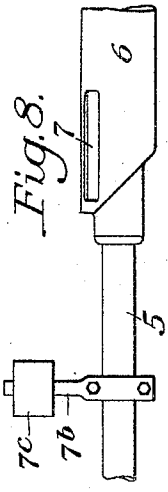


Fig. 8.

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UNITED STATES PATENT OFFICE

THORLEIF THORSTEN, OF PITTSBURGH, PENNSYLVANIA

METHOD AND APPARATUS FOR SAMPLING MATERIAL

Application filed March 1, 1926. Serial No. 91,643.

This invention relates to the sampling of materials and particularly to the obtaining of samples from a continuously moving stream of material.

Various forms of spoon-like devices have heretofore been used for the dipping of samples out of moving streams of material, such for instance, as a continuous moving run of coal on a conveyor. Such devices as heretofore provided, dip down into the stream of material. The sample thus secured is not fairly representative of the grade of the material carried on the belt, because, dipping in from the top as it does, it fills, with material from the top of the stream and cannot, therefore, take a sample across the entire depth of the stream. In the case of some materials, particularly coal moving on a long conveyor, more or less stratification of the material takes place, so that the sample thus secured is representative of the upper strata only. Likewise, such samplers dip always in the same part of the stream, and not at various points across the width of the stream.

According to the present invention, it is proposed to provide a sampling device which, at every operation, will secure a representative cross section through the thickness of the stream of material.

A further important object of the invention is to provide a sample taking device which shall automatically remove samples of the entire depth of material at different points across the width of the stream.

The invention may be readily understood by reference to the accompanying drawings, in which

Figure 1 represents, in a diagrammatic manner, the side elevation of the discharge end of conveyor belt with a sampling device embodying my invention associated therewith;

Figure 2 is a plan view of the arrangement shown in Fig. 1;

Figure 3 is a detail side elevation of the sampling device and driving mechanism;

Figure 4 is an end view of the element shown in Fig. 3 showing the carriage in which one end thereof is supported;

Figure 5 is a diagrammatic view illustrating the driving mechanism for imparting a transverse oscillating movement to the sampler;

Figure 6 is a transverse section through the sampler in the plane of line VI—VI of Fig. 3;

Figure 7 is a detail side elevation of the driving connection for rotating the sampler; and

Figure 8 is a view similar to Fig. 3, showing a counterweight on the sampler.

In the drawings, 2 designates the conveyor supporting roll at the discharge end of a belt conveyor 3. The material A on the conveyor is discharged from the upper run of the conveyor in a stream onto a suitable receiving means, such as the chute 4.

The sampling device includes a shaft 5 inclined across the path of travel of the discharged material. The lower end portion 6 of this shaft is hollow and has an elongated intake orifice 7 in one side thereof intermediate its ends and in a plane at substantially right angles to the path of the discharged material.

The upper end of the shaft 5 is rotatably carried in a bearing 8 in a supporting member 8*a* pivotally mounted at 9 in a fixed bracket 10. With this arrangement the shaft 5 may rotate and at the same time oscillate transversely across the path of the discharged material to the positions shown in dotted lines in Fig. 2. The lower end of the shaft is rotatably guided in a carriage 11 movable along a guideway 12 under the roller 2 out of the path of discharge of the material.

The extreme lower end portion of the shaft projects through the carriage into the top of a receiving hopper 13 leading to the crushing unit 14 or receiving means.

In order to periodically take samples from the falling stream of material, the shaft is rotated to periodically turn the intake orifice toward the falling stream of material for effecting the rotation of the shaft 5 in the desired manner, I have provided a driving gear 15 which may be a suitable motor, or which may be a standard reducing gear as shown, the reducing gear being operated from a shaft 16 having a sprocket 17 thereon which

is connected through chain 18 with a sprocket 19 on the end of the shaft of the main roller 2. The reducing gear drives a shaft 20 having a crank 21 on one end thereof and a sprocket 22 on its other end. The crank or arm 21 is adapted to cooperate with a similar crank or arm 23 on the end of shaft 5.

This form of driving connection between the reducing gear and the shaft 5 provides a flexible driving connection between the shaft 20 and the shaft 5 which will permit of the shaft 5 being oscillated to the different positions shown in Fig. 2. This drive will also permit the shaft 5 to rotate at a speed greater than the speed of rotation of the shaft 20. This is of considerable advantage for the reason hereinafter described.

The sprocket 22 drives a chain 24 which in turn drives a sprocket 25 on a shaft 26. The shaft 26 has a second sprocket wheel 27 thereon which drives an endless chain 28 passing over the sprocket 27 and around idler sprockets 29 at each side thereof. The chain 28 has a connector 30 thereon carrying a pin 31. Connected to the pin 31 are flexible ropes or cables 32 extending in opposite directions around similarly arranged guiding sheaves 33, 34 and 35. One of the cables connects at 36 with one side of the carriage 11 and the other cable connects at 37 with the opposite side of the carriage 11.

When the shaft 20 revolves, the shaft 26 is rotated, rotating the sprocket wheel 27. This rotation of the sprocket wheel imparts a continuous movement in one direction to the chain 28. As the chain 28 is moved, the member 30 is carried around with the chain thereby travelling in a substantially reciprocable path. This movement of the member 30 back and forth in a substantially reciprocable path imparts a reciprocating movement to the ropes 32 causing the carriage 11 to be pulled along its guideway 12 first in one direction and then in the other. In this manner the shaft 5 with its sampling means is caused to continuously reciprocate or oscillate across the path of the falling material, the shaft moving to the limits shown in dotted lines in Fig. 2.

At the same time that the shaft is being oscillated in this manner it is being continuously rotated at the desired speed by the driving element 21. The driving element 21 serves to rotate the shaft to bring the opening 7 to the position where it will receive the material being discharged from the conveyor. As soon as the shaft has been rotated to this position, the stream of falling material will strike the plate 7*a* arranged on the portion of the shaft 6, adjacent the receiving orifice 7 tending to rotate the shaft. Because of the driving arrangement provided by the cooperating members 21 and 23, the shaft will be rotated in this manner very rapidly to a position where the orifice will be turned away from the falling stream of material. In this way the orifice will be turned toward the falling stream of material for only an instant and during this time its entire length will be exposed to the falling stream. Consequently the sample collected will represent a section through the entire depth of the material in the stream and thereby give a fairly characteristic sample of all of the material on the conveyor. Since the shaft 5 is being continuously oscillated, successive samples will be taken at different points in the width of the stream so that the samples which are taken will be fairly representative of the entire body of material moving along the conveyor.

In the construction shown in Fig. 8, the operation of the device is generally similar and similar reference numerals have been used to designate the corresponding parts in the construction herein shown. However, the plate 7*a* is omitted and an arm 7*b* is substituted, therefor. This arm 7*b* carries a counterweight 7*c* at its end. The counterweight is so located with respect to the receiving orifice 7 that when the receiving orifice 7 is exposed to the material being discharged from the conveyor, the counterweight will have a tendency to rotate the shaft very rapidly to quickly move the orifice 7 out of material receiving position. Furthermore, I have here shown the orifice in a cylindrical body portion without side flanges thereabout.

The samples which fall into the orifice 7 travel down the hollow portion of the shaft 6 and are discharged into the receiving hopper 13 of the crushing unit 14.

The advantage of this arrangement resides in the fact that a method is provided for obtaining fairly representative samples at the different points in the width of the entire stream of material and which samples also contain material from the top to the bottom of the stream. If there has been any stratification of the material on the conveyor belt 4 it will be of no consequence as the sampling device will collect a section of the material throughout the complete depth of the stream.

While I have illustrated and described a specific embodiment of my invention it will be obvious that various changes and modifications may be made in the construction and operation thereof within the spirit of the invention and within the scope of my broader claims.

I claim:

1. A method of sampling a traveling stream of material which comprises causing the stream of material to fall and removing a section at one point in the width of the stream through the full dimension substantially normal to but less than the width of the falling stream and at regularly recurring intervals.

2. A method of sampling a traveling

stream of material which comprises causing the stream to fall from a carrier through space and intermittently removing a section at a point in the width of the stream through the full dimension of the stream substantially normal to but less than the width of said stream and at regularly recurring intervals.

3. A method of sampling a traveling stream of material which comprises causing the stream to fall through space from a carrier, and periodically removing a section through the full dimension substantially normal to but less than the width of the falling stream, successive samples being taken at various points across its width, the sections removed being of substantially equal volume.

4. A method of taking successive samples from a traveling stream of material which comprises causing the stream of material to fall, and intermittently exposing the receiving orifice of a sampling device to the full dimension of the falling stream substantially normal to but less than the width of said stream for short periods of time.

5. A method of taking successive samples from a traveling stream of material which comprises causing the stream to fall through space and intermittently exposing the receiving orifice of a sampling device to the full dimension of the falling stream substantially normal to but less than the width of the falling stream for short periods of time and at different points across the width of the stream.

6. A method of sampling material carried along on a conveyor which consists in intermittently removing a section through the full dimension of the material normal to but less than the width of the falling stream and adjacent the point of discharge of the conveyor in the discharge stream thereof before the stratification of the stream has been disturbed.

7. A sampling means including a conveyor having a delivery terminal, and a revolvable and transversely movable sample selecting element adjacent to the delivery terminal of the conveyor and in the path of the discharge of the material therefrom, means for revolving the sample selecting element in the said path of discharge, and means for effecting transverse movement thereof.

8. A sampling means including a conveyor having a delivery terminal, a hollow sample selecting element adjacent the delivery terminal of the conveyor and inclined across the path of discharge of the material therefrom, said sample selecting means having a receiving orifice therein, and means for rotating the sample selecting element to intermittently turn the receiving orifice toward the path of discharge of material from the conveyor, and means for moving the sample selecting element transversely across the path of the discharge of material.

9. A sampling means including a conveyor having a delivery terminal, a hollow sample selecting element adjacent the delivery terminal of the conveyor and inclined across the path of discharge of the material therefrom, said sample selecting means having a receiving orifice therein, means for rotating the sample selecting element to intermittently turn the receiving orifice toward the path of discharge of material from the conveyor, and means for continuously moving the sample selecting element transversely back and forth across the path of the discharge of material from the conveyor.

10. A sampling means including a conveyor having a delivery terminal, a hollow rotatable sample selecting element adjacent the delivery terminal of the conveyor and with its axis of rotation inclined across the path of discharge of the material therefrom, said sample selecting means having a receiving orifice therein, means for rotating the sample selecting element to intermittently turn the receiving orifice toward the path of discharge of material from the conveyor, and means for oscillating the sample selecting element transversely of the path of discharge of material from the conveyor.

11. A sample selecting mechanism for use with conveyors including a rotatable shaft having a sample receiving passage therein, said shaft having a receiving orifice in the surface thereof opening into the sample receiving passage, means for rotating the shaft, and a driving connection between the shaft rotating means and the shaft, said driving connection permitting the rotation of the shaft at a greater speed than the rotation of the driving means through a portion only of its revolution.

12. A sample selecting mechanism for use with conveyors including a rotatable sample selecting device having a receiving orifice therein, means for rotating the device, and means on the device for effecting its motion independent of the driving means during a portion of its rotation.

13. The combination with a conveyor having a discharge terminal, of a sample selecting mechanism in the path of discharge of the conveyor, said mechanism including a rotatable sampling device having a receiving orifice therein adapted to be intermittently exposed to the stream of material discharging from the conveyor by the rotation of the shaft, means for rotating the sampling device, and means on the sampling device for effecting its partial rotation independently of the driving means and at a speed greater than the speed of the rotation imparted thereto by the driving means.

14. The combination with a conveyor having a discharge terminal, of a sample selecting mechanism in the path of discharge of the conveyor, said mechanism including a ro-

tatable sampling device having a receiving orifice therein adapted to be intermittently exposed to the stream of material discharging from the conveyor by the rotation of the shaft, means for rotating the sampling device, means on the sampling device for effecting its partial rotation independently of the driving means and at a speed greater than the speed of the rotation imparted thereto by the driving means, and means for effecting the back and forth travel of the sampling device across the path of discharge of the falling material.

15. A sampling means comprising a traveling conveyor having a delivery terminal, an elongated hollow sampling selecting element adjacent the delivery terminal of the conveyor and inclined across the path of discharge of the material therefrom, the longitudinal axis of said sample selecting element extending in substantially the direction of the travel of the conveyor, said sample selecting means having a receiving orifice therein, and means for rotating the sample selecting element about its longitudinal axis to intermittently turn the receiving orifice toward the path of discharge of material from the conveyor.

16. Apparatus for selecting a sample from a predetermined point in the width of a traveling stream of material comprising an elongated rotatable sample selecting element projecting into the stream with its longitudinal axis in a direction substantially normal to the face of the stream, said element having a receiving orifice therein, and having a passageway extending therethrough through which material entering the orifice may travel axially of the element, said element having a discharge orifice therein at the end of said passageway, and means for rotating the element about its axis for intermittently presenting the receiving orifice to the flow of material.

17. Means for selecting a sample from a predetermined point in the width of a falling stream of material comprising an elongated sample selecting element projecting into the stream with its longitudinal axis in a direction substantially normal to the face of the stream, but being inclined from a horizontal plane, said element having a receiving orifice therein and having a closed passageway extending therethrough longitudinally thereof through which material entering the receiving orifice may travel axially of the element, said axial travel of the material occurring through the inclination of the sample selecting element from a horizontal plane, said element having a discharge orifice therein at the end of said passageway.

18. A sampling means including a conveyor having a delivery terminal and an elongated sample selecting element rotatable about its longitudinal axis, having a receiving orifice therein adjacent the delivery terminal of the conveyor and in the path of discharge of material therefrom, the longitudinal axis of said sample selecting element extending substantially in the direction of travel of said conveyor, said selecting element having a discharge passage therein extending longitudinally thereof, and means for rotating the sample selecting element.

19. A sample selecting device comprising a hollow elongated body rotatable about its longitudinal axis and having a receiving orifice therein, and a discharge passage at one end thereof, means for rotating said body, and means for moving the body back and forth transversely of its longitudinal axis.

20. A sample selecting device for divided solid material comprising a rotatable substantially tubular exposed sampling body projecting into the material to be sampled and having an opening through the wall thereof for receiving material and having its longitudinal axis inclined with respect to the horizontal and vertical, said body having a discharge outlet at its lower end, means supporting the tubular body, and means for rotating it about its longitudinal axis.

In testimony whereof I have hereunto set my hand.

THORLEIF THORSTEN.