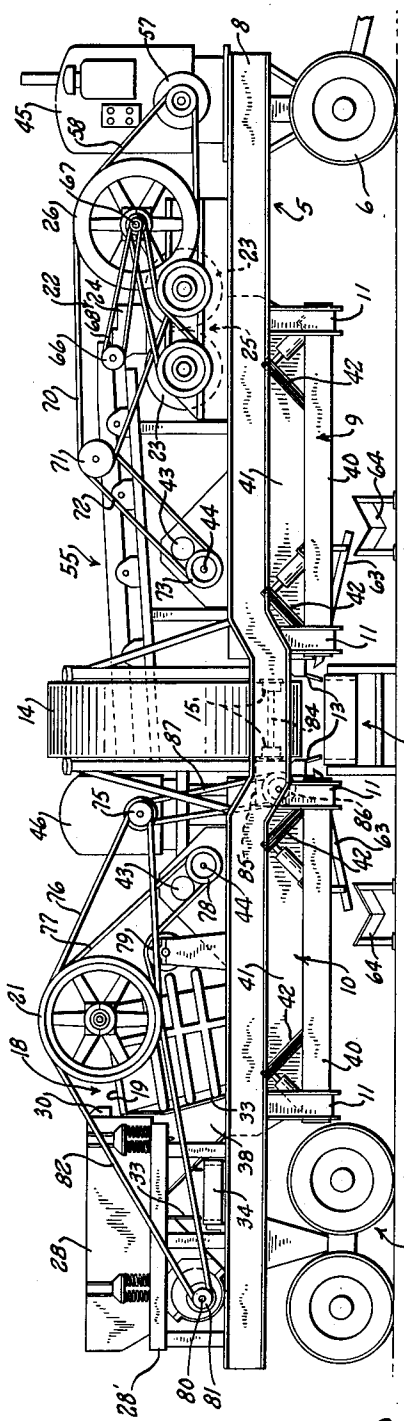
Jan. 15, 1963 J. N. QUINN 3,073,536

PORTABLE CRUSHING PLANT

Filed June 22, 1959 3 Sheets-Sheet 1

Fig. 1.



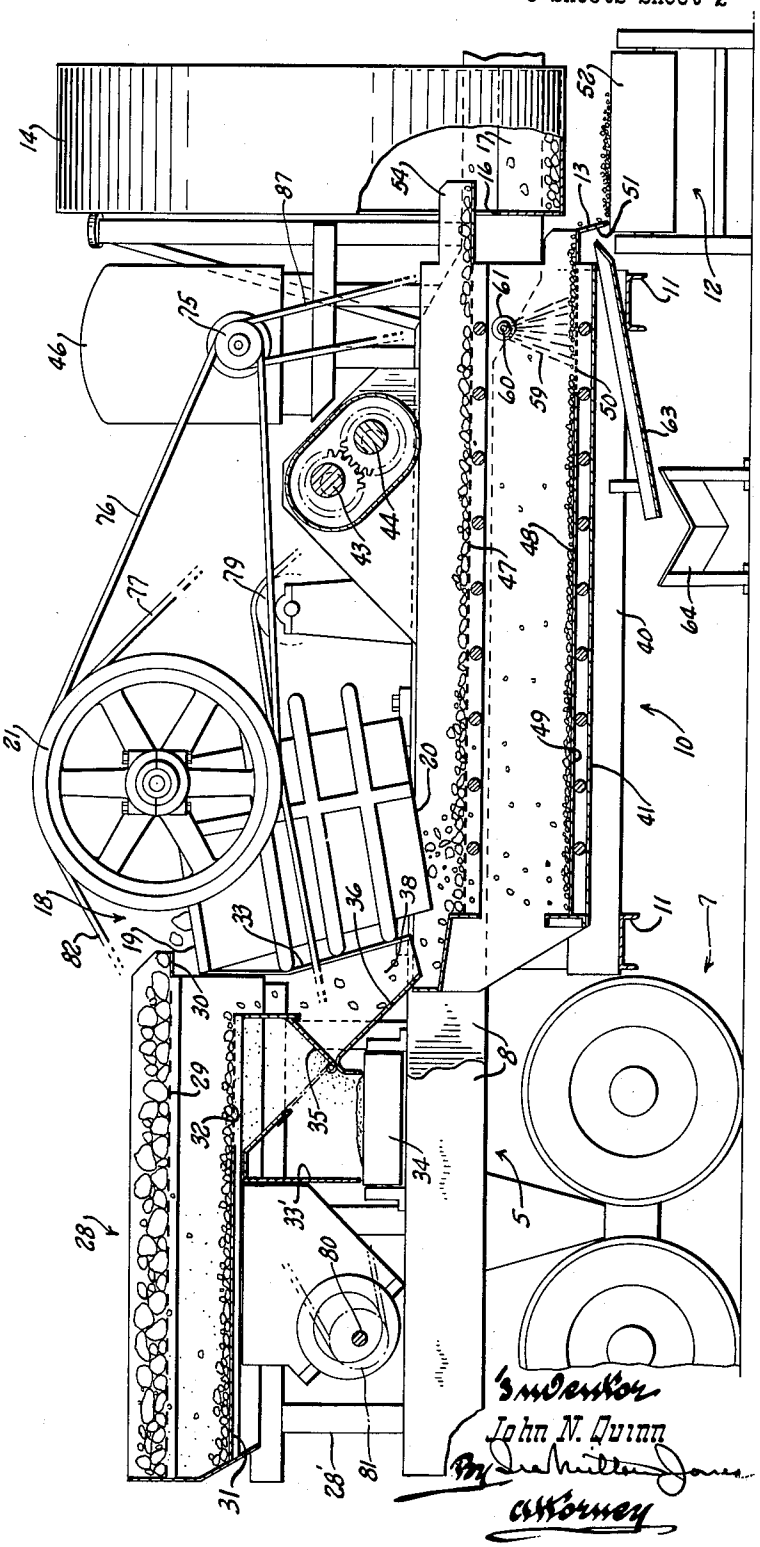
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PORTABLE CRUSHING PLANT

Filed June 22, 1959 3 Sheets-Sheet 2

Fig. 2a.

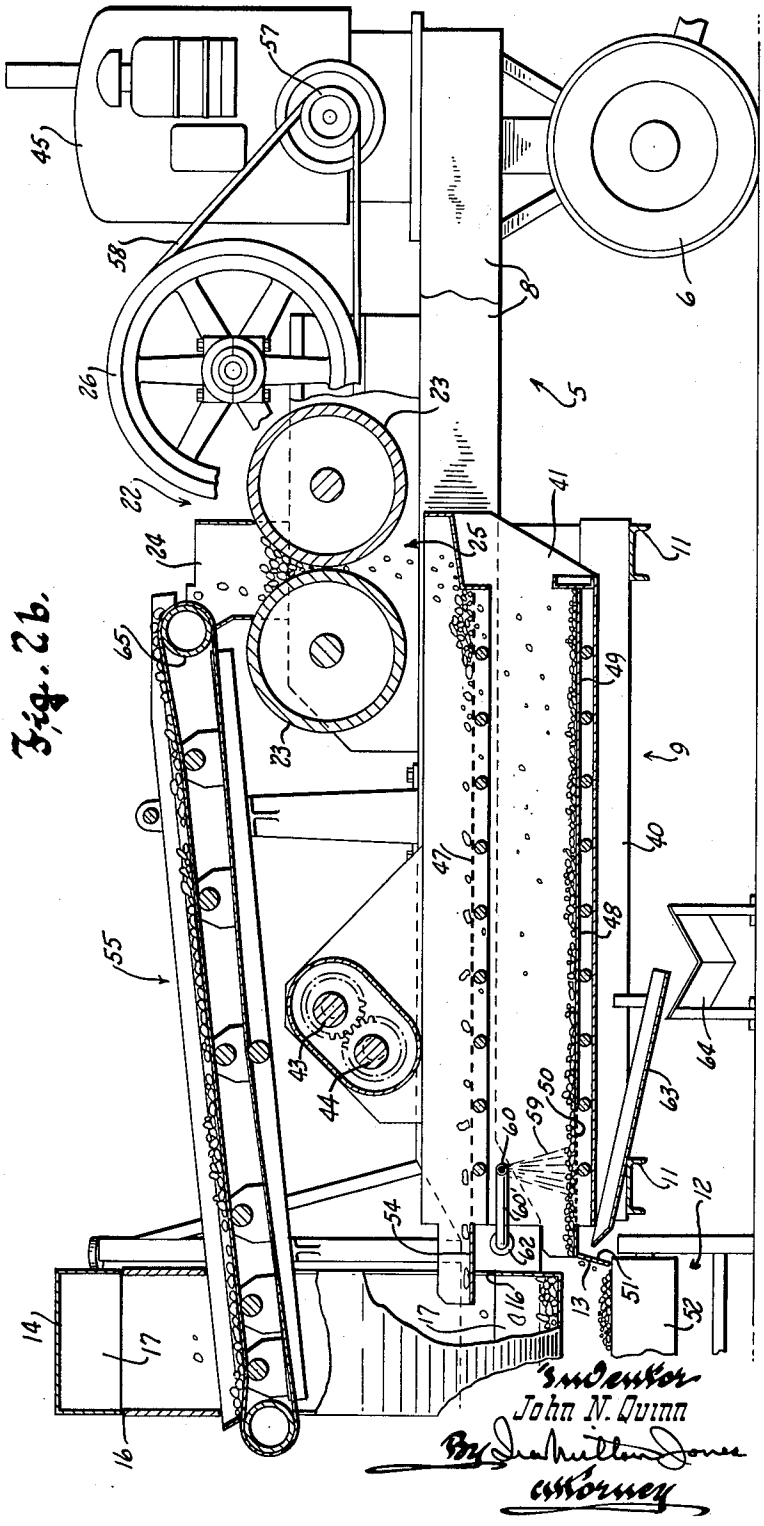


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PORTABLE CRUSHING PLANT

Filed June 22, 1959 3 Sheets-Sheet 3



United States Patent Office

3,073,536

Patented Jan. 15, 1963

3,073,536

PORTABLE CRUSHING PLANT

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Filed June 22, 1959, Ser. No. 821,853
11 Claims. (Cl. 241—76)

This invention relates generally to crushing apparatus, and has more particular reference to portable apparatus for processing gravel and producing aggregate or crushed materials of substantially uniform size that is especially suited for use in road construction projects.

Apparatus of this nature usually is quite large and complex and comprises a multiplicity of components for subjecting gravel to be processed to a plurality of crushing, screening and sorting operations, and such apparatus heretofore incorporated several conveyor mechanisms for conducting the materials to the various components of the apparatus.

In general, it is an object of this invention to provide an improved portable crushing plant which has a capacity far greater than existing plants, and which in addition features an arrangement of components that not only renders them readily accessible for servicing and/or replacement, but also results in improved overall compactness of the plant.

More specifically, it is the purpose of this invention to achieve the above objects through the use of vibratory screen units which are arranged and employed in a way that not only makes possible the elimination of certain of the conveyor mechanisms that were considered indispensable in crushing plants heretofore available, but which also enables placement of the remaining components of the crushing apparatus in locations most favorable from the standpoint of service accessibility.

It is a well known fact that an appreciable percentage of the gravel in most deposits will pass certain desired specifications as to particle size without having to be run entirely through a crushing plant. Accordingly, it is a further purpose of this invention to provide a crushing plant having means to effect quick separation from the gravel fed into the plant for processing all those particles having the desired size, and to also substantially directly deliver such separated materials to a zone at which the finished materials issue from the plant with a minimum of handling enroute.

Another object of this invention resides in the provision of a crushing plant for producing aggregates of predetermined particle size, wherein the finished materials may be washed prior to their discharge from the plant to free them of undesirable powdery materials.

Still another object of this invention resides in the provision of a portable crushing plant of the character described, wherein the components of the apparatus are so arranged on a wheeled chassis as to assure substantially uniform weight distribution on the axles of the chassis.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is a side elevational view of the portable crushing plant of this invention;

FIGURE 2*a* is an enlarged view of the lefthand half of the plant shown in FIGURE 1, portions being broken away and shown in longitudinal section; and

FIGURE 2*b* is an enlarged view of the righthand half of the plant seen in FIGURE 1, portions thereof also being broken away and shown in longitudinal section.

Referring now more particularly to the accompanying drawings, in which like reference characters have been applied to like parts throughout the views, it will be noted that for purposes of portability, the crushing plant of this invention has all of its components mounted upon a chassis 5 supported by sets of front and rear wheels 6 and 7, respectively. However, the crushing plant of this invention may be used to substantially equal advantage in a permanent installation, where standards or columns would be employed in place of wheels, to support the plant at any desired elevation above ground.

The chassis 5 provides a supporting framework for all of the components of the crushing plant, and it is comprised of transversely spaced beams 8 that extend the entire length of the apparatus and are suitably connected by cross beams, not shown, at various locations.

All but two of the components mounted on the supporting framework project thereabove. The remaining two components are elongated front and rear vibratory screen units 9 and 10, respectively, which are supportingly slung from the underside of the beams 8 by hangers 11. The two screen units 9 and 10 are carried by the beams 8 with the units in lengthwise spaced opposing relation, one forwardly and the other rearwardly of a delivery zone 12 located medially of the ends of the chassis, so that the adjacent or discharge ends 13 of the units face one another across the delivery zone.

A rotatable elevating wheel 14 is supported by rollers 15 on the chassis for rotation about an axis disposed longitudinally of the chassis, with its lower portion above the delivery zone 12 and located partly between the discharge ends 13 of the screen units 9 and 10. The elevating wheel is a standard component on crushing plants of the type herein concerned, having large openings 16 in its opposite axial faces and a series of circumferentially adjacent inwardly opening pockets 17 arranged about the peripheral portion of the wheel.

As is customary, materials fed into the lower portion of the rotating elevating wheel, through one of the axial openings 16 therein, are carried around to the upper portion of the wheel where the materials may discharge onto a chute or a conveyor for delivery to another station. Consequently, the wheel may be said to have a receiving portion at its bottom, and a discharge portion at its top.

A jaw crusher 18, of a conventional type, is mounted in any suitable fashion upon the framework provided by the chassis at a location substantially midway between its rear extremity and the elevating wheel 14. As is usual, the jaw crusher 18 has an inlet portion 19 at its top, an outlet portion 20 at its bottom, and a large diameter drive pulley 21.

A roll crusher, generally designated 22, is mounted upon the framework at a location intermediate the elevating wheel 14 and the front extremity of the chassis. The roll crusher may be of any conventional type having a pair of cooperating crushing rollers 23, an inlet 24 above the rollers, an outlet 25 beneath the rollers, and a large diameter pulley 26 drivingly connected with the rollers.

With the arrangement of the components described thus far, it will be noted that the screen unit 9 extends forwardly beneath the outlet 25 of the roll crusher to receive crushed materials that discharge therefrom. Similarly, the rear screen unit 10 extends rearwardly beneath

the outlet of the jaw crusher 18 to receive crushed materials that discharge therefrom.

Materials to be processed are fed into still another vibratory screen unit 28 mounted on an elevated frame 28' on the rear portion of the chassis, directly over the rear wheels 7, and behind the jaw crusher 18. The vibratory screen unit 28 is constructed to serve as a receiving hopper for the gravel to be processed, and at an upper level therein it has a substantially coarse mesh screen 29 onto which all the gravel charged into the plant for processing is deposited as it is fed into the hopper-like screen unit 28. The larger stones and rocks, of a size suitable to be fed into the jaw crusher 18, are retained on the screen 29 while smaller materials pass therethrough and drop downwardly into the lower portion of the screen unit.

The larger stones and rocks thus scalped by the screen 29 are advanced forwardly, toward the jaw crusher, as a consequence of vibration of the screen unit 28, and they discharge from the front of the unit directly into the inlet 19 of the jaw crusher, through a short spout 30. The rocks and large stones that are thus fed into the jaw crusher, of course, are broken up into smaller pieces and discharged from the bottom of the jaw crusher into the receiving portion of the screen unit 10 therebeneath.

The receiving screen unit 28 also has a lower deck conjointly defined by an imperforate bottom section 31 and a coplanar screen 32, spaced beneath the screen 29. The mesh of the screen 32 is selected to allow "fines" such as sand and silt to pass therethrough but to deny passage to all particles of larger size that drop onto the lower deck from the upper screen 29.

The screen 32 is supported from the opposite sides of the unit 28 at a location spaced a short distance behind an upright wall 33 carried by the frame 28' and extending transversely across the front portion of the vibratory unit 28 beneath the level of its screen 29. The imperforate bottom section 31 is also supported by the sides of the unit 28, and it extends from the rear of the screen 32 to the rear of the unit.

Consequently, during and as a result of vibration of the unit 28, materials that reach the lower deck of the unit, through the upper screen 29, will be conducted in a forward direction, toward the jaw crusher, with all of the "fines" dropping downwardly through the screen 32 and the remainder discharging from the front of the unit, in bypass relation to the jaw crusher, into the rear portion of the vibratory screen unit 10. The silt and other "fines" of particle size too small to meet specifications, that pass the screen 32 of the vibratory unit 28, drops down through a chute 33' carried by the frame 28' into a trough or conveyor 34, the function of which is to conduct the rejected materials laterally, to one side of the plant, where they may be discharged as waste.

Such rejection of the "fines" depends upon the position of a gate 35 hingedly mounted on and providing the medial portion of a wall 36 that extends downwardly and forwardly from the rear of the screen 32 to the rear of the screen unit 10. The gate 35, which is shown in open position in FIGURE 2a, out of the plane of the wall 36, may be swung to a closed position indicated in dotted lines, flush with the wall 36, at which it prevents the "fines" from discharging to waste and instead directs them down the wall 36 and into the vibratory screen unit 10. Thus, the sand and other "fines" may either be rejected right at the receiving station of the apparatus, or they may be retained if specifications permit the finer materials to be saved for use.

It should be noted that the transverse walls 33 and 36 are disposed in downwardly convergent relation to one another, and that they cooperate with opposite side walls 38 to define a chute leading downwardly and forwardly from the front of the receiving unit 28 to the receiving end portion of the lower screen unit 10.

From the description thus far, it will be evident that the rear screen unit 10 is fed from two sources, when the gate 35 is open, or three sources when it is in closed position coplanar with the wall 36. This follows from the fact that materials resting on and conducted forwardly off the front of the screen 32, as well as the materials that discharge from the bottom of the jaw crusher, are received in the rear portion of the unit 10, along with fines when the latter are not being rejected.

Both the vibratory screen units 9 and 10 are constructed similarly to the screen unit disclosed in Patent No. 2,312,477, issued to H. C. Pollitz on March 2, 1943, and their operation is now well understood by those skilled in the art. It will suffice to note that each of the units 9 and 10 comprises a rigid rectangular frame 40, and a box-like vibratory unit 41 supported from the frame 40 by means of leaf springs 42 at the fore and aft ends of the unit (see FIGURE 1). The leaf springs, of course, constrain the box-like structures 41 to fore and aft vibratory motion during their operation. The units 9 and 10 also include pairs of eccentric shafts 43 and 44, the latter of which are connected in any suitable manner with sources of power, as for instance with separate internal combustion engines 45 and 46 mounted upon the front and medial portions of the chassis respectively. The manner in which shafts 44 are driven from the engines will be described hereinafter, but it should be borne in mind that the shafts of the front unit 9 are so disposed as to effect rearward vibratory advance of materials in the unit, toward the delivery zone 12, while the shafts for the rear unit 10 are disposed to effect forward vibratory advance of materials therein, also toward the delivery zone.

Each of the vibratory screen units 9 and 10 comprises horizontal upper and lower material supporting and conducting means 47 and 48, respectively, supported in vertically spaced relation by the side walls of their box-like structures 41. The upper level material supporting means 47 is a screen having a mesh smaller than that of the screen 29 of the receiving unit 28 but somewhat larger than the mesh of the screen 32 in the receiving unit. The lower level material supporting means 48 may comprise the bottom of the vibrating unit, but the forward screen unit 9, and also the rear unit 10 if desired is preferably provided conjointly by an elongated imperforate tray 49 and a short section of fine mesh screen 50 at the end portion of the unit adjacent to the medial delivery zone 12.

In operation, the screen units 9 and 10 are vibrated in such a fashion that stones too large to pass through their screens 47 will be conducted thereby toward and into the opposite axial ends of the elevating wheel 14. The gravel that passes through the screens 47 may be termed "finished" material, and it drops onto the bottoms 48 of the units to be conducted thereby toward the medial zone of the plant, for discharge by means of short spouts 51 onto a common collector 52 in the form of a conveyor or trough leading laterally from the plant.

In practice, the collector 52 may most conveniently comprise a conveyor to receive the "finished" materials discharging from the lower screen units 9 and 10 and to conduct these materials to where ever they are needed. This conveyor, of course, may be a portable component which is separate from the crushing plant of this invention, and it may be supported directly on the ground with its receiving end under the delivery zone of the plant.

The upper level material supporting and conducting means or screens 47 of the lower front and rear screen units are supported at a level slightly above the inlet openings in the axial ends of the elevating wheel 14, and have extensions 54 projecting into the opposite ends of the wheel. When the screen units are in operation, the oversize materials supported on these screens are thus fed into the elevating wheel across the extensions 54 to be carried upwardly by the wheel and discharged onto the receiving portion of a belt conveyor 55.

The belt conveyor is supported by the chassis with its

rear portion extending into the opening in the front axial end of the elevating wheel 14, and with its forward or discharge end located or arranged directly over the inlet 24 of the roll crusher 22. Consequently the materials that are elevated by the wheel 14 drop onto the belt conveyor and are conducted thereby into the inlet of the roll crusher where they are broken up into smaller pieces and discharged into the forward or receiving end portion of the vibatory screen unit 9.

It is to be understood that the rollers 23 of the roll crusher are so adjusted that substantially nearly all of the materials discharging therefrom are of the desired "finished" size capable of passing through the screen 47 of the unit 9. Only a very small percentage of the materials thus fed into the screen unit 9 will fail to pass through the screen 47 thereof, and these oversize materials will be "recirculated" through the roll crusher by means of the elevating wheel and belt conveyor 55.

It will also be understood that much of the material fed into the lower rear screen unit 10 from the jaw crusher 18 and the lower deck of the receiving screen unit 28 will be of "finished" size. Such material, of course, drops through the screen 47 of the lower rear unit 10 onto the bottom or conveyor deck 48 of the unit for delivery directly to the conveyor 52.

The roll crusher 22 is driven by the forward internal combustion engine 45 which, it will be noted, is mounted on the chassis of the plant directly over the front wheels 6. The engine 45 has a small diameter drive pulley 57 which is connected with the large diameter pulley 26 on the roll crusher 22 by means of belting 58.

One of the most important features of this invention is made possible through the provision of a short screen section 50 in each of the lower vibratory screen units 9 and 10. These screen sections enable the "finished" material conducted toward the delivery zone 12 by the lower deck 48 of each unit to be washed and cleansed of pulverous material produced in and issuing from the roll crusher, as well as any sand or silt that may not have been separated from the stone in the receiving unit 28, and which renders the aggregate objectionable for certain uses. Such washing of the finished material, just prior to its discharge onto the collecting conveyor 52, may be advantageously effected by spraying water, as at 59, downwardly onto the aggregate passing over the screens 50, from spray heads 60 extending transversely across the interiors of the box-like vibratory structures directly over the screens 50 therein. These spray heads may be supported in any suitable fashion either from the vibratory structures themselves or from the beams 8 of the chassis. As shown, the ends of the rear spray head are supported as at 61 from the sides of the box-like structure 41, while the front spray head has opposite side branches 60' extending rearwardly from the unit and directed toward the beams 8 to be supported thereby as at 62.

The water and entrained sand, silt and other powdery substances washed from the aggregate at the discharge end of each of the screen units 9 and 10 may flow out of the discharge end of the unit and into a trough 63 carried by the frame 40 of the unit and leading downwardly, away from the delivery zone 12, to have its discharge end located over a laterally extending ground supported trough 64. If desired, that part of the bottom of each box-like unit 41 which is directly beneath the screen 50 may be cut away or perforated to facilitate entry of the wash water into the trough 63.

It will be understood, of course, that the water sprays 59 are not used when the gate 35 is swung to its position shown in dotted lines in FIGURE 2a to provide for retention of the sand and other "fines" when specifications so permit.

Another important feature of this invention is the high output capacity of the plant that results from the employment of the two lower vibratory screen units 9 and 10, each with a bottom material supporting and conveying deck for conducting "finished" material toward the common delivery zone 12 as a consequence of vibration of the units. These units not only enable the elimination of all belt conveyors, except the conveyor 55 by which the roll crusher is fed, but the arrangement of the rear screen unit 10 so that it acts upon materials fed to it both from the receiving unit 28 and the jaw crusher 18 also minimizes handling of the gravel being processed. It accomplishes this desirable result by passing the material of "finished" size in its bottom, directly to the delivery zone 12, in by-pass relation to the elevating wheel 14, the conveyor 55, the roll crusher 22, and the front screen unit 9.

The engine 45 on the front of the chassis also provides the source of power for the belt conveyor 55 and for the front vibratory screen unit 9. For that purpose, the front roller 65 of the belt conveyor has a pulley 66 fixed thereto rearwardly opposite a small pulley 67 that is fixed with respect to the drive pulley 26 of the roll crusher. A belt 68 encircling the pulleys 66 and 67 thus causes the conveyor to be driven by the engine 45 through the belts 58 and 68.

The drive for the front screen unit 9 is also taken off of the drive pulley 26 of the roll crusher, which is connected by belting 70 with an idler pulley 71 supported by suitable bearings (not shown) for rotation on a transverse axis lying in a plane containing the axes of the eccentric shafts 43 and 44 of the unit 9 and located above and forwardly of said shafts. The idler pulley 71 is thus disposed substantially midway between the roll crusher pulley 26 and the elevator wheel, and it is connected by belting 72 with a pulley 73 on the shaft 44 of the unit 9, so that the unit 9 is vibrated whenever the engine 45 is in operation.

The rear engine 46, which is located ahead of the jaw crusher 18, also has a small diameter pulley 75 on its crankshaft, connected by belting 76 with the larger drive pulley 21 of the jaw crusher to drive the latter. Other belting 77 drivingly connects the jaw crusher pulley 21 with a pulley 78 on the shaft 44 of the rear screen unit 10 to cause vibration of the unit whenever the engine 46 is in operation. One of the stretches of the belting 77 is trained over an idler pulley 79 to assure that both stretches of the belting approach the pulley 78 in substantially parallel relationship to a plane containing the axes of the eccentric shafts 43 and 44 of the rear vibratory screen unit 10, as is also the case with the belting 72 connecting with the shaft 44 of the front screen unit 9.

The receiving unit 28 is also caused to vibrate as a consequence of rotation of a transverse eccentric shaft 80 on the unit, located therebeneath and near its rear. This shaft has a pulley 81 thereon that is connected by belting 82 with the drive pulley 21 of the jaw crusher. Consequently, whenever the engine 46 is in operation, the receiving unit 28 will be caused to vibrate in a manner to cause gravel fed thereinto to be advanced in the forward direction.

The elevating wheel 14 is also driven from the engine 46. For this purpose, the shaft 84 carrying one set of rollers 15 upon which the elevating wheel is mounted is drivingly connected with the output of a speed reducing device 85 which has an input pulley 86 connected by belting 87 with the pulley 75 on the crankshaft of the engine 46. Consequently, the elevating wheel is slowly rotated on its supporting rollers 15 whenever the engine 46 is in operation.

The disposition of the various components of the crushing plant as described has the advantage of exceptionally good distribution of weight along the length of the chassis 5. Moreover, the heavier components such as the engine 45 and the roll crusher 22 driven thereby are located close to the front wheels of the chassis, while the jaw

crusher 18 and the receiving unit 23 are located as close as possible to the rear wheels 7.

Equally important advantages which result from the placement of components in the manner described are the compactness of the plant, especially its low overall height, and the accessibility of its components for service or replacement. Compactness, however, is not achieved at the expense of capacity. On the contrary, the provision of the front and rear vibratory screen units 9 and 10, beneath the chassis, and both delivering "finished" materials to a common delivery zone, assures a capacity for the plant which is far greater than presently available crushing plants of comparable size.

From the foregoing description, together with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides a crushing plant which features portability, high capacity despite its compactness, and fewer parts, good accessibility of its components, and the ability to wash the produced aggregate in an exceptionally simple but efficient manner.

What is claimed as my invention is:

1. In a crushing plant: an elongated substantially horizontal supporting frame; a jaw crusher carried by the frame and having an inlet in an upper portion thereof and an outlet at its bottom; a roll crusher carried by the frame at a location longitudinally remote from the jaw crusher, and having an inlet at its upper portion and an outlet at its bottom; elevator means mounted on the frame at a location substantially medially between said crushers, and operable to receive materials at a lower portion thereof and to discharge said materials at an upper portion thereof; a conveyor carried by the frame and extending lengthwise thereof between the upper portion of said elevator means and the inlet of the roll crusher to deliver materials discharging from the elevator means into the roll crusher; first and second vibratory screen units carried by the frame, each having a receiving and a discharge end and adapted to advance materials at two levels but in the same direction toward its discharge end in consequence of vibration of the unit, each of said screen units having a screen at the upper of said levels and a material supporting member at the lower of said levels onto which materials drop that pass through the screen, both of said screens being of substantially the same mesh; means mounting said first and second screen units on the frame with their discharge ends adjacent to the lower portion of the elevator means and with their receiving ends respectively under the outlets of the jaw and roll crushers to receive materials discharging therefrom, whereby materials received in said screen units are advanced toward the elevator means; means on the plant for delivering materials advanced by the screens of said screen units to the material receiving lower portion of the elevator means; means carried by the frame for directing materials discharging from the bottoms of said screen units to a common zone at which finished materials may be collected; and a vibratory receiving unit carried by the frame, into which materials to be processed are initially charged, for vibratorily advancing materials at two levels toward a discharge end of the unit, said receiving unit having a coarse mesh screen for advancing materials at the upper of said levels, and being disposed on the frame with its discharge end adjacent to the inlet of the jaw crusher, in position to have materials on said screen thereof discharge into the inlet of the jaw crusher, and to have materials advancing at its lower level discharge substantially directly into the receiving end of said first screen unit.

2. In a crushing plant: an elongated substantially horizontal supporting frame; jaw and roll crushers carried by the frame at longitudinally remote locations and at substantially the same level, each of said crushers having an inlet in an upper portion thereof and an outlet at its bottom; elevator means carried by the frame at a location substantially medially between said crushers, said elevator means having a material receiving lower portion thereof at a level below that of the crushers, and being adapted to discharge materials at an upper portion thereof; elongated conveyor means carried by the frame for conducting materials discharging from said elevator means into the inlet of the roll crusher; first and second vibratory screen units carried by the frame at a common level beneath that of said crushers, respectively having receiving ends in material receiving relation to the outlets of the jaw and roll crushers, and having discharging ends adjacent to the lower portion of the elevator means, each of said vibratory units having upper and lower elements for advancing materials at two levels but in the same direction toward its discharging end by vibration, the upper ones of said elements being "finish" screens of the same mesh adapted to deliver materials substantially directly to the material receiving lower portion of the elevator means, and the lower level elements of said screen units being adapted to discharge substantially directly to a common delivery zone at which finished materials may be collected; a vibratory receiving unit into which materials to be processed are initially charged, having a discharge end and upper and lower level members for advancing materials toward its discharge end by vibration, the upper of said members comprising a substantially coarse mesh screen; and means mounting said receiving unit on the frame with its discharge end adjacent to the jaw crusher and in position to have materials on said screen thereof discharge substantially directly into the inlet of the jaw crusher and to have materials advanced by its lower level member discharge substantially directly into the receiving end of said first vibratory unit.

3. In a crushing plant: an elongated substantially horizontal supporting frame; jaw and roll crushers carried by the frame at longitudinally remote locations, and each having an inlet in the upper portion thereof and an outlet at its bottom; an elevator wheel rotatably carried by the frame at a location substantially medially between said crushers, and adapted to receive materials at a lower portion thereof and to discharge said materials at an upper portion thereof during rotation of the wheel; conveyor means carried by the frame for conducting materials discharged by the elevator means lengthwise along the frame and into the roll crusher; first and second vibratory screen units carried by the frame, each having a receiving end, a discharge end, and a screen through which materials of finished size drop and upon which materials of larger size are supported and vibratorily advanced toward the discharge end of the unit; means mounting said first and second vibratory units on the frame, with said screens thereof arranged to discharge into the material receiving lower portion of the elevator wheel and with the receiving ends thereof respectively under the outlets of the jaw and roll crushers to receive materials discharging therefrom; material advancing means carried by said vibratory units under the screens thereof for vibratorily conducting finished materials toward a common zone beneath the elevator wheel, at which said finished materials may be collected, said material advancing means including screens of fine mesh to support materials of finished size but to pass sand and other fines; a vibratory receiving unit carried by the frame at a location adjacent to the jaw crusher, and into which materials to be processed are initially charged, said receiving unit having a coarse mesh screen through which materials of certain sizes drop and upon which materials of larger size are supported to be vibratorily advanced and fed into the inlet of the jaw crusher; means carried by the receiving unit beneath said coarse mesh screen thereof providing a vibratory conveyor for receiving and conducting materials that drop through said coarse mesh screen into the receiving end of said first vibratory unit; and means carried by the frame for spraying water upon the finished materials passing over said fine mesh screens of the first and second vibratory units.

4. In a gravel crushing plant; an elongated frame having front and rear ends; primary and secondary crushers carried by the frame adjacent to its rear and front ends respectively; front and rear vibratory units mounted on the frame, each having a receiving portion under one of said crushers, said units having discharge end portions adjacent to a common zone intermediate the crushers, the rear unit having a screen at an upper level onto which crushed materials drop from the primary crusher and through which materials of finished size pass, and being adapted to vibratorily advance materials that are larger than finished size toward and out of the discharge end portion of the unit, and both of said units having material supporting means at a lower level adapted to vibratorily advance materials of finished size toward and out of the discharge end portions of the units, said lower level material supporting and advancing means of each vibratory unit including a fine mesh screen over which the finished materials pass; means carried by the frame for effecting washing of the finished materials as they are vibratorily conveyed along said fine mesh screens; a vibratory gravel receiving unit on the frame behind the primary crusher, having means for effecting separation of materials into sizes suitable to be fed into the primary and secondary crushers, for vibratorily conveying the larger size materials into the primary crusher and the smaller size materials into the receiving portion of said rear vibratory unit; and means carried by the frame for conducting discharging materials advanced by the screen of said rear vibratory unit into the secondary crusher.

5. In a crushing plant; an elongated frame having front and rear portions; primary and secondary crushers carried by the frame at the rear and front portions thereof, respectively, each of said crushers having an inlet and an outlet; feed means on the rear of the frame for feeding materials to be crushed into the inlet of the primary crusher; elongated front and rear vibratory units carried by the frame in material receiving relation to the outlets of said front and rear crushers, respectively, said vibratory units extending longitudinally of the frame toward one another and having discharging ends adjacent to one another and to a common delivery zone intermediate the crushers, each of said vibratory units having material supporting elements for vibratorily advancing materials at a plurality of levels but in the same direction toward its discharging end, the upper one of said elements of each vibratory unit comprising a screen, and a lower one of said elements being adapted to receive scalped materials that pass through said screen and to conduct scalped materials of finished size to said delivery zone; and conveyor means mounted on the frame in position to receive carry-over material from said screens of both vibratory units, and adapted to conduct such carry-over material to the inlet of the secondary crusher.

6. The crushing plant of claim 5 further characterized by: the fact that said feed means include a scalping device through which materials of a size suitable for crushing by the secondary crusher pass in bypass relation to the primary crusher; and means to conduct scalped materials from said feed means onto the screen of said rear vibratory unit.

7. In a gravel crushing plant: an elongated frame; primary and secondary crushers carried by the frame at longitudinally spaced locations; means on the frame for feeding aggregates to be crushed into the primary crusher; a vibratory unit carried by the frame in a position to directly receive materials discharging from the secondary crusher, said vibratory unit having an upper screen adapted to support materials of larger than finished size, and having a lower screen adapted to receive and support materials of finished size that pass through the upper screen, each of said screens being adapted to vibratorily convey materials thereon substantially horizontally in a direction away from the secondary crusher to a zone at which materials discharge from the screen; means on the frame including common conveyor mechanism for conducting crushed material from the primary crusher and materials discharging from the upper screen of said vibratory unit into the secondary crusher; and means carried by the frame at a location between said upper and lower screens for spray washing said finished materials as they are vibratorily conveyed along said lower screen toward the delivery zone.

8. In a gravel crushing plant: an elongated frame having front and rear ends; primary and secondary crushers carried by the frame near its rear and front ends, respectively; front and rear vibratory units mounted on the frame, each having a receiving portion under one of said crushers, said units having discharge end portions adjacent to a common zone intermediate the crushers and each having a screen at an upper level onto which crushed materials drop from its associated crusher and through which materials of finished size pass, said screens being adapted to vibratorily advance carry-over materials that are larger than finished size toward and out of the discharge end portions of the units, and both of said units having material receiving and supporting means beneath their screens adapted to vibratorily advance materials of finished size toward the discharge end portions of the units; a vibratory gravel receiving unit on the frame behind the primary crusher having means for effecting separation of materials into sizes suitable to be fed into the primary and secondary crushers, for vibratorily conveying the larger size materials into the primary crusher and the smaller size materials into the receiving portion of said rear vibratory unit; and means for conducting carry-over materials discharging from the screens of both of said vibratory units to the secondary crusher, including an elevator device carried by the frame intermediate the crushers and in position to receive the carry-over materials from the screens of said vibratory units.

9. In a crushing plant: an elongated substantially horizontal supporting frame; a pair of crushers carried by the frame at longitudinally remote locations, each of said crushers having an inlet and an outlet; elevator means carried by the frame at a location intermediate said crushers, said elevator means having a material receiving lower portion thereof at a level below that of the crushers, and being adapted to discharge materials from an upper portion thereof; elongated conveyor means carried by the frame and extending lengthwise thereover, for conducting materials discharging from said elevator means to the inlet of one of said crushes; a pair of vibratory units carried by the frame, one adjacent to and associated with each crusher, and each having a receiving portion in material receiving relation to the outlet of its associated crusher, a discharging end adjacent to said lower portion of the elevator means, and material supporting elements for vibratorily advancing materials at a plurality of levels but in the same direction toward its discharging end, the upper one of said material supporting elements of each vibratory unit comprising a screen adapted to conduct carry-over materials of larger than finished size to the material receiving lower portion of the elevator means, and a lower one of said elements of each vibratory unit being adapted to conduct finished material to a delivery zone at which finished materials may be collected; a receiving unit into which materials to be processed are initially charged, said receiving unit having a discharge end and having scalping means at an upper level thereof adapted to support and conduct carry-over materials of larger than finished size to the discharge end of the receiving unit while scalped materials of smaller size pass through said scalping means; means mounting said receiving unit on the frame with its discharge end adjacent to the other of said crushers; means at the discharge end of the receiving unit for directing carry-over materials on the scalping means into the inlet of said other crusher;

and means to conduct scalped materials which pass through said scalping means to the receiving portion of the vibratory unit associated with said other crusher.

10. In a crushing plant: a frame; a crusher mounted on the frame and having an inlet and an outlet; an elongated low level vibratory unit carried by the frame with one end portion positioned to receive materials discharging from the outlet of the crusher, said unit comprising a screen adapted to pass materials which are smaller than a given size and to support and vibratorily advance carry-over materials of larger size toward and out of the opposite end of the unit, and means beneath said screen to receive such smaller materials; a high level vibratory unit mounted on the frame and having a discharge end positioned adjacent to the crusher, said high level unit having a screen onto which materials to be processed are deposited, said screen being adapted to pass said smaller size materials and being adapted to support and vibratorily conduct carry-over materials toward the inlet of the crusher, said high level unit having a material supporting and advancing member beneath the screen thereof including a fine mesh screen to allow fines such as sand and silt to pass therethrough, but to support and vibratorily advance carry-over materials toward the discharge end of the high level unit; means including a chute structure for conducting carry-over materials discharging from said material supporting and advancing member onto the screen of said low level vibratory unit, in bypass relation to the crusher: and controllable means carried by the frame beneath said material supporting and advancing member of the high level unit defining a material receiving and directing structure for the fines that pass through said fine mesh screen,

said receiving and directing structure providing a pair of defined paths along which said fines can be selectively directed either into the low level vibratory unit, or to a zone from which said fines can be discharged from the plant separately from the remainder of the processed materials.

11. The crushing plant of claim 10 wherein said controllable means comprises a gate carried by the frame for movement between a first operative position at which the gate directs fines passing through said fine mesh screen along one of said paths and into said chute structure for delivery of the fines into the low level vibratory unit, along with carry-over materials discharging from said material supporting and advancing member, and a second operative position at which said gate directs the fines along the other of said paths to the zone from which the fines can be discharged from the plant.

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