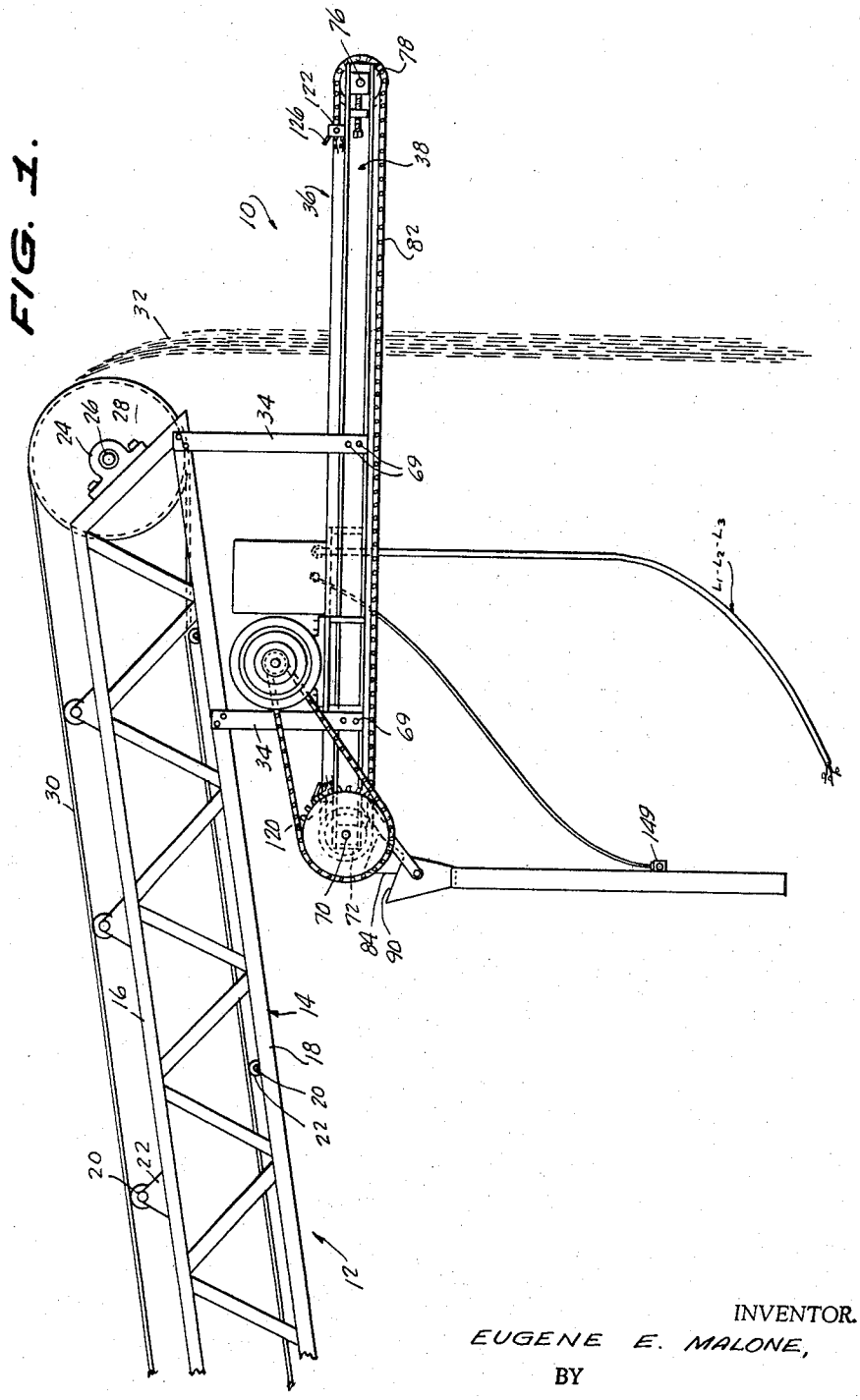
April 9, 1968 E. E. MALONE 3,376,752

GRAVEL SAMPLING MACHINE

Filed Aug. 20, 1965 3 Sheets-Sheet 1

FIG. 1.



INVENTOR.
EUGENE E. MALONE,
BY
Berman, Davidson & Berman
ATTORNEYS.

April 9, 1968 E. E. MALONE 3,376,752

GRAVEL SAMPLING MACHINE

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FIG. 2.

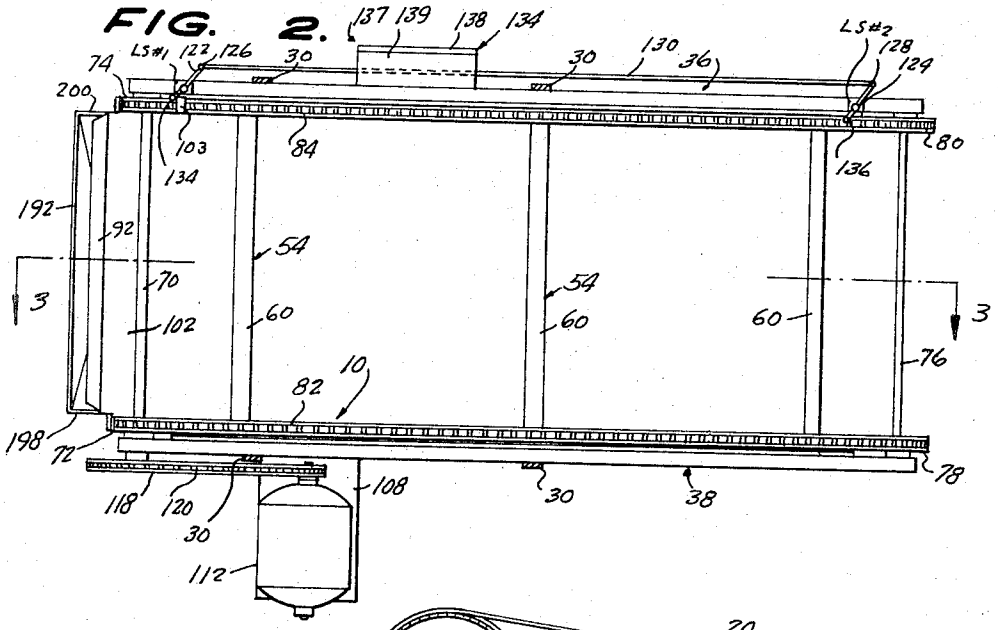
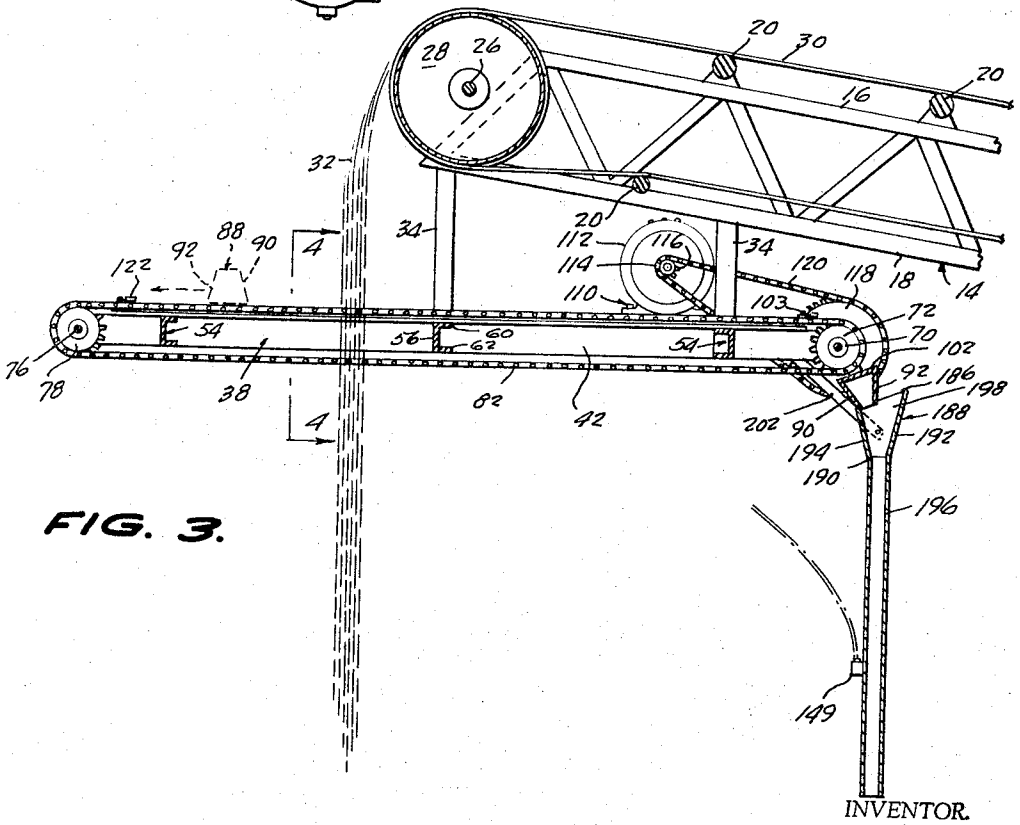


FIG. 3.



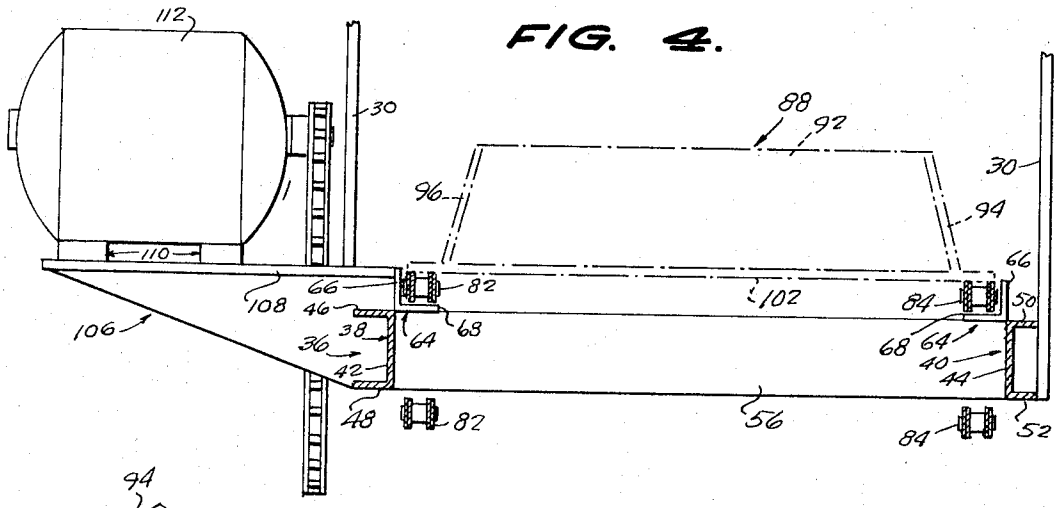
INVENTOR.
EUGENE E. MALONE,
BY.
Berman, Davidson & Berman
ATTORNEYS.

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Filed Aug. 20, 1965 3 Sheets-Sheet 3

FIG. 4.



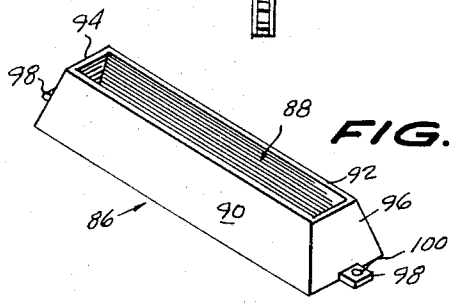
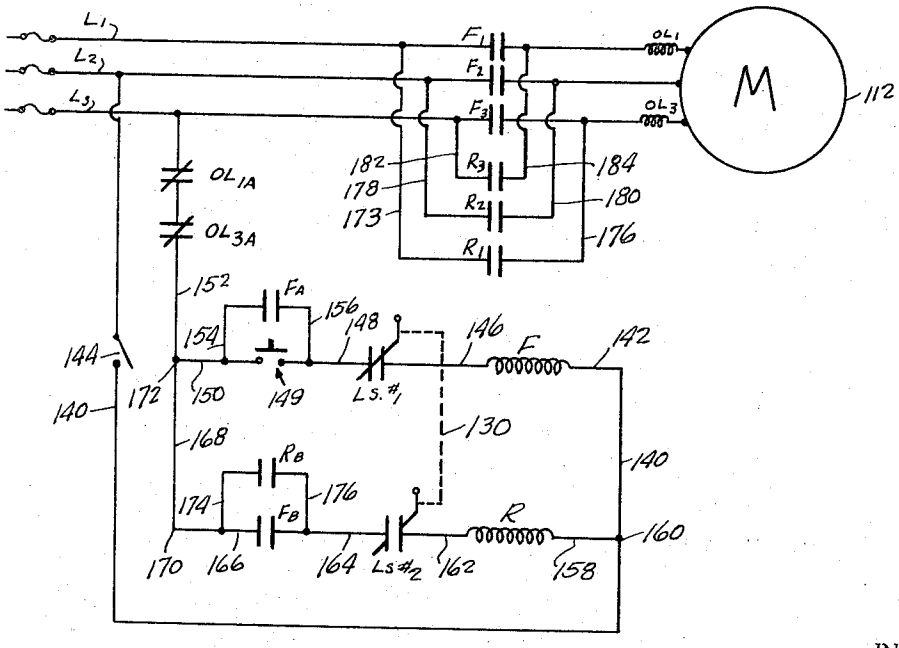


FIG. 5.

FIG. 6.



INVENTOR.
EUGENE E. MALONE,
BY
Berman, Davidson & Berman
ATTORNEYS.

United States Patent Office 3,376,752
Patented Apr. 9, 1968

3,376,752

GRAVEL SAMPLING MACHINE

Eugene E. Malone, 319 Filer Ave. W.,
Twin Falls, Idaho 83301

Filed Aug. 20, 1965, Ser. No. 481,288
10 Claims. (Cl. 73—423)

ABSTRACT OF THE DISCLOSURE

An apparatus for taking a sample of an aggregate from the discharge end of a conveyor belt. An open topped receptacle is reciprocally mounted on a frame so that it moves across and beyond the stream of falling aggregate and back again to obtain the sample. The frame is mounted on the conveyor belt support so that the whole is movable as a unitary structure.

This invention relates to a machine for sampling solid materials and, more specifically, the invention pertains to the provision for sampling aggregates of gross compositions such as, for example, gravel, and the like.

It is a well-known fact that both Federal and State Governments have established certain specifications pertaining to the quality of gravel supplied to certain types of construction. These standards are relatively high and when the coarse composition of gravel is taken into consideration, it is most difficult to employ known sampling means in order to obtain a fair average sample of any given quantity of gravel.

It is, therefore, one of the primary objects of this invention to provide a gravel sampling machine which will take samples of gravel discharged from a rock crusher in order to obtain a fair average sample of the gravel being discharged therefrom.

A further object of this invention is to provide a gravel sampling machine or device which is entirely automatic in operation.

A still further object of this invention is to provide a gravel sampling device to automatically remove a small quantity of the gravel from a run of the gravel over a conveyor or similar device, the gravel sampling device taking from the run a fair sampling of the fines, middlings and tailings of the gravel.

Still another object of this invention is to provide a gravel sampling machine or device which is mechanically-operated without the use of manual labor, thereby eliminating the possibility of personal injury to the operator taking the sample.

This invention contemplates, as a still further object thereof, the provision of a gravel sampling device which may be incorporated in any existing rock-crushing machine or built into newly manufactured rock crushers, the sampling device being non-complex in construction and assembly, inexpensive to manufacture and maintain, which is rugged and durable in use.

Other and further objects and advantages of the instant invention will become more evident from a consideration of the following specification when read in conjunction with the annexed drawings, in which:

FIGURE 1 is a side elevational view of a gravel sampling device constructed in accordance with this invention and showing the same as being mounted on the discharge end of a conveyor system leading from the outlet end of a conventional rock-crushing machine;

FIGURE 2 is a top plan view of the sampling machine shown in FIGURE 1;

FIGURE 3 is a detail cross-sectional view, partly in side elevation, FIGURE 3 being taken on the plane of line 3—3 of FIGURE 2, looking in the direction of the arrows;

FIGURE 4 is an enlarged end elevational view, partly in cross-section, FIGURE 4 being taken substantially on the vertical plane of line 4—4 of FIGURE 3, looking in the direction of the arrows;

FIGURE 5 is an enlarged perspective view of the sampling receptacle utilized in this machine; and

FIGURE 6 is a schematic wiring diagram showing the control circuits for operating the gravel sampling machine.

Referring now more specifically to the drawings, reference numeral **10** designates, in general, a gravel sampling machine or device constructed in accordance with the teachings of this invention. As shown in FIGURES 1 and 3, the gravel sampling device **10** is adapted to be supported below and in spaced relationship relative to the discharge end of a conventional conveyor system **12** the loading end of the conveyor system **12** being disposed in such a position as to receive gravel from the outlet end of a conventional rock-crushing machine (not shown). The conveyor system **12** comprises the usual elongated boom **14** normally positioned in an elevated position, the boom having a pair of vertically-spaced longitudinally-extending top and bottom side frame members **16, 18** (only one pair being shown) at the opposed sides thereof and between which transversely-extend a plurality of conveyor belt-supporting rollers **20** suitably journaled for rotation in standards **22**, all in the known manner. Bearing blocks **24** at the discharge end of the conveyor system **12** journal the opposed ends of a transversely-extending shaft **26** on which is mounted the usual idler roller **28**. Trained about the rollers **20, 28** is an endless conveyor belt **30** on which is carried gravel **32**, a sample of which it is desired to obtain. The discharge end of the conveyor system **12** is normally positioned over a truck or other vehicle to be loaded for the transport of the gravel assuming, of course, that the test sample of the gravel meets the required specification as to the composition thereof.

Fixedly-secured to the bottom side frame members **18** are a plurality of elongated substantially flat rectangular hanger straps **34** formed of any suitable rigid material with the straps on one side of the boom **14** being disposed in laterally-spaced, parallel and confronting relation relative to the straps on the other side thereof.

Reference numeral **36** denotes an open elongated normally horizontal rectangular frame of the sampling machine or device **10**. The frame **36** is seen to comprise a pair of longitudinally-extending substantially parallel laterally-spaced side frame members **38, 40** having upright bights **42, 44**, respectively, from which laterally-project vertically-spaced and substantially parallel outwardly-extending pairs of flanges **46, 48** and **50, 52**. The frame **36** also includes a plurality of transversely-extending, parallel cross-frame members **54** longitudinally-spaced relative to the side frame members **38, 40** and to which the opposed ends of the cross-frame members are rigidly secured. The cross-frame members **54** are also U-shaped in transverse cross-section and each includes a bight **56** from the opposed ends of which laterally-project the pairs of flanges **60, 62** vertically-spaced from one another with the flanges **60** of one cross-frame member **54** being coplanar with corresponding flanges of the others of the cross-frame members.

Fixedly-secured to the upper sides of the cross-frame members **54** (by means not shown) and extending parallel and proximate to the side frame members **38, 40** are a pair of elongated, substantially L-shaped conveyor chain guide and support members **64**. As is seen in FIGURE 4, each L-shaped member **64** includes an upstanding leg **66** and a laterally-projecting foot **68** and, as in this figure, the L-shaped members **64** open toward one another. Through reference to FIGURES 1, 3 and 4, it is seen that the side frame members **38, 40** are fixedly-

secured to the lower ends of the hanger straps **34** at **69** (representing conventional means) in such a manner that the inner and outer ends of the frame **36** extend on opposite sides of the discharge end of the conveyor system **12** and in substantially parallel relation relative to the boom **14**.

The bights **42**, **44** adjacent the inner ends of the side frame members **38**, **40** rotatably-support the opposed ends of a first cross-shaft **70** on which is fixedly-connected for rotation therewith the pair of drive sprocket wheels **72**, **74**, the sprocket wheel **72** being disposed adjacent the inner side of the bight **42** and the sprocket wheel **74** being positioned proximate the inner side of the bight **44**. A second cross-shaft **76** has its opposed ends also rotatably-supported on the bights **42**, **44** adjacent the outer ends of the side frame members **38**, **40** and has a pair of driven sprocket wheels **78**, **80** fixedly-secured thereon for rotation therewith. The sprocket wheel **78** is positioned adjacent the inner side of the bight **42** and is aligned with the sprocket wheel **72**, and the sprocket wheel **80** is mounted proximate the inner side of the bight **44** and is aligned with the sprocket wheel **74**. An endless link chain **82** is trained about the pair of aligned sprocket wheels **72**, **78** and a second endless conveyor link chain **84** is trained about the aligned sprocket wheels **74**, **80**. As is seen in FIGURE 4, the upper lays of the conveyor chains **82**, **84** are supported, respectively, and are guided in the L-shaped members **64**.

Mounted on the conveyor chains **82**, **84** and extending transversely therebetween is a gravel sampling receptacle generally indicated by reference numeral **86**. The gravel sampling receptacle **86** has an elongated frusto-pyramidal configuration having an open top **88** lying substantially in the plane of the frustum (see FIGURE 5). The receptacle **86** includes the opposed longitudinally-extending sidewalls **90**, **92** and the opposed end walls **94**, **96** from which laterally-extend connecting lugs **98** each being apertured at **100** for connection in the chains **82**, **84**. The side and end walls rise from a common substantially rectangular base wall **102**. A substantially rectangular switch-operating block **103** is also fixedly-secured on the chain **84** (see FIGURE 2) and is disposed adjacent to, but spaced from the receptacle **86**. The function of the block **103** will be described in detail infra.

The gravel sampling receptacle **86**, when connected (by conventional means) with the chains **82**, **84** is adapted to reciprocate longitudinally of the frame **36** in a cycle which includes the moving of the receptacle **86** from its unloading position shown in FIGURES 1, 2 and 3, adjacent the inner end of the frame **36** and proximate the cross-shaft **70** toward the other or outer end of the frame **36** (adjacent to, but spaced inwardly from the axis of the cross-shaft **76**), and the return of the receptacle **86** to its above-described gravel-unloading position. In so reciprocating, the receptacle **86** makes a minimum of two passes transversely across the flow of gravel **32** as it is discharged from the conveyor system during any given one complete cycle of the movement of the receptacle **86**. As will become apparent from the description which follows, the sampling runs may be made without the involvement of manual effort on the part of the operator with the exception of operating a pair of electrical control circuits to initiate and terminate the sampling runs. The cycling operation may be continued through repeated runs or, if desired, the control circuits may be so wired that after one complete cycle of operation, the control circuits may be de-energized. In the instant case, the schematic wiring diagram shown in FIGURE 6 includes wiring circuits wherein the gravel samples may be taken continuously if the operator so desires, or these circuits may be interrupted at any point at the will of the operator.

Accordingly, to drive the receptacle **86** throughout its complete cycling operation, a support bracket **106** is rigidly-secured to the side frame member **38** and to adjacent portion of the leg **66** of the angle iron **64** adjacent to, but spaced inwardly from the shaft **70**. The bracket **106** includes a normally horizontal motor-mounting plate **108** on which is fixedly-secured the base **110** of a three-phase reversible electric motor **112** having a drive shaft **114** on which is fixedly-secured a drive sprocket **116**. The drive sprocket **116** is aligned with a driven sprocket **118** fixedly-secured on the cross-shaft **70** on that end thereof adjacent the side frame member **38**. An endless drive chain **120** is trained about the sprockets **116**, **118** in driving relation therewith. Mounted on the flange **46** of the side frame member **38** adjacent the opposed ends thereof are a pair of conventional limit switches L.S. #**1** and L.S. #**2**. The limit switch L.S. #**1** (see FIGURE 6) is normally closed and the limit switch L.S. #**2** is normally open. Each of the limit switches L.S. #**1** and L.S. #**2** is provided with a toggle arm **122**, **124**, respectively, and as is seen in FIGURE 2, one of the ends of each of the toggle arms **122**, **124** is pivotally-connected at **126**, **128** to one of the ends, respectively, of an elongated switch-operating lever **130**. The toggle arms **122**, **124** are pivotally-supported on their respective associated limit switches L.S. #**1**, L.S. #**2**, and their respective other ends **134**, **136** normally extend transversely across the chain **84** in the path of movement of the rectangular switch-operating block **103**.

Reference numeral **137** designates a switch box support bracket similar to the bracket **106**, the bracket **137** being fixedly-secured to the side frame member **40** by conventional means (not shown), and on which is rigidly-secured an elongated normally horizontal switch box mounting plate **138** for a vertically-elongated substantially hollow rectangular switch box **139** of conventional construction.

The switch box **139** is adapted to receive and house circuit-reversing switches for reversing the direction of rotation of the motor shaft **114** together with their respective control solenoids. These switches, solenoids and the circuits controlled thereby are shown in FIGURE 6 of the drawings wherein it is seen that the motor **112** is normally energized through the main lines L_1, L_2, L_3. The lines L_1, L_2, L_3 to the motor **112** are interrupted by the normally open switches F_1, F_2, F_3, all operated by the energization and de-energization of the solenoid F. The lines L_1, L_3 also include in series therewith the overload switch solenoid coils OL_1, OL_3, respectively. The overload switches OL_{1A}, OL_{3A} are, of course, normally closed.

The energizing circuit for the solenoid F comprises the wire **140** having one of its ends connected with one end of the wire **142**, the wire **140** being interrupted intermediate the ends thereof by a manually-operable switch **144** which is normally open. The function of the switch **144** will be described in greater detail below.

As is seen in FIGURE 6, the other end of the wire **142** connects with one side of the solenoid F, and the other side of the solenoid F is connected by the wire **146** to one side of the normally closed limit switch L.S. #**1**. One end of a wire **148** connects the other side of the limit switch L.S. #**1** with one side of a conventional motor-starting switch **149**, the switch **149** being manually-operable in the usual manner. The other side of the switch **149** connects through the wire **150** with one end of a wire **152** in which are connected, in series, the normally closed overload switches OL_{1A}, OL_{3A}, and the other end of the wire **152** is connected with the line L_3. Wires **154**, **156** connect the opposite sides of a motor circuit holding switch F_A to opposite sides of the motor-starting switch **149**. Thus, and with reference to FIGURES 2, 3 and 6, when the frusto-conical pyramidal gravel sampling receptacle **86** has reached its shown discharge position, the chains **82**, **84** have moved in a corresponding direction, and in so moving, the rectangular switch-operating block **103** has engaged against the end **134** of the toggle arm **122** moving the limit switch L.S. #**1** to its closed position shown in FIGURE 6. Movement of the toggle arm

122 causes the limit switch L.S. #2 to move to its open position since the connecting lever 130 has followed the movement of the toggle arm 122. It should now be apparent that the energization of the solenoid F will cause the normally open switches F_1, F_2 and F_3 to pick up or close, thereby causing the motor 112 to be energized through the lines L_1, L_2 and L_3. The energization of the motor 112 initiated by this motor control circuit causes the shaft 114 to rotate in one direction. To reverse the direction of the rotation of the shaft 114, a second circuit is employed and the second circuit is seen to comprise the following elements.

Again referring to FIGURE 6 of the drawings, it is seen that one end of a wire 158 connects with the wire 140 at 160 between the aforementioned one side of the solenoid F and the manually-operable switch 144. The other end of the wire 158 connects to one side of a solenoid R, the other side of the solenoid R being connected through wire 162 with one side of the limit switch L.S. #2. It will be recalled that this limit switch is normally open. The other side of the limit switch L.S. #2 is connected by wire 164 to one side of the normally open switch F_B. The switch F_B closes and opens, alternately, as the solenoid F is energized and de-energized. The other end of the wire 166 connects with one end of a wire 168 as at 170. The other end of the wire 168 is connected at 172 in the wire 150 between the aforementioned other side of the motor-operating switch 149 and the overload switches OL_A.

Reference characters R_1, R_2 and R_3 all designate switches under the direct control of the solenoid R. These switches are in their normally open position and, as is seen in FIGURE 6, the line L_1 connects with one side of the switch R_1 through a wire 173, the other side of the switch R_1 being connected to the line L_3 through the wire 176. In a like manner, a wire 178 connects the line L_2 to one side of the switch R_2, and the wire 180 connects the other side of this switch with the line L_2. In similar manner, one end of the wire 182 connects the line L_3 to one side of the switch R_3 and the wire 184 connects the other side of the switch with the line L_1. As is seen in FIGURE 6, the wires 176, 180, 184 all connected their associated switches R_1, R_2 and R_3 with the dead sides of the lines L_1, L_2 and L_3 when the switches F_1, F_2 and F_3 are in their normally open positions.

From the foregoing description it is now obvious that with the overload switches OL_A closed and with the manually-operated switch 144 closed and upon the closing of the switches R_B and L.S. #2, the solenoid R is energized to close the switches R_1, R_2 and R_3, thereby connecting the lines L_1, L_2 and L_3 to the motor 112 to energize it in such a manner as to effect the reverse rotation of the drive shaft 114. The switch F_B, under these circumstances, has been dropped out or opened since the solenoid F is not energized concurrently with the solenoid R.

Having described the component elements of the present invention in detail, and their relationship with respect to one another, it is believed that the operation of the gravel sampling machine or device 10 is self-evident. However, and in the interest of clarity, a brief summary of the operation of the machine or device 10 is set forth below.

Assuming that the component elements of this invention are in their respective positions shown in full lines in the several figures of the drawings, and assuming further that gravel 32 is being fed to the inlet end of the convoyer belt 30 for discharge into a transporting vehicle or on a gravel pile, and still further assuming that the gravel sampling device or machine 10 is connected to the framework of the conveyor system 12 in the manner described, the gravel 32 will normally fall between the side frame members 38, 40 of the frame 36 of the sampling mechanism or device 10. The flow of gravel 32 is unimpeded until such time as it becomes necessary to obtain a sample thereof in order to ascertain if the gravel being discharged meets with the required specifications.

To this end, and assuming that the lines L_1, L_2 and L_3 are energized, the operator closes the switch 144 and momentarily closes the switch 149 which, being of conventional construction, normally moves to its open position as soon as released. This instantaneously causes the energization of the solenoid F which picks up or closes the switches F_1, F_2, F_3 and F_B the motor 112 is now energized and, assuming it is energized to cause the motor drive shaft 114 to rotate in a counterclockwise direction, reference being had to FIGURE 3 of the drawings, the conveyor link chains 82, 84 will be driven in the same direction causing the receptacle 86 to move its discharge position shown in FIGURES 1, 2 and 3, at the inner end of the frame 36 toward the outer end thereof at a point adjacent the cross-shaft 76. The chain 84 in so being driven will cause the block 103 to engage the toggle arm 124 of the switch L.S. #2 causing the toggle arm 124 to pivot thereby shifting the lever 130 to the left, as viewed in FIGURE 2. It should here be noted that as soon as the switch 149 has been closed and the solenoid F energized, the holding switch F_A closes to maintain the series circuit through the solenoid F.

As soon as the switch L.S. #1 opens and the switch L.S. #2 closes, the solenoid F becomes de-energized and opens the switches F_1, F_2 and F_3, de-energizing the motor 112. However, the position of the switch L.S. #1 and L.S. #2 relative to each other and the throw of their respective toggle arms 122, 124 when engaged by the block 103 is such that the solenoid R becomes energized substantially simultaneously with the de-energization of the solenoid F. As a consequence of this arrangement and disposition of the switches L.S. #1 and L.S. #2, the receptacle 86 will not override the outer end of the frame 36.

The receptacle 86 in traveling from its innermost position to its outermost position relative to the frame 36 passes transversely through the stream of gravel 32 dwelling thereunder only such time as is necessary to partially fill the receptacle 86 and to cause the block 103 to engage and pivot the other end 136 of the arm 124. Thus, when the positions of the switches L.S. #1 and L.S. #2 reverse themselves from those shown in FIGURE 6, the circuits to the motor 112 are now energized to cause the return of the receptacle 86 to its innermost or discharge position relative to the frame 36.

Attention is here directed to the fact that the switch F_B is closed as long as the solenoid F remains energized. Thus, upon the closing of the switch L.S. #2 the solenoid R is energized to close the holding switch R_B. The solenoid F being de-energized when the switch L.S. #1 is moved to its open position drops out or opens the switch F_B, but since the switch R_B is closed, the solenoid R remains energized to hold the switches R_1, R_2 and R_3 in their respective close positions, thereby completing the circuits from the lines L_1, L_2 and L_3 to the motor 112 to effect rotation of the shaft 114 in the reverse direction, whereby the chain 120 is driven in a clockwise direction (reference being made to FIGURE 3) causing the same to effect a second pass of the receptacle 86 through the discharged gravel 32 as the receptacle 86 moves to its discharge position adjacent the inner end of the frame 36. The chains 82, 84 are, of course, now driven in the reverse direction to eventually cause the block 103 to strike against the other end of the toggle arm 122, thereby shifting the lever 130 to the right as viewed in FIGURE 2, whereby the switches L.S. #1 and L.S. #2 are restored to their normally closed and open positions, respectively, thereby de-energizing the solenoid R and energizing the solenoid F. The positions of the switches employed in the control circuits are now re-established as described.

The receptacle 86 will, it is seen, make two passes through the discharge gravel 32 during each complete cycle of the operation of the gravel sampling machine or device 10. The sampled gravel is discharged at the end

of each complete cycle, and the cycling operation will continue to repeat itself in the manner described above as long as the solenoids F and R are alternately energized and de-energized. As a general rule, however, only a limited amount of sample gravel need be taken and a sufficient amount is usually gathered in the receptacle **86** during one complete cycle of operation of the machine or device **10**. To limit the number of passes to be made by the receptacle **86** the control switch **144** is provided. This switch, it will be recalled, was the first of the described switches to be closed. It will be recognized upon inspection of the wiring diagram of FIGURE 6 that the operator of the machine or device **10** may manually open the switch **144**, thereby opening the circuits to both of the solenoids F, R. The switch **144** is, of course, preferably opened when the receptacle **86** has reached its inner or discharge position. The operator immediately closes the switch **144** after the same has once been opened in order to condition the circuits controlled by the solenoid F, R for their respective alternate energization and de-energization as described supra.

The gravel sample taken in the receptacle **86** is discharged into the open upper end **186** of an inverted pyramidal discharge chute **188**, the lower end of the chute **188** being open as at **190**. The back wall **192** of the chute **188** is substantially higher than the front wall **194** in order to prevent the accidental throw of gravel from the receptacle **86** under centrifugal force beyond the open upper end **186**. The open lower end **190** of the chute **188** is fixedly-connected to the open upper end of an elongated normally upright conduit **196**, the open lower end of which is positioned above a gravel-receiving bucket or other type of vessel easily carried to the site where the analysis of the gravel sample taken is to be made. The opposed sidewalls **198**, **200** are rigidly-connected to the lower ends of a pair of braces **202** (only one being shown) and the upper ends of the braces **202** are rigidly-secured to the undersides of the flanges **48**, **52** adjacent the outer ends of the side frame members **38**, **40**.

Having described and illustrated one embodiment of this invention in detail, it will be understood that the same is offered merely by way of example, and that this invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. In combination, a conveyor system for transferring solid aggregates from a conveyor loading station to a conveyor discharge station and means for taking a sample of said aggregate as it leaves said discharge station to flow downwardly under the force of gravity, said sampling device comprising an open elongated substantially rectangular frame having a pair of opposed ends, said frame being disposed below said discharge station and extending across the aggregate flow on opposite sides thereof, a substantially hollow receptacle having an open top, means for reciprocating said receptacle along said frame transversely through and beyond opposite sides of said aggregate flow while retaining the receptacle open top facing in the same direction to take a sample from said aggregate flow, and said reciprocating means including means to invert said receptacle to discharge said sample therefrom after passing back and forth through the aggregate flow.

2. In combination, a conveyor system for transferring solid aggregates from a conveyor loading station to a conveyor discharge station and means for taking a sample of said aggregate as it leaves said discharge station to flow downwardly under the force of gravity, said sampling device comprising an open elongated substantially rectangular frame having inner and outer ends, said frame being disposed below said discharge station and having its outer end extending across the flow of aggregate as it leaves said discharge station and on opposite sides thereof, a receptacle having an open top, means for reciprocating said receptacle along said frame from said inner end of said frame across the path of flow of said aggregate to the outer end of said frame and back to the inner end of said frame while retaining the open top of the receptacle facing in the same direction to receive a sample of said aggregate, and said reciprocating means including means to invert said receptacle when said receptacle returns to said inner end of said frame thereby discharging said sample from said receptacle.

3. The combination as recited in claim **2**, and means on said frame controlling said reciprocable means to reverse said receptacle as said receptacle reaches said outer end of the frame and to halt said receptacle as it reaches the inner end of the frame.

4. In combination, a conveyor system for transferring a solid aggregate from a loading station to a discharge station, said system including an elongated elevated boom having an endless belt mounted thereon to receive said aggregate at said loading station for transfer to said discharge station, and an aggregate sampling machine for taking a sample of the aggregate flow as the same leaves said discharge station to fall under the force of gravity, said machine comprising an elongated open substantially rectangular frame having oppositively-disposed inner and outer ends, said frame extending substantially parallel to said boom, means rigidly-connecting said boom with said frame and suspending the latter from the former in vertically-spaced relation relative thereto, said outer end of said frame projecting on opposite sides of said conveyor discharge station and traversing said aggregate flow, said frame including a pair of elongated laterally-spaced and substantially parallel side frame members, a substantially hollow receptacle extending transversely of said frame between said side frame members and having an open top, said receptacle normally being positioned adjacent said inner end of said frame, means for reciprocating said receptacle along said frame from its said inner end, across the path of aggregate flow, to its said outer end and back to the inner end while retaining the open top of the receptacle facing in the same direction to receive a sample of said aggregate as said receptacle traverses said aggregate flow, means on said frame controlling said reciprocable means and limiting the movement of said receptacle in one direction and the other, and said reciprocating means including means inverting said receptacle at said inner end of said frame to discharge said sample from said receptacle.

5. In combination, a conveyor system for transferring a solid aggregate from a loading station to a discharge station, said system including an elongated elevated boom having an endless belt mounted thereon to receive said aggregate at said loading station for transfer to said discharge station, and an aggregate sampling machine for taking a sample of the aggregate flow as the same leaves said discharge station to fall under the force of gravity, said machine comprising an elongated open substantially rectangular frame having oppositely-disposed inner and outer ends, said frame extending substantially parallel to said boom, means rigidly-connecting said boom with said frame and suspending the latter from the former in vertically-spaced relation relative thereto, said outer end of said frame projecting on opposite sides of said conveyor discharge station and traversing said aggregate flow, said frame including a pair of elongated laterally-spaced and substantially parallel side frame members, a substantially hollow receptacle extending transversely of said frame between its said side frame members and having an open top and opposed end walls, said receptacle normally being positioned adjacent said inner end of said frame and having one of its said end walls adjacent, respectively, one of said side frame members, an endless chain mounted, respectively, on each of said side frame members and extending longitudinally thereof, means connecting said end walls with an adjacent one of said chains, drive means connected with said chains, means controlling said drive means to effect simultaneous reciprocable movement of

said chains and consequently of said receptacle whereby said receptacle is moved from its said inner end of said frame across the path of aggregate flow as it leaves said discharge station and nears said outer end of said frame, and vice versa, said receptacle taking samples of said aggregate as it reciprocates through said flow, and said receptacle being inverted at said inner end of said frame to discharge said samples therefrom.

6. In the combination recited in claim 5, wherein said drive means includes an electric motor, and said control means includes a pair of motor reversing circuits and a limit switch for each of said circuits, said limit switches being mounted on one of said side frame members adjacent, respectively, an end thereof and being disposed in the path of movement of said receptacle, said limit switches being simultaneously operable to energize and de-energize one and the other of said circuits, respectively, as said receptacle engages said limit switches alternately.

7. In the combination recited in claim 6, and chute means connected on said side frame members adjacent said inner end of said frame and being suspended therefrom in vertically-shaped relation relative thereto, said chute means receiving therein said inverted receptacle and said sample discharged therefrom to convey said sample to a receiving station.

8. In the combination recited in claim 7, and means on said frame to guide and support said chains intermediate said inner and outer ends of said frame.

9. In the combination recited in claim 8, and a shaft for each end of said frame, means journaling the opposed ends of said shaft for rotation on the adjacent ends of said side frame members, a sprocket for each end of each of said shafts with the sprockets on one of said shafts being aligned with the sprockets on the other of said shafts,

each of said chains, respectively, being trained about a pair of aligned sprockets, a third sprocket mounted on one of said shafts adjacent one of said frame side members, means mounting said electric motor on said side frame member, said motor having a drive shaft, a sprocket mounted on said drive shaft for rotation therewith and being aligned with said third sprocket, and a third chain trained about said drive shaft sprocket and said third sprocket.

10. Apparatus for taking a sample of an aggregate from a freely flowing path of travel thereof, comprising a frame, a receptacle movably supported on said frame to cross the aggregate travel path, said receptacle having an open end facing said aggregate travel path, means for moving said receptacle across and beyond the aggregate path of travel and then for reversing and again moving said receptacle across and beyond the aggregate travel path in the opposite direction while retaining the open end of the receptacle facing in the same direction, and means for inverting said receptacle at a point on said frame remotely-disposed with respect to said aggregate travel path to discharge the aggregate sample from said receptacle after the receptacle has passed through the aggregate path twice.

References Cited

UNITED STATES PATENTS

946,744	1/1910	Van Mater	73—421
3,302,769	2/1967	Platzer et al.	73—423
3,005,346	10/1961	Pearman	73—421

LOUIS R. PRINCE, *Primary Examiner.*

S. C. SWISHER, *Assistant Examiner.*