June 30, 1964 P. H. CLAUSSEN 3,139,271

CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 1

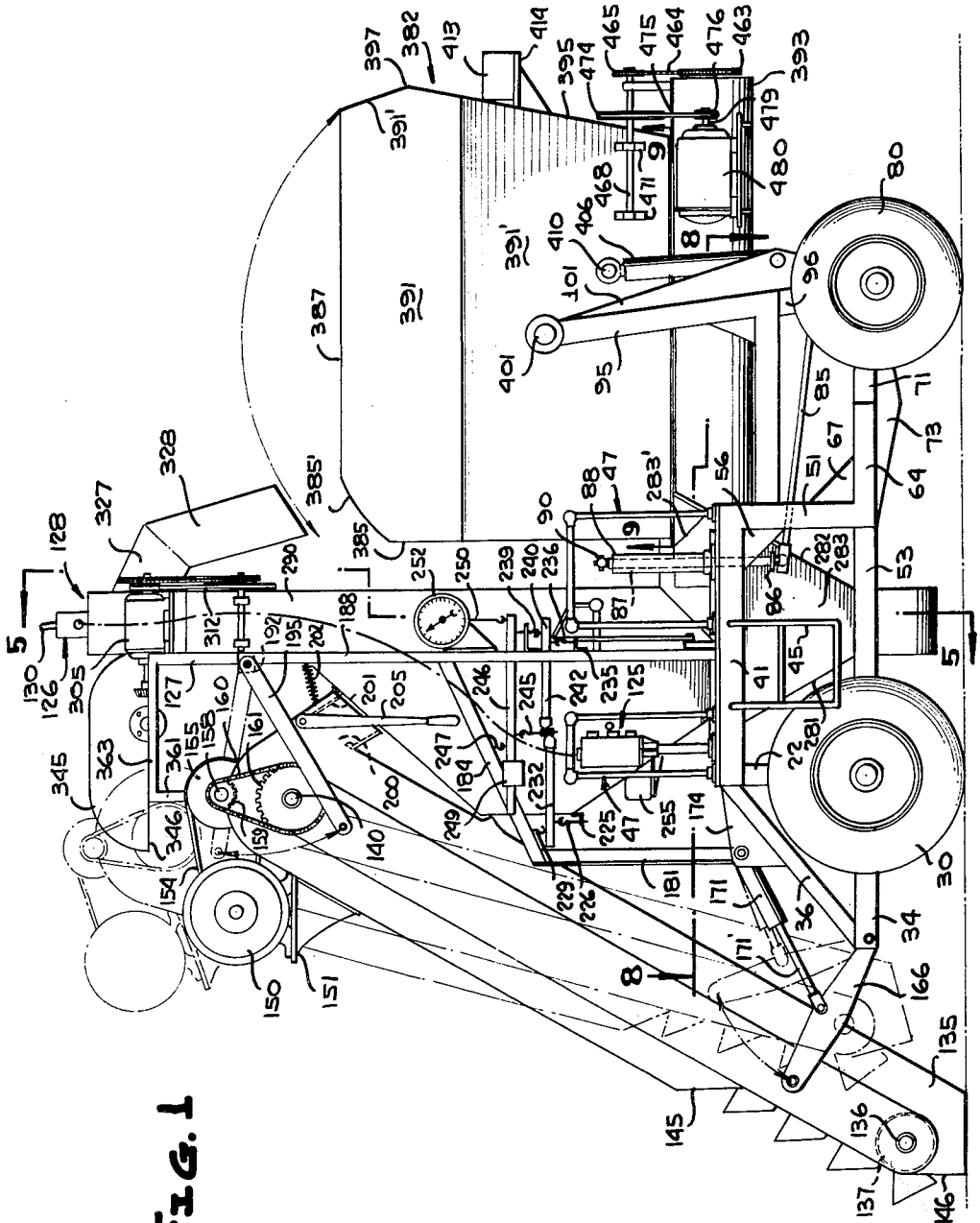


FIG. 1

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CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 2

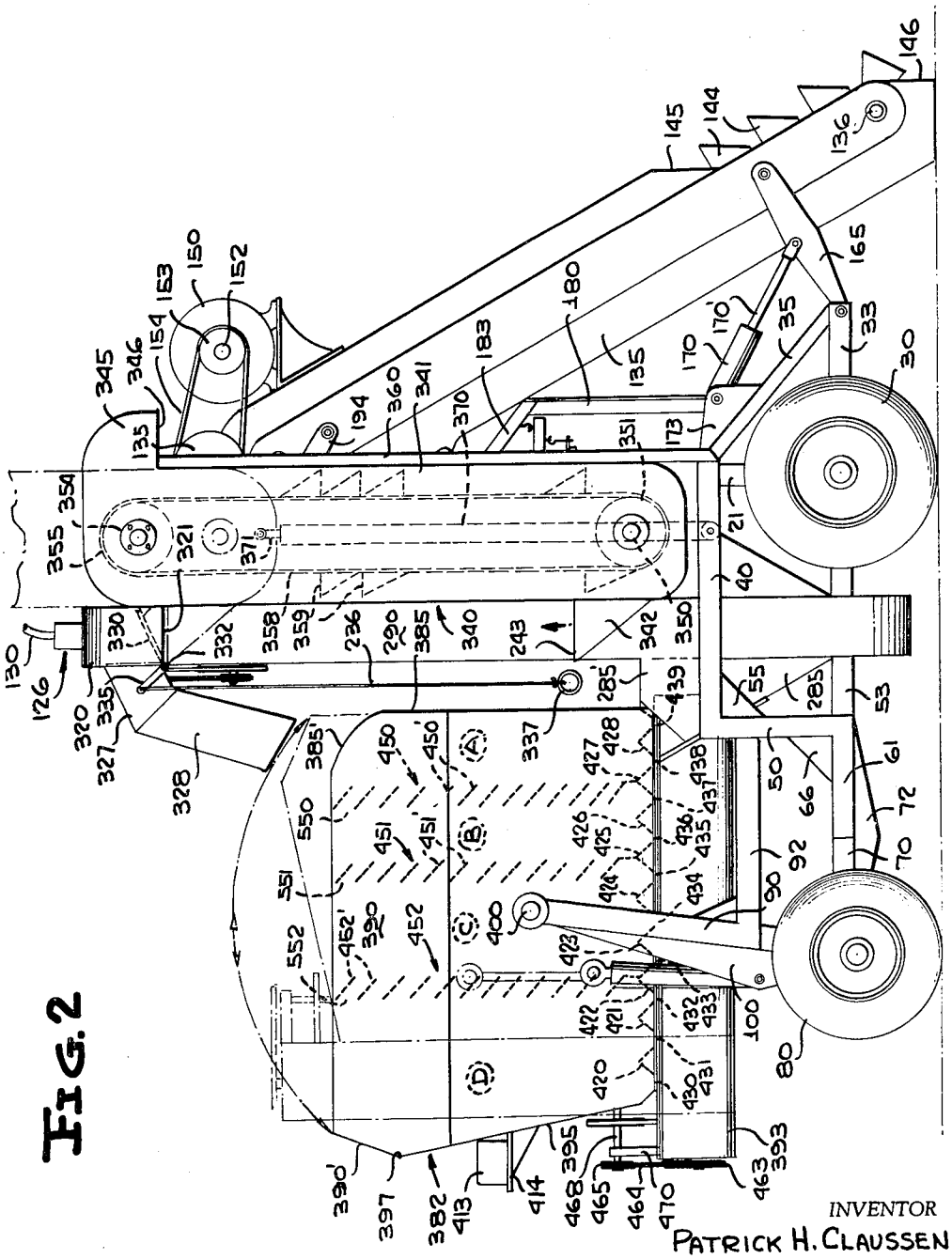


FIG. 2

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CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 3

FIG. 3

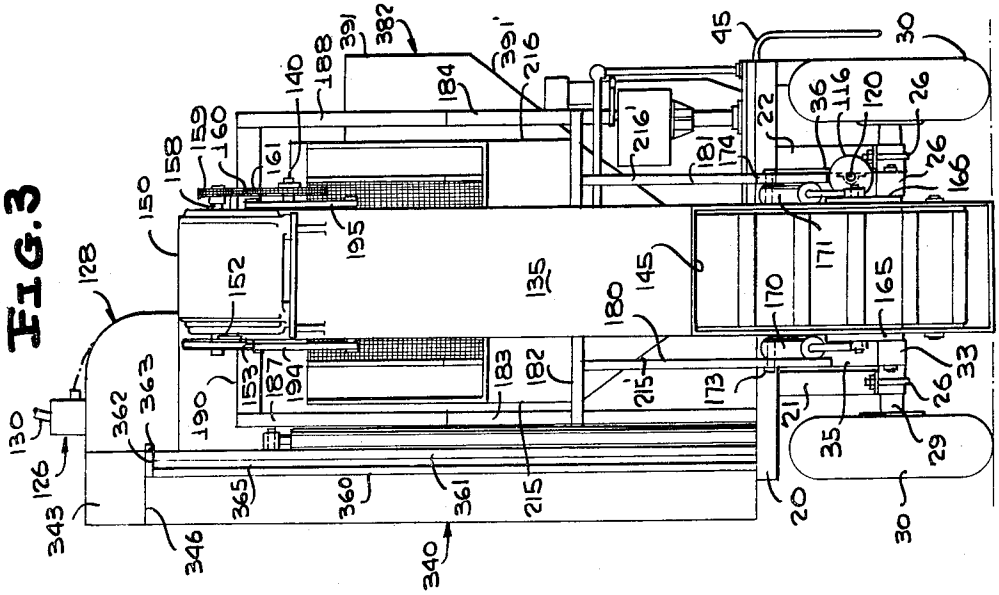
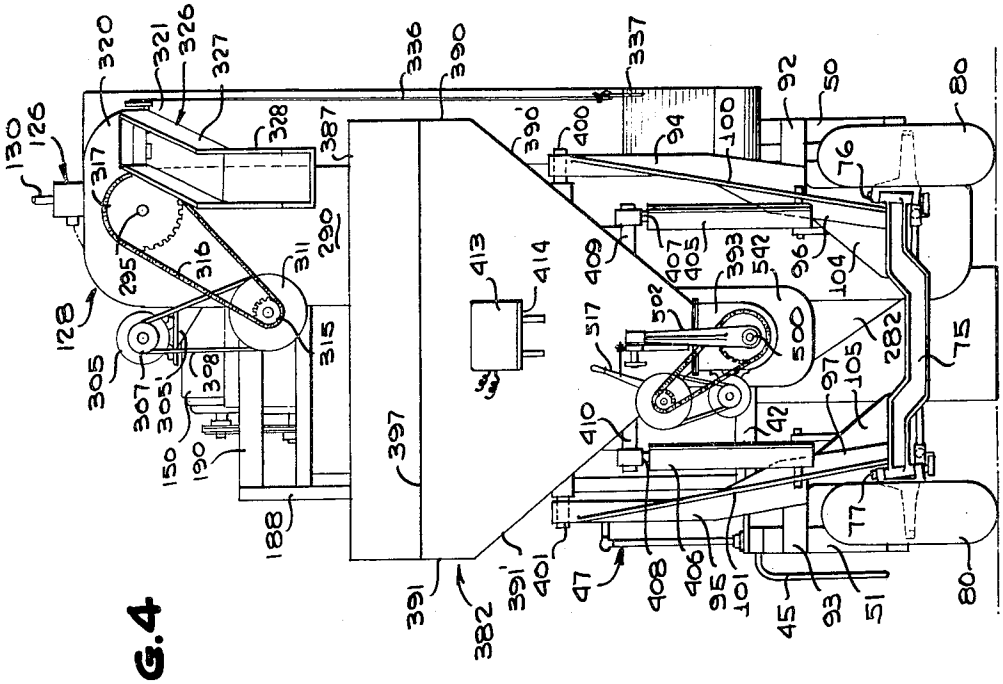


FIG. 4



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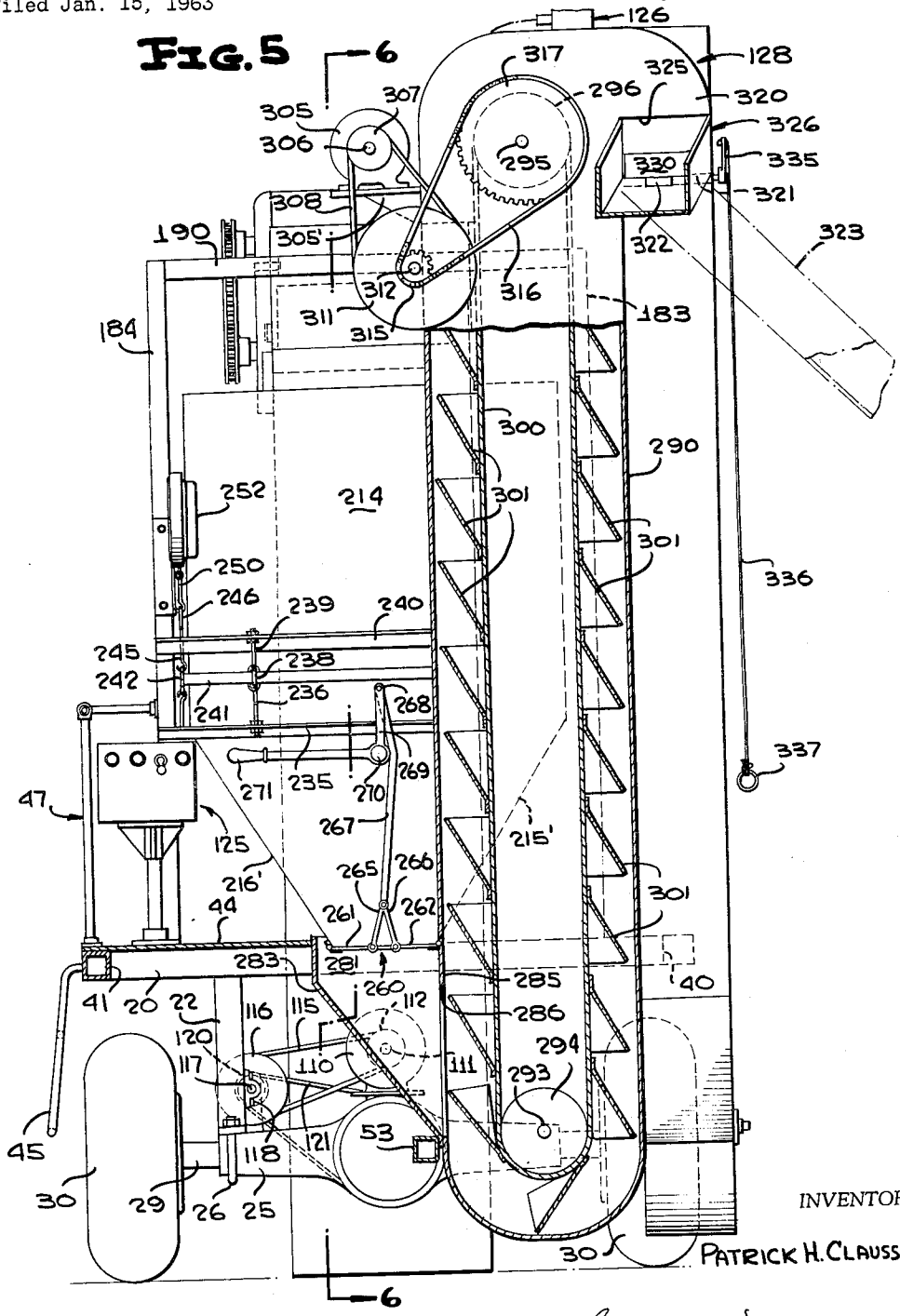
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June 30, 1964 P. H. CLAUSSEN 3,139,271

CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 4

FIG. 5



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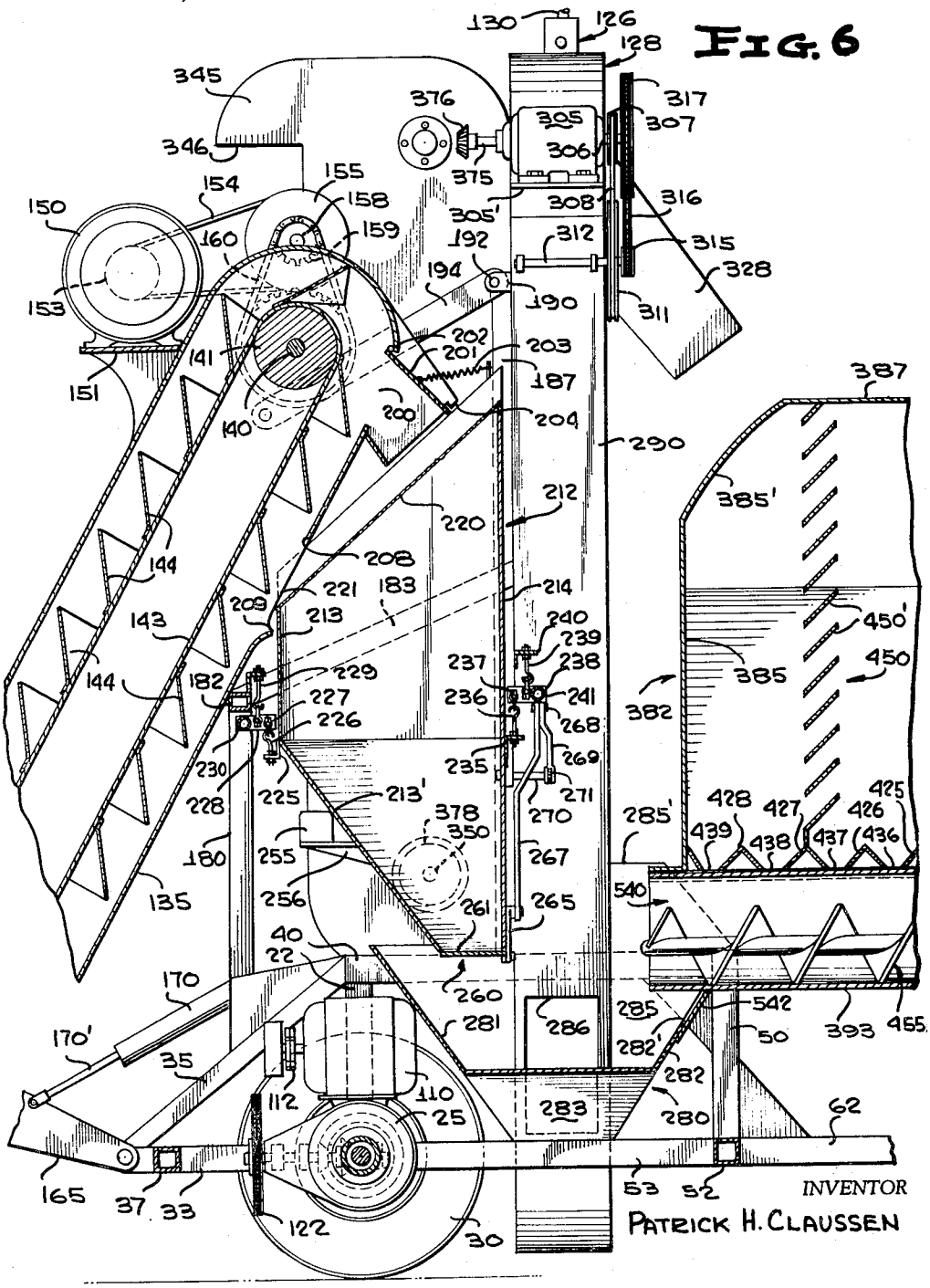
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June 30, 1964 P. H. CLAUSSEN 3,139,271

CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 5

FIG. 6



BY Shoemaker and Mattare

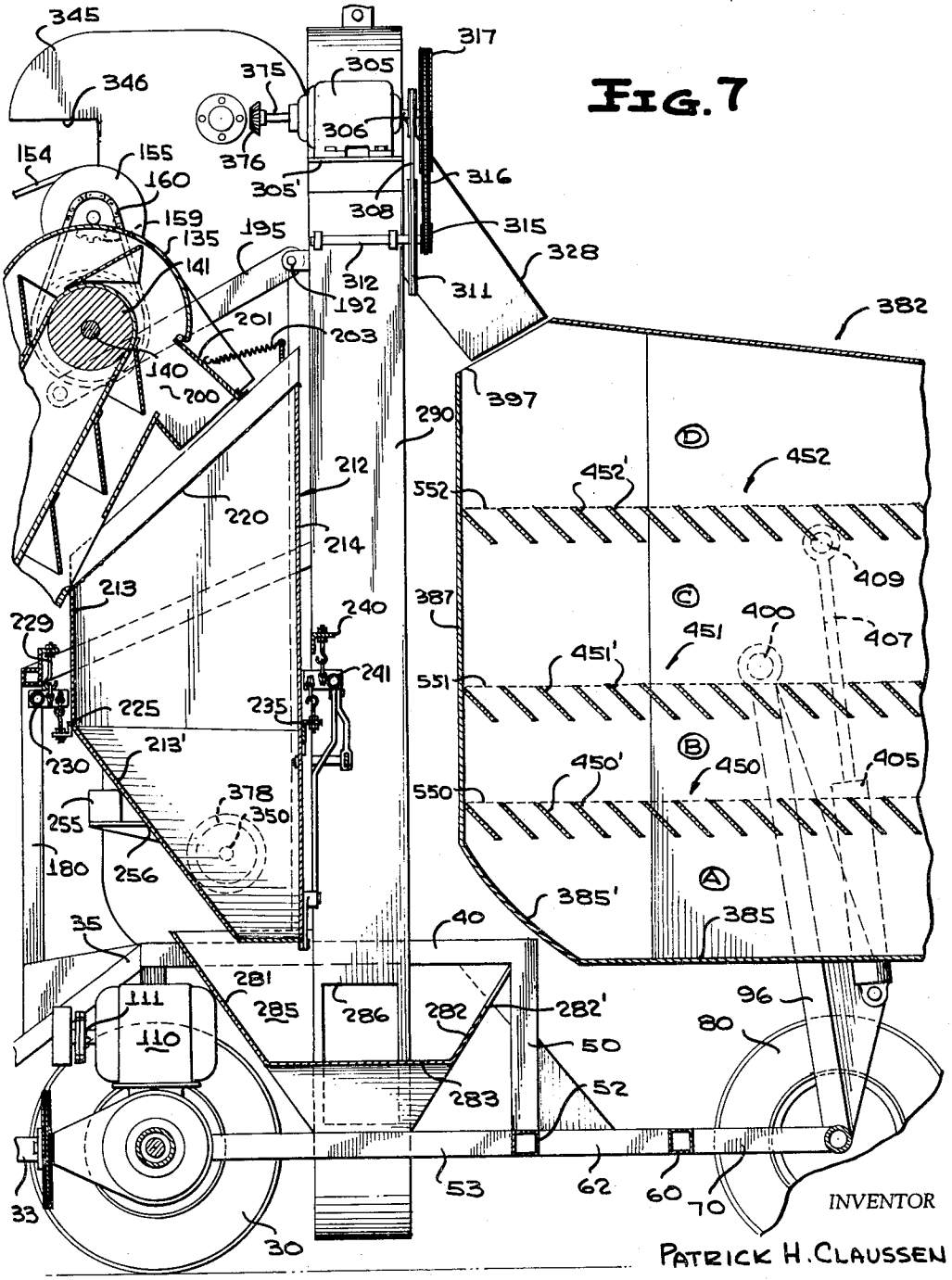
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June 30, 1964 P. H. CLAUSSEN 3,139,271

CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 6

FIG. 7



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June 30, 1964 P. H. CLAUSSEN 3,139,271

CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 7

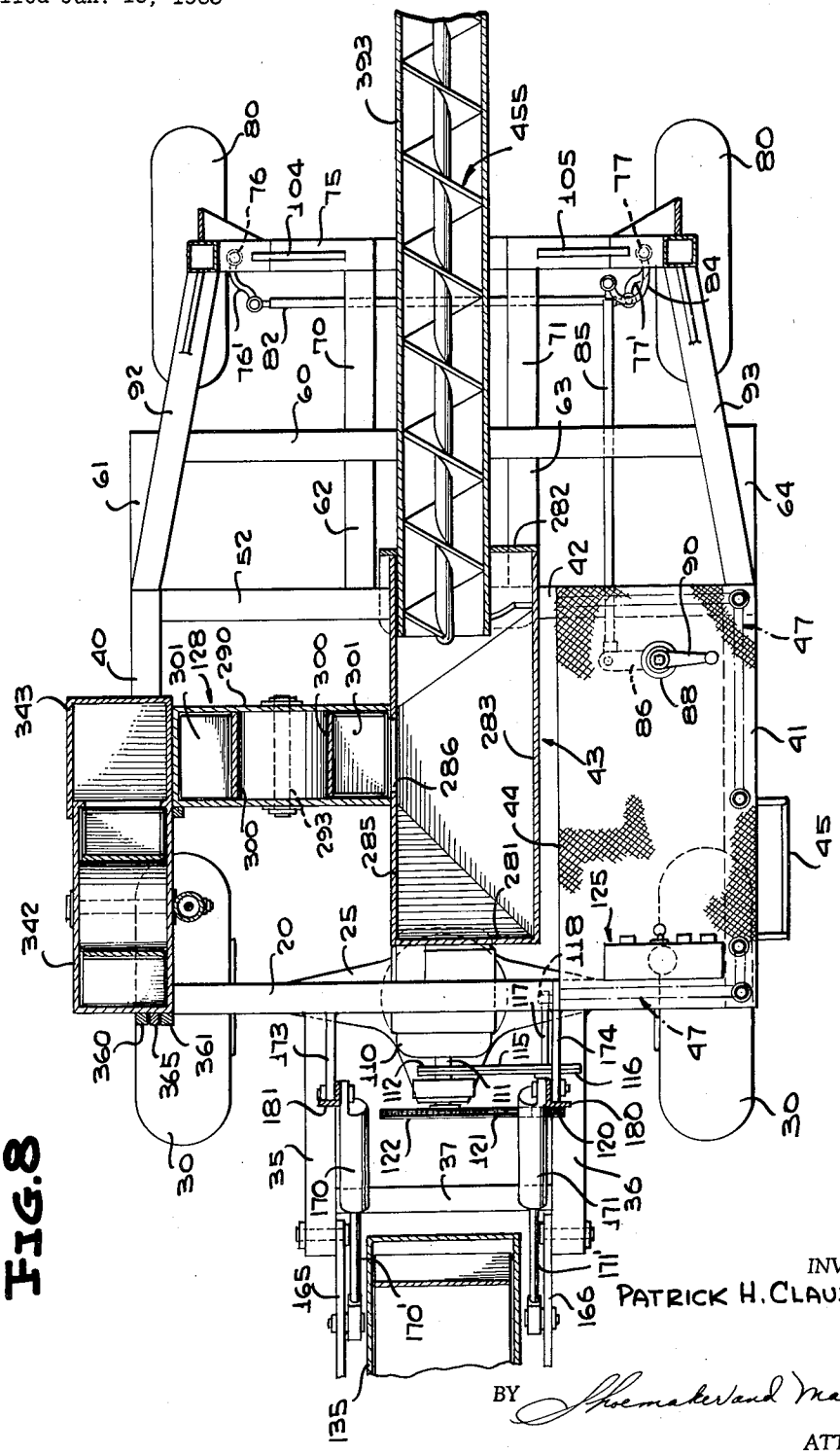


FIG. 8

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June 30, 1964 P. H. CLAUSSEN 3,139,271

CUSTOM MIXING APPARATUS

Filed Jan. 15, 1963 8 Sheets-Sheet 8

FIG. 9

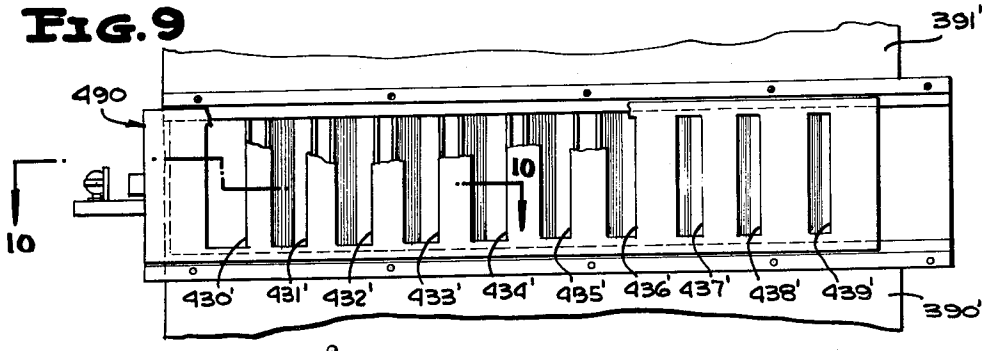


FIG. 10

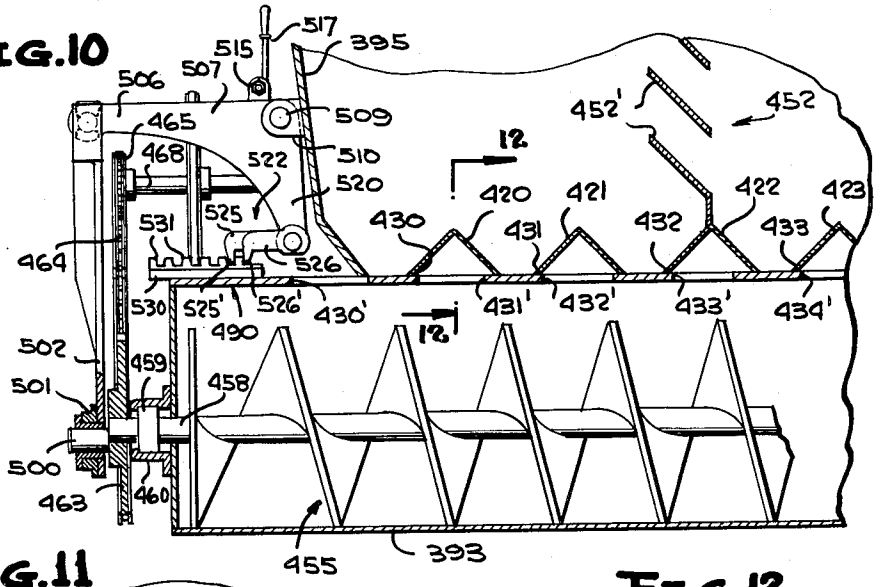


FIG. 11

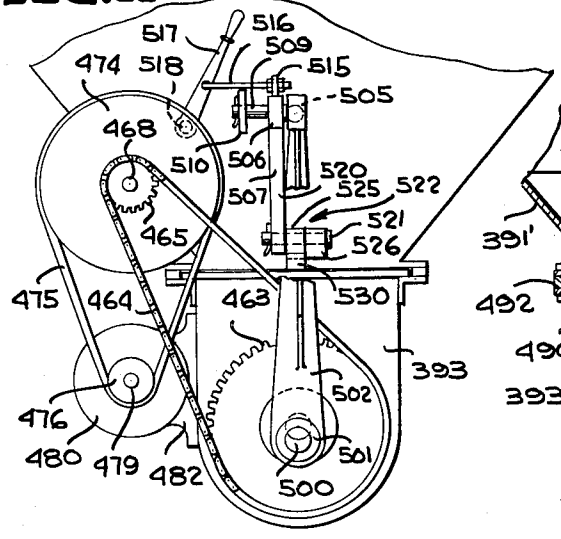
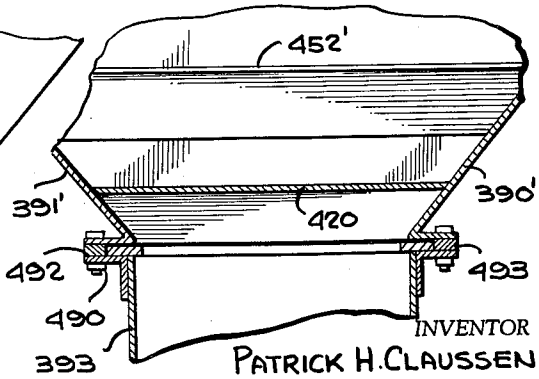


FIG. 12



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United States Patent Office 3,139,271 Patented June 30, 1964

3,139,271

CUSTOM MIXING APPARATUS

Patrick H. Claussen, Columbia, Mo., assignor to Missouri Farmers Association, Inc., Columbia, Mo., an association of the State of Missouri

Filed Jan. 15, 1963, Ser. No. 251,649
36 Claims. (Cl. 259—154)

The present invention relates to custom mixing apparatus, and more particularly to an apparatus which incorporates in a completely self-contained mobile unit all of the necessary structure for providing a custom mix formula from various raw bulk materials.

The present invention may be utilized in many different applications where it is desired to obtain a substantially homogeneous and uniform mixture of two or more materials. In particular, the present invention is especially adaptable for use in providing a mixture of fertilizer materials. It is a common practice to store bulk raw materials of a fertilizing nature and to periodically mix up various custom formulas as are determined according to the soil tests on particular land.

In the prior art, it has been a common practice to erect a rather substantial permanent installation including a relatively large warehouse having bins or bays therein within which are stored raw materials in bulk form. In this type of permanent installation which is now in common use, it is necessary to provide a mobile payloader for entering the various bins or bays and to dig and transport the raw materials to a pit area. In this pit area, the necessary apparatus is provided for weighing the bulk materials and mixing the bulk materials so as to obtain the desired custom formula.

In the present invention, the cost involved in erecting a custom mix station is lowered by almost one half since by employing the self-contained mobile unit of the present invention, the payloader which was formerly required is completely eliminated, and the pit and associated weighing and mixing machinery which heretofore has been of a rather complex and bulky nature can also be eliminated.

The apparatus of the present invention incorporates in the mobile unit all of the necessary structure for carrying out the various functions which are necessary to produce the final custom mix wherein the various materials are mixed in a substantially homogeneous and uniform manner.

The apparatus of the present invention includes a framework which is mounted upon wheels such that the apparatus can be readily moved from place to place, the mobile unit incorporating both driving means and steering mechanism so that the mobile unit can be readily maneuvered to any desired location.

Mounted upon the mobile unit of the present invention is digging and lifting mechanism which is adapted to dig into and lift raw bulk material as it is normally stored in piles in a bin or the like.

Also mounted on the mobile unit of the present invention is a weighing or measuring means whereby an operator is enabled to accurately determine the exact amount of material which is in the weighing hopper of the weighing mechanism, means being provided for stopping the flow of material into the weighing mechanism when a desired amount is therein. In this manner, the operator can accurately weigh out the exact amount of any particular raw material which it is desired to incorporate in the custom mix formula.

An elevating means in the form of a bucket conveyor or the like is provided for lifting the material to an elevation such that it can then be discharged into a mixing hopper means. It will be understood that several different kinds of raw material can be incorporated in the final mixture, and in a typical example, three different

materials may be employed. Each of these materials is sequentially discharged into the mixing hopper means to form horizontal layers or strata when the mixing hopper means is in its vertical position for loading. Means is provided for subsequently moving and pivoting the mixing hopper means into its normal horizontal operative position whereby the materials previously disposed therein are then disposed in vertical layers or strata. Baffle means is incorporated within the mixing hopper means to minimize any tendency of the strata or layers of material to shift as the mixing hopper means is pivoted from its vertical operative position to its horizontal operative position.

The mixing hopper means is provided with discharge openings at the lower part thereof which are adapted to discharge material into a feed auger mechanism. This feed auger mechanism is adapted in turn to provide a substantially uniform mixture of the material in cooperation with a control means of a novel construction which assures that the initial feeding of material from the mixing hopper means into the feed auger mechanism will be progressive in nature such that a substanially homogeneous mixture will be provided at the discharge portion of the feed auger means.

The feed auger mechanism is in turn adapted to discharge into a surge hopper means which serves the dual purpose of receiving material both from the weighing hopper of the apparatus as well as the feed auger means as will hereinafter be more fully explained.

The elevating means may then again be utilized for lifting material discharged by the feed auger means to a discharge portion at the upper part of the elevating means whereupon the completed homogeneously mixed formula may be discharged into a suitable vehicle such as a truck or the like.

A particular advantage of the present invention is the fact that the mobile unit can be readily maneuvered from one place to another such that it can be moved into the storage bays as desired for digging up the necessary bulk materials whereupon the mobile unit can be maneuvered to a suitable location adjacent to a truck or any other means whereby the completed mix can be discharged into such a desired vehicle. Furthermore, the construction of the apparatus of the present invention is such that it can be substantially continuously in operation so as to handle a relatively large volume of bulk material over a given period of time.

An object of the present invention is to provide a new and novel custom mixing apparatus which comprises a completely self-contained mobile unit.

Another object of the invention is the provision of custom mixing apparatus including means for digging and lifting raw material which may be stored in bins or the like.

A further object of the invention is to provide custom mixing apparatus including means for weighing and measuring specific amounts of raw bulk materials as are necessary for completing the final custom mix.

A still further object of the invention is the provision of custom mixing apparatus incorporating means for ensuring a substantially homogeneous mixture of the various raw materials which go into making the final custom mix.

Yet another object of the invention is to provide custom mixing apparatus which eliminates the necessity of providing a payloader and the pit and machinery associated therewith in prior art installations to thereby reduce the cost of an installation for providing custom mixes of fertilizer and the like by a factor of about one half.

Still another object of the invention is the provision of custom mixing apparatus which is relatively simple

and inexpensive in construction and yet which is efficient and reliable in use.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIG. 1 is a side elevation of the apparatus of the present invention;

FIG. 2 is a side elevation of the apparatus as seen from the opposite side as FIG. 1;

FIG. 3 is a front view of the apparatus shown in FIG. 1;

FIG. 4 is a rear view of the apparatus shown in FIG. 1;

FIG. 5 is a sectional view taken substantially along line 5—5 of FIG. 1 looking in the direction of the arrows;

FIG. 6 is a sectional view taken substantially along line 6—6 of FIG. 5 looking in the direction of the arrows;

FIG. 7 is a view similar to FIG. 6, illustrating the mixing hopper means in a different operative position;

FIG. 8 is a sectional view taken substantially along line 8—8 of FIG. 1 looking in the direction of the arrows;

FIG. 9 is a sectional view taken substantially along line 9—9 of FIG. 1 looking in the direction of the arrows;

FIG. 10 is an enlarged sectional view taken substantially along line 10—10 of FIG. 9 looking in the direction of the arrows;

FIG. 11 is an end view of the structure shown in FIG. 10; and

FIG. 12 is a sectional view taken substantially along line 12—12 of FIG. 10 looking in the direction of the arrows.

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, the mobile unit of the present invention includes a supporting framework comprising a front upper cross brace member 20 from which depends a pair of spaced vertical members 21 and 22. An axle and transmission housing 25 is supported at the lower ends of members 21 and 22 by means of conventional U-bolt shackles 26. Axle means 29 is supported by the housing 25 and front wheels 30 are fixed to the outer ends of the axle means.

A pair of forwardly extending frame members 33 and 34 are secured at their rear portions to the housing 25 and extend forwardly as seen for example in FIGS. 1 and 2. A pair of sloping brace members 21 and 22 extend from the outer ends of members 33 and 34 to the front brace member 20 previously described. A cross brace member 37 is secured between the inner surfaces of members 33 and 34 to rigidify this structure.

A pair of rearwardly longitudinally extending members 40 and 41 are secured at their forward ends to the cross brace member 20. At the rear end of member 41 a laterally extending frame member 42 is connected at one end to frame member 41 and at the opposite end to a portion of a surge hopper indicated generally by reference numeral 43 which will be more fully hereinafter described. A platform of expanded metal or the like is indicated by reference numeral 44 and is supported between frame members 20 and 42 for supporting an operator thereon. The operator will normally stand on platform 44 during operation of the apparatus. A ladder means 45 is secured to the side surface of frame member 41 to enable an operator to readily mount the platform 44. A guard rail indicated generally by reference numerals 47 is provided around the outer portion of the platform to prevent the operator from accidentally falling from the platform while operating the apparatus.

A pair of depending members 50 and 51 are connected to the rear portions of frame members 40 and 41 respectively, a cross brace member 52 being connected between the lower ends of frame members 50 and 51. A longitudinally extending frame member 53 extends forwardly from member 52 and is secured at its forward end to the housing 25. Gusset members 55 and 56 are connected between members 40, 50 and members 41, 51 respectively for rigidifying the framework.

A cross frame member 60 is disposed in spaced parallel relationship to frame member 52 and is connected with frame member 52 by longitudinally extending frame members 61, 62, 63 and 64. A gusset member 66 is connected between members 50 and 61, and a gusset member 67 is connected between members 51 and 64 for rigidifying the structure.

A pair of frame members 70 and 71 extend rearwardly from frame member 60 in substantial alignment with frame members 62 and 63, gusset members 72 and 73 lying beneath these aligned members for strengthening the structure. The rear portions of frame members 70 and 71 are connected to a rear cross frame member 75 which supports at the opposite ends thereof a pair of king pins 76 and 77 upon which are mounted the rear wheels 80 of the apparatus.

The lower ends of the king pins 76 and 77 are connected with links 76' and 77' which in turn are connected by a cross link 82 to cause the king pins to be rotated in unison when it is desired to turn the dirigible wheels 80 when steering the apparatus. The upper end of king pin 77 is connected with a link 84 which in turn is pivotally connected with a longitudinally extending link 85 which in turn is connected to a crank arm 86 at the forward end portion thereof.

As seen in FIGS. 1 and 8, crank arm 86 is in turn connected with a shaft 87 which extends upwardly through a vertically extending housing 88, shaft 87 having a handle 90 secured to the upper end thereof, this laterally extending handle 90 serving as a steering mechanism such that pivotal movement of handle 90 will cause turning of the rear dirigible wheels 80 to steer the vehicle during operation.

A pair of rearwardly and inwardly extending frame members 92 and 93 extend from members 50 and 51 respectively, members 94 and 95 extending upwardly from the rear end portions of members 92 and 93 respectively and serving as a pivotal support for the mixing hopper means hereinafter described. A pair of depending frame members 96 and 97 are secured to frame members 94 and 95 respectively and are secured at their lower ends to the frame member 75.

A pair of smaller gusset members 104 and 105 are secured to frame members 94, 96 and 95, 97 respectively. A pair of smaller gusset members 104 and 105 are secured between frame members 96 and 97 respectively and the frame members 75 for rigidifying the structure.

Driving Mechanism

As seen particularly in FIGS. 5 and 8, the driving means of the present invention includes a reversible electric motor 110 which is mounted on the upper portion of the housing 25. A drive shaft 111 extends forward from the electric motor and has a sheave 112 secured thereto. This sheave is drivingly connected through a belt 115 with a sheave 116 which is mounted on a jack shaft 117. Jack shaft 117 is supported from the frame by pillow block bearing means 118. A sprocket 120 is secured to the forward end of jack shaft 117 and is connected by chain 121 with a sprocket 122 which in turn is connected with the transmission mechanism disposed within housing 25. It is apparent that when electric motor 110 is energized, the front wheels 30 will be driven through the drive chain described above.

Operation of electric motor 110 can be controlled in any conventional manner, and a control panel 125 is illustrated as being mounted on the platform 44 such that an operator standing on the platform will have ready access to this control panel. Any conventional control means may be employed for varying the speed of the electric motor as desired and for reversing the electric motor

so as to be able to maneuver the unit forwards or backwards as the case may be.

Electric power for operating the driving motor as well as various other electrically driven components as hereinafter described may be provided to the apparatus in a suitable manner. As illustrated, a junction box 126 is mounted on the upper portion of the device and is connected with the control panel as is indicated schematically by the phantom line in FIG. 1 of the drawings. The junction box may be supported on the upper portion of the elevating means illustrated generally by reference numeral 128 which will be hereinafter more fully described.

An advantage of having the electric power provided to the apparatus through a junction box mounted on the upper portion of the apparatus is that the junction box may be in turn connected as by a flexible cable indicated by reference numeral 130 to an overhead reel which is adapted to permit the mobile unit of the invention to travel to any desired location within a given installation, the overhead reel preferably being fixed and supported by the roof or overhanging structure to permit maximum mobility of the apparatus of the present invention.

Digging and Lifting Means

Mounted at the forward end of the unit of the present invention is a digging and lifting mechanism which is mounted in such a manner as to be remotely selectively moved into and out of operative position. The digging and lifting mechanism is illustrated in its lowered operative position in full lines in FIG. 1 and is illustrated in its lifted or inoperative position in phantom lines in this figure.

The digging and lifting means includes an outer protective casing indicated by reference numeral 135, this casing serving to journal between the opposite side walls thereof a pair of shafts 136 and 140 upon which are respectively mounted roller members 137 and 141. Trained over these roller members is a flexible belt member 143 to which is secured a plurality of bucket-like members 144 to thereby provide a bucket-type lifting means which operates in a well-known manner to dig into a body of material and lift the material.

The forward portion of the protective casing 135 is cut away along lines 145 and 146 to expose the buckets 144 at the lowermost portion of the digging and lifting means and partway up in their upward movement such that the buckets can readily dig into a body of bulk material in a well understood manner.

The means for driving the digging and lifting means includes an electric motor 150 mounted on a supporting platform 151 secured to the forward portion of casing 135. Electric motor 150 includes an output driving shaft 152 to which is secured a sheave 153. Sheave 153 is connected through a belt 154 with a sheave 155 mounted on a jack shaft 158 supported by suitable bearing means from the casing 135. Sprocket 158 is connected to an end portion of jack shaft 153 and is connected through chain 160 to a sprocket 161 secured to the outer end of shaft 140 for driving roller member 141 within the casing of the digging and lifting means. It is apparent that energization of electric motor 150 will cause rotation of roller member 141 and consequently movement of the belt 143 and buckets 144 mounted thereon. Electric motor 150 is connected with a suitable control member on control panel 125 previously described such that the operator may readily control operation of the movement of the bucket members of the digging and lifting means from the operator's platform.

A pair of arms 165 and 166 are each pivotally supported at the inner ends thereof to frame members 33 and 34 respectively, while the other ends of arms 165 and 166 are pivotally connected with opposite side wall portions of the casing 135. In this manner, the lower portion of the digging and lifting mechanism is pivotally connected with the frame of the mobile unit.

In order to operate and control the pivotal movement of the digging and lifting means, a pair of hydraulic cylinders 170 and 171 are provided, the upper ends of these cylinders being pivotally connected with plate members 173 and 174 respectively which are mounted upon the upper surfaces of frame members 35 and 36 respectively. The outer ends of the piston rods 170' and 171' respectively of the two hydraulic cylinders are in turn pivotally connected with the inner portions of the arms 165 and 166 respectively. It is accordingly apparent that extension of the hydraulic rams 170 and 171 will result in lowering of the digging and lifting means into operative position, while retraction of these two rams will elevate the digging and lifting mechanism into its inoperative position.

A pair of upwardly extending frame members 180 and 181 are connected at their lower ends with plates 173 and 174 and are connected at their upper ends with a cross frame member 183. Extending upwardly and rearwardly from the cross frame member 182 are a pair of frame members 183 and 184 which in turn engage intermediate portions of vertical frame members 187 and 188 extending upwardly and supporting at their upper ends a cross frame member 190.

Extending forwardly from cross frame member 190 are plate-like members 192 which serve to pivotally support one end portion of each of arms 194 and 195 which have their outer ends respectively connected with the opposite side wall portions of the casing 135 of the digging and lifting means. It is apparent that the swingable arms 194 and 195 will serve to pivotally support the upper portion of the digging and lifting mechanism and cause the digging and lifting mechanism to pivot into the dotted line position as shown in FIG. 1 when the rams 170 and 171 are retracted to move the digging and lifting mechanism to its inoperative position.

As seen particularly in FIGS. 1 and 6, the digging and lifting means includes a discharge portion indicated by reference numeral 200 at the upper rear part thereof, this discharge portion including an opening which is directed in a downward direction to discharge material from the buckets as they pass over the upper sheave 141. A gate member 201 is pivotally supported about a hinge member 202 and is normally pulled into an open position by a tension spring 203, a stop member 204 being provided for limiting the movement of the gate member in an opening direction. As seen especially in FIG. 1, a handle 205 is operatively connected with the hinge portion 202 of the gate member for manually actuating the gate member and is further readily available to an operator standing on the platform of the apparatus such that when a predetermined amount of material has been discharged into the weighing hopper hereinafter described, the gate member 201 may be manually closed until it is again desired to discharge material into the weighing hopper.

A further cutout portion 208 is provided in the rear wall of the casing of the digging and lifting means, and an outwardly flared lip 209 is formed at the bottom portion of this cutout portion, the purpose of this cutout portion being hereinafter more fully described.

Weighing and Measuring Means

The weighing mechanism of the present invention includes a weighing hopper indicated generally by reference numeral 212 and including a forward wall 213 and a rear wall 214. The upper side wall portions 215 and 216 define with the forward and rear wall a substantially rectangular cross-sectional configuration in the upper portion of the hopper while the lower portion of forward wall 213 slopes downwardly and inwardly as seen for example in FIG. 6, and the lower portions 215' and 216' of the side wall portions 215 and 216 respectively slope downwardly and inwardly to define a tapered lower portion of the hopper such that the material within the hopper will be

fed down by gravity to the discharge portion at the lower end of the hopper.

As seen in FIG. 6, a scalping screen 220 extends between the forward and rearward walls 213 and 212 and is disposed on an angle such that material discharged through the discharge portion of the digging and lifting means will impinge upon the scalping screen. Particles which are smaller than the openings in the scalping screen will, of course, pass downwardly within the hopper while larger particles will be caught by the scalping screen and will slide downwardly due to the slope thereof and through the cutout portion 221 at the front of the hopper and into the opening 208 in the casing of the digging and lifting means. It is apparent that the curved lip 209 of the casing will ensure that the particles falling downwardly along the scalping screen will be received within the casing of the digging and lifting means and thence pass downwardly therein.

It is, of course, apparent that the scalping screen may be of any desired mesh in accordance with the types of materials being handled and this can readily be determined depending on the application to which the invention is directed.

The weighing hopper is suspended on weighing beams which in turn are pivotally supported by the framework, this construction being relatively conventional and serving to provide an accurate indication of the weight of the material disposed within the hopper. The suspension means for the weighing hopper includes a first member 225 which is secured to the forward wall 213 of the hopper, this member in turn being connected with a pair of spaced hook members 226. These hook members each are connected through links 227 with connector members 228 which are in turn supported by hook members 229 from the framework. The two connector members 228 are connected by a tubular member 230 with one end of a weighing beam 232.

A member 235 is connected to the rear wall 212 of the hopper, member 235 being supported by hook members 236 which are connected to links 237 secured to connector members 238 identical to the connector members 228 previously discussed. The two spaced connector members 238 are in turn connected by hook members 239 which are suspended from a cross member 240 extending between the frame members 187 and 188 previously described. Connector members 238 are in turn connected by tubular member 241 with one end portion of a weighing beam 242.

The opposite end portions of weighing beams 232 and 242 are in turn connected by hook member 245 with an intermediate portion of a balance arm 246 which is mounted for swinging movement about hook member 247. A weight member 249 is mounted on arm 246 to facilitate adjustment of the apparatus, weight 249 being movable along the arm in a well-known manner as required.

The opposite end of arm 246 is connected by means of a hook member 250 to the scale indicator mechanism 252. It is apparent during operation of the apparatus that the operator can readily determine the weight of the material within the weighing hopper by glancing at the indicating dial 252 which will indicate the weight of the material within the hopper at any particular time.

The weighing mechanism described hereinabove is of a conventional construction such as manufactured by the Webb Corporation of Webb City, Missouri and identified as a Suspension Hopper Scale.

In order to assure complete discharge of the material within the weighing hopper, a vibrator mechanism 255 is mounted upon a suitable bracket member 256 secured to the wall portion 213'. This vibrator mechanism may be of a conventional electrically operated construction and connected with the control panel 125 so that it can be remotely controlled as required.

As seen particularly in FIGS. 5 and 6, the lower portion of the weighing hopper comprises a discharge portion and is adapted to be closed by a closure means in the form of a clam shell type gate indicated generally by reference numeral 260 and including two portions 261 and 262 which are pivoted about longitudinally extending axes and which are adapted to move downwardly into an open position. The two closure portions 261 and 262 are pivotally connected with links 265 and 266 which are in turn pivotally connected with the lower end of an arm 267. The upper end of arm 267 is in turn pivotally connected by a pin 268 with an arm 269. Arm 269 is pivoted about a shaft 270 mounted in the rear wall of the weighing hopper and in turn is connected with a handle portion 271. It is evident that by pivoting the handle portion 271, the closure means at the discharge portion of the weighing hopper may be selectively opened and closed as desired. The handle portion 271 is readily operable by an operator when he is standing on the platform as aforedescribed.

Surge Hopper Means

A surge or intermediate hopper means is provided for receiving material discharged from the weighing hopper. The surge hopper means is indicated generally by reference numeral 280. The surge hopper includes a front wall 281, a rear wall 282, and opposite side walls 283 and 285. Side wall 285 is substantially vertically disposed while the lower portions of each of wall portions 281, 282 and 283 taper downwardly and inwardly such that the material received within the surge hopper will be fed downwardly to pass into an opening 286 formed in the side wall portion 285 for a purpose hereinafter described. It will be noted that the lowermost portion of the weighing hopper extends downwardly slightly below the upper edge portion of each of the side wall portions of the surge hopper to ensure that the material discharge through the bottom of the weighing hopper will be received and contained within the surge hopper means which will in turn feed the material downwardly by gravity through opening 286.

Rear wall portion 282 of the surge hopper is provided with an arcuate cutout portion 282' for a purpose hereinafter described. Wall portions 283 and 285 also have upwardly extending projections 283' and 285' at the rear portion of these wall portions for a purpose which will be hereinafter described.

Elevating Means

The elevating means indicated generally by reference numeral 128 previously referred to includes a protective casing 290, it being noted as seen for example in FIG. 5 that the wall portion 285 previously referred to in connection with the surge hopper means extends upwardly to form one side wall of the casing 290 for the elevating means. It will be seen in FIG. 5 that the opening 286 provided in wall 285 provides communication between the surge hopper means and the interior of the elevating means casing such that material within the surge hopper means will feed downwardly therein due to the sloping surfaces of the side walls thereof to feed the material into the lower portion of the casing 290, the bottom of which extends a substantial distance below the bottom portion of the opening 286 formed in the side wall thereof.

A first shaft 293 is journalled between the opposite side walls of casing 290 and supports a roller member 294. A similar shaft 295 is disposed at the upper portion of the elevating means and is journalled between the opposite side wall thereof, shaft 295 serving to support roller member 296.

A belt 300 is trained over roller members 294 and 296, belt 300 having a plurality of bucket members 301 attached thereto. It is apparent that as the belt and bucket members pass around the roller members 294 and 296, material at the bottom portion of the elevating means will be trapped in the buckets 301 and will be carried to the upper portion of the elevating means.

The driving mechanism for the elevating means includes

an electric driving motor 305 having an output drive shaft 306 to which is secured a pulley 307. A driving belt 308 is trained over pulley 307 and is also trained over a pulley 311 fixed to a jack shaft 312 which is suitably secured as by pillow block bearings or the like to a side wall of the elevating means casing. A sprocket 315 is secured to the outer end of jack shaft 312 and is connected by means of a driving chain 316 to a sprocket 317 fixed to the outer end of shaft 295. It is apparent that energization of electric motor 305 will cause rotation of shaft 295 and the associated roller member 296 to thereby cause belt 300 and buckets 301 to be moved within the casing 290 to engage and lift material from the bottom of the casing to the upper portion thereof. Electric motor 305 is connected by suitable connections with the control panel 125 previously described whereby energization of the electric motor 305 and operation of the elevating means may be remotely controlled by the operator.

Disposed at the upper portion of the elevating means is an offset discharge portion 320. This offset discharge portion opens in a downward direction through a discharge opening 321, and as illustrated for example in FIG. 5, a discharge chute or the like 323 may be disposed beneath the downwardly facing discharge opening 321 to carry material discharged from the elevating means to a suitable truck or other means within which it is desired to discharge the finished product as will be hereinafter more fully explained.

Also formed in the discharge portion 320 is an opening 325 which faces toward the rear of the apparatus, a chute means 326 being supported by the portion 320 so as to receive material passing through opening 325. The chute means includes a bottom wall and a pair of side walls as will be seen in FIG. 5, and as seen for example in FIGS. 1, 2 and 4, the chute means includes a first rearwardly extending portion 327 which joins with a further rearwardly and sharply downwardly extending portion 328. This discharge chute means 326 is adapted to discharge material from the elevating means into the mixing hopper means hereinafter described.

Means is provided for controlling the discharge of material from the elevating means, and this means takes the form of a gate means 330 which is supported for pivotal movement about a hinge means 332. Connected with the gate means is an arm 335 from which depends a cord or chain 336 having a ring 337 at the lower end thereof. Gate means 330 as seen in FIGS. 2 and 5 is shown in its normally biased position due to the weight and balance thereof, wherein the gate means 330 closes off the downwardly facing discharge 321 and will cause material discharged from the buckets 301 of the elevating means to pass outwardly through opening 325 and thence downwardly through the discharge chute 326. It is evident that a person standing on the supporting surface next to the apparatus may grasp the ring 337 and pull downwardly thereon to pivot the gate into a position wherein the gate means 330 will be in a vertical position so as to close off the opening 325 and thereby cause material to be discharged from the elevating means through the downwardly facing discharge opening 321 and into an auxiliary chute means 323 which may be mounted in position beneath the discharge opening 321 as desired.

In certain instances, the discharge portion 320 of the elevating means may not be of a sufficient height as for example wherein it is desired to discharge the finished mixture into a truck having high sides or in similar situations. In this case, an auxiliary extension means is provided for the elevating means as indicated generally by reference numeral 340. This auxiliary extension means includes a casing 341 quite similar to the casing 290 of the elevating means previously described. The casing is provided with an offset inlet portion 342 having an inlet opening 343 facing in an upward direction, this inlet portion being formed at the lower end of the casing 341.

The upper portion of casing 341 is provided with an offset outlet portion 345 which has a discharge opening 346 facing in a downward direction. Discharge opening 346 is similar to the discharge opening 321 previously described and may have a suitable auxiliary chute or the like associated therewith for discharging material into a desired location.

A first shaft 350 is journalled within the lower portion of casing 341 between opposite side walls thereof and supports a roller member 351 thereon. A similar shaft 354 is journalled between opposite side walls at the upper portion of casing 341 and supports a roller member 355 thereon. A belt member 358 is trained over roller members 351 and 355 and carries bucket members 359, it being apparent that the construction of the auxiliary elevating means 340 is quite similar to the elevating means 128 previously described.

In the case of the auxiliary elevating means, the buckets will merely discharge through the discharge opening 346 and there is no need to provide a pair of discharge openings as was the case with the previously described elevating means.

The auxiliary elevating means 340 is mounted for vertical reciprocation, and to assist in guiding the auxiliary elevating means in its vertical reciprocal movements, a pair of guide members 360 and 361 are fixed at their lower ends to the cross brace frame member 20 and extend upwardly and are interconnected at their upper ends by a member 362. A further member 363 extends from member 362 to the forwardly facing wall of the casing 290 of the first described elevating means 128. This guide means including members 360 and 361 as well as the associated rigidifying members cooperate with a guide member 365 fixed to the forwardly facing wall of the casing 342 of the auxiliary elevating means. As seen particularly in FIGS. 3 and 8, for example, the guide member 365 fixed to the auxiliary elevating means fits snugly between the guide means 360 and 361 supported by the framework of the apparatus such that the auxiliary elevating means will be guided for accurate vertical movement.

In order to raise the auxiliary elevating means, hydraulic means may be provided in the form of a hydraulic cylinder 370 which is pivotally connected to frame member 40 and which has the piston rod 371 thereof pivotally connected to the inwardly facing surface of the auxiliary elevating means casing. This hydraulic ram means may be remotely controlled from the control panel previously described whereby an operator may remotely control the raising and lowering of the auxiliary elevating means.

It will be noted as seen for example in FIG. 2 that the inlet portion 342 of the auxiliary elevating means may be raised to a point as indicated in phantom line wherein the upwardly directed inlet opening 343 thereof may be positioned closely adjacent to the downwardly directed discharge opening 321 of the first described elevating means such that material may be discharged directly from a first elevating means into the auxiliary elevating means to be lifted to a still greater height.

Suitable means for driving the auxiliary elevating means may be provided, and as shown, the electric motor 305 is illustrated as having an output drive shaft 375 extending oppositely from the output drive shaft 306, output drive shaft 375 having a bevel gear 376 secured to the outer end thereof. Bevel gear 376 is adapted to engage a cooperating bevel gear 378 which may be fixed to the outer end of the shaft 350 to which the roller member 351 of the auxiliary elevating means in fixed. The arrangement is such that when the auxiliary elevating means is in its raised vertical position, bevel gear 378 will engage bevel gear 376 whereupon rotation of the driving motor 305 is adapted to cause rotation of roller 351 such that the two elevating means may be operated simultaneously. It is apparent that any other suitable driving means may be provided for operating the auxiliary

elevating means while in its raised position, to cause continuous rotation of the driving roller thereof and hence cause the buckets therewithin to carry material upwardly within the casing and thence outwardly to the discharge portion thereof. It is apparent that materials discharged from the first elevating means 128 will pass downwardly through the inlet portion 342 of the second elevating means into the bottom of the casing 341 thereof to be picked up by the buckets 359 in a well understood manner.

Mixing Hopper Means

The mixing hopper means of the present invention is indicated generally by reference numeral 382, this mixing hopper means being movable between two operative positions, one of these positions being referred to as the horizontal position and being shown where the mixing hopper means appears in all of the figures except FIG. 7 wherein the mixing hopper means is illustrated as being in its so-called vertical operative position.

The mixing hopper means includes a forward or front wall 385 having an arcuate upper portion 385' which slopes in a rearwardly direction and joins with a top wall 387. The mixing hopper means also includes a pair of opposite side wall portions 390 and 391 which include lower portions 390' and 391' respectively which taper downwardly and inwardly towards one another and which support at the lower ends thereof a feed and mixing means housing 393 hereinafter described. The mixing hopper means also includes a back or rear wall portion 395 which tapers downwardly and forwardly as seen for example in FIGS. 1 and 2. It will be noted that the upper rear edge portions 390'' and 391'' of each of side walls 390 and 391 extend forwardly and upwardly, and an inlet opening 397 is defined between these rear upper edge portions of the side walls, the upper edge of the rear wall 395 and the rear edge of the top wall 387. The material to be mixed in the hopper is adapted to be passed through this inlet opening as hereinafter described.

The mixing hopper is mounted for pivotal movement as most clearly seen in FIG. 4 by a pair of laterally extending trunnions 400 and 401 which extend outwardly from the side wall portions 390' and 391' respectively of the mixing hopper, these trunnions being mounted for rotary movement within suitable journal means at the upper ends of frame members 94 and 95 respectively. Means is provided for selectively pivoting the mixing hopper means into either of its operative positions as discussed hereinabove, and this means takes the form of a pair of hydraulic cylinders 405 and 406 which have the piston rods 407 and 408 thereof respectively connected with laterally extending members 409 and 410 which are fixed to the side walls 390' and 391' of the mixing hopper means respectively. Members 409 and 410 may be suitably journalled within enlarged journal portions at the outer ends of piston rods 407 and 408 of the hydraulic rams whereby it is apparent that extension of the rams will move the mixing hopper into its so-called vertical operative position as seen in full lines in FIG. 7 and as indicated in phantom line in FIG. 2, while contraction of the hydraulic rams 405, 406 will result in movement of the mixing hopper to its so-called horizontal operative position as seen in the remaining figures. Hydraulic rams 405 and 406 may be suitably connected with the control panel 125 previously described whereby the pivotal movement of the mixing hopper may be selectively controlled from the operator's station.

In order to obtain substantially uniform distribution of material within the mixing hopper when it is filled as hereinafter described, a suitable vibrator means is provided, this vibrator means being indicated by reference numeral 413 and being mounted on the rear wall 395 of the mixing hopper by a bracket means 414 of suitable construction. Vibrator 413 may be of any conventional construction and preferably electrically operated, suitable connections being made to the control panel 125 such that the operator may remotely control operation of the vibrator means as required.

The forward wall 385, the two side wall portions 390' and 391', and the rear wall portion 395 define at the lower edges thereof a rectangular opening. As seen most clearly in FIG. 2, 9 similar substantially equally spaced members 420, 421, 422, 423, 424, 425, 426, 427, 428 are provided at the lower portion of the mixing hopper and extend between the opposite side wall portions 390' and 391'. These members 420–428 serve to define a plurality of substantially spaced discharge openings at the bottom of the mixing hopper, it being noted as seen in FIG. 2 for example that the bottommost portions of front wall 385 and rear wall 395 slope inwardly to define with members 420 and 428 the endmost openings 430 and 439 respectively.

Referring now to FIG. 10 wherein the details of construction are more readily apparent, it will be seen that each of the similar members 420–428 is of substantially V-shaped cross-sectional configuration to thereby define a substantial funnel-shaped configuration immediately above each of the spaced discharge openings 430–439 inclusive.

As seen particularly in FIG. 2, baffle means is preferably provided within the mixing hopper, and for the purpose of illustration, three sets of baffle means indicated by reference numerals 450, 451 and 452 respectively are illustrated. It will be understood that the number and spacing of the baffle means may be varied as required. As illustrated, baffle means 450 comprises a plurality of individual baffle members 450' which extend between opposite side walls of the mixing hopper. In a similar manner, baffle means 451 comprises a plurality of individual baffle members 451' and baffle means 452 comprises a plurality of individual baffle members 452', all of the various baffle members having the opposite end portions thereof attached to opposite side wall portions of the mixing hopper. It will be noted that all of the individual baffle members slope obliquely to the horizontal when the mixing hopper is in its so-called horizontal operative position as seen in FIG. 2, for example, each of the individual baffles in fact sloping upwardly and rearwardly toward the inlet opening 397 to the mixing hopper. It will be noted as seen in FIG. 2 that when the mixing hopper is in its horizontal operative position, the upper edge portion of each individual baffle of one of the baffle means is on substantially the same level or slightly higher than the lower edge portion of the next baffle thereabove to thereby substantially eliminate any tendency of material within the hopper to shift laterally as will be more fully hereinafter described.

Feed and Mixing Mechanism

The feed and mixing mechanism of the present invention takes the form of a screw auger means indicated generally by reference numeral 455 as seen particularly for example in FIGS. 6, 8 and 10, and as seen especially in FIG. 10, the screw auger means includes a central shaft portion 458 which is supported by bearing means 459 within a housing portion 460 fixed to the rear wall of the feed mechanism casing 393. It is apparent that the screw auger means of the present invention is supported in position beneath the discharge openings of the mixing hopper when the mixing hopper is in its horizontal operative position such that material can be discharged through the discharge openings of the mixing hopper under the influence of gravity into the screw auger means which will in turn then carry the material laterally for a purpose hereinafter described.

A sprocket 463 is fixed to the rear end of shaft portion 458 and is connected through a chain 464 to a sprocket 465 fixed to the outer end of a jack shaft 468. Jack shaft 468 is supported for rotation by support member 470 extending upwardly from the casing 393 and a

pair of pillow block bearings or the like 471 supported from the side wall portion 391' of the mixing hopper. A pulley 474 is fixed to an intermediate portion of jack shaft 468 and is connected by means of belt 475 with a pulley 476 fixed to the outer end of the output drive shaft 478 of an electric motor 480 which in turn is mounted upon a bracket 482 fixed to the side portion of the feed and mixing mechanism casing 393.

It is apparent that energization of the electric motor 480 will cause the screw auger means to be rotated and the electric motor 480 may be suitably connected with the control panel 125 such that an operator may remotely control operation of the screw auger means as desired.

Feed Control Means

The feed control means of the present invention takes the form of a body means 490 comprising a flat plate which as seen particularly in FIG. 12 is slidably supported between outwardly extending flanges at the lowermost portions of side walls 391' and 390' and the uppermost wall of casing 393 having angle members secured thereto, spacer means 492 and 493 being interposed between the lowermost portions of the side walls of the mixing hopper and the feed and mixing mechanism casing so as to provide a space for receiving the flat plate 490.

As seen particularly in FIG. 9 of the drawings, plate 490 is provided with ten spaced openings 430', 431', 432', 433', 434', 435', 436', 437', 438', and 439', which cooperate with the openings 430–439 inclusive previously described as hereinafter explained. Whereas the discharge openings 430–439 inclusive at the bottom of the hopper are of equal size and are equally spaced from one another, the openings 430'–439' inclusive in the plate 490 are of unequal size and are unequally spaced from one another. As seen in FIG. 9, openings 430'–439' inclusive are progressively smaller from the rear end portion thereof to the forward end portion, or in other words, in a direction toward the discharge portion of the feed auger means. In other words, opening 430' is the largest opening considering its dimension in a direction parallel with the direction of feed of the feed auger means. It is apparent that each of openings 430'–439' inclusive will be of susbtantially the same width extending laterally of the plate, but these openings vary in their dimension extending longitudinally of the plate.

Opening 431' is the next largest opening, opening 432' is in turn the next largest opening, and the openings progressively decrease in size until we arrive at opening 439' which is the smallest of all of the openings in plate 490.

The spacing and difference in size of the openings 430'–439' inclusive in the feed control means or plate 490 have a particular intercooperative relationship with the discharge openings at the bottom of the feed hopper as will hereinafter appear.

Means is provided for driving or moving the plate 490 in a direction parallel with the longitudinal axis thereof, and this means includes a shaft portion 500 as seen in FIG. 10, for example, which is eccentric to the shaft portion 458 of the feed auger means. Shaft portion 500 has means thereon for journalling the outer end portion 501 of a connecting link 502 the upper end of which is connected as by a ball joint 505 with a rearwardly directed leg portion 506 of a bell crank member 507. Bell crank member 507 is in turn pivotally supported as by a pin member 509 which is journalled within bracket portions 510 secured to the rear wall 395 of the mixing hopper.

It will be apparent that upon rotation of the feed auger means, the eccentric portion 500 will cause up and down reciprocation of the link 502 which will in turn cause bell crank member 507 to oscillate about the pin means 509.

As seen particularly in FIGS. 10 and 11, a bracket member 515 extends upwardly from the upper edge of bell crank member 507 and is connected with a connecting link 516 which in turn is pivotally connected with an intermediate portion of an operating lever 517 supported about a member 518 supported in turn by the rear wall 395 of the mixing hopper. It will be seen in FIG. 11 that the pin means 509 is sufficiently wider than the bell crank member 507 such that the bell crank member 507 may be shifted laterally along pin member 509 for a purpose hereinafter described, the bell crank member being suitably connected for rotation with the pin member 509 as by a spline or a pin and slot connection in a well-understood manner.

Bell crank member 507 includes a downwardly extending leg portion 520 having a pin means 521 extending laterally therefrom upon which is pivotally supported pawl means indicated generally by reference numeral 522. The pawl means 522 includes two separate and independent pawl portions 525 and 526. These pawl portions may be made integral if desired. It will be noted that the two pawl portions 525 and 526 include depending pawl teeth 525' and 526' respectively which are adapted to engage a ratchet or rack member 530 secured to plate 490 and having a plurality of spaced upwardly directed teeth 531.

As bell crank member 507 is oscillated about pin means 509 thereof during operation, one or the other of the pawl members 525 and 526 is aligned with the ratchet or rack member 530 which is of a sufficient width to accommodate only one of the pawl means at a time. It is apparent that in the position shown in FIGS. 10 and 11, oscillation of bell crank member 507 will produce movement of the plate 490 toward the discharge end portion of the feed auger means since as seen in FIG. 10, pawl teeth 525' has a sloping cam surface on the left side thereof, and a flat operating surface on the right side thereof. Accordingly, oscillation of the bell crank member 507 in a clockwise direction about pin means 509 will cause the pawl member to be cammed up out of the ratchet or rack member whereas oscillation of the bell crank member 507 in a counter clockwise direction will move the rack or ratchet member 530 and associated plate to the right as seen in this figure a sufficient distance that upon the next complete cycle of oscillation of the bell crank member, the pawl teeth 525' will again engage within the next space defined between the teeth 531 of member 530 and again move the body means 490 to the right.

It is accordingly clear that the pawl and ratchet drive mechanism for the plate 490 will move the plate in a stepwise direction toward the discharge end portion of the feed auger means.

In a corresponding manner, wherein the bell crank member 507 is shifted from the position shown in FIG. 11 to the left, by operating lever 517 so as to move the pawl means 526 into operative position relative to the ratchet or rack member 530, further oscillation of the bell crank member will move the plate 490 in a stepwise direction to the left as seen in FIG. 10 due to the configuration of the pawl tooth 526' which has a flat operating surface on the left side thereof and a sloping cam surface on the right side thereof.

During the initial opening cycle of the discharge openings at the bottom of the feed hopper by the control plate 490 after the feed hopper has been filled and placed in its horizontal operating position, there is a particular relationship between the movement of the control plate 490 and the rotation of the feed auger means. At the initiation of such cycle, the plate 490 will be in the position shown in FIG. 10, wherein all of the discharge openings at the bottom of the feed hopper are closed due to the fact that the openings in the plate 490 are misaligned with the openings at the bottom of the mixing hopper.

Upon initial energization of the electric motor 480 to rotate the feed auger means 455, the driving mechanism including members 500–526 previously described is set to move the plate 490 toward the discharge end portion of the feed auger means. As the plate 490 initially moves

toward the right as seen in FIG. 10, opening 430 nearest to the rear wall of the mixing hopper will be initially opened due to the fact that the forwardmost portion of opening 430' in plate 490 will become aligned with the rearmost portion of opening 430. It is apparent that upon further movement of plate 490 to the right, opening 430 will be progressively opened wider and wider. Continued movement of plate 490 to the right as seen in FIG. 10 will in turn progressively open discharge openings 431 and then 432 and then 433 and so on until the discharge opening 439 is the last to be opened. The openings 430'–439' inclusive are so graduated in size and so spaced and timed with the configuration and rotation of the feed auger means that material initially discharged through discharge opening 430 is carried by feed auger means to a position below discharge opening 431 just as the opening 431' of the plate 490 begins to open the discharge opening 431. The sequence continues progressively from one discharge opening to the next toward the discharge end portion of the feed auger means such that material from previously opened discharge openings will be carried to the subsequent discharge openings by the feed auger means just as these subsequent discharge openings are opened. This insures that by the time material initially fed through the first discharge opening 430 arrives adjacent the opening 439, there will be a substantially homogeneous mixture which in turn will receive material through discharge opening 439, and this homogeneous mixture will then pass from the feed auger means discharge as hereinafter described.

Referring particularly to FIG. 6, it will be seen that when the mixer hopper is in its horizontal operative position, the discharge end portion 540 of the feed auger means is adapted to be disposed within the upper portion of the surge hopper means previously described. This is enabled due to the fact that the arcuate cut-out portion 282' in the rear wall 282 of the surge hopper permits the discharge end portion of the feed auger means to be pivoted into the position shown in FIG. 6. A downwardly and forwardly extending plate means 542 is supported from the bottom portion of the casing 393 surrounding the feed auger means and serves to prevent the leakage of any material between the discharge end portion of the feed auger means and the wall portion 282 of the surge hopper means. It will also be noted that the wall portions 283' and 285' of the opposite side walls of the surge hopper extend upwardly a sufficient amount to ensure that there will be no leakage of material from the discharge end portion of the feed auger means laterally of the surge hopper means. In other words, all of the material discharged from the feed auger means can be readily discharged into the surge hopper means without the possibility of any of the material escaping from the surge hopper means.

Operation

When it is desired to operate the apparatus, the operator will normally mount the platform thereof by means of ladder 45 and can then remotely control the entire operation of the apparatus. The first step in the processing of bulk materials according to the present invention is to move the self-contained unit into operative position relative to a pile of raw bulk material. This can, of course, be accomplished by controlling the driving motor 110 to move the apparatus either forwardly or rearwardly as desired, and the rear wheels can be steered by means of the steering lever 90 as required to direct the unit into the proper operative position.

The digging and lifting means can then be moved into its operative position by extending the hydraulic rams 170 and 171 which are of course normaly retracted when the unit is being moved from place to place. When the digging and lifting means is in its lower operative position as seen for example in FIG. 1, electric motor 150 can be energized from the control panel to cause the buckets 144 on belt 143 to continuously dig into and lift material from a pile of raw material. The material lifted by the buckets 144 will be discharged through the discharge portion 200 onto the scalping screen 220 of the weighing means and thence downwardly into the hopper 212 thereof. Any excess material which is not passed by the scalping screen will fall off downwardly through the opening 208 in the casing of the digging and lifting means and thence will travel downwardly by gravity back to the underlying supporting surface.

The weighing mechanism of the apparatus will provide a constant indication of the weight of material within the weighing hopper which is normally closed by the closure means 260 at the lower portion thereof. The operator will observe the scale indicator 252 until the desired amount of material is disposed within the weighing hopper whereupon he will grasp handle 205 to shut off the flow of the material into the weighing hopper. The digging and lifting means may then be de-energized, and the operator may then travel to another location if necessary to obtain a different type of material which it is designed to mix into the finally finished mixture.

Vibrator 255 of the weighing hopper may then be energized to ensure complete discharge of the material therein. The operator may then either discharge the material within the weighing hopper into the surge hopper by opening the closure means 260 by means of the manually operable handle 271, or the operator may proceed to feed additional material into the weighing hopper.

In any event, when the operator has the desired amount of one or more materials within the weighing hopper, the closure means 260 is manually opened, and the material will fall under the influence of gravity into the surge hopper 280. It will be noted that the arcuate cutout portion 282' of the surge hopper is sufficiently high along the wall 282 thereof such that angle of repose of material discharged from the weighing hopper to the surge hopper will not cause any of the material to pass through the arcuate cutout portion 282'.

Material discharged into the surge hopper will pass through opening 286 into the elevating means 128, and upon energization of electric motor 305, the material will be raised within the elevating means and discharged through chute means 326 due to the fact that the gate 330 will be in its normally closed position.

Material discharged through chute means 326 will be discharged into the mixing hopper means 332 which at this point in the operation of the apparatus is in its vertical operative position as illustrated in FIG. 7 with the hydraulic ram means 405 and 406 extended.

It is, of course, apparent that various numbers and quantities of materials may be mixed with the apparatus of the present invention, and purely for the purpose of illustration, it is assumed that it is desired to mix four different materials which will be designated A, B, C and D respectively. In such a case, material A will first be discharged through the lower portion 328 of the discharge chute as seen in FIG. 7 downwardly into the mixing hopper to form a body of material A up to a line for example as indicated by the dotted line 550 which would lie adjacent to the baffle means 450. Material B will subsequently be discharged into the feed hopper to form a body of material B up to a line 551 adjacent to baffle means 451. Material C will then be discharged into the mixing hopper to form a body of material C up to a line indicated by reference numeral 552 adjacent baffle means 452. Additional material may then be discharged into the mixer hopper to form a body of material D above the baffle means 452.

After all of the various materials have been fed into the mixing hopper as described in connection with FIG. 7, the hydraulic ram means 405 and 406 is retracted to move the mixing hopper means into its horizontal operative position as shown in full lines in FIGS. 1, 2, 4, 6 and 10. As seen particularly in FIG. 2, the bodies of material A, B, C and D now form vertically extending

strata or layers whereas these layers A, B, C and D were horizontally disposed when the mixing hopper was in its vertical operative position as shown in FIG. 7. The baffle means 450, 451 and 452 are provided for the purpose of preventing or substantially eliminating lateral shifting of the strata or layers of material A, B, C and D when the mixing hopper is pivoted from its vertical operative position to the horizontal operative position thereby assuring that the layers of material will remain intact and will not intermingle with one another.

At this point in the operation of the device, all of the discharge openings from the mixing hopper are closed by the plate 490. The mixing cycle is then initiated by placing the bell crank member 507 into the position as shown in FIG. 11 and energizing electric motor 480. This causes the feed auger means to continuously rotate and it causes the plate 490 to be moved toward the discharge end portion of the feed auger means in a step-by-step manner.

As pointed out previously, the discharge openings 430–439 inclusive will be progressively opened in such a manner during the initial cycle of operation that material will not be discharged through the discharge opening 439 until the material initially discharged through opening 430 has reached a point immediately beneath discharge opening 439. This assures that during the initial opening of the discharge openings, a substantially homogeneous mixture of the various materials A, B, C and D in the proper proportions will be assured.

Once all of the discharge openings 430–439 have been opened by plate 490, the material will continue to continuously discharge into the feed auger means until all of the material has been discharged from the mixer hopper. It is apparent that the pawl and ratchet drive will only move plate 490 a sufficient distance to open all of the discharge openings of the mixer hopper whereupon the pawl and ratchet drive will become ineffective to move the plate any further.

When all of the material has been discharged from the mixer hopper, the bell crank member 507 may be shifted to the left as seen in FIG. 11, whereupon subsequent oscillation of the bell crank member will move the plate 490 back to its original position as seen in FIG. 10 closing off all of the openings at the bottom of the mixer hopper.

As the material is fed by the feed auger means, it discharges into the surge hopper means and will then be subsequently raised by the elevating means 128. Gate 330 may then be shifted to its vertical position by pulling down on ring 337 to cause the completely mixed homogeneous mixture to be discharged through the discharge opening 321 thence the final mixture may be carried into any suitable container.

As discussed previously, if it should be desired to discharge the material from a higher level, the auxiliary elevating means 340 may be lifted into its upper position whereupon the material can be discharged through the discharge opening 346 of the auxiliary elevating means.

It will be apparent that while material is being mixed and discharged from the apparatus through the elevating means thereof, the operator may be digging and lifting additional materials and weighing them in the weighing hopper in preparation for the next batch which it is desired to mix.

The operator may also periodically operate the vibrator means 413 mounted on the mixer hopper to ensure complete discharge of the material therewithin.

It is apparent from the foregoing that there is provided according to the present invention a custom mixing apparatus which is a completely self-contained mobile unit and which includes means for digging and lifting raw bulk material as stored in bins and the like. The apparatus of the present invention also incorporates weighing or measuring apparatus whereby specific amounts of raw bulk materials may be accurately employed. The feeding and mixing apparatus of the present invention ensures a substantially homogeneous mixture of raw materials by firstly incorporating a control means during the initial cycle of mixing to assure that the materials will be homogeneously mixed from the various vertical layers of material in the mixer hopper, and by further providing a feed auger means which will in turn move the materials in a lateral direction and produce a thorough mixing thereof as the materials are moved into the surge hopper means of the apparatus.

The present invention apparatus eliminates the necessity of employing a payloader along with the pit and machinery required in the permanent installations utilized for similar purposes in the prior art. This results in a substantial saving in the cost of the installation, and it is considered that such cost may be reduced by a factor of approximately 50 percent. The apparatus of the present invention is relatively simple and inexpensive in construction, and yet is quite efficient and reliable in use.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. Custom mixing apparatus including mixing hopper means having an inlet opening at the upper portion thereof and including a plurality of spaced discharge openings at the lower portion thereof, means supporting said mixing hopper means for pivotal movement through an angle of at least about 90 degrees, feed and mixing mechanism comprising screw auger means disposed beneath the lower portion of said mixing hopper means so as to receive material passing through said discharge openings, said screw auger means including a discharge portion which is adapted to discharge the mixed material into a suitable container, gate means movably mounted between said discharge openings and said screw auger means, said gate means having a plurality of openings formed therethrough each of which is adapted to be aligned with one of said discharge openings, the openings in said gate means being of different sizes and being of progressively smaller dimensions in the direction of movement of the gate means from the outer portion of the screw auger means toward the discharge inner portion thereof, whereby upon movement of said gate means the discharge opening remote from said discharge portion of the screw auger means is opened first and the remaining discharge openings are progressively opened upon further movement of the gate means until the discharge opening adjacent the discharge portion of the screw auger means is last opened by the gate means, means for driving said screw auger means at a predetermined rate, and means for moving said gate means in timed relationship to the movement of said screw auger means such that upon the opening cycle of the gate means, each discharge opening in the mixing hopper means is opened to feed material into the screw auger means simultaneously with the arrival of the initially fed material from the discharge openings more remote from the discharge portion of the screw auger means whereby substantially homogeneous mixing of the material initially fed from the mixing hopper means into the screw auger means is ensured.

2. Custom mixing apparatus including mixing hopper means having an inlet opening at the upper portion thereof and including a plurality of spaced discharge openings at the lower portion thereof, means supporting said mixing hopper means for pivotal movement through an angle of at least about 90 degrees, feed and mixing mechanism comprising screw auger means disposed beneath the lower portion of said mixing hopper means

so as to receive material passing through said discharge openings, said screw auger means including a discharge portion which is adapted to discharge the mixed material into a suitable container, gate means movably mounted between said discharge openings and said screw auger means, said gate means having a plurality of openings formed therethrough each of which is adapted to be aligned with one of said discharge openings, the openings in said gate means being of different sizes and being of progressively smaller dimensions in the direction of movement of the gate means from the outer portion of the screw auger means toward the discharge inner portion thereof, whereby upon movement of said gate means the discharge opening remote from said discharge portion of the screw auger means is opened first and the remaining discharge openings are progressively opened upon further movement of the gate means until the discharge opening adjacent the discharge portion of the screw auger means is last opened by the gate means, means for driving said screw auger means at a predetermined rate, and means for moving said gate means in timed relationship to the movement of said screw auger means such that upon the opening cycle of the gate means, each discharge opening in the mixing hopper means is opened to feed material into the screw auger means siumultaneously with the arrival of the initially fed material from the discharge openings more remote from the discharge portion of the screw auger means whereby substantially homogeneous mixing of the material initially fed from the mixing hopper means into the screw auger means is ensured, and a completely self-contained mobile vehicle including a supporting framework, said mixing hopper means and said feed and mixing mechanism being supported on said framework whereby the apparatus may be readily moved from place to place for conducting mixing operations in various locations.

3. Custom mixing apparatus including surge hopper means for receiving material to be mixed, elevating means positioned to receive material from said surge hopper means, said elevating means including a discharge portion at the upper part thereof, mixing hopper means having an inlet opening at the upper portion thereof and a plurality of discharge openings at the lower portion thereof, means mounting said mixing hopper means for pivotal movement so as to position the inlet opening thereof adjacent the discharge portion of said elevating means, mixing mechanism disposed beneath said discharge openings of the mixing hopper means for receiving material passing through said discharge openings, and control means for closing off said discharge openings and progressively opening the discharge openings to provide communication between said mixing hopper means and said mixing mechanism during initial opening of the said discharge openings.

4. Apparatus as defined in claim 3, wherein said surge hopper means includes a portion for receiving the discharge portion of the mixing mechanism upon pivotal movement of the mixing hopper means.

5. Apparatus as defined in claimed 3, wherein said mixing mechanism comprises screw auger means supported from the lower portion of said mixing hopper means for pivotal movement therewith, said surge hopper means having a cutout portion formed along one side thereof for receiving the discharge portion of said screw auger means upon pivotal movement of the mixing hopper means so as to move the screw auger means into a substantially horizontal feeding position.

6. Apparatus as defined in claim 3, including a mobile vehicle means having drive means and steering mechanism incorporated therein so as to comprise a self-contained unit, all of the structure defined in claim 3 being supported on said vehicle means for movement from place to place to carry out custom mixing operations.

7. Custom mixing apparatus including measuring means for measuring out predetermined amounts of raw material, said measuring means including an inlet portion and a discharge portion, surge hopper means positioned adjacent the discharge portion of said measuring means for receiving material from said measuring means, elevating means including an inlet portion and a discharge portion, the inlet portion of said elevating means being positioned to receive material from said surge hopper means, mixing hopper means including an inlet opening at the upper portion thereof and a plurality of discharge openings at the lower portion thereof, means movably supporting said mixing hopper means so as to move said inlet opening thereof into position to receive material from the discharge portion of said elevating means, and feed and mixing mechanism disposed so as to receive material discharged through said discharge openings, and control means for closing off said discharge openings and progressively opening different ones of said discharge openings so as to progressively provide communication between said mixing hopper means and said feed and mixing mechanism to ensure substantially homogeneous mixing of material in said feed and mixing mechanism during the initial cycle of operation and opening of said discharge openings.

8. Apparatus as defined in claim 7, wherein said feed and mixing mechanism comprises screw auger means supported at the lower portion of said mixing hopper means, said screw auger means including a discharge portion, said control means comprising a body means having a plurality of openings formed therethrough each of which is adapted to be aligned with one of said discharge openings, the openings in said body means being of progressively smaller dimension toward the discharge portion of said screw auger means for opening the discharge openings of the mixing hopper means remote from the discharge portion of the screw auger means first, and progressively opening the remaining discharge openings toward the discharge portion of the screw auger means during movement of the control means.

9. Apparatus as defined in claim 8, wherein said surge hopper means includes a portion for receiving the discharge portion of the screw auger means such that material mixed and fed by the screw auger means will pass into the surge hopper means during operation.

10. Apparatus as defined in claim 7, including supporting means in the form of a mobile framework, means for driving the mobile framework and steering the movement thereof so as to make the framework readily movable from place to place, all of the structure defined in claim 7 being mounted on said framework so as to provide a completely self-contained movable apparatus.

11. Custom mixing apparatus comprising digging and lifting means for digging and lifting raw bulk material, measuring means positioned to receive material from said digging and lifting means, said measuring means including a discharge portion, surge hopper means positioned adjacent the measuring means discharge portion for receiving material therefrom, said surge hopper means including a discharge portion, elevating means positioned to receive material from the discharge portion of said surge hopper means, said elevating means being adapted to elevate material from said surge hopper means to a higher level, mixing hopper means including an inlet portion at the upper part thereof, and a plurality of spaced discharge openings at the lower part thereof, means for positioning said mixing hopper means such that the inlet portion thereof is adapted to receive material from said elevating means, feed and mixing mechanism supported adjacent said discharge openings of the mixing hopper means for receiving material therefrom, control means for closing off said discharge openings and for progressively opening said discharge openings upon initiation of operation of the device, said feed and mixing mechanism

including a discharge portion for discharging substantially homogeneously mixed material therefrom.

12. Apparatus as defined in claim 11, including means movably supporting said digging and lifting means for movement into and out of operative position relative to said measuring means.

13. Apparatus as defined in claim 11, wherein said measuring means comprises a weighing hopper, weighing beams operatively connected with an indicating means, said weighing beams being pivotally supported, said weighing hopper being supported by said weighing beams.

14. Apparatus as defined in claim 11, wherein said mixing hopper means is mounted for pivotal movement, said surge hopper means including means for receiving the discharge portion of said feed and mixing mechanism, the discharge portion of the feed and mixing mechanism being adapted to discharge into said surge hopper means upon pivotal movement of said mixing hopper means in one direction.

15. Apparatus as defined in claim 11, wherein said feed and mixing mechanism comprises screw auger means, means for driving said screw auger during operation of the apparatus, and means operatively connected with said driving means for controlling movement of said control means such that the control means is operated in timed relationship to the movement of said screw auger means.

16. Custom mixing apparatus comprising a self-contained mobile unit including a supporting framework, means supporting said framework for movement along a supporting surface, means for driving and steering said framework such that it can be readily moved from place to place, digging and lifting means supported by said framework, weighing means supported by said framework and being positioned to receive material from said digging and lifting means, surge hopper means supported by said framework and being positioned to receive material from said weighing means, elevating means supported by said framework and being positioned to receive material from said surge hopper means, mixing hopper means movably supported by said framework and including an inlet portion and a plurality of discharge openings, said inlet opening being adapted to be positioned to receive material from said elevating means, feed and mixing mechanism supported adjacent said discharge openings of the mixing hopper means for receiving material therefrom, and control means for closing off said discharge openings of the mixing hopper means, means for driving said feed and mixing mechanism, and means operatively associated with said last-mentioned driving means and connected with said control means for moving the control means in such a manner as to progressively open said discharge openings of the mixing hopper means to progressively provide communication between said mixing hopper means and said feed and mixing mechanism during the initial cycle of operation of the apparatus.

17. Apparatus as defined in claim 16, wherein said digging and lifting means is pivotally supported by said framework for movement into and out of operative position, and means for remotely controlling pivotal movement of said digging and lifting means.

18. Apparatus as defined in claim 16, wherein said weighing means includes a weighing hopper, a plurality of weighing beams movably supported by said framework, said weighing hopper being movably supported by said weighing beams, and scale means operatively connected with said weighing beams for indicating the weight of the material within said weighing hopper.

19. Apparatus as defined in claim 16, wherein said feed and mixing mechanism includes a discharge portion, said surge hopper means including means for receiving said discharge portion of the feed and mixing mechanism upon pivotal movement of said mixing hopper means such that said feed and mixing mechanism is adapted to discharge material into said surge hopper means.

20. Apparatus as defined in claim 16, wherein said mixing hopper means includes a plurality of series of baffles extending from a point adjacent said discharge openings to the opposite side of said mixing hopper means for minimizing lateral shifting of material within said mixing hopper means when it is moved from one position to another.

21. Apparatus as defined in claim 16, wherein said control means comprises a body means having a plurality of openings spaced therethrough, each of the openings in said body means being adapted to be aligned with one of the discharge openings of said mixing hopper means, said feed and mixing mechanism comprising screw auger means having a discharge portion, the openings in said body means having progressively smaller dimensions from the end of the body means remote from the discharge portion of the screw auger means to the end of the body means adjacent the discharge portion of the screw auger means, whereby upon movement of the body means in a direction away from the discharge portion of the screw auger means, the discharge opening of the mixing hopper means closest to the discharge portion of the screw auger means will be opened last and the discharge opening from the mixing hopper means remote from the discharge portion of the screw auger means will be opened first.

22. Custom mixing apparatus comprising a self-contained mobile unit having driving means and steering means whereby the unit can be readily moved from place to place, digging and lifting means removably supported by said unit, said digging and lifting means including a discharge portion, weighing means supported by said unit and positioned to receive material from the discharge portion of the digging and lifting means, said weighing means including a discharge portion, mixing hopper means movably supported by said unit and including an inlet portion and a plurality of discharge openings formed therein, means for feeding material from said weighing means to the inlet portion of said mixing hopper means, means for moving said mixing hopper means between two operative positions, screw auger means supported adjacent said discharge openings of the mixing hopper means for feeding and providing a mixing action of materials passing from said discharge openings into said screw auger means, and control means disposed between said mixing hopper means and said screw auger means for closing off said discharge openings and for progressively opening said discharge openings to provide progressive communication between said mixing hopper means and said screw auger means during the initial cycle of operation of the apparatus to ensure a substantially homogeneous mixing of materials passing from said mixing hopper means into said screw auger means.

23. Apparatus as defined in claim 22 wherein the discharge openings from said mixing hopper means are of substantially uniform size, said control means including a body means having a plurality of openings formed therethrough of different sizes, said screw auger means including a discharge portion, the openings in said body means being progressively smaller toward the discharge end portion of said screw auger means, means for driving said screw auger means so as to feed material toward the discharge portion thereof, and means operatively connecting said drive means with said control means to move the control means in timed relation with respect to said screw auger means for providing progressive communication between said mixing hopper means and said screw auger means starting at the discharge opening remote from the discharge portion of the screw auger means and moving progressively toward the discharge portion of the screw auger means.

24. Apparatus as defined in claim 23, wherein the means operatively connecting said drive means with said control means comprises an eccentric operatively connected with said screw auger means, and a pawl and ratchet mechanism operatively connected with said control means and also operatively connected with said eccentric.

25. Custom mixing apparatus including weighing means,

mixing hopper means, means for feeding material from said weighing means to said mixing hopper means, said mixing hopper means including a plurality of spaced discharge openings, and mixing mechanism disposed adjacent said spaced discharge openings for receiving material passing therethrough, and control means for providing progressive communication between different ones of said discharge openings and said mixing mechanism upon initiation of operation of the apparatus.

26. Custom mixing apparatus including weighing means, mixing hopper means, means for feeding material from said weighing means to said mixing hopper means, said mixing hopper means including a plurality of spaced discharge openings, screw auger means supported adjacent said discharge openings for receiving material passing therethrough, means for driving said screw auger means, said screw auger means including a discharge portion, control means for closing off said discharge openings, said control means including body means having a plurality of spaced openings each of which is adapted to be aligned with one of said discharge openings, means for moving said control means in timed relation with respect to rotation of said screw auger means, the openings in said body means each being of different size and being progressively smaller toward the discharge end portion of said screw auger means, said control means moving in timed relationship to the rotation of said screw auger means such that the discharge openings from said mixing hopper means are open for communication with said screw auger means sequentially, the discharge opening remote from the discharge portion of said screw auger means opening first, and the remaining discharge openings then opening progressively in a direction toward the discharge end portion of the screw auger means until all of the discharge openings are simultaneously open to feed material from the mixing hopper means into the screw auger means.

27. Custom mixing apparatus comprising a completely self-contained movable unit including drive means for moving the unit from place to place and steering mechanism for controlling the direction of movement, said mobile unit including a supporting framework, weighing mechanism supported by said framework and including means for accurately weighing certain amounts of material, mixing hopper means pivotally supported on said supporting framework and including an inlet portion, means for feeding material from said weighing means to the inlet portion of said mixing hopper means, said mixing hopper means also including a plurality of spaced discharge openings, screw auger mixing mechanism disposed adjacent said discharge openings for receiving material passing therethrough, and control means disposed between said mixing hopper means and said screw auger means for controlling flow of material from said mixing hopper means to said screw auger means, said control means being adapted to completely close off said discharge openings, and also having a plurality of spaced openings formed therethrough adapted to be aligned with the discharge openings in said mixing hopper means, the openings of said control means being of different size and being progressively smaller toward the discharge end portion of said screw auger means whereby the plurality of discharge openings in said mixing hopper means may be progressively open to progressively provide communication between said mixing hopper means and said screw auger means to ensure homogeneous mixing of material during the initial cycle of operation of the apparatus.

28. Apparatus as defined in claim 27, wherein said weighing means comprises a weighing hopper adapted to receive material therein, a plurality of weighing beams movably supported by said supporting framework, said weighing hopper being movably supported by said weighing beams, and means for indicating the amount of material within the weighing hopper so as to accurately measure amounts of material therein.

29. Mixing hopper means comprising a substantially closed container, said mixing hopper means having an inlet formed at the upper portion thereof for receiving material, said mixing hopper having formed in the lower portion thereof a plurality of spaced discharge openings, said mixing hopper means having formed in the lower portion thereof a plurality of sloping surfaces disposed adjacent each of said discharge openings for ensuring that the material feeds downwardly through said discharge openings and does not accumulate between such openings, a plurality of series of baffles, each of said series of baffles extending from a point adjacent said discharge openings to a point adjacent the opposite wall of the mixing hopper means, said baffles being disposed obliquely to the horizontal when the mixing hopper means is in an operative horizontal position whereby the baffle means minimizes lateral shift of material within the mixing hopper means.

30. Custom mixing apparatus including a container means adapted to be disposed in a normal horizontal operative position with material to be mixed disposed therewithin in vertically extending layers, said container having a plurality of spaced discharge openings at the bottom portion thereof, said discharge openings opening in a downward direction to feed material therefrom by gravity, the openings being substantially of the same size and equally spaced from one another, feed auger means supported immediately below said discharge openings when the container means is disposed in the aforesaid horizontal operative position, means for rotating said feed auger means to feed material in a horizontal direction toward a discharge end portion of the feed auger means, control means disposed between said container and said feed auger means and being mounted for movement relative thereto, said control means including a body means having a plurality of spaced openings therein corresponding in number to the discharge openings formed in the bottom portion of said container means, said body means being adapted to completely close off said discharge openings, the openings formed through said body means being of different size and being progressively smaller from the portion of the control means remote from the discharge end portion of the feed auger means to the portion adjacent to the discharge end portion of the feed auger means, and means for moving said control means and being operatively connected with the means for driving the feed auger means to move the control means in timed relationship to movement of the feed auger means, whereby the discharge opening of said container remote from the discharge end portion of the feed auger means is initially opened and then subsequently the remaining discharge openings are sequentially opened in a direction toward the discharge end portion of the feed auger means until the last discharge opening nearest to the discharge end portion of said feed auger means is finally opened, the opening of said discharge openings being timed with the speed of rotation of said feed auger means such that after the first discharge opening is opened by the control means each subsequent discharge opening is sequentially opened just as material which was initially fed through the first opened discharge opening is moved beneath each subsequently opened discharge opening.

31. Apparatus as defined in claim 30, wherein the means for moving the control means in timed relation to rotation of the feed auger means includes an eccentric driving mechanism connected with said feed auger means, and a pawl and ratchet mechanism operatively connected with said control means and said eccentric drive mechanism for moving the control means in a step-by-step manner in a direction toward the discharge end portion of said feed auger means.

32. Custom mixing apparatus comprising a self-contained mobile unit including a supporting framework, wheels mounting the supporting framework for movement over a supporting surface, means for steering certain of said wheels for guiding movement of the unit,

means for supporting an operator on the unit, digging and lifting means pivotally supported by said framework for movement into and out of operative position, means for remotely controlling the movement of said digging and lifting means into and out of operative position, said digging and lifting means including a discharge portion, weighing means supported on said framework, said weighing means including a weighing hopper positioned to receive material from the discharge portion of said digging and lifting means, means for selectively controlling flow of material from said digging and lifting means into said weighing hopper, means for indicating the amount of material within said weighing hopper to determine the weight of the material in the weighing hopper, said weighing hopper including a discharge portion, selectively operable means for opening and closing the discharge portion of said weighing hopper, surge hopper means disposed beneath the discharge portion of said weighing hopper for receiving by gravity material from said weighing hopper into said surge hopper, elevating means including an inlet portion for receiving material by gravity from said surge hopper means, said elevating means including a discharge portion, mixing hopper means pivotally supported by said framework, means for remotely controlling pivotal movement of said mixing hopper means, said mixing hopper means including an inlet portion at the upper part thereof and having a plurality of spaced discharge openings disposed at the bottom part thereof, feed auger means supported adjacent said discharge openings of the mixing hopper means, to receive material from said mixing hopper means, said feed auger means being adapted to discharge into said surge hopper means when said mixing hopper means is in one operative position thereof, and control means disposed between said mixing hopper means and said feed auger means for controlling the initial flow of material from said mixing hopper means into said feed auger means, said control means including a body means having a plurality of spaced openings formed therethrough, the openings in said body means being of different size and being progressively smaller from the portion of the body means remote from the discharge end portion of the feed auger means to the portion of the body means which is adjacent the discharge end portion of the feed auger means, each of the discharge openings in the bottom portion of the mixing hopper means being of substantially similar dimensions, means for driving said feed auger means to feed material into said surge hopper means, and means for moving said control means in timed relationship to driving movement of said feed hopper means so as to move the body means of the control means toward the discharge end portion of the screw auger means whereby the openings in said body means first open the discharge opening of the mixing hopper means remote from the discharge end portion of the feed auger means and whereupon the remaining discharge openings in the bottom portion of the mixing

hopper means are progressively opened in a direction toward the discharge end portion of the feed auger means, each discharge opening in the mixing hopper means being opened to discharge material downwardly into the feed auger means just as material discharged through the preceding discharge opening is carried beneath the subsequently opened discharge opening by the feed auger means.

33. Apparatus as defined in claim 32, wherein said digging and lifting means comprises a bucket conveyor, means for substantially continuously rotating said bucket conveyor during the digging and lifting operation, said digging and lifting means including a protective casing disposed in surrounding relationship to a substantial portion of said bucket conveyor, a scalping screen disposed between the discharge portion of said digging and lifting means and said weighing hopper, said protective casing having an opening formed therein for receiving material from said scalping screen.

34. Apparatus as defined in claim 32, wherein said surge hopper means includes a cutout portion in one side thereof for receiving the discharge end portion of said screw auger means, whereby the screw auger means is adapted to discharge into the surge hopper means, and means depending from said screw auger means for engaging a portion of said surge hopper means to prevent material from escaping through the cutout portion of the surge hopper means while the screw auger means is discharging into the surge hopper means.

35. Apparatus as defined in claim 32, wherein said elevating means comprises a bucket conveyor, means for substantially continuously operating said bucket conveyor during operation of the apparatus, said elevating means including a plurality of separate discharge portions at the upper portion thereof, and means for selectively controlling the flow of material through one or the other of said discharge portions as desired.

36. Apparatus as defined in claim 32, wherein said mixing hopper means has disposed therewithin baffle means, said baffle means being in the form of a plurality of series of baffles, each of said series of baffles extending from a point adjacent the discharge openings of said mixing hopper means to a point adjacent the opposite wall of the mixing hopper means, said baffle means sloping obliquely toward said inlet portion of the mixing hopper means to facilitate filling of the mixing hopper means with material and minimizing lateral shift of the material when the mixing hopper means is pivoted to its normal horizontal mixing operative position.

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