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ROCK CATCHER AND REMOVER

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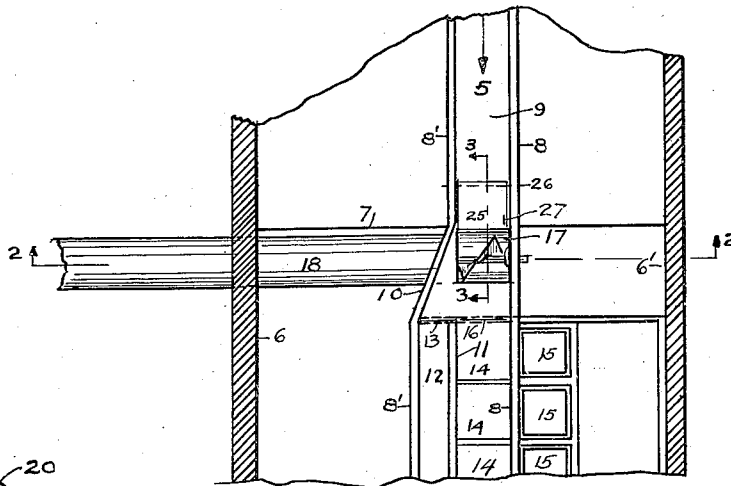


Fig. 1

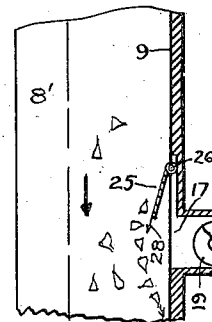


Fig. 3

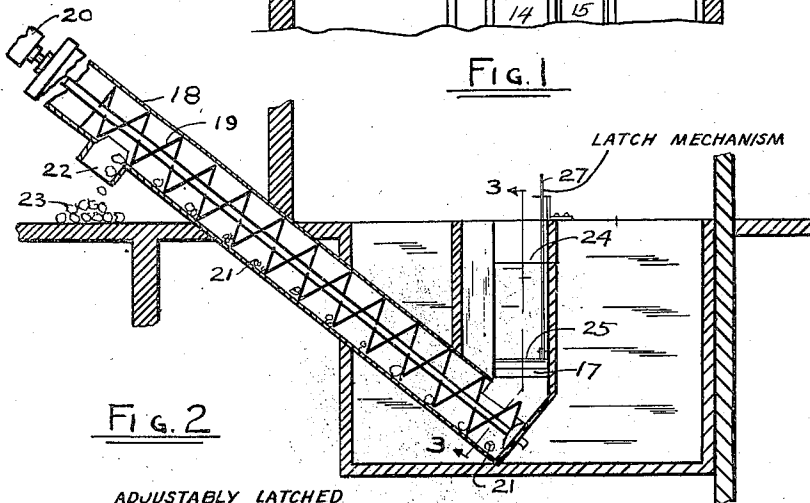


Fig. 2

ADJUSTABLY LATCHED

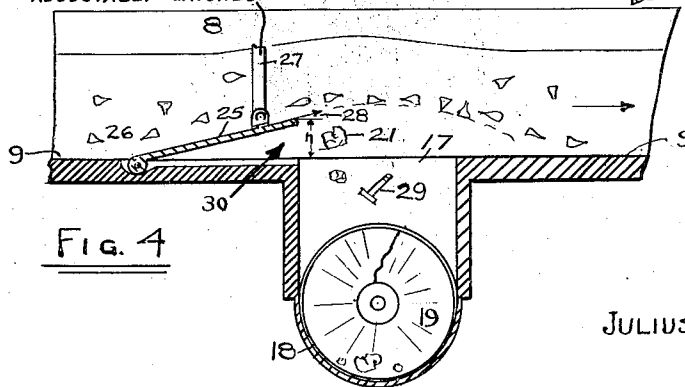


Fig. 4

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ROCK CATCHER AND REMOVER

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1 Claim. (Cl. 209—118)

This invention relates to improvements in rock catchers for use in sugar beet factories and similar places.

In the processing of sugar from sugar beets, the beets are delivered to the sugar factory from the beet fields and piled in places adjacent to a flume which conveys them to the beet washers from which they are elevated into bins and passed from these to slicing machines.

The harvesting of beets and their loading on trucks is now effected almost entirely by machinery. The gathering of the beets from the ground and loading them onto trucks by means of power operated machines results in a great saving of labor, but has this objectionable feature that since the loading machines cannot distinguish between a beet and a stone, or other hard object, it frequently happens that stones, bolts, hard pieces of wood and other objects are picked up along with the beets and deposited in the trucks and are finally mixed with the beets at the sugar factory. Beets are transported to the beet washers in flumes where a stream of water flows towards the washer and carries the beets. The rate at which the beets are fed to the washer is controlled by a suitable device comprising a multi-spoked wheel positioned in the flume and rotated by power at a given speed or by a hydraulic gate operating in the flume.

The water in the flume flows at a considerable velocity and pebbles and stones of considerable size and sometimes pieces of iron, such as bolts and nuts, are carried along with the beets and unless these hard solid bodies are separated before the beets are elevated to the slicing machines, they injure the knives and sometimes cause breakage to such an extent that certain parts of the machinery must be closed down for repairs.

Flumes carrying beets, in the manner described, have heretofore been provided with certain mechanisms for removing stones and other heavy hard material from the beets, such devices comprising a series of catcher baskets positioned in the bottom of the flume and pumps for pulsating the water through the baskets. Such rock catchers have been found very satisfactory and efficient so far as removing rocks and other heavy particles is concerned. The amount of material removed by such rock catchers is usually quite large and as a result the baskets must be continually removed, emptied and replaced and this requires the services of one or more men during the entire beet campaign.

It is the object of this invention to produce a

rock catcher that can be readily incorporated in or connected with the present flumes at a point above the ordinary rock catcher, or used in connection therewith, which will automatically separate stones and other heavy material from the beets and convey them continuously to a suitable dump outside of the building.

The additional rock catcher to which this invention relates, has been found to be sufficiently efficient to practically eliminate the necessity of removing or cleaning the rock catcher baskets except at very infrequent intervals with the result that a large amount of expense that would otherwise be entailed through the necessity of servicing the rock catcher, is eliminated.

This invention, briefly described, consists in positioning a scroll conveyor in an incline with its lower end positioned underneath the flume. A hole is cut in the bottom of the flume directly above the lower end of the conveyor. Any heavy material such as rocks, bolts or other hard and heavy material that is being swept along the bottom of the flume by the water, will naturally drop into the opening and onto the scroll and since the latter is being continuously rotated, the solid materials will be elevated and deposited in a suitable place outside of the building in a continuous manner.

Since sugar beets are quite heavy and have a density of approximately one, and sometimes more than one, it follows that unless some means is provided to prevent it, the heavier beets that follow the bottom of the flume will drop through the opening and onto the scroll along with the rocks and be carried away, which, of course, is highly objectionable. If a sufficiently fine grating is provided in the bottom of the flume to prevent beets from going through, it will not permit the larger stones and pebbles to pass with the result that the apparatus will soon become inoperative.

It has been found that by means of the simple expedient of providing an adjustable section in the flume bottom directly above the opening leading to the scroll conveyor and inclining this upwardly in the direction of flow, an upwardly curved stream can be created in the water of the flume that will carry the beets over the opening and which will not interfere with the heavier material dropping into the conveyor.

Having thus described the objects of the invention and briefly described the apparatus by means of which the objects are attained, the apparatus will now be described in detail and for this pur-

pose reference will be had to the accompanying drawing in which the invention has been illustrated, and in which:

Figure 1 is a top plan view of a portion of a beet carrying flume showing the relative positions of the different means for removing rocks;

Figure 2 is a section taken on line 2—2, Figure 1;

Figure 3 is a section taken on line 3—3, Figure 1; and

Figure 4 is a section similar to that shown in Figure 3, but drawn to a somewhat larger scale, and looking in the opposite direction.

In the drawing reference numeral 5 designates a flume which is employed for transporting the beets from the beet pile into the factory, the water flowing in the direction of the arrow.

At a point shortly before the beets reach the washer, a pit is provided. This pit has side walls 6, 6' and end walls 7 and 7', the wall 7' has been broken away and is not visible on the drawing. The flume is usually provided with cement side walls 8, 8' and a bottom 9. At the point where the flume enters the pit, it is widened, the wall 8' being provided with an incline wall 10 which connects the two displaced portions of wall 8'. A wall 11 forms a continuation of the corresponding wall of the flume and divides the space between walls 8 and 8' into two passageways, the one designated by reference numeral 12 being a by-pass. A gate 13 controls a flow of water through the by-pass. The space between walls 8 and 11 forms the normal passageway for the beets and the bottom of the flume at this point is provided with removable rock catcher baskets 14, three of which have been shown. Pulsator pumps, whose pistons have been designated by reference numerals 15, are reciprocated by a suitable mechanism and cause the water to pulsate through the baskets, preventing the beets from settling thereinto, while permitting rocks and heavy material to fall into the baskets. When the baskets are cleaned, the gate 16, which controls the flow through the passage above the baskets can be shut and the beets directed through the by-pass 12. The construction so far described is the old and well known rock catcher mechanism which is extensively employed. Although this forms no part of this invention, it has been shown and described to facilitate the description of my improvement.

In the present construction an opening 17 has been cut in the flume floor. A scroll conveyor comprising a scroll housing 18 and a rotatable scroll 19 positioned therein, is placed with its lower end beneath the opening 17, the housing being provided with an opening communicating with the flume through the opening 17 in the floor. A motor 20 is connected with the scroll and rotates it in such a direction that any solid material such as the rocks 21 shown in Figure 2, will be carried upwardly and discharged through the spout 22 onto the rock pile 23. When the beets are being transported to the factory, the flume is provided with sufficient water to form a stream whose top has been designated by reference numeral 24. The flume is inclined so as to give this stream the necessary velocity to transport the beets.

As the beets and stones reach the opening 17, the stones will drop through this opening and into the scroll conveyor, which will carry them upwardly and deposit them on the pile 23.

Due to the fact that the beets are quite heavy, a large number of them will fall through the

opening and into the conveyor unless some means is provided to prevent it. As above described, a screen or grating is not satisfactory for the reason that the openings must be small enough to prevent the beets from falling through and such openings are oftentimes too small to permit rocks that are carried along with the stream, to drop through. Although a screen may be employed, it must have sufficiently large openings to permit the biggest rocks to pass and since it frequently happens that these rocks are larger than some of the beets, the smaller beets can pass through such a screen.

In order to prevent the beets from falling into the conveyor, through the opening 17, a plate 25 having a width substantially equal to the width of the flume, has its end pivoted to a bolt or bar 26 that extends through the flume walls as shown in Figure 1. This plate can be tilted upwardly and held in adjusted position by means of a suitable bar 27 that can be clamped or latched in various vertically adjusted positions.

Referring now more particularly to Figures 3 and 4, where the plate 25 has been shown as upwardly inclined in the direction in which the water flows, it will be observed that when the water strikes the upwardly inclined surface of plate 25, it will be given an upward direction and the stream of water will leave the lower edge of the plate in an upwardly inclined direction. The stream will then travel in an upwardly arched path as designated by arrows 28 in Figure 4 and the beets which are either heavier or have almost the same density as the water will travel in a path corresponding to the curved path of the water and will thus pass over the opening 17 and be deposited on the flume floor below this opening.

Heavy rocks, such as that designated by reference numeral 21 and bolts such as the one designated by reference numeral 29 being much heavier than the beets, will not be materially affected by the upwardly curved stream, but will fall downwardly as soon as they leave the edge of plate 25 and will drop into the conveyor and be carried upwardly by the action of the scroll therein.

The width of the opening 17, the inclination of plate 25 and the velocity of the water in the flume must be so proportioned that under normal operating conditions the beets will pass entirely over the opening. For the purpose of removing the rocks and iron and other heavy material, a very narrow opening 17 would be necessary, but it is desirable to have the opening as wide as practicable so as to be sure that rocks having a low specific gravity will also be removed.

In the drawing and in this description, a single scroll conveyor has been shown and this is ordinarily sufficient to completely remove all dangerous rocks and solid matter. It is, of course, possible to provide two or more such rock separators positioned at different points along the flume and a very thorough separation can thus be assured.

Where a factory is not already provided with the ordinary rock catcher mechanism comprising the baskets 14 and pulsators 15, these need not be installed as one or more rock catchers of the type to which this invention relates, will perform the same function and perform it better and eliminate all of the labor and service necessitated by the use of the old type basket rock catcher.

Attention is called to the fact that the function of the plate 25 is to give an upward direction to the water as it begins its journey across

the opening 17. The use of an inclined and adjustable plate is believed to be the simplest means to effect the results desired. It is to be understood, however, that this means is merely illustrative of means to produce an upwardly arched stream of water over the opening to the scroll conveyor and that other mechanical equivalent means can be substituted without departing from the spirit of the invention. As an example of another means for this purpose, a stream of water directed upwardly in the direction of arrow 30 in Figure 4 might be employed. Such a stream of water can be produced by the use of a centrifugal pump. The use of a plate 25 has been shown because it is believed to be simpler and equally efficient.

In the above described embodiment, a tiltable plate 25 has been shown to effect the desired mode of operation because of its simplicity and because it can be installed in flumes already constructed.

Attention is directed to the fact that the raised or lower end of plate 25 is considerably higher than the bottom of the flume on the opposite side of opening 17 and therefore any article carried by the water and having a tendency to sink therein must fall at least the distance of the lower edge of plate 25 above the bottom of the flume in passing over the width of the opening 17. This can be easily effected by heavy objects,

such as rocks, but the sugar beets being so nearly of the same density of the water do not sink very fast and therefore pass over.

Having described the invention what is claimed as new is:

A device for continuously separating sugar beets from rocks and the like, comprising a flume, means for flowing a stream of water therein, the bottom of the flume having an opening extending across the same, that portion of the bottom directly adjacent the upstream side of the opening being provided with a plate of the width of the flume bottom and hinged to the flume along its upstream end, for movement about a horizontal axis, the downstream end of the plate terminating adjacent the upstream wall of the opening, means for raising the free end of the plate to adjust its height relative to the flume bottom on the downstream side of the opening, to a position in which it will be upwardly inclined in the direction of flow, said means comprising an upwardly extending tension member having its lower end attached to the plate at a point below the pivot, and means positioned above the flume for latching the tension member in any desired position whereby the beets and rocks carried along by the stream will be discharged into the space above the opening at a point elevated above the flume bottom on the downstream side.

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