Jan. 21, 1947. A. L. COOPER 2,414,721

BEET JIG WITH MOVING BED

Filed June 18, 1945 3 Sheets-Sheet 1

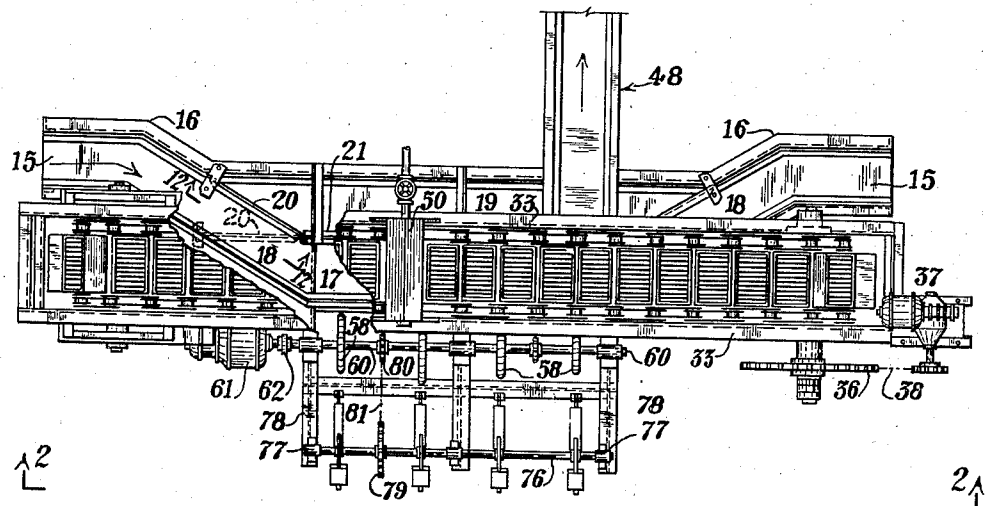


Fig. 1

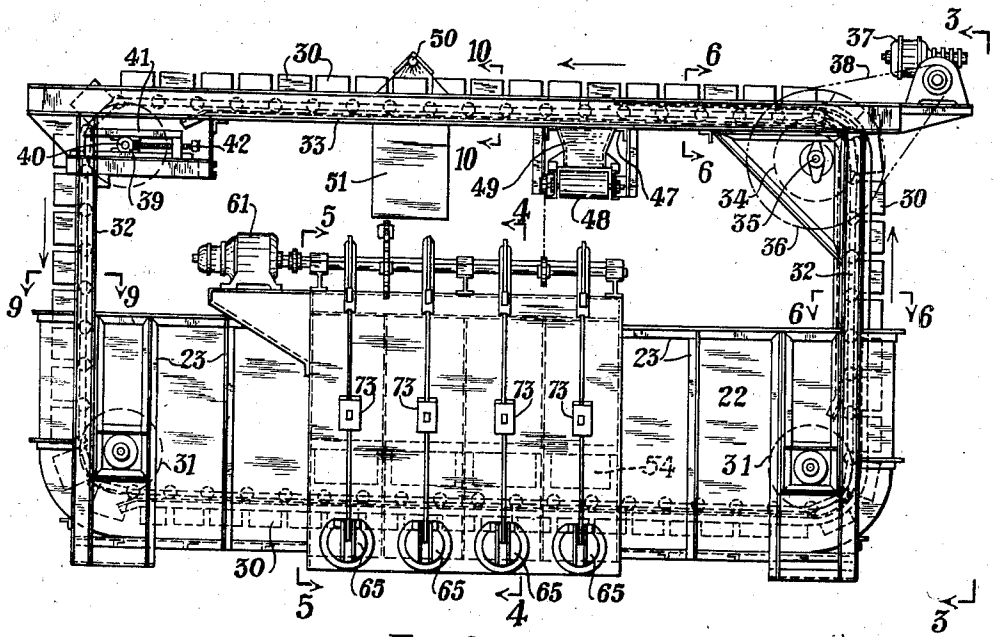


Fig. 2

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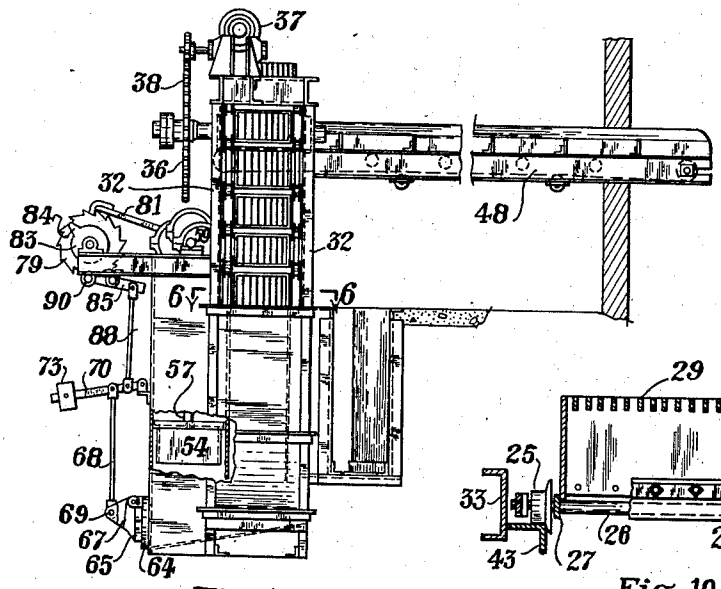


Fig. 3

Fig. 10

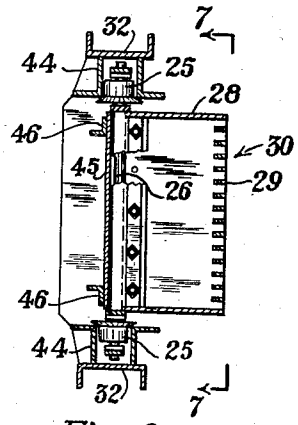


Fig. 6

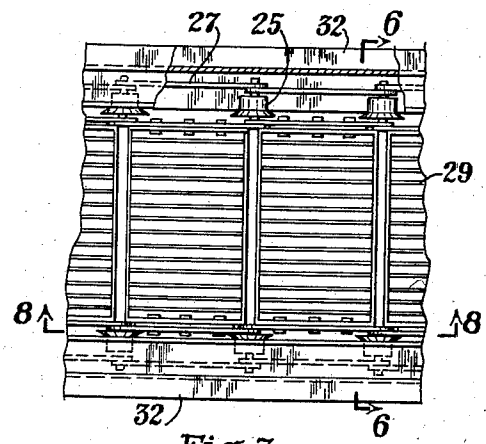


Fig. 7

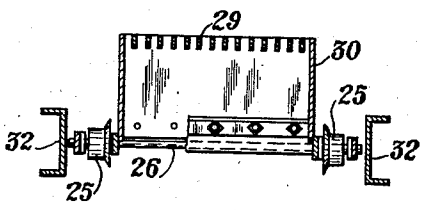


Fig. 9

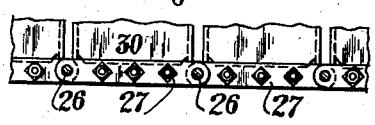


Fig. 8

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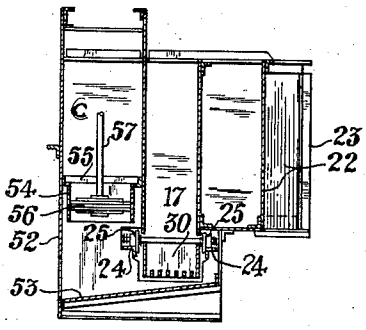


Fig. 4

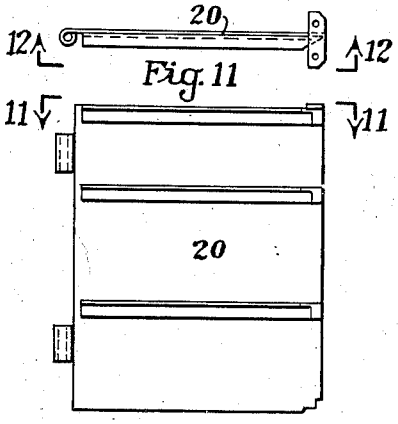


Fig. 11

Fig. 12

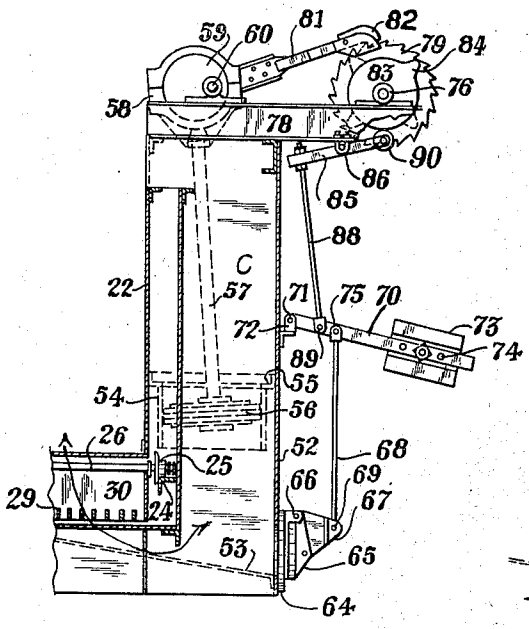


Fig. 5

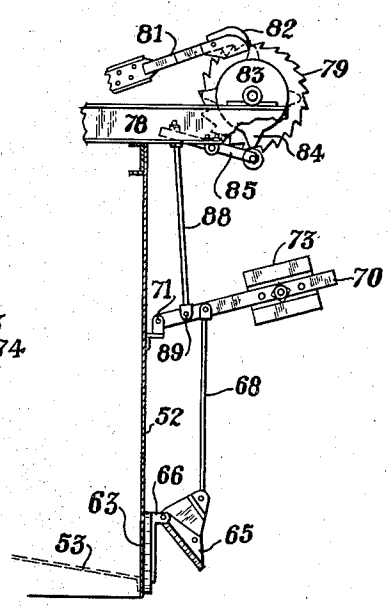


Fig. 5a

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BEET JIG WITH MOVING BED

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Application June 18, 1945, Serial No. 600,093

4 Claims. (Cl. 209—427)

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This invention relates to improvements in rock catchers.

In many places, and more particularly in factories where sugar beets are processed to form sugar, the beets are transported from the dump to the factory in a flume through which a fairly strong current of water is flowing.

Since the specific gravity of beets is approximately one, they will, as a rule, float in the stream. Due mostly to the use of mechanical devices for harvesting and more particularly for loading the beets into trucks, stones, hard pieces of clay and even iron sometimes become mixed with the beets when they are gathered from the field and these hard objects are transported from the dump to the slicing machine, by the high velocity of the current in the flume. If these hard objects are not removed before the beets reach the slicing machine, they will break, or at least greatly dull, the knives employed in the latter.

The need for an automatic means for separating rocks and other hard objects from the beets before they reach the machinery of the sugar beet factory has been recognized and various methods and apparatus have been employed to effect such a separation.

Since the use of mechanical beet loaders and harvesters has become quite prevalent, the amount of rocks and other foreign matter that finds its way into the beet dumps has greatly increased. The separators that have so far been employed require the attendance of an attendant for the purpose of cleaning the rock receiving baskets and otherwise operating the rock catchers. Sometimes the work in connection with these rock catchers is more than a single attendant can accomplish and two or more must then be employed.

It is the object of this invention to produce a rock catcher of such construction that it will automatically separate the rocks from the beets and remove the rocks and other hard material to a dump at some convenient place and do this without the need of an attendant.

It is the further object of this invention to produce a machine for the purpose described, which shall be provided with automatic means for removing fine mud and other accumulations that settle out in the rock catcher.

This invention, briefly described, comprises a flume having a section thereof offset a distance at least as great as the width of the flume and to encircle this offset portion with an endless conveyor moving in a substantially vertical plane. The conveyor is formed from a plurality of baskets hingedly connected along their open sides so as to form in effect a link belt. The bottoms of the baskets are formed from open work and serve as strainers for retaining solids above a certain size. Means is provided for moving the conveyor, preferably with the lower portion thereof in the same direction as the stream in the flume. Means is also provided for closing the open ends of the baskets along those portions of the conveyor where the latter moved upwardly and during a portion of the path where the baskets are inverted so as to keep the rocks and other material from spilling out until they reach a predetermined point. A transversely extending conveyor is positioned so as to receive the discharge from the baskets.

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Having thus called attention to some of the principal objects of this invention and in a general way described the invention itself, the latter will now be described in detail and for this purpose reference will be had to the accompanying drawings in which the invention has been illustrated in its preferred form, and in which:

Figure 1 is a top plan view of the rock catcher;

Figure 2 is a side elevation looking through plane 2—2, Figure 1;

Figure 3 is an end elevation looking through plane 3—3, Figure 2;

Figure 4 is a section taken on line 4—4, Figure 2;

Figure 5 is a section taken on line 5—5, Figure 2;

Figure 5a is a section similar to that shown in Figure 5, but showing the parts in a slightly different position;

Figure 6 is a section taken on lines 6—6, Figure 2;

Figure 7 is a side elevation looking through plane 7—7, Figure 6;

Figure 8 is a section taken on line 8—8, Figure 7;

Figure 9 is a section taken on line 9—9, Figure 2;

Figure 10 is a section taken on line 10—10, Figure 2;

Figure 11 is a view looking down onto a hinged gate for diverting the flow from the main flume to the rock catcher by-pass; and

Figure 12 is a side elevation of the gate looking through plane 12—12, Figure 11.

In the drawings reference numeral 15 designates the bottom of an ordinary flume, such as is employed for transferring beets from a dump to the sugar factory. In the present embodiment the flume has been offset between points 16 to a distance at least as great as the width of the

flume and preferably somewhat greater than this. The offset portion has been designated by reference numeral 17 and this is connected with the main flume by inclined flume sections 18. Extending parallel to the offset portion is a section 19 of the main flume which serves to by-pass section 17. A gate 20 is hinged to one end of partition 21 and when it is in the full line position shown, any water flowing through the flume will be directed to offset flume portion 17. When the latter is to be cleaned or when it is desired for any other reason to by-pass this cleaning section, the gate 20 is moved to the dotted line position shown in Figure 1. The sides of the flume sections 17 and 19 are formed by steel plates 22 secured in suitable frames of angle iron that have been indicated by reference numeral 23. Since the plates form no function except that of forming walls, there will be no further reference made to them.

Extending along the sides of the offset portion 17 are angle iron tracks 24 (see Figs. 4 and 5) on which the flanged wheels 25 travel. These wheels are mounted for rotation at the ends of axles 26 which form pivot pins for the hinges of a plurality of links 27 from which are suspended baskets having sides 28 and open work bottoms formed from a plurality of spaced parallel bars 29. The assembly of links and shafts form an endless conveyor that encircles the offset portion of the flume in the manner shown in Figure 2. The baskets have been designated in their entirety by reference numeral 30 so as to simplify the description. At the ends of the offset flume section are two pairs of sprockets 31 that engage the inside of the conveyor as shown in Figure 2. A frame work comprising vertically extending steel channels or other structural members 32 and horizontal top channels 33 is associated with the offset flume section. At the upper righthand corner, when viewed as in Figure 2, there is a pair of sprockets that has been designated by reference numeral 34 which serves as drivewheels for moving the conveyor. Sprockets 34 are secured to a shaft 35 that carries a large sprocket 36 to which motion is transmitted from the motor 37 by means of a roller chain 38. At the upper lefthand corner of the frame is another pair of sprockets mounted on shaft 39 which is journaled in bearing blocks 40. These blocks can be moved between the guides 41 by means of a suitable screw mechanism that has been indicated in a general way and designated by reference numeral 42. The sprockets on shaft 40 serve also as tighteners for the conveyor.

Referring now to Figures 6 and 10, it will be seen that there is a track formed from angle irons 43 associated with each of the top channels 33. The conveyor is supported from the tracks 43 in the manner shown in Figure 10 from which it will also be seen that in this position the baskets are inverted with their open work bottoms at the top. It is evident that nothing would remain in the baskets when in the inverted position unless some means were provided for closing their open ends.

Referring now to Figure 7, which is a section taken through a vertical portion of the conveyor and conveyor supporting frame, and to Figure 6, it will be observed that the flanged wheels 25 are each positioned between two angle irons 44 and that plate 45 is supported in front of the baskets 30 by means of angle irons 46. Plate 45 closes the open side of the baskets and prevents the contents from falling out during their passage from the lower horizontal part of the conveyor to the upper horizontal part thereof. Plate 45 extends underneath the conveyor to the point indicated by reference numeral 47 in Figure 2, as shown in Figure 6. Since the basket closing plate terminates at point 47, it is evident that as soon as any of the baskets reach and pass this point, the contents will drop out. A conveyor, which has been designated in a general way by reference numeral 48, is positioned directly beneath the conveyor to the left of point 47 and any solid material that drops from the basket will pass through the chute 49 onto the conveyor 48 and be discharged to one side as indicated in Figure 1. Conveyor 48 is operated by a suitable mechanism, which has not been shown. A washer 50 is positioned above the conveyor and discharges a strong stream of water through the open work bottoms and removes any material that might cling to the bars 29. The solid material and water so discharged is directed into flume section 17 by a launder 51.

Let us now assume that a stream of water carrying beets and solid matter is flowing through the flume in the direction of the arrow in Figure 1 and that gate 20 is in full line position. The water with its load of beets and solid matter will then pass into the offset flume section 17 whose bottom is formed by the conveyor that has been described above. The very heavy material such as rocks and pieces of iron will settle downwardly and enter the baskets and will be carried along by the conveyor until it reaches point 47 where it will drop from the basket onto the conveyor 48.

It has been found that in order to effect a satisfactory separation it is not always sufficient to flow the stream of water with its load over a series of rock catcher baskets; it has further been found that in order to effect a satisfactory separation, the water in the offset flume section must be pulsated in an upward and downward direction. The pulsation of the water has a very decided beneficial effect on the separation as has been demonstrated in connection with ore separation where such pulsators are extensively employed.

For the purpose of pulsating the water in the offset section of the flume a compartment C is formed adjacent the outside of the offset flume section as shown most clearly in Figures 4 and 5. The outside wall of this compartment has been designated by reference numeral 52 and the inside wall thereof by reference numeral 22. An inclined bottom plate 53 extends from the lower end of wall 52 to the inside wall of the offset flume section 17. Positioned in chamber C are a pluraltiy of short cylinders 54 that are held in position by means of angle iron frames 55. Positioned within each of these short cylinders is a piston 56 from which a piston rod 57 extends upwardly. The upper end of each piston rod has a bearing 58 that operatively engages and encircles an eccentric 59 which is secured to a shaft 60. Shaft 60 is rotated by means of a motor 61 to which it has been shown as directly connected. A suitable reduction gear, however, is provided so as to reduce the speed of shaft 60 to that which is best suited for this purpose. When shaft 60 and the eccentrics 59 rotate, pistons 56 will be reciprocated, thereby causing the water to pulsate and move alternately in opposite directions through the baskets 30. The direction of the pulsating water has been indicated by a doubleheaded arrow in Figure 5. Any small material or material that

is partially soluble in water will pass between the bars 29 onto the inclined floor 53 and will accumulate at the lowest point on floor 53.

Walls 52 are provided with a plurality of openings 63 that are encircled by means of annular frames 64, a cover 65 is hinged to frame 64 at point 66. The covers have outwardly extending brackets 67, to the ends of which rods 68 are connected by means of pivots 69. A lever 70 is pivoted at 71 to a supporting bracket 72 that is attached to the outer surface of wall 52. A weight 73 is secured to the outer end of lever 70, which is provided with a number of holes 74 that permit the weight to be changed with respect to the pivot 71. The upper end of connecting rod 68 is pivoted to lever 70 at point 75. It will now be obvious that the cover 65 will be biased to closed position by the action of weight 73.

A shaft 76 is mounted for rotation in bearings 77 carried by the laterally extending I-beams 78. Shaft 76 is provided with a ratchet wheel 79. Shaft 60 has an eccentric 80 from which an arm 81 extends. This arm is provided at its free end with a pawl 82 that engages the teeth of the ratchet wheel, as shown most clearly in Figures 5 and 5*a*. The throw of eccentric 80 is such that the ratchet wheel will be stepped one notch for each revolution of shaft 60. Secured to shaft 76 are a plurality of cams 83, each of which has at least one outwardly extending cam surface 84. A lever 85 is pivoted at 86 to the under surface I-beams 78. The inner end of lever 85 is connected by means of a rod 88 with lever 70 at point 89. The free end of lever 85 has a roller 90 that is held against the surface of cam 83 by the action of weight 73. When cam 83 reaches the position shown in Figure 5*a*, lever 85 will be rocked clockwise about its pivot and will lift arm 70 with weight 73 and thereby rock the cover 65 about its pivot 66 due to the action of the connecting rod 68. This opens a passage through opening 63, allowing any accumulation of mud or other material to be discharged. In the drawings four covers 65 have been shown and four mechanisms for opening and closing the openings 63. The material discharged through opening 63 can be removed by any suitable means, such as centrifugal pumps or by an inclined trench if this can be employed.

It will now be seen that whenever motor 61 is operating, it will rotate shaft 60 and reciprocate the several pistons 56, producing the desired pulsation of the water that flows through the offset flume section. The eccentrics 59 are preferably angularly spaced so that the several pistons will be at different points in their cycle at the same time. Cams 83 are also angularly displaced so that the several covers 65 operate in sequence instead of opening and closing simultaneously.

Operation

The rock catcher that has been described above operates in the following manner. Motors 37 and 61 are put into operation, whereupon the conveyor that encircles the offset portion of the flume will move in the direction of the arrows shown in Figure 2. At the same time pistons 56 will reciprocate and cover 65 will open and close. Conveyor 48 will also be operated in such a direction as to move material outwardly in the direction of the arrow shown in Figure 1. When a stream of water carrying a mixture of beets, rocks, pieces of iron and any other hard material flows through the flume, the heavy material will

tend to settle and fall into the baskets in their passage through the offset flume section. The pulsation of the water keeps the beets afloat and permits the heavier material to settle. Any mud or slime that passes through the open work bottoms of the baskets will accumulate at the angle formed by wall 52 and bottom 53 and will be finally discharged through openings 63. When the baskets reach the sprockets 31 and begin to turn upwardly, the open side will be closed by plate 45, which prevents any solid material from falling out. Plate 45 continues up and over to point 47. When the baskets pass point 47 and material contained therein will be released and fall onto the conveyor 48, which will transport it to any desired dump.

In the drawings and in this description, the fine details of the construction have not been shown or described because the exact construction of the frame and specific mechanism can be altered without affecting the general principle of operation.

The gist of the invention as has already been pointed out, consists in offsetting a section of the flume and encircling this section with an endless conveyor composed of a series of hingedly connected baskets. The conveyor forms the bottom of and extends the entire length of the offset flume section with the result that any solid matter that settles downwardly will fall into the baskets and these will carry such solid matter upwardly and deposit it on the transverse conveyor 48.

The construction employed in which the conveyor extends lengthwise of the offset provides a long space in which the separation may take place; this assures a complete separation of all materials that have a density materially greater than that of the beet.

The automatic means for cleaning any sludge that passes through the open work bottom of the baskets and for pulsating the liquid, has been shown and adds its effect to the other parts of the mechanism.

The rock catcher above described is entirely automatic in its operation and has a large capacity and is therefore well suited for use in sugar factories where the beets are usually mixed with a considerable amount of solid foreign matter.

Although this device has been described in connection with the separation of high density solid matter from beets, it is not the intention to limit its use to this purpose, as it is conceivable that this device may be used for specifically different, but analogous purposes.

Having described the invention what is claimed as new is:

1. A rock catcher comprising, in combination, a flume having a section thereof offset a distance at least as great as its own width, an endless conveyor encircling the offset portion for movement in the longitudinal vertical plane thereof, the conveyor comprising a plurality of hingedly interconnected baskets having open work bottoms, the open sides of the baskets facing inwardly, said baskets forming the entire bottom of the offset portion of the flume, means for moving the conveyor in the direction of its length, the bottom moving in the direction of materials flow, means for closing the open sides of the baskets during the upward passage of the conveyor and for a portion of the upper portion thereof, and means for receiving and transporting rocks discharged from the conveyor at the end of the basket closure.

2. A rock catcher comprising, a flume having

a section thereof offset a distance at least as great as its own width, an endless rectangular conveyor encircling the offset section and mounted for movement in a substantially vertical plane, parallel with the offset, the conveyor forming the entire bottom of the offset section, means for imparting to the conveyor a continuous movement, the bottom of the conveyor moving in the direction of its length, the conveyor consisting of a plurality of baskets hingedly interconnected along their open ends to form an endless assembly, the baskets having open work bottoms serving to screen out solid objects above a predetermined size, means for closing the open ends of the baskets along that portion of their path where they move upwardly and for a portion of the path where the baskets travel in inverted position, to retain the solid matter therein and means positioned to receive the solid matter when it is released from the baskets at the end of the closure and for transferring it to one side of the flume.

3. A rock catcher comprising a flume having a section thereof offset a distance at least as great as its own width, an endless conveyor encircling the offset section and mounted for movement in a substantially vertical plane, the lower side of the conveyor being straight, forming the bottom of the offset section of the flume, means for imparting to the lower side of the conveyor a continuous movement, in the direction of materials flow the conveyor consisting of a plurality of baskets hingedly interconnected along their open ends to form an endless assembly, the baskets having open work bottoms serving to screen out solid objects above a certain size, means associated with the offset flume section for imparting to water flowing therethrough, a pulsating movement to facilitate separation of different density,

means for closing the open sides of the baskets along that portion of their path where they move upwardly and for a portion of the path where they travel in inverted position, to retain solid objects therein to the point where the closure terminates, and a conveyor positioned underneath the upper part of the conveyor in position to receive solid objects as they drop from the inverted baskets.

4. A rock catcher comprising, a flume having a section thereof offset a distance at least as great as its own width, forming a by-pass to a portion of the main flume, means comprising a gate for directing material from the main flume to the by-pass, an endless conveyor loop encircling the offset section and mounted for movement in a substantially vertical plane, parallel with the offset, the lower side of the conveyor forming the bottom of the offset section of the flume, means for imparting to the conveyor a continuous movement in the direction of materials flow, the conveyor consisting of a plurality of baskets hingedly interconnected along their open ends to form an endless assembly, the baskets having open work bottoms serving to screen out solid objects above a certain size, means associated with the offset by-pass for imparting to water flowing therethrough a pulsating movement to facilitate separation of materials of different densities, means for closing the open sides of the baskets along that portion of their path where they move upwardly and for a portion of the path where they travel in inverted position, to retain solid objects therein to the point where the closure terminates, and a conveyor positioned underneath the upper part of the first mentioned conveyor in position to receive solid objects as they drop from the inverted baskets.

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