# United States Patent

**Quinn**

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## [54] CRUSHING PLANT


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[21] Appl. No.: **148,722**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 882,197, Dec. 4, 1969, Pat. No. 3,622,089.

[52] **U.S. Cl.**.....**241/76**, 241/80, 241/81, 241/101 M, 241/152 A

[51] **Int. Cl.**.....**B07b 1/28**, B02c 21/02

[58] **Field of Search**.....241/69, 75, 76, 80, 81, 97, 241/101 M, 152 A, 154, 155



[56] **References Cited**

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| 3,409,235 | 11/1968 | Quinn | 241/76 |
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[57] **ABSTRACT**

A crushing plant having elevator means located primary and secondary crushers, each comprising first and second stage crushing devices. Input material is fed into a receiving unit is separated thereby into pieces of finish size which are discharged onto a delivery conveyor, and pieces of two different larger sizes. The latter are separately fed to the primary crusher stages, which discharge onto separate screens located above the delivery conveyor. Carryover material on the screens is separately conducted by means including said elevator to the two secondary crusher stages, which discharge onto a common finish screen member also located above the delivery conveyor.


**18 Claims, 7 Drawing Figures**

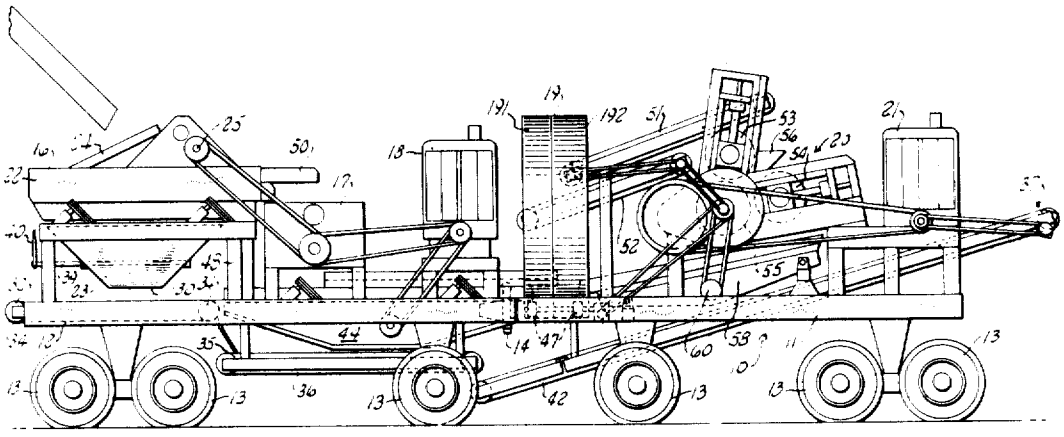
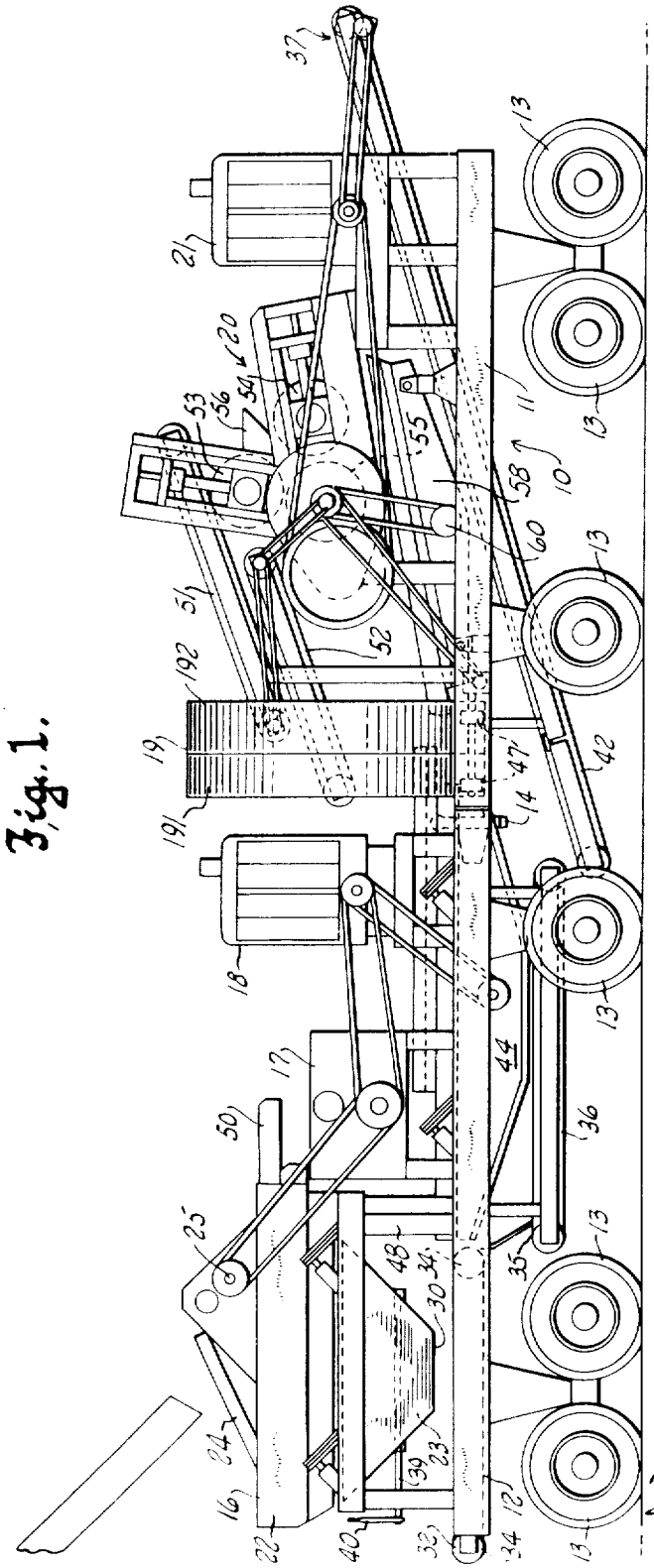


Fig. 1.




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Fig. 2a.

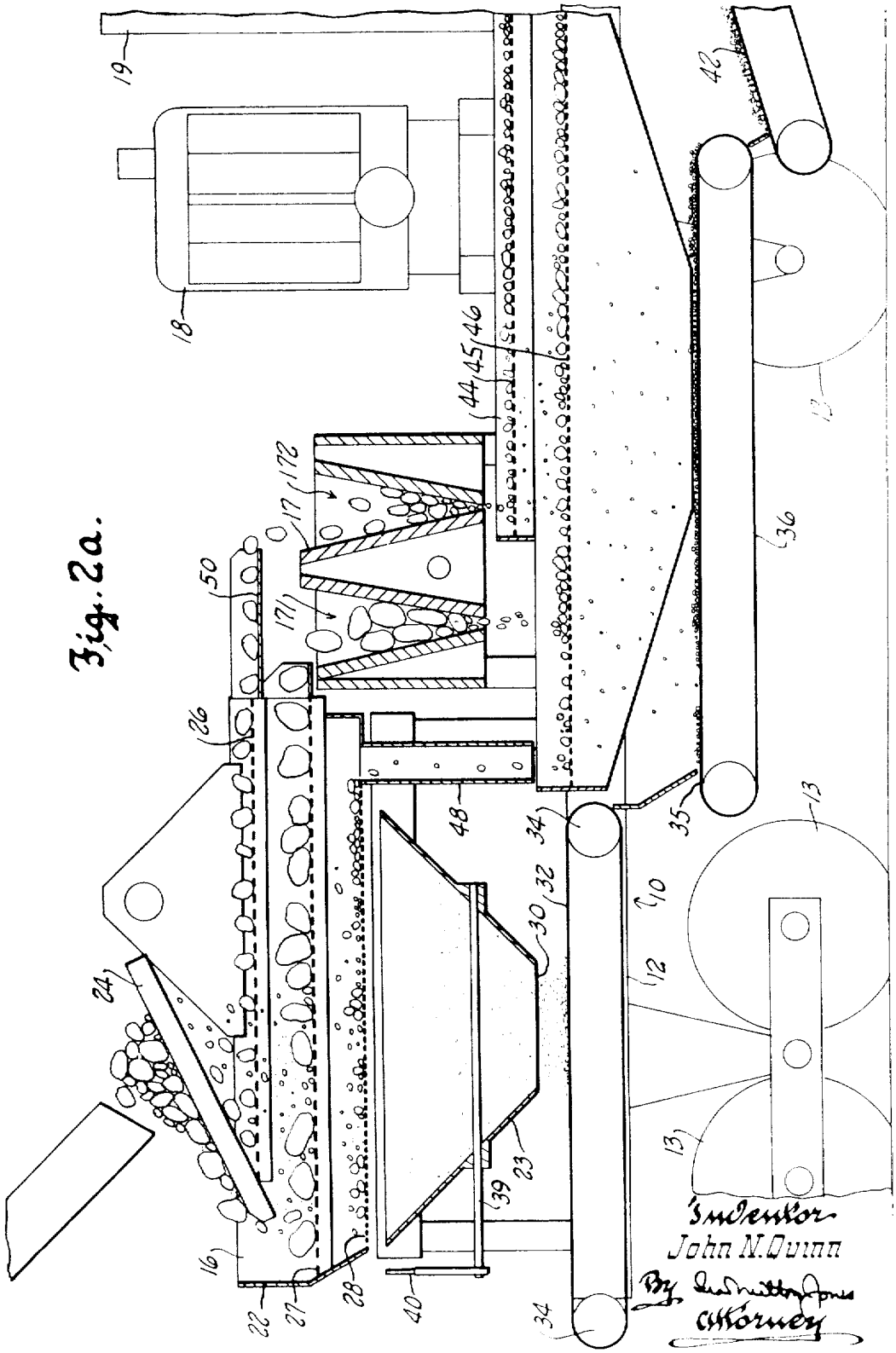
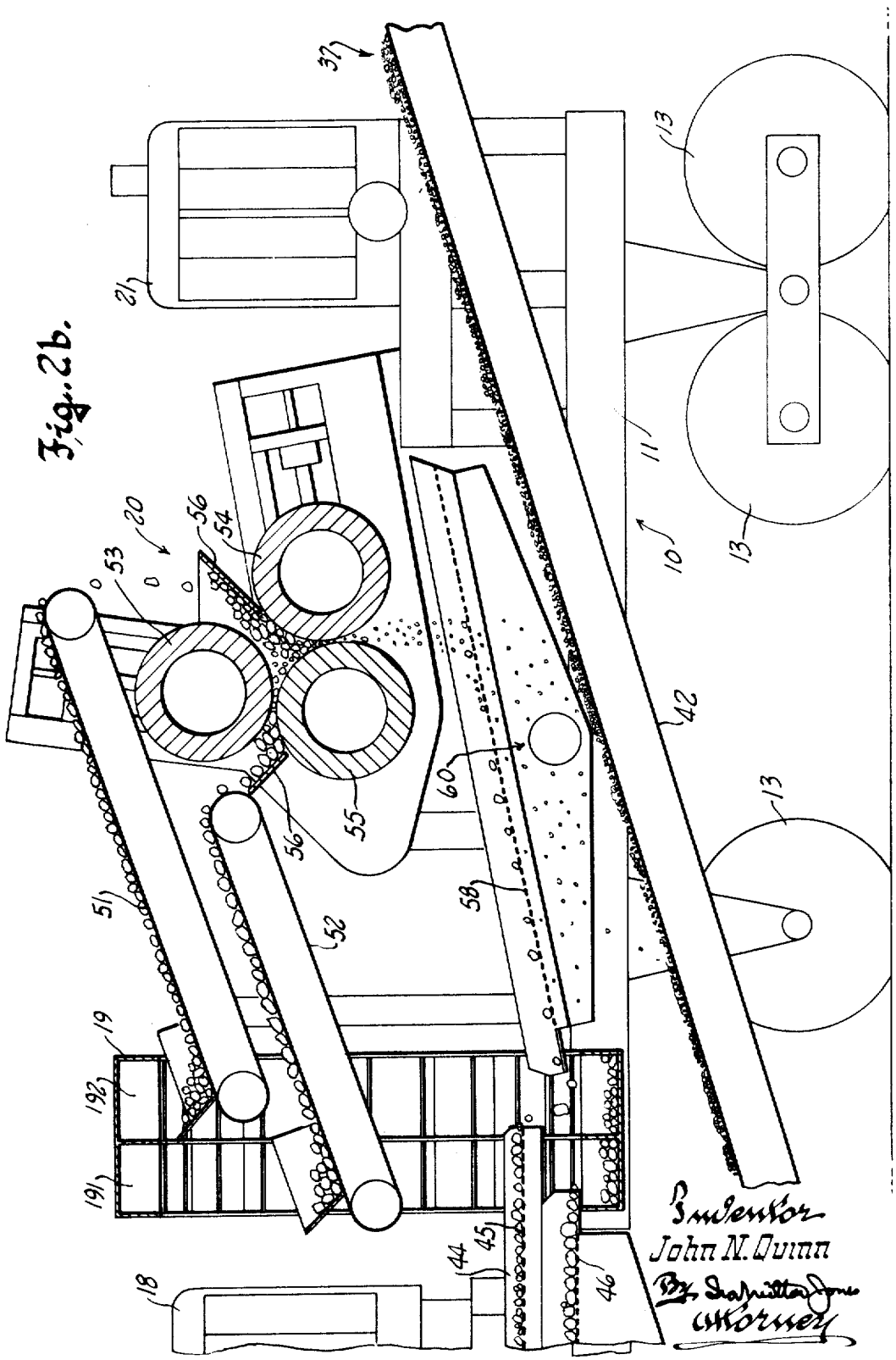

19
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42
44,45,46
17,17a
50
17b
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26
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34
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30,32
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24
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39
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Fig. 2b.


37
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13
11
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13
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56
54
53
56
55
60
42
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51
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45
44
46
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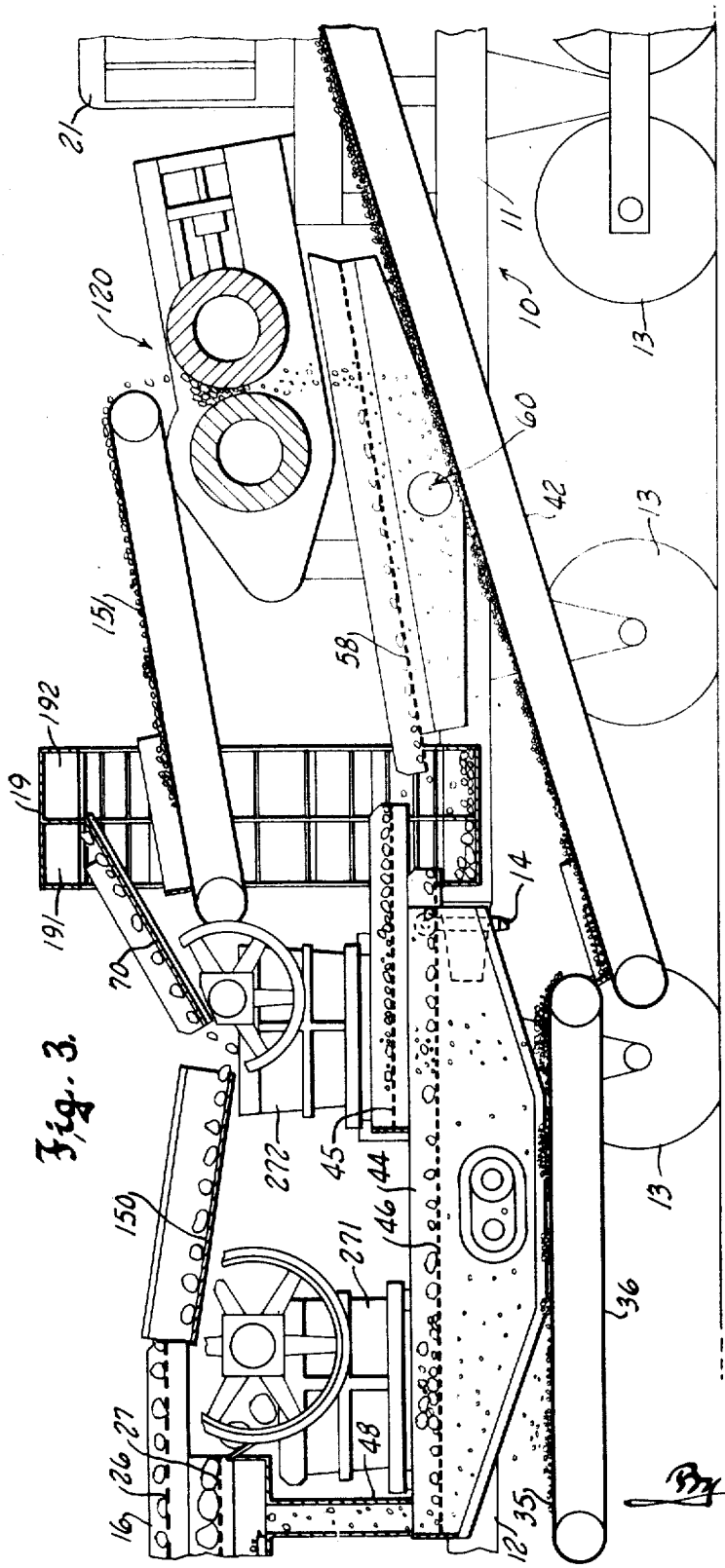



Fig. 3.

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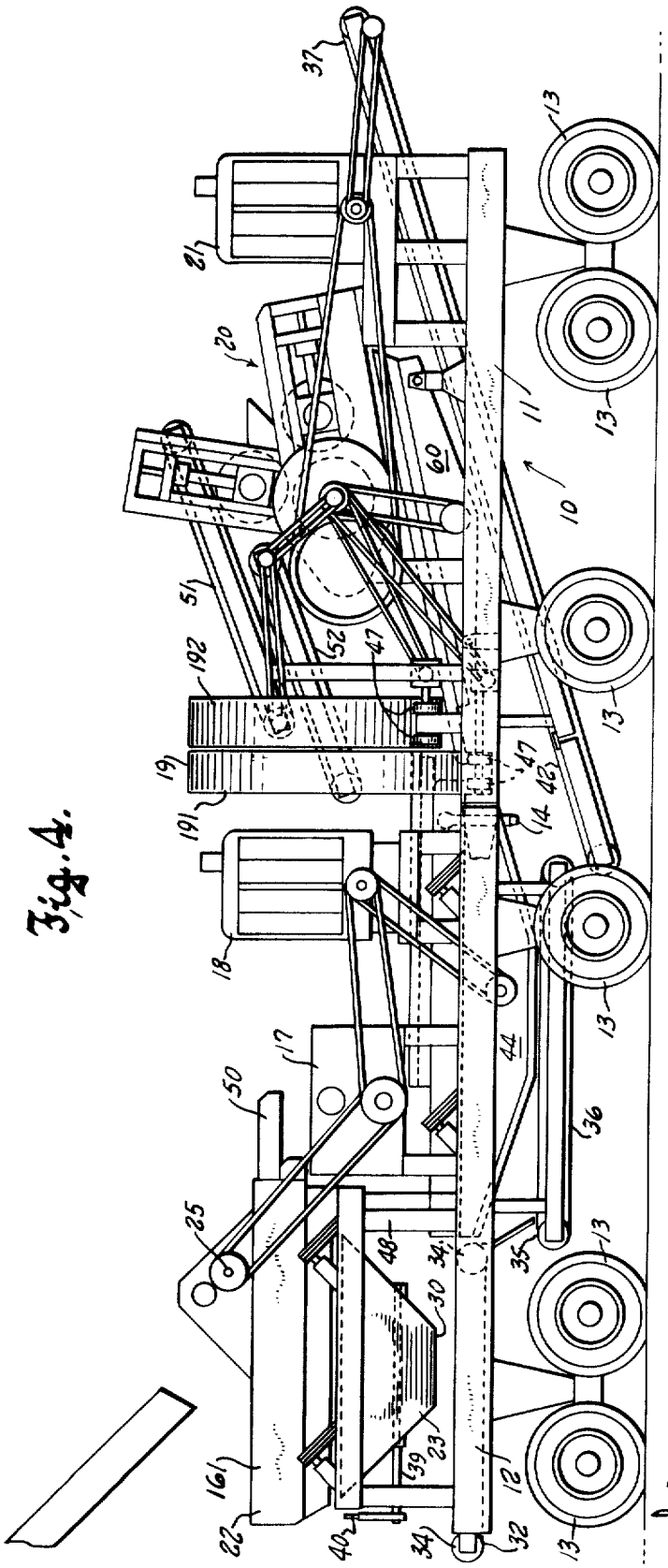


Fig. 4.

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Fig. 5a.

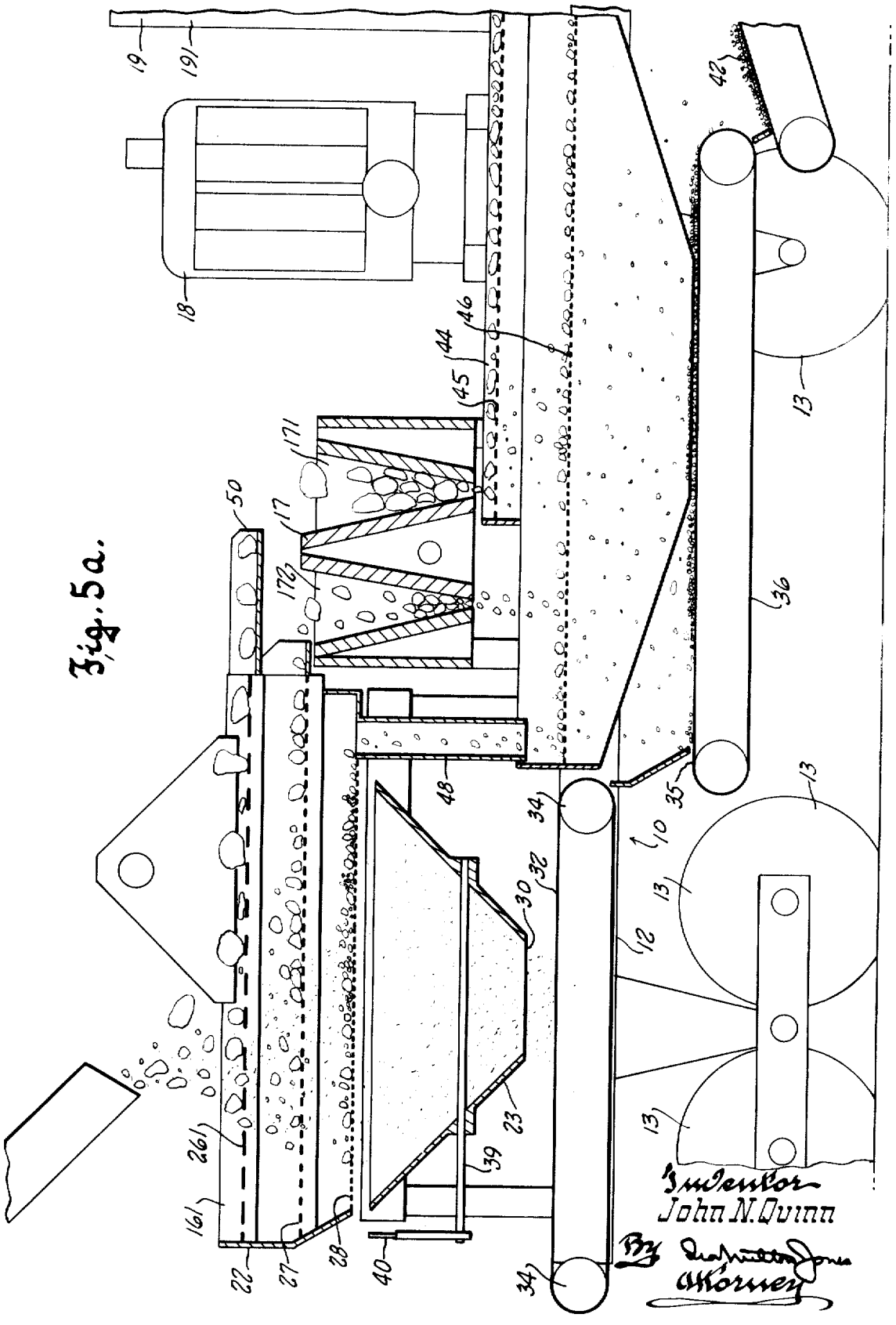
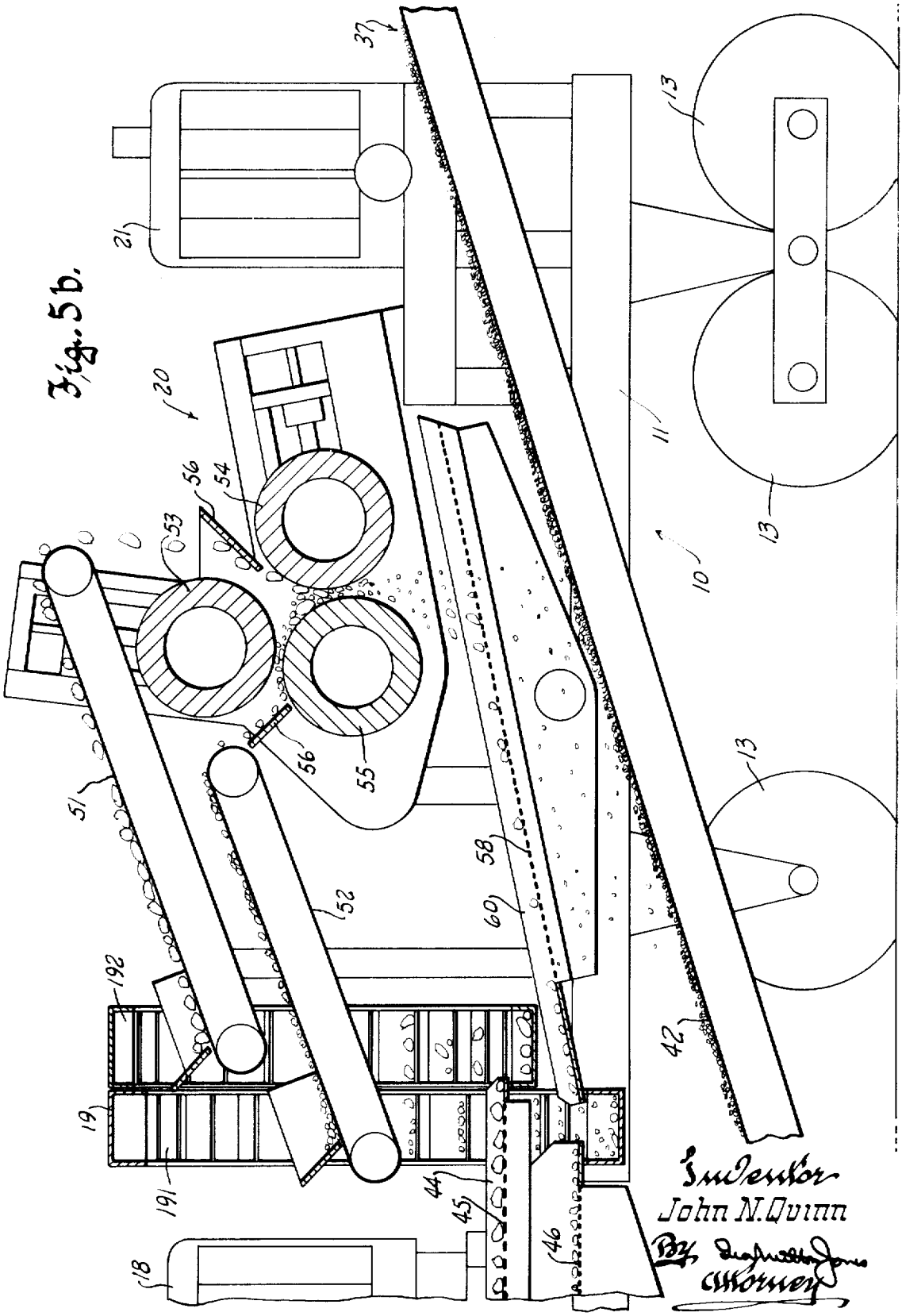

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30
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23
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261
161
22
27
28
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Fig. 5b.


37
21
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20
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54
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51
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192
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191
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# CRUSHING PLANT

## CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my copending application, Ser. No. 882,197, filed Dec. 4, 1969, now U.S. Pat. No. 3,622,089, and entitled Crushing Plant.

This invention relates to crushing plants of the type disclosed in my U.S. Pat. Nos. 3,073,536 of Jan. 15, 1963, and 3,409,235 of Nov. 5, 1968, and its object is to effect improvements in plants for crushing stone, gravel or other crushable materials, for the purpose of achieving speedier processing of input materials and substantially increased output.

In general, it is an objective of this invention to provide a stone or gravel crushing plant of the type referred to in my aforesaid patents, but which features an improved receiving unit for input material, along with associated crushing, screening and conveying structures which cooperate to minimize the handling of the material being processed.

Another object of the invention is to provide a crushing plant of the type referred to, wherein materials can be crushed at a plurality of zones either forwardly or rearwardly of a rotary lift, or at both sides of the lift if desired, to greatly increase the output of the crushing plant.

With these observations and objectives in mind, the manner in which the invention achieves its purpose will be appreciated from the following description and the accompanying drawings which exemplify the invention.

The accompanying drawings illustrate several complete examples of embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

FIG. 1 is a side elevational view of a crushing plant embodying this invention;

FIGS. 2*a* and 2*b* are enlarged side views of the rear and front portions, respectively, of the plant seen in FIG. 1, and partly in section;

FIG. 3 is a side view of a crushing plant of modified construction, but having its receiving end portion removed to avoid duplication;

FIG. 4 is a view similar to FIG. 3 of a further modified embodiment of the invention; and

FIGS. 5*a* and 5*b* are enlarged side views of the rear and front portions, respectively, of the plant seen in FIG. 4.

Referring now to the accompanying drawings, the numeral **10** generally designates the elongated horizontal frame upon which all of the components of a crushing plant of this invention are mounted. In a portable plant such as shown, the frame consists of front and rear frame sections **11** and **12**, respectively, each provided with pairs of wheels **13** so as to be capable of support independently of the other. The adjacent end portions of the frame sections are pinned together, as at **14**, to enable them to be easily disconnected and transported separately from one location to another.

Input material to be processed is loaded into a receiving unit **16** mounted on the frame section **12** at its extreme rear end portion. Also mounted on the rear frame section but at a location forwardly of the receiving unit, is a primary crusher **17**. The primary crusher is located just behind the prime mover **18** from which it is driven. The prime mover **18** is here shown as an internal combustion engine mounted on the front of the rear frame section **12**.

Mounted on the front frame section **11**, reading from rear to front thereof, is a rotary elevator or lift **19**, a secondary crusher **20**, and another prime mover **21**, again shown as an internal combustion engine.

It is to be understood, however, that the prime movers referred to above could be provided by electric motors receiving power from an off-plant diesel electric unit, if desired.

The receiving unit **16** is comprised of superimposed upper and lower hoppers **22** and **23**, respectively, each open at its bottom. A grizzly **24** extends forwardly and upwardly out of the top of the upper hopper **22**, and it is positioned so that all



input material loaded into the receiving unit will fall onto the bars of the grizzly. The upper hopper **22** comprises part of a vibratory screen device having an eccentric mechanism driven by a cross shaft **25** which in turn is driven from the prime mover **18** in a conventional way. The vibratory screen device has three superimposed screens **26**, **27** and **28** that are vibrated in the fore and aft direction by the eccentric mechanism to cause carryover material of greater than finish size which fails to pass through the screens, to be vibrationally advanced in the forward direction toward the primary crusher **17**.

The uppermost screen **26** is positioned horizontally beneath the grizzly **24** to receive material that passes down between its bars. All but the largest pieces of input material dumped onto the grizzly pass through it to fall onto the vibratory screen **26** therebeneath. The largest pieces of input material are directed downwardly and rearwardly by the inclined bars of the grizzly to fall onto a portion of the intermediate vibratory screen **27** that extends rearwardly beyond the upper screen **26**. All the fines, such as sand and the like small particle size material, plus materials of so-called finish size, pass through the mesh of the upper and intermediate vibratory screens **26** and **27** and drop onto the lower vibratory screen **28**. The lower screen **28** can have the smallest mesh if the fines are to be rejected, but it is otherwise sized to allow all the fines and finish size pieces of input material to pass downwardly therethrough while preventing passage of larger than finish size material.

The material passing through the lower screen **28** drops into the bottom hopper **23**, which can have a pair of side-by-side downwardly and outwardly inclined discharge compartments with mouths **30** to separately direct the material onto the upper stretches of laterally adjacent endless conveyor belts **32** therebeneath. The conveyor belts extend lengthwise of the frame, under the receiving unit **16**, and each is trained over a pair of rollers **34** which can be driven in either direction by means of reversible electric motors. Hence, the top stretch of either belt can travel either forwardly or rearwardly of the frame, depending upon the direction in which its motor is operated.

In this way, either conveyor belt can be run in a direction to reject materials thereon by dumping them over the rear end of the plant, when such materials are to be discarded; or when such materials are to saved and used, said conveyor belt can be run in the opposite direction to discharge the material thereon onto the rear section **35** of a delivery conveyor **36**, which carries the materials forwardly along the frame for discharge at a delivery zone **37** at the front end of the plant.

All of the screens **26**, **27** and **28** can be of ⅞ inch or 1 inch mesh when the fines are to be retained. However, if the fines are to be rejected, the bottom screen **28** is replaced by a screen of either one-fourth inch or three-eighths inch mesh, and the finish size material is advanced forwardly thereon as carryover material, to be discharged onto the rear portion of a screen deck **46**. The fines that pass through the screen **28** are deposited onto the conveyor belts **32**, which are then run in the direction to discard the fines over the rear end of the frame.

It will be appreciated that it is possible, with the aforementioned arrangement of the conveyor belts **32**, to have one belt driven forwardly while the other is simultaneously driven rearwardly. Moreover, by the adjustment of a flap valve mounted in the lower hopper **23** on a pivot bar **39** having a handle **40** on its rear end, different amounts of the fines can be directed onto either conveyor for keeping or for discard at the rear of the plant. This gives a wide range of choice in the retention and/or rejection of fines; all can be retained or any desired percentage thereof can be rejected, depending upon the direction the conveyor belts **32** are driven and upon the adjustment of the flap valve.

The rear section **35** of the delivery conveyor **36** is mounted on the rear frame section beneath the primary crusher **17**, and it dumps materials on the upper stretch of its belt onto the rear end portion of the forward section **42** of the delivery con-

veyor. The forward section **42** is mounted on the front frame section **11**, and it extends at an upward and forward inclination, under the secondary crusher **20**, from a level well beneath the frame to a level a substantial distance above the frame and beyond the front thereof. This assures the discharge of finish materials at a relatively high delivery zone and facilitates loading of such finish material into trucks or other transit vehicles.

Also mounted on the frame under the primary crusher is a vibratory screen unit **44** having an upper screen deck **45**, and the lower screen deck **46** mentioned hereinbefore, both located over the rear section **35** of the delivery or finish conveyor. The forward ends of both decks **45**, **46** extend into the open rear end of the rotary lift **19**.

The rotary lift or elevator comprises a drum open at both ends, and mounted on pairs of rollers **47** at each side of the frame. The rollers at one side can be suitably driven by the forward prime mover, as from the input shaft of the secondary crusher **20**. The rotary lift is of the twin chambered type, having axially separated but adjacent rear and front compartments **191** and **192**, respectively.

The bottom deck **46** of the vibratory unit **44** extends rearwardly beyond the rear of the upper deck **45** and under the bottom of an upright chute **48** having its open upper end in position to receive carryover materials from the forward end of the bottom screen **28** of the receiving unit **16**. Hence, all carryover materials from the screen **28** are deposited on the bottom deck **46** of the vibratory unit **44**, for passage of any finish size material therethrough and deposit of the same on the rear section of the delivery conveyor.

The forward end of the deck **46** on unit **44** projects into the rear compartment **191** of the rotary lift **19**, while the upper deck **45** extends forwardly into the front compartment **192** of the rotary lift **19**, from the open rear thereof.

It will also be noted that the primary crusher **17** is comprised of first and second stage crushing devices **171** and **172**, respectively. The first stage of the primary crusher is located rearwardly of the second stage, with its inlet in position to receive the largest pieces of input material vibrationally advanced toward and off of the forward end of the middle screen **27** of the receiving unit **16**.

Crushed material discharges from the first stage of the primary crusher onto the rearwardly extending portion of the lower deck screen **46** of the vibratory unit **44**, which functions to vibrationally advance all of the pieces of material that are larger than finish size forwardly into the rear compartment **191** in the rotary lift **19**.

The second stage **172** of the primary crusher is fed from the top screen deck **26** of the vibratory receiving unit **16**. Carryover material on the top deck **26**, as stated, is of somewhat smaller size than the largest size pieces of input material on the center deck **27**. Carryover material on the top deck **26** is vibrationally advanced forwardly to a short chute **50**, which is in the nature of an extension of the deck **26**. This carryover material is advanced along the chute and over the top of the first stage crushing device, in bypass relation thereto, and it is directed by the chute into the upwardly opening inlet of the second stage crushing device **172**. Crushed material issuing from second stage crushing device **172** discharges from the bottom thereof onto the rear portion of the upper deck **45** on the vibratory screen unit **44**.

In this way, the largest pieces of input material are crushed in the first stage **171** of the primary crusher, while the second largest pieces of input material bypass the first crushing stage and flow directly into the second stage **172** of the primary crusher. Material of finish size and smaller passes downwardly through both decks **45** and **46** of the vibratory screen unit **44** to drop onto the rear section **35** of the finish conveyor.

Carryover material on the top deck **45** of the vibratory unit **44** is usually comprised of pieces that are smaller than those that remain on the lower deck **46** of said unit. The larger pieces are discharged into the rear compartment **191** of the rotary elevator **19**, while the smaller carryover pieces are vibrationally carried forwardly by the top screen **45**, through the rear compartment **191** of the rotary lift, and discharged into the forward compartment **192** of the lift.

The materials thus received in the elevator wheel **19** are lifted upwardly thereby to discharge zones at its top. There, the material from the front compartment drops down onto the rear of the upper one **51** of a pair of endless conveyors, and the material from the rear compartment drops down onto the rear of the lower one **52** of said conveyors. The conveyors **51** and **52** are of the endless belt type, and they extend upwardly and forwardly out of the open front of the rotary lift **19** to zones above the secondary crusher **20**.

The secondary crusher **20** also has two crushing stages. While the primary crusher has been shown merely by way of example as comprising a twin chambered jaw crusher that provides first and second stage crushing devices, the secondary crusher can, for example, comprise a triple roll crusher having coarse first and fine second stage crushing rolls **53** and **54**, respectively, cooperating with a common crushing roll **55**.

The inlet of the first stage of the secondary crusher opens upwardly to the left of the roll **53**; and the inlet of the second stage of the secondary crusher likewise opens upwardly, but to the right of the roll **53**. A chute **56** can be located at each inlet, to direct material thereinto.

The upper conveyor **51** carries material forwardly over and past the top crushing roll **53** for discharge into the inlet of the second stage of the secondary crusher; while the lower conveyor **52** discharges into the inlet of the first stage of the secondary crusher, behind the roll **53**.

Materials issuing from both stages of the secondary crusher discharge from its bottom onto a screen **58** beneath the secondary crusher but above the forward section **42** of the delivery conveyor.

Materials of finish size pass through the screen **58** and drop onto the forward section **42** of the delivery conveyor therebeneath.

The screen **58** extends rearwardly into the open front of the rotary lift **19**, to discharge oversize carryover material thereon into the front compartment **192** of the lift. Such flow of carryover materials into the rotary lift is facilitated by mounting the screen in a downwardly and rearwardly inclined attitude on the frame. However, the screen may comprise part of another vibratory unit, generally designated **60**, which can be driven from the prime mover **21** via the input shaft of the secondary crusher.

It will thus be appreciated that the forward compartment **192** of the rotary lift **19** receives oversize material from both the secondary crusher and from the second stage **172** of the primary crusher; while the rear compartment **191** of the rotary lift receives oversize material from only the first stage **171** of the primary crusher **17**.

The crushing plant illustrated in FIG. 3 differs from that previously described only in the arrangement and type of crushing units employed therein. However, crushing is also effected at several zones spaced apart lengthwise of the plant. For this purpose, primary crushing is again accomplished in two stages, by means of a first stage crusher **271**, and a separate second stage crusher **272** spaced forwardly of the first stage crusher and substantially close to the rear of the rotary lift **19**. These crushers can be individually driven by electric motors, not shown, powered from an off-plant diesel electric generator.

The secondary crusher **120** has only one stage, and it is mounted on the frame a distance forwardly of the elevator **19** but behind the prime mover **21** at the extreme front of the plant.

As before, the largest pieces of input material are sorted out by the grizzly **24** and are carried forwardly on the vibratory center screen deck **27** of the receiving unit directly into the inlet of the first primary crushing stage **271**. The next largest pieces of input material are, as before, vibrationally advanced forwardly along the top screen deck **26** of the receiving unit and onto a vibrating chute **150** which in effect provides a sub-

stantial forward extension of the top screen deck. The chute **150** extends forwardly over the top of the first primary crushing stage **271**, and it bridges the space between the latter and the second primary crushing stage **272**. The forward end portion of the chute **150** is angled downwardly somewhat, and it directs materials thereon into the upwardly opening inlet of the second primary crushing stage **272**.

Again in this embodiment of the invention oversize pieces of crushed material issuing from the first primary crushing stage, along with finish size pieces of material from the lower screen deck **28** of the receiving unit, drop onto the screen deck **46** of the vibratory unit **44**. All larger than finish size material remains on the screen **46** to be vibrationally advanced thereby forwardly into the rear compartment **191** of the twin chambered rotary lift **19**. Such material is discharged adjacent to the top of the rotary lift and falls onto a chute **70** supported on the plant in a position of downward and rearward inclination, so as to direct material out of the upper portion of the rear compartment in the lift to the inlet of the second primary crushing stage **272**. Consequently, such oversize material is fed into the second primary crushing stage to be reduced in size by its passage therethrough.

The crushed material issuing from the bottom of the second primary stage crusher **272** drops onto the vibratory screen **45**, which as before extends into the open rear of the rotary left, near its bottom, and through the rear compartment **191** to the front compartment **192**. Consequently, materials of finish size pass downwardly through the screen **45**, while oversize materials thereon are vibrationally conducted forwardly thereby and discharged into the forward compartment **192** of the rotary lift **19** along with oversize material deposited on the screen **58** from the bottom discharge of the secondary crusher **120**. Such oversize material charged into the forward compartment of the rotary lift **19** is discharged adjacent to the top of the lift, onto a belt conveyor **151** similar to the conveyor **51** described previously. The conveyor **151**, of course, is mounted on the plant in an upwardly and forwardly inclined attitude, with its rear end inside the upper portion of the forward lift compartment **192** and its forward end in position to discharge materials into the inlet of the secondary crusher **120**.

The triple vibratory screen deck receiving unit **16**, with its grizzly **24**, is also an important feature of the plant illustrated in FIG. **3**, and is also used to advantage in the crushing plant illustrated in FIG. **4**. In the latter case, the receiving unit **161** has no grizzly, and its screen deck **261** is extended to the rear extremity of the unit.

Because of the elimination of the grizzly, the top vibratory screen deck **261** of the receiving unit **161** will now carry the coarsest input material forwardly therealong and discharge it via the chute **50** into the inlet of the first stage **171** of the primary crusher **17**. Smaller pieces of the input material are advanced along the second vibratory screen deck **27** to discharge into the inlet of the second stage **172** of the primary crusher. The second stage **172** of the primary crusher is thus here located behind the first stage thereof, and under the chute **50**.

FIG. **5***b* best illustrates how oversize pieces of material discharged from the rearwardly located second stage **172** of the primary crusher are vibrationally conducted forwardly along the lower screen deck **46** of unit **44** to a discharge zone in the bottom portion of the rearmost section **191** of an elevator mechanism **19**. Oversize pieces of material discharged from the first stage **171** of the primary crusher are also vibrationally conducted forwardly along the upper screen deck **45** of unit **44** to the elevator mechanism **19**. In this case, however, the screen deck extends forwardly through the lower portion of the rear elevator section **191** and the open rear of its companion elevator section **192** ahead of it to a discharge zone in the lower portion of the latter.

Note that the forward elevator section **192** is a unit separate from the rear section **191** and is supported on the frame for rotation with its bottom at an elevation slightly above that of the rear elevator section. This is so that the downwardly and rearwardly extending end portion of the screen **58** beneath the secondary crusher **20** can pass under the forward elevator section **192** and into the open front of the rear elevator section **191**. Accordingly, both screens **46** and **58** discharge carryover materials thereon into the lower portion of the rear elevator section **191**.

The larger pieces of material being processed are carried to the top of the forwardly located elevator section **192**, from whence they are conducted to the first stage of the secondary crusher **20**. The first stage of this crusher is provided by the crushing rolls **54** and **55**, which can be spaced slightly farther apart than the crushing rolls **53** and **55** which provide the second stage of the secondary crusher. The carryover material discharged from the screen deck **46** into the rearward elevator section **191** is carried to the top of the latter, from whence such material is conducted to the second stage of the secondary crusher **20** comprising rolls **53** and **55**.

The means for conducting the material from the elevators to the first and second stages of the secondary crusher can comprise upper and lower conveyors **51** and **52**, as before.

It should be noted that the elimination of the grizzly from the receiving unit **161** has the effect of reversing the positions of the first and second stages of the primary crusher from what they were in the first described embodiments of the invention; and also of reversing the functions of the crushing rolls in the secondary crusher. Whereas before, the coarser material was conducted by the conveyor **52** into a first stage of the secondary crusher comprising the cooperating rolls **53** and **55**, the rolls **54** and **55** now comprise the first stage crushing device to which the coarser material is conducted by the upper **51** of the two conveyors that feed the triple roll secondary crusher.

This arrangement is advantageous, since the finer materials passing between the second stage rolls **53**, **55** can more readily pass between the downstream first stage rolls **54**, **55** without placing any extra load on the latter.

As mentioned hereinabove, the rearward end of the screen **58** beneath the secondary crusher passes under the forward section **192** of the rotary elevator and into the bottom portion of the rear elevator section **191**. Accordingly, any pieces of material of larger than finish size that discharge onto the screen from the secondary crusher **20** will be carried along the screen **58** into the rear elevator section **191** and then conducted to the second stage rolls **53**, **55** of the secondary crusher. When such material has been reduced to finish size, of course, it passes through the screen **58** and falls onto the forward stretch of the delivery conveyor therebeneath.

It is one of the features of the crushing plant of FIGS. **4**, **5***a* and **5***b* that the elevator mechanism is comprised of independent rotary lifts, which can be axially adjacent to one another or separated any desired distance. These lifts are ideally suited for use with secondary crusher means of the type comprising laterally adjacent first and second stage crushing devices. An example of such a secondary crushing means is the twin dual roll crusher manufactured by the Universal Engineering Corp. of Cedar Rapids, Iowa.

Twin dual roll crushers mounted in side-by-side relation on the frame of the plant can be individually fed from side-by-side conveyors or chutes having their rear end portions projecting into the rotary lifts, and disposed near the sides of said lifts. If desired, the lifts can be driven in opposite directions to facilitate their discharge into the side by side conveyors or chutes which feed the dual twin roll crusher.

From the foregoing description, together with the accompanying drawings, it will be readily appreciated by those skilled in the art that this invention provides for sorting input material into a number of different sizes, and further provides means by which such sorted material is conducted forwardly through the plant along a plurality of paths that lead to crushing devices at zones spaced lengthwise of the plant, so as to achieve faster processing of the material and greater output than was possible with crushing plants heretofore available.

Those skilled in the art will appreciate that the invention can be embodied in forms other than as herein disclosed for purposes of illustration.

The invention is defined by the following claims:

1. In a crushing plant, the combination of:
A. elongated conveyor means for conducting materials of finish size forwardly to a delivery zone;
B. first and second vibratory screens mounted above the conveyor means and extending lengthwise thereof toward one another, said screens being adapted to pass materials of finish size and to vibrationally advance carryover materials thereon toward their adjacent ends to a first low level discharge zone;
C. a third vibratory screen intermediate the conveyor means and said first screen, and having a portion extending a distance rearwardly of the latter, said third screen being adapted to pass materials of finish size and to vibrationally advance carryover materials thereon forwardly to a second low level discharge zone adjacent to said first discharge zone;
D. elevator means to receive carryover materials conducted to said first and second discharge zones and to elevate the same to respective first and second high level discharge zones;
E. primary crusher means behind the elevator means and comprising first and second stage crushing devices one of which discharges crushed material onto the rearwardly extending portion of the third screen and the other of which discharges crushed material onto said first screen;
F. a receiving unit located at an input station adjacent to the primary crusher means and having
1. means to separate the largest size pieces from the input material and to feed the same into said first stage crushing device,
2. and means to separate the next largest size pieces from the input material and to feed them into said second stage crushing device;
G. secondary crusher means located ahead of the elevator means and comprising first and second stage crushing devices both of which discharge onto said second screen;
H. and means for separately conducting materials from said high level discharge zones to said first and second stage crushing devices of the secondary crusher means.

2. The crushing plant of claim 1, further characterized in that said primary crusher means comprises first and second stage crushing devices which respectively discharge crushed material onto the rearwardly extending portion of the third screen and onto said first screen.

3. The crushing plant of claim 2, wherein said last named conducting means separately conducts material from said first and second high level discharge zones to said first and second stage crushing devices, respectively, of the secondary crusher means.

4. The crushing plant of claim 1, wherein said primary crusher means comprises first and second stage crushing devices which respectively discharge crushed material onto said first screen and onto the rearwardly extending portion of the third screen.

5. The crushing plant of claim 1, wherein said elevator means comprises a twin chambered rotary lift having a rear compartment into which carryover materials are discharged by said third screen, and having a forward compartment into which carryover materials are discharged by said first and second screens.

6. The crushing plant of claim 1, further characterized by:
A. said primary crusher means comprising a twin chambered jaw crusher providing first and second stage primary crushing devices;
B. and said secondary crusher means comprising a roll crushing unit having first and second stage secondary crushing devices.

7. In a crushing plant having an elongated frame and delivery conveyor means supported thereby for conducting materials of finish size forwardly toward a discharge zone, the combination of:
A. means on the frame for crushing materials at three crushing zones spaced from one another lengthwise of the frame;
B. elevating means comprising a pair of elevator devices mounted on the frame intermediate one of said zones and the other two, each such elevator device having a low level receiving portion and a higher level discharge portion;
C. vibratory screen members under the crushing means at said crushing zones to receive materials crushed thereat, said screen members being adapted to vibrationally advance carryover material thereon toward said elevating means and being located over the conveyor means,
1. two of said screen members being arranged to receive crushed material from crushing means located both fore and aft of the elevating means and to discharge their carryover materials into the receiving portion of one of said elevator devices,
2. and the third screen being adapted to discharge its carryover material into the receiving portion of the other elevator device;
D. means for conducting material from the discharge portion of one of said elevator devices to the crushing means at a first one of said crushing zones;
E. means for conducting material from the discharge portion of the other of said elevator devices to the crushing means at a second one of said crushing zones;
F. and a receiving unit on the frame located at an input station adjacent to the third crushing zone and adapted to separate the largest pieces from the input material and to feed said pieces to the crushing means at said third crushing zone.

8. The crushing plant of claim 7, wherein a separate vibratory screen member is mounted under the crushing means at each of said crushing zones.

9. The crushing plant of claim 7, wherein one of said crushing zones is located forwardly of the elevator means and the other two of said crushing zones are located rearwardly of the elevating means, and said third crushing zone is the rearward one of said other two crushing zones.

10. The crushing plant of claim 9, further characterized by:
A. said first mentioned material conducting means providing for the delivery of material from the discharge portion of one of said elevator devices rearwardly to the crushing means at the forward one of said two crushing zones;
B. and said second designated material conducting means providing for the delivery of material from the discharge portion of the other of said elevator devices forwardly to the crushing means at said one crushing zone.

11. The crushing plant of claim 7, wherein said third crushing zone is located between the elevator means and one of the remaining crushing zones.

12. In a crushing plant having elongated forwardly extending delivery conveyor means for finished material, the combination of:
A. a receiving unit for input material having means thereon for sorting the largest pieces of input material into two different sizes;
B. three crushing devices at zones spaced successively farther forwardly from the receiving unit along the length of the conveyor means;
C. means for effecting feeding of the pieces of material of one of said sizes into a crushing device at a first one of said zones;
D. means extending over the crushing device at said first zone for effecting transfer of the pieces of material of the other of said sizes to a crushing device at a second one of said zones forwardly of the first designated zone;
E. an elevator device ahead of said second zone and having low level receiving means and higher level discharge means;

F. a vibratory screen under each crushing device but above the conveyor means, and through which material of finish size can pass, each of said screens being adapted to vibrationally advance carryover material thereon toward and into the receiving means of the elevator device;

G. and means for delivering materials from said discharge means of the elevator device to the crushing devices at two of said zones forwardly of the first designated zone.

13. The crushing plant of claim 12, wherein said last named means effects delivery of material from said discharge means of the elevator device to the crushing device at said second zone.

14. The crushing plant of claim 12, further characterized by:

A. said first and second crushing zones being located between the receiving unit and the elevator device;

B. there being a third crushing device at a zone at the side of the elevator device remote from the receiving unit, to which said last named means delivers materials from the discharge means of the elevator device.

15. The crushing plant of claim 14, further characterized by:

A. a pair of elevator devices;

B. a double staged primary crusher rearwardly of said elevator devices;

C. a double staged secondary crusher forwardly of said elevator devices;

D. a common vibratory screen beneath the two crushing zones provided by said double staged secondary crusher;

E. and means for separately delivering material from the discharge means of each of said elevator devices respectively to the two stages of the secondary crusher.

16. A crushing plant having an elongated frame and delivery conveyor means extending lengthwise thereof, characterized by:

A. primary crushing means having first and second stage crushers;

B. secondary crushing means having first and second stage crushers;

C. a receiving unit located at an input station adjacent to the primary crushing means, said receiving unit having means for separating the largest pieces of the input material into two different sizes and for separately feeding the same into the first and second stages, respectively, of the primary crushing means;

D. a separate screen under each stage of the primary crushing means to receive material crushed thereby, and through which finish material can pass to reach said delivery conveyor means;

E. a single screen under the secondary crusher to serve both stages thereof, and through which material of finished size can pass to reach said delivery conveyor means;

F. a pair of rotary elevator devices on the frame between the primary and secondary crushing means, each adapted to receive material at a low level and to discharge said material at a higher level;

G. means for effecting discharge of carryover material from the screen associated with the first stage of the primary crushing means into the receiving means of one of said elevator devices;

H. means for effecting discharge of carryover materials from said other screens into the receiving means of the other elevator device;

I. and separate means for conducting materials respectively discharged from said elevator devices into the first and second stages of the secondary crushing means.

17. In a crushing plant having an elongated frame, and mounted thereon, the following components:

A. delivery conveyor means for finish material;

B. a receiving unit at the rear of the frame, having means thereon for sorting input material into large and larger size pieces;

C. first, second and third crushing devices at zones spaced successively farther forwardly from the receiving unit;

D. means to effect feeding of said larger and large size pieces into said first and second crushing devices, respectively;

E. elevator means located between the second and third crushing devices and comprising a pair of lifting devices each having a low level receiving zone and a higher level discharge zone;

F. a vibratory screen under each of said second and third crushing devices but above the conveyor means, through which material of finish size can pass, each of said screens being adapted to vibrationally conduct carryover material thereon to the low level receiving means of the same one of said lifting devices;

G. a third vibratory screen under the first crushing device but above the conveyor means and through which material of finish size can pass, said third screen being adapted to vibrationally conduct carryover material thereon to the low level receiving means of the other of said lifting devices;

H. means for conducting materials to the third crushing device from the higher level discharge zone of said one lifting device;

I. and means for conducting materials to said second crushing device from the higher level discharge zone of said other lifting device.

18. The crushing plant of claim 17, further characterized by:

A. said receiving unit having upper and lower vibratory screens on which said large and larger size pieces, respectively, are sorted out of the input material;

B. and chute means for conducting said large pieces from the upper of said screens and from the other of said lifting devices into the second crushing device, one of said chute means extending over the first crushing device.

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# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,670,972 Dated June 20, 1972

Inventor(s) John N. Quinn

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

ABSTRACT

Line 1, "between" should be inserted after "located"

Last three lines of Abstract (shown on lines 1-3 of page 2 of our specification) are omitted from patent:

"Carryover material on the finish screen member is led back to the elevator and is again passed through the secondary crusher."

Signed and sealed this 5th day of December 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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