July 19, 1960 G. J. OLNEY 2,945,589

VEGETABLE SEPARATING MACHINE

Filed June 9, 1955 3 Sheets-Sheet 1

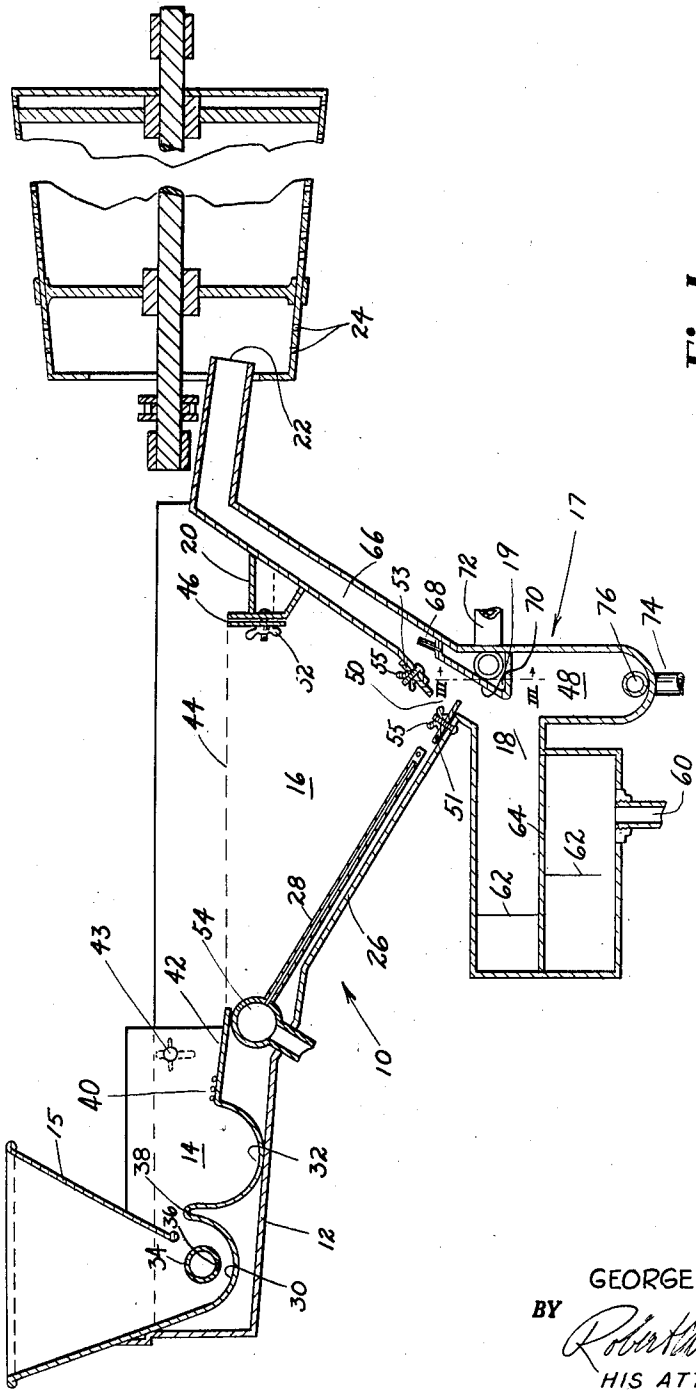


Fig 1

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VEGETABLE SEPARATING MACHINE

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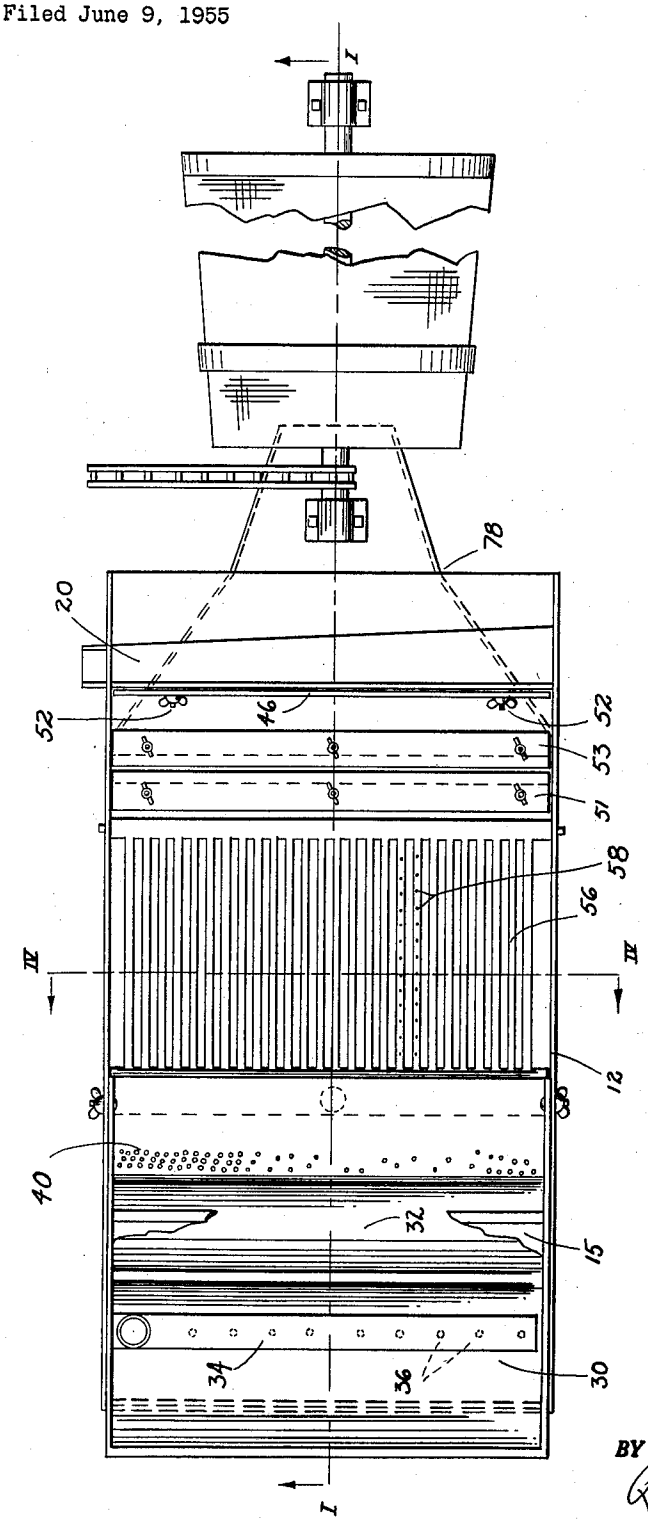


Fig II

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VEGETABLE SEPARATING MACHINE

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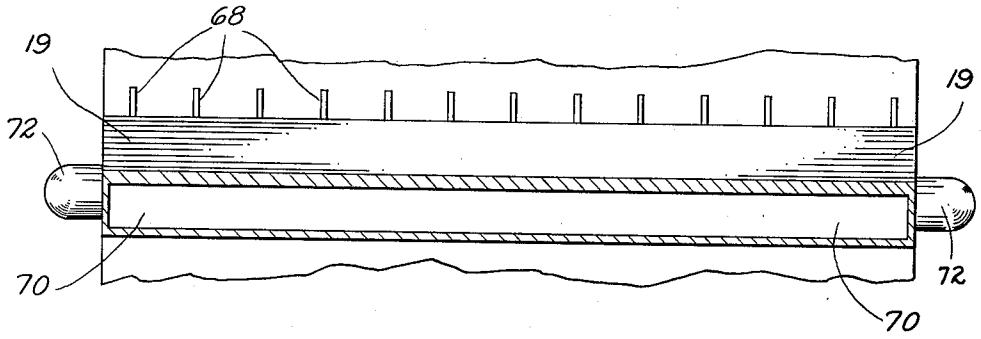


Fig III

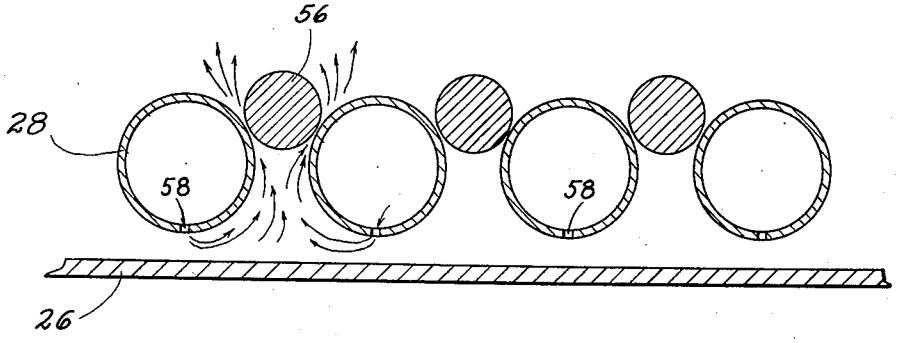


Fig IV

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2,945,589

VEGETABLE SEPARATING MACHINE

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12 Claims. (Cl. 209—164)

This invention concerns vegetable separating and cleaning mechanisms and more particularly flotation type machines for separating fresh shelled peas, lima beans, cut kernels of corn and the like from both heavy and light foreign matter.

In certain aspects the present invention may be said to be an improvement over my prior Patents 2,198,390 issued April 23, 1940, and 2,571,056 issued October 9, 1951. Generally speaking, vegetables such as raw shelled peas, lima beans and so forth have mixed therein with the good vegetables foreign material or trash such as crushed stems, pods, leaves and so on known as "light trash" and stones, glass, nails and so on known as "heavy trash." As is well known, these different kinds of trash have different specific gravities from good vegetables and consequently can be readily separated by properly controlled water currents.

Flotation machines used in food processing industries customarily use tanks from 24 inches to 72 inches in width into which the vegetables are introduced to be cleaned. To obtain maximum efficiency in separating the light trash and heavy materials like stones, cinders, broken glass, etc., from the good vegetables, the products should be fed into the flotation chamber continuously in a thin stream covering the whole width of the flotation chamber. Various complicated devices are in use to obtain this wide even spread, but perfect results are rarely obtained.

Likewise, inefficient operation is caused by the fact that the vegetable products once dispersed for cleaning, must be brought to a central point at the lower point of these flotation tanks for final ejection. Some designs use a single outlet pipe, others try to improve results by using two pipes. The necessity of converging the products to a central point of discharge induces various water currents that upset the quiet state of the water required in the flotation tank, for good cleaning purposes. To offset this various baffle plates are introduced. While these plates correct these uncontrolled water currents to some extent, their presence entails a cleaning problem.

In my prior Patent 2,511,056, I show an apparatus for floating off the light trash at the top and removing the heavy trash directly below the entrance to the settling tank. This apparatus has proved successful for certain applications but has been limited in capacity and efficiency by the input method and the numerous baffles. According to the present invention, I have eliminated all obstructions and increased the efficiency and capacity by feeding the vegetables in a layer of unit thickness throughout the entire width of a settling tank regardless of how they are introduced into the machine. In addition I have provided a settling tank which has no water movement therein except that caused by the entrance of the vegetables, and I utilize the water current that removes the heavy trash to aid in the discharge of the good vegetables.

My present invention has for an object the provision of an improved form of separating and cleaning machine that is simpler and easier and more economical to produce and operate. It is another object of the present invention to provide a flotation type separating and cleaning machine that needs no baffles in the settling tank. It is another object to provide means for utilizing the entire width of the separating tank in a uniform manner. It is another object to provide a machine with a settling tank having no undesired water currents. It is another object to provide a more efficient and positive separating and cleaning machine than heretofore available. It is a further object to provide a separating and cleaning machine that can utilize plain water, water and air bubbles, and/or oil and a detergent or soap to aid in removing the light foreign material. It is a further object to provide a machine that will process the vegetables in substantially a single layer and which utilizes certain of the separating streams of water more than once. These and other and further objects will be in part apparent and in part pointed out as the specification proceeds.

In the drawings:

Figure I is a longitudinal sectional view on line I—I of Figure II,

Figure II is a top plan view of the machine of Figure I,

Figure III is a sectional view on line III—III of Figure I, and

Figure IV is a sectional view on line IV—IV of Figure II.

Referring now to Figure I, the separating and cleaning machine **10** comprises generally an outer frame **12** which has at one end a vegetable feeding chamber **14**, a V-shaped settling tank **16** adjacent the mid-portion thereof, a destoning unit **17** including a water supply chamber **18** below said tank **16**, a discharge trough **20** adjacent the end of settling tank **16** and a discharge spout **22** at the other end of frame **12**. Spout **22** discharges into a rotatable screen **24** which removes the water from the discharged vegetables and presents them for further operation. (This screen may be of any convenient type, rotated, vibrated etc. as is well known in the art and forms no part of the present invention.) Settling tank **16** has therein alongside bottom plate **26** a plurality of pipes **28** for aiding in the removal of the light trash as will be described therein.

As may be seen in Figures I and II, feeding chamber **14** comprises advantageously a hopper member **15** and a pair of troughs **30** and **32** disposed transversely of frame **12** and extending across the full width thereof. Trough **30** is higher than trough **32** and has disposed therein feed water pipe **34**. Pipe **34** has therein along the bottom a series of small holes **36** through which the feed water flows from a suitable source (not shown). This construction results in a water level in trough **30** slightly above dam **38** which together with the turbulence caused by the streams of water flowing out of holes **36** tends to distribute the peas, beans or the like, dumped in one spot in trough **30**, throughout the entire width thereof.

The turbulence above pipe **34** while desirable must not extend into settling tank **16** and accordingly is substantially eliminated by dam **38**. In fact in certain installations, particularly those where the width is less than thirty inches, a single trough has been found to be entirely satisfactory. In the embodiment shown a second trough **32** is provided which completely prevents any turbulence from reaching tank **16** and also insures that the vegetables **40** fed into trough **30** flow into settling tank **16** in a single layer throughout the entire width.

In operation the shelled peas, beans, or the like are dumped into trough **30**, preferably near the middle of hopper **15**, and spread under the natural floating action of the water in the trough and the turbulence of the water streams from holes **34** as described above. The flow of water from pipe **34** is controlled by a valve (not shown) such that the overflow from trough **30** to trough **32** and

from trough 32 into tank 16 is about one quarter inch in depth which is slightly less than the thickness of one pea, bean or the like. Although a few may go over dam 38, two or three at a time, trough 32 has a similar action so that the vegetables 40 feeding into settling tank 16 from plate 42 enter in a single layer throughout the entire width thereof. Plate 42 may be adjusted by wing nuts 43 so that it will discharge the vegetables 40 into tank 16 at water level 44 as established by dam 46.

Once in tank 16 the light trash floats across the surface 44 of the water, over dam 46 and into discharge trough 20 as will be described herein. The good material and the heavy trash drop directly onto pipes 28 and rods 56 and descend to the bottom of tank 16. As this mixture approaches the bottom of the tank 16 the good material moves to the top of the heavy trash and they pass through opening 50 in this altitude where the separation occurs as described herein. As may be readily seen the only water current in tank 16 is that of the very top layer moving from plate 42 over dam 46. Dam 46 may be adjusted up or down by wing nuts 52 to maintain the desired water level 44 in tank 16. This level is normally adjusted for maximum discharge of trash per unit volume of water circulation. Similarly plates 51 and 53 may be adjusted by wing nuts 55 to control the flow through opening 50.

Although tank 16 is exceptionally quiet and most light trash is carried off, sometimes with certain vegetable conditions there may be a tendency for the more solid pieces of "light trash" to sink with the good material. To overcome this, various methods have been used such as introducing fresh water and air bubbles, pretreating with oil and then introducing a soap or detergent, or other means to produce a froth which tends to cling to this "light trash," which is generally relatively rough, and not to the smooth good vegetables. This "light trash" is thus moved upward and may be more readily separated.

With the present apparatus any one of these methods may be used by utilizing pipes 28. Preferably I provide a series of pipes 28 having in the bottoms thereof a plurality of small holes 58. Pipes 28 are aligned with the direction of flow of vegetables along bottom plate 26 in a somewhat vertical fashion and are connected to header 54 through which may be fed a mixture of air and water and/or detergent as described. This is introduced through holes 58 at a very gentle rate so as not to create any undesired currents and the air bubbles and/or detergent in passing upward to the surface 44 of tank 16 tend to pick up and cling to the rough surfaced light trash.

As may be seen in Figure IV, there is a single stream of air bubbles (or other medium) moving upwardly from between adjacent pipes 28. Preferable I split each of these streams into two parts by placing rods 56 just above and between each pair of pipes. Rods 56 have a diameter slightly greater than half the diameters of pipes 28 and are spaced therefrom not more than one half the average diameter of the vegetables being processed. This forms a sort of screen to prevent the peas, beans and so on from getting caught below the pipes 28 and causing a cleaning problem. Also the bubbles of the solution or air being introduced through the pipes produces a slight tumbling action of the vegetables which improves the cleaning efficiency permitting greater capacity per unit of space.

It is to be understood that while under certain conditions these pipes aid the separating action, they may be omitted entirely under other conditions.

The light trash is thus carried up if necessary, and along water surface 44, over dam 46 and into discharge trough 20 which slants downwardly (to the upper side in Figure II) where it is discharged into baskets or other suitable containers not shown. As suggested in my prior patents the water may be strained and then recirculated.

It will be noted that trough 20 utilizes the wall of tank 16 as one side making for more economical construction.

Referring now to Figure I the "destoning" unit 17 has been positioned in an entirely new relationship to settling tank 16, and is of improved design and construction over my prior patents and the art such that less water is used and a marked increase in efficiency of separation is obtained. Destoning unit 17 in effect now performs the dual function of separating the good vegetables from the heavy trash and also acting as a reservoir for vegetable discharging water currents.

Separating plate 19 is positioned opposite opening 50 so that the heavy trash moving down along wall 26 will tend to hit plate 19 approximately at its midpoint. Plate 19 is bent back on itself and fixed to the outer wall of chamber 18 to form a header chamber 70.

Chamber 18 provides a gentle, smooth flowing current from inlet pipe 60 by means of baffles 62 and partition 64. This current is directed upwardly between plate 19 and opening 50 throughout the entire width of tank 16 and cooperates therewith to perform the destoning operation. The strength of the water current is controlled so that it is just strong enough to separate the good vegetables from the heavy trash as the two emerge through opening 50 as described above. The heavy foreign matter such as stones, nails, and so on strike plate 19 and then drop down into chamber 48.

Chamber 48 collects the heavy trash in a similar manner to the corresponding chamber in my prior patents. This trash is removed by a stream of water from inlet pipe 74 which carries the trash out outlet 76 to any suitable container from which the water can be removed and recirculated. The heavy foreign matter is thus completely separated from the good peas, beans, and so forth and the latter are started up discharge passageway 66 toward discharge spout 22.

Since the "destoning" water current acts throughout the entire width of settling tank 16 on but a single layer of material a much more gentle current can be used which means a smaller volume and also less unwanted currents. Consequently, with my present invention I can separate better than ninety percent of the light cinder that often caused considerable difficulty heretofore. Also with destoning unit 17 no unwanted water currents are created in tank 16 so that all baffles heretofore necessary are eliminated. In operation plates 51 and 53 are adjusted to give the desired separation for the machine load without causing undesired currents in tank 16. Generally speaking once plate 53 is adjusted it can be left alone and only plate 51 need be varied with the load at which the machine is to be run.

While this "destoning" water current would actually carry some of the good vegetables into screen 24, aid is provided, in the form of a plurality of additional small streams, to increase the capacity of the machine. These smaller streams are provided from a plurality of small, short pipes 68 (see Figure III) mounted in the upper side of plate 19 of header 70 which acts as a reservoir as mentioned above. Water is supplied through pipe 72 to both ends of header 70 so as to insure a uniform flow across the entire width of tank 16. The flow is adjusted to give maximum output from the machine per unit volume of water circulation. The cleaned and separated vegetables are thus carried up passageway 66, out spout 22 and into screen 24 where the water is removed and the vegetables delivered for canning or other operations.

As may be seen in Figures I and II, passageway 66 is formed on the outside of tank 16 and tapers from the full width of tank 16 at opening 50 to approximately one half that width at 78 and then to a relatively small discharge spout 22, to bring the vegetables together into a more readily manageable concentration for further operations. Also, since passageway 66 is on the outside of tank 16 (Figure I), it leaves the inner surface of tank

16 smooth and level throughout the entire width so that it may be easily cleaned. This, together with the absence of baffles, greatly facilitates maintaining the machine in a sanitary condition while at the same time assisting in increasing the capacity and efficiency of the machine.

While I have given above a certain specific example of this invention and its application in practical use, it should be understood that this is not intended to be exhaustive or to be limiting of the invention. On the contrary, this illustration and explanation herein are given in order to acquaint others skilled in the art with this invention and the principles thereof and a suitable manner of its application in practical use, so that others skilled in the art may be enabled to modify the invention and to adapt and apply it in numerous forms each as may be best suited to the requirement of a particular use.

I claim:

1. In a vegetable cleaner and separator of the water using type the combination of a main separating tank having smooth ends and converging, substantially unbroken bottom plates; said ends and bottom plates forming a wide unobstructed tank of triangular cross section; a multi-dam input chamber mounted at the top edge of one of said bottom plates on one end of said tank for distributing the input uniformly across said tank, a discharge trough mounted in the other end of said tank adjacent to the top edge of the other bottom plate; an adjustable discharge slot extending across the full width of said tank at the junction of said converging bottom plates; a pair of discharge passageways outside said tank communicating with said slot; and water input means adjacent said slot for providing a flow of water through said discharge passageways, reservoir means for directing said flow of water whereby only good material is discharged through one of said pair of passageways and the undersirable material, heavier than said good material, is discharged through said other passageway.

2. A vegetable cleaner and separator of the flotation washer type which comprises in combination a main separating tank having a uniform width and downwardly converging bottom plates forming a broad surfaced hopper of inverted triangular cross section; a discharge slot extending across the width of said tank at the intersection of said bottom plates; a discharge trough mounted in one end of said tank adjacent the top edge of one of said bottom plates; input means for introducing the vegetables to cleaned throughout the entire width of said tank in a layer of unit thickness mounted at the other end of said tank; pipe means disposed along the bottom plate in the input end of said tank for selectively making the light trash material introduced into said tank lighter and easier to remove; a pair of discharge passageways communicating with said discharge slot, one being positioned to carry off the good material and the other to carry off the heavy trash material, and water input means adjacent said slot to direct the proper material into the proper passageway and facilitate the discharge thereof.

3. A vegetable cleaner and separator of the type adapted to separate light and heavy trash from good vegetables by water currents comprising an outer casing having adjacent the middle thereof a large trough portion; a pair of small troughs mounted transversely of said cleaner and separator adjacent one end of said large trough portion, said small trough further from said large trough being slightly elevated above said other small trough; a water inlet pipe positioned in said elevated small trough; a discharge trough mounted in the other end of said large trough portion to receive therein the light trash, a discharge opening adjacent the bottom of said large trough; an adjustable plate mounted on each edge of said opening to adjust the size thereof; a vegetable discharge passageway formed on the outer surface of the discharge end of said large trough and communicating with said opening; a heavy material discharge passageway positioned below said large trough and communicating with

said opening; a water supply chamber positioned below said large trough and communicating with said discharge passageway so as to cause currents of water to flow therethrough; auxiliary water supply means positioned adjacent said opening to direct auxiliary streams of water through said vegetable discharge passageway to discharge the separated vegetable from said large trough and screening means for removing the water from the separated vegetables in preparation for further operations.

4. Apparatus as described in claim 3 which includes a plurality of pipes mounted in the input end of said large trough, said pipes having a plurality of small holes on the underside thereof, and means for introducing mixtures of air, detergent, oil and the like into said pipes to selectively aid in the removal by flotation of light trash.

5. A vegetable cleaner and separator of the type adapted to separate both heavy and light foreign matter from a quantity of a vegetable such as green shelled peas, beans, whole grain corn and the like by water currents alone comprising in combination an outer casing; a generally hopper shaped main separating tank in one end thereof; an adjustable opening extending across the width of the bottom of said hopper tank, vegetable distributing input means mounted in said casing adjacent the edge of said tank, said input means including first and second troughs mounted transversely of said casing in ascending order from said tank; a water supply pipe positioned in said second trough; means for controlling the rate of flow through said pipe so as to just overflow said troughs; a first discharge passageway extending from said adjustable opening to a water removing screen, said passageway tapering to approximately one-half its initial width; a second discharge passageway extending downwardly from adjacent said adjustable opening; a water supply compartment positioned to feed a slowly and smoothly flowing current of water into said first passageway; a second water supply positioned in the entrance of said first passageway; a plurality of small, short pipes extending upwardly from said second water supply into said first passageway to provide a strong discharge water current through said first passageway; a light trash discharge trough extending transversely across the end of said separating tank; an adjustable plate mounted on said last mentioned trough to regulate the height of water in said tank; a plurality of perforated pipes mounted side by side and extending throughout the input end of said hopper tank, and means for introducing into said pipes agents designed to adhere to rough foreign material and help float it off into said discharge trough.

6. In a vegetable cleaner and separator of the type adapted to separate both heavy and light foreign matter from a vegetable of the type of green shelled peas, beans, whole grain corn and the like by water currents alone the method of separating the vegetable from the foreign matter which comprises feeding the matter to be separated in a thin layer throughout the entire width of the top surface of a large unobstructed settling zone; causing only the top layer of water in said zone to move in a gentle current to a light foreign matter discharge zone; allowing the heavy foreign matter and good vegetable to settle to the bottom of said settling zone; removing said settled matter from said settling zone; passing a first current of water through said settled matter strong enough to separate the good vegetable from the heavy foreign matter; allowing the heavy matter to settle into a discharge zone; adding a second current of water to said first to carry said good vegetable to a water removing zone and removing the water therefrom for recirculation.

7. The method of claim 6 including passing through said settling tank mixtures of air, detergent, oil and the like to selectively aid in the removal by floatation of light foreign matter therefrom to a refuse discharge zone.

8. In a vegetable cleaner and separator the method of cleaning and separating stock of the type of shelled

peas, beans, and the like from heavy and light foreign matter by the use of water comprising the steps of feeding the stock into a settling tank throughout its entire width in a unit thickness, excluding all water currents from said tank except for a gentle surface current, removing all settled matter from said tank, flowing a current of water through said settled matter to remove the good stock therefrom, utilizing said last named current to partially discharge said good stock, and introducing a plurality of auxiliary streams of water to complete the discharge of the good stock.

9. In a vegetable cleaner and separator of the water using type the combination of a main separating tank having smooth sides and converging, substantially unbroken bottom plates, said sides and bottom plates forming a wide unobstructed tank of triangular cross section; a stock spreading chamber mounted at the top edge of one of said bottom plates on one end of said tank for distributing the input uniformly across said tank, a discharge trough mounted in the other end of said tank adjacent to the top edge of the other bottom plate; an adjustable discharge slot extending across the full width of said tank at the junction of said converging bottom plates; a pair of discharge passageways outside said tank communicating with said slot; and water input means adjacent said slot for providing a gentle flow of water past said slot whereby only good material is directed into one of said pair of passageways and the undesirable material, heavier than said good material, is discharged through said other passageway.

10. In a vegetable cleaner and separator of the type adaptd to separate both heavy and light refuse matter from a stock of a vegetable such as green peas, beans, and the like by water currents alone the method of separating the vegetable which comprises feeding the stock to be separated in a shallow substantially horizontal layer into a large, unobstructed settling zone, introducing said layer into said settling zone substantially at the surface of the water therein adjacent one edge thereof in a manner to cause only a very shallow surface current of water away from said entrance edge; allowing said surface current to discharge from said settling zone carrying therewith light refuse matter; allowing the heavy refuse matter and good vegetable to settle in the bottom of said settling zone; removing all said settled mattter from said settling zone; flowing a gentle current of water through said removed settled matter to separate the good vegetable therefrom and at least partially transport said good vegetable away from said settling zone.

11. In a vegetable cleaner and separator of the water-using type the combination of a main separating tank having smooth sides and converging substantially unbroken bottom plates; said sides and bottom plates forming a wide, unobstructed tank of triangular cross-section; an input chamber mounted at the top edge of one of said bottom plates on one end of said tank for distributing the vegetable to be cleaned uniformly across said tank; a discharge trough mounted at the other end of said tank adjacent to the top edge of the other bottom plate; an adjustable discharge slot extending across the whole width of said tank at the junction of said converging bottom plates; a pair of discharge passageways outside said tank communicating with said slot at least one of said passageways having a wide volume discharge capability; water input means adjacent said slot for providing a flow of water through said discharge passageways; a plurality of alternately spaced pipes and rods aligned with the direction of flow of said vegetables and mounted along the input bottom plate; input means for supplying a fluid to said pipes; a plurality of small holes along the bottom of said pipes and means for controlling said flow of water through said discharge passageways.

12. A device as described in claim 11 wherein said alternately spaced pipes and rods are spaced from said input bottom plate and the space between adjacent rod and pipe is less than the average diameter of the vegetables to be cleaned.

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