Nov. 1, 1932. F. D. CHAPMAN 1,885,987

METHOD OF AND MEANS FOR QUALITY GRAVITY SEPARATING MATERIALS

Filed Dec. 12, 1929 2 Sheets-Sheet 1

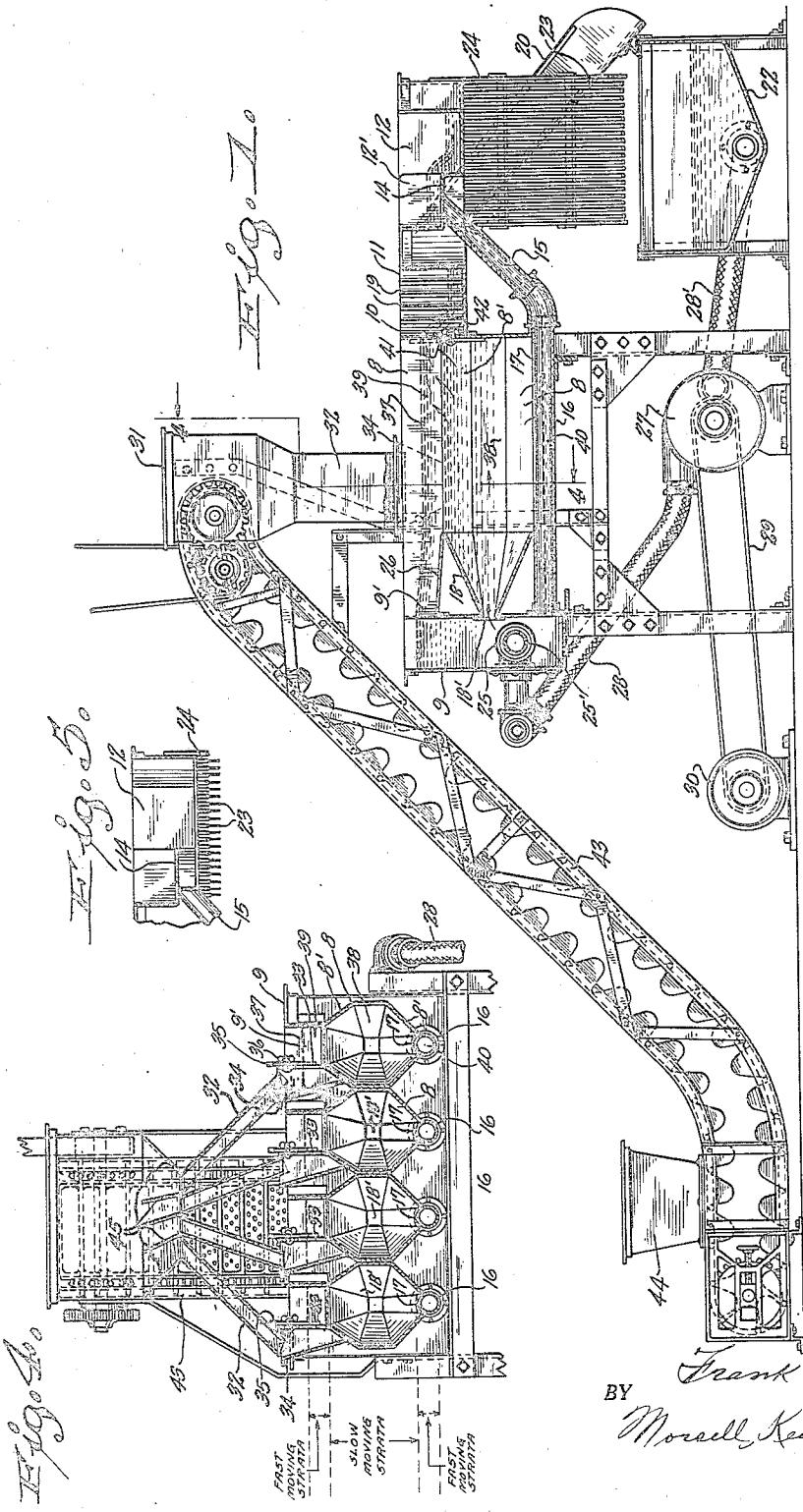


Fig. 1.

Fig. 5.

Fig. 4.

INVENTOR.
Frank D. Chapman
BY
Morsell, Keeney & Morsell
ATTORNEYS.

Nov. 1, 1932. F. D. CHAPMAN 1,885,987

METHOD OF AND MEANS FOR QUALITY GRAVITY SEPARATING MATERIALS

Filed Dec. 12, 1929 2 Sheets-Sheet 2

Fig. 2.

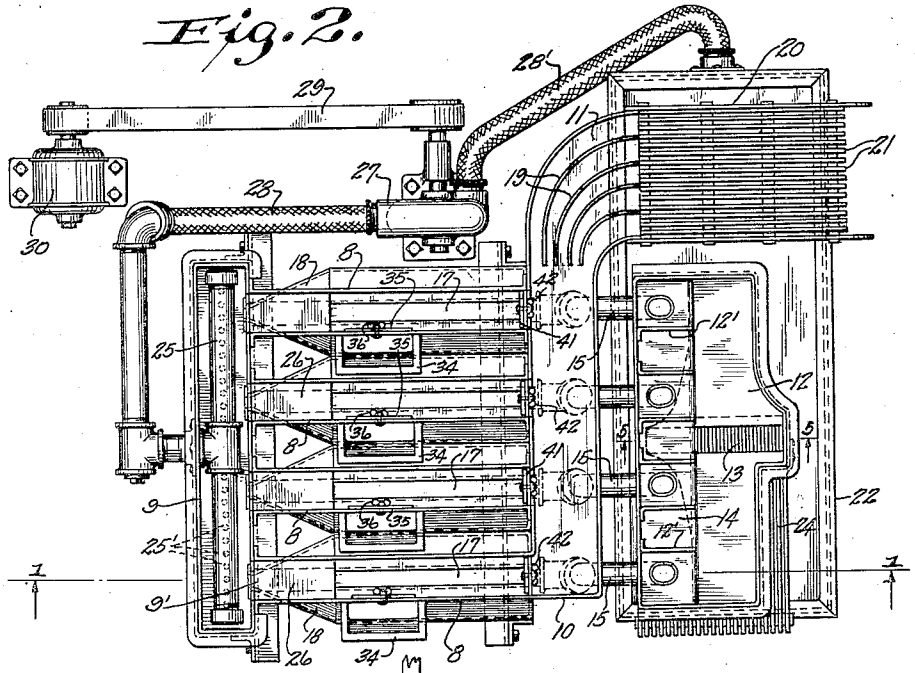
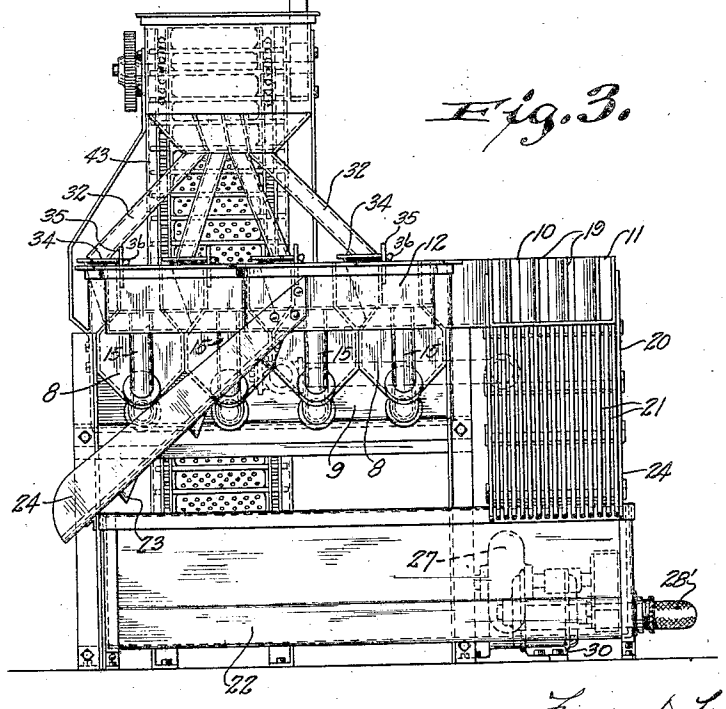


Fig. 3.



INVENTOR.

Frank D. Chapman

BY

Morsell, Keeney & Morsell

ATTORNEYS.

Patented Nov. 1, 1932 1,885,987

UNITED STATES PATENT OFFICE

FRANK D. CHAPMAN, OF BERLIN, WISCONSIN

METHOD OF AND MEANS FOR QUALITY GRAVITY SEPARATING MATERIALS

Application filed December 12, 1929. Serial No. 413,507.

This invention relates to improvements in method of and means for quality gravity separating materials, such as peas, lima beans and other vegetables of the leguminous or seed pod family.

It is one of the objects of the present invention to provide a method of and means for quality gravity separating materials in which good quality peas for instance are separated from the poorer quality ones passing through a tank containing brine.

A further object of the invention is to provide a method of and means for quality gravity separating materials in which currents of brine, one relatively fast, are used for separating good quality peas from the poorer quality.

A further object of the invention is to provide a method of and means for quality gravity separating materials in which the peas are discharged into a stratum of slow flowing brine interposed between other strata of relatively faster flowing brine to separate the different grades.

A further object of the invention is to provide a method of and means for quality gravity separating materials in which a plurality of separating units are combined in one machine for expediting the separating method.

A further object of the invention is to provide a method of and means for quality gravity separating materials in which all of the peas will be discharged from the units after the feed has stopped.

A further object of the invention is to provide a method of and means for quality gravity separating material in which the brine is used over and over again, and which is easily carried out and the apparatus is of simple construction, is strong and durable and is well adapted for the purpose described.

With the above and other objects in view the invention consists of the improved method of and means for quality gravity separating materials and its parts and combinations as set forth in the claims, and all equivalents thereof. Some of the novel features of quality gravity separation disclosed but not specifically claimed herein, form the subject of co-pending application Serial No. 334,001, filed January 21st, 1929, patented Dec. 8, 1931, No. 1,835,634.

In the accompanying drawings in which the same reference numerals indicate the same parts in all of the views:

Fig. 1 is a longitudinal sectional view taken on line 1—1 of Fig. 2, of the improved quality gravity separator used in carrying out the method, the conveyor being shown in full lines;

Fig. 2 is a plan view thereof, the conveyor being removed;

Fig. 3 is a rear or discharge end view of the separator;

Fig. 4 is a transverse sectional detail view taken on line 4—4 of Fig. 1, the view also illustrating the brine strata; and

Fig. 5 is a longitudinal sectional detail view taken on line 5—5 of Fig. 2.

Referring to the drawings the reference numeral 8 indicates a plurality of elongated separating chambers or tanks which at their forward ends are connected to and in communication with an elongated transversely extending brine inlet tank 9. The rear ends of the separating chambers at their upper portions are connected to and in communication with an elongated transversely extending brine discharge tank or trough 10, having a discharge end 11 which curves rearwardly from one end. The discharge tank also receives the peas of the first quality which have been separated from the poorer quality in the separating chambers.

A second elongated brine discharge tank or trough 12 is positioned to the rear of and in parallel relation to the first discharge tank 10 and is formed with a central downwardly opening discharge 13 extending the full width of the tank. The forward part of the bottom portion of the second tank is offset upwardly to provide an inlet portion 14 which is on a higher plane than the remaining portion and to which upwardly inclined portion, discharge ducts or pipes 15 are connected. The lower ends of these discharge pipes are connected to the rear ends of the lower tubular portions 16 as clearly shown

in Fig. 1. The mixing chambers 8 in cross section are restricted or of less width at their upper and lower portions than their medial portions to provide more space medially for the food units to separate from each other while they are being separated as to quality, and furthermore side wall portions 8′ of the medial portions of the chamber incline towards each other both above and below to avoid abrupt shoulders which might retard the movement of the food units. The upper inclined walls 8′ join the upper portions of the chamber walls of less width, while the lower inclined portions 8′ are connected to the tubular portions 16 and are in communication with said tubular portions by means of elongated openings or slots 17 of sufficient size to permit the second grade peas to pass therethrough. The front ends of the tubular portions 16 are connected to and in communication with the lower rear portion of brine inlet tank 9 to permit the brine to flow therethrough. The forward medial end portions of the separating chambers are of tapered formation as indicated by the numeral 18 and connect to the inner side wall of the inlet tank 9 and the openings 18′ form conduits between the inlet tank and the chambers which gradually increase in size from the tank to the chambers to decrease the speed of the flow of the brine through the medial portions of said separating chambers 8.

The discharge tank 10 at its curved discharge end portion is provided with a plurality of curved partitions 19 to prevent all of the food units from flowing against the outer side wall of the tank in passing therethrough. An inclined discharge chute or through 20 having a bottom portion formed of spaced slats or bars 21 is connected to the curved discharge end portion of the tank 10 to receive the food units therefrom while the brine, by means of which they are separated, is discharged between the slats and into a container 22 positioned beneath the inclined discharge chute. To prevent the brine from running down and discharging from the lower ends of the bars, the said bars are provided with saw teeth shaped fins 23 which extend downwardly from the lower sides of the bars and in spaced relation longitudinally which interrupt the flow downwardly and cause the brine to drop into the receptacle 22.

An inclined chute 24 similar to the chute 20 is connected to the second discharge tank 12 beneath the discharge opening 13 to receive the second grade food units and to remove the units from the brine. The units are discharged from the ends of the chutes and may be received in receptacles (not shown) as desired.

A closed end pipe 25 positioned within the brine inlet tank 9 is provided with downwardly extending openings 25′ through which the brine enters the tank and is directed toward the end openings of the tubular portions 16 of the separating chambers. The upper portions of the separating chambers are connected to the brine inlet tank 9 through openings 9′, and the bottom portions 26 of said chambers are inclined downwardly from the tank 9 to increase the speed of the flow of the upper stratum of brine as indicated in Fig. 1.

A medial portion of the pipe 25 extends through the tank 9 and is connected to a rotary pump 27 by a flexible hose 28. Another section of flexible hose 28′ connects the pump intake to the receptacle 22 and provides for returning the brine from the receptacle to the inlet tank 9. The pump has a belted connection 29 with an electric motor 30 or other source of power, and is driven thereby.

The flexible hose connections between the pump and the machine eliminate any vibration from the pump being transmitted to the machine which might interfere with the separating method.

A feed hopper 31 mounted above the separating chambers 8 is provided with downwardly inclined feed ducts 32 which respectively extend to the separating chambers below. Each separating chamber on one side is provided with a side inlet opening 33 and a side hopper like extension 34 enclosing the same and into which extensions the lower ends of the feed ducts 32 extend and discharge their food units. The inlet openings 33 are provided with gates or closures 35 adjustably mounted on the inner side walls of the separating chambers by means of thumb nuts 36 to control the size of the inlet openings. Particular attention is directed to the fact that the inlet openings 33 are so positioned that the food units will enter the separating chambers below the surface of the brine 37 and into the intermediate stratum 38 of brine slowly flowing through the chambers to give said units sufficient time to overcome the inertia of their downward movement through the feed ducts and either rise into the upper relatively faster moving brine stratum 39 or sink downwardly into the lower brine stratum 40 which flows relatively faster than the intermediate stratum 38.

The first grade units will rise into the upper fast moving stratum of brine 39 and will be carried with the flow into the discharge tank 10 and down the discharge trough or chute 20 while the second grade units will sink downwardly into the tubular portion of the separating chamber and into the fast moving stratum of brine 40 and be carried thereby upwardly through the tube 15 and into the second discharge tank 12 and the discharge trough or chute 24. Said tank 12 is provided with portions 12′ to form equal flow of the brine through the tank. In both cases the units in passing down the chutes will be separated from the brine by the bars form-

ing the bottom portions of the chutes. The second grade units which are initially in a state of equilibrium in the slow moving stratum of brine will quickly absorb enough brine to increase in specific gravity and they will then sink into the lower brine stratum as before explained.

To regulate the flow of the brine through the separating chambers the outlet duct portions thereof are provided with transverse obstructions or dams 41 which are adjustably held in position by thumb nuts 42 and serve to raise or lower the level of the brine within the separating chambers 8. In elevating a dam to raise the brine level the increased head will increase the speed of flow of the lower brine stratum, while the increased head will slow up the speed of travel of the upper brine stratum. This variation in head by adjustment of the dams 41, also causes the balanced peas at the discharge end of the intermediate stream, that is, those peas having substantially the same specific gravity as that of their submerging liquid, to enter either the upper or the lower stratum, depending upon the selected position of adjustment. Under all conditions of adjustment the intermediate brine stratum will move in the same direction as the upper and lower brine strata and at the end of the tank part the intermediate stratum of brine will merge or flow with both the upper and lower brine strata and thus keep the peas moving and prevent their being held in suspension.

An inclined endless conveyor 43 extends from the floor upwardly to the hopper 32 and is connected thereto to convey food units from a lower hopper 44 to the upper hopper 31. Partitions 45 positioned within the lower portion of the upper hoppers 31 divide the food units from the mass to direct an equal portion down each duct 32. The endless conveyor may be driven in any manner desired.

In operation the tank and other portions of the machine are filled with brine to the desired extent and the pump is started to circulate the brine from the receptacle to the tanks and separating chambers and inclined troughs where it will be discharged into the receptacle. In entering the intake tank the downwardly extending openings of the inlet pipe 25 will direct portions of the flow with sufficient speed through the tubular portions 16 of the separating chambers to carry the second grade food units upwardly through the inclined pipes 15 and into the discharge tank and through the inclined trough, and thus return to the receptacle 22.

Another portion of the brine will flow upwardly in the inlet tank and over the inclined bottom portions 26 and through the upper portions of the separating chambers and over the dams 41 to the discharge tank 10. From said tank the flow will be downwardly through the trough and into the receptacle 22.

The third portion of the brine will flow through the conduits 18', and due to the outwardly tapering formation of the conduits and independent discharge openings, the flow will be materially checked while the flow of the brine strata 39 and 40 above and below will be relatively greater. The intermediate slower brine strata 38 will flow to the ends of the separating chambers and will then divide, parts joining the upper brine strata and other parts joining the lower brine strata.

The food units are dropped into intermediate brine strata which will move them forward slowly while they are separating and either moving upwardly or downwardly into the other and faster moving brine strata, depending upon their grade and to some extent upon the setting of the dams 41.

After the food units have been separated from the brine they may be sprayed or washed to remove all traces of brine in any well known manner.

The positioning of the inlet openings 33 to one side of the separating chambers and below the brine surface permits all of the food units to be automatically discharged from the hopper spaces when the pump is stopped and the surface of the brine lowers.

From the foregoing description it will be seen that the method of and means for quality gravity separating materials of the edible leguminous seed type is very simple and the exemplifying construction shown is well adapted for the purpose described.

What I claim as my invention is:

1. A quality gravity separator, comprising a chamber containing a liquid, the upper and lower portions of the chamber being restricted, a discharge duct extending outwardly and downwardly from the upper portion of the chamber, a discharge duct extending upwardly, outwardly and downwardly from a lower portion of the chamber, means for feeding edible leguminous seed vegetables into one end portion of the chamber below the surface of the liquid, and means for causing the liquid to flow through the chamber in different speed strata and to discharge therefrom through the ducts, said liquid separating the better quality seeds from the poorer quality by specific gravity and causing the separated seeds to travel in different strata to the ducts and through the ducts and to be discharged from the outer lower end portions thereof, the liquid in passing through the downwardly extending portions of the ducts being separated from the seeds.

2. A quality gravity separator, comprising a separating chamber of elongated form having restricted upper and lower portions, the lower portion of the separating chamber being of tubular formation, a discharge duct

extending outwardly and downwardly from the upper portion of the chamber, a discharge duct extending upwardly and downwardly from the tubular portion of the chamber, a brine receptacle positioned to receive brine from the ducts, means for moving the brine from the receptacle to and through the chamber in different speed strata to the discharge ducts and back to the receptacle, and means for feeding leguminous seed vegetables into one end portion of the chamber below the surface of the liquid.

3. A quality gravity separator, comprising a separating chamber, tanks connected to said chamber, inclined slatted ducts connected to some of the tanks, a brine receptacle, a pump means for moving the brine from the receptacle to one of the tanks and through the separating chamber in different speed strata and then to some of the tanks and to the inclined ducts and through the slatted portions thereof to the brine receptacle, and means for feeding edible leguminous seed vegetables into the separating chamber below the surface of the brine, the seeds being separated as to their quality by specific gravity and the different speed strata of the brine and discharged from the inclined ducts.

4. A quality gravity separator, comprising a separating chamber having an upper and a lower discharge duct, an inlet tank connected to the forward end of the chamber and having means for directing brine through the brine receptacle in three speed strata, of which the upper stratum flows at a different speed than the lower statum and the intermediate stratum flows at a less speed than the upper and lower strata, discharge tanks connected to the discharge ducts, inclined slatted ducts connected to the discharge tanks, a brine receptacle, a pump means for moving brine from the receptacle to the inlet tank, and means for feeding edible leguminous seed vegetables into the forward end portion of the separating chamber below the surface of the brine, the seeds being separated as to their quality by specific gravity and different speed strata of brine and discharged from the inclined ducts.

5. A quality gravity separator, comprising a separating chamber having an enlarged medial portion and a lower tubular portion with a restricted opening, a brine receptacle, an inlet tank positioned adjacent the chamber therebetween and connected to the tubular portion and to the upper portion of the chamber, the front portion of the enlarged medial portion of the chamber being tapered longitudinally and connected at its smaller end part to a medial portion of the inlet tank to decrease the speed of flow of one portion of the brine, the upper portion of the chamber which is connected to the inlet tank having a downwardly inclined bottom portion to increase the speed of flow of another portion of the brine, and discharge tanks positioned adjacent the rear end of the chamber, one of said discharge tanks being connected to the upper portion of the chamber and the other tank having an inclined tubular connection with the lower tubular portion of the chamber.

6. A quality gravity separator, comprising a separating chamber having an enlarged medial portion and a lower tubular portion with a restricted opening, a brine receptacle, an inlet tank positioned adjacent the chamber therebetween and connected to the tubular portion and to the upper portion of the chamber, the front portion of the enlarged medial portion of the chamber being tapered longitudinally and connected at its smaller end part to a medial portion of the inlet tank to decrease the speed of flow of one portion of the brine, the upper portion of the chamber which is connected to the inlet tank having a downwardly inclined bottom portion to increase the speed of flow of another portion of the brine, said separating chamber having a side opening positioned below the surface of the brine, and means for feeding edible leguminous seed vegetables into the side opening of the chamber below the brine surface, the seeds being separated as to their quality by specific gravity and the different speed strata of brine and discharged from the inclined ducts.

7. The method of separating leguminous seed vegetables, which consists in creating a plurality of liquid strata having different horizontal speeds and in vertical communication with each other, discharging leguminous seeds into the liquid beneath the surface thereof to separate them according to quality by specific gravity into the different liquid strata, and then discharging the separated strata of seeds together with the transporting liquid separately from the receptacle while causing seeds which tend to remain in suspension between said strata to discharge selectively with either strata.

8. The method of separating edible leguminous seed vegetables which consists in creating a plurality of liquid strata having different horizontal speeds and in vertical communication with each other, the intermediate stratum being of greatest cross sectional area and flowing at a slower rate of speed than the other strata, discharging leguminous seeds into the chamber below the surface of the liquid and into the intermediate stratum to separate them according to quality by specific gravity into the different liquid strata, causing seeds which tend to remain in suspension in said intermediate strata to selectively enter either of the other strata and discharging the separated strata of liquid and seeds separately from the chamber, and then returning the liquid to the chamber.

9. The method of grouping like quality of edible leguminous vegetable seeds, which consists in creating a plurality of superimposed liquid strata having different horizontal speeds, separating the seeds by specific gravity by discharging the mixed quality seeds below the surface of and into an intermediate slower moving stratum, and then removing the separated seeds together with the liquid from the separated fluid strata while causing seeds which tend to remain in suspension in the intermediate stratum to discharge selectively with either of the other strata.

10. The method of separating edible leguminous vegetable seeds, which consists in creating a plurality of superimposed liquid strata having different horizontal speeds, discharging the seeds into the liquid below the surface thereof, then bringing the different strata of liquid to substantially the same vertical and horizontal planes before the separated seeds are removed therefrom, and varying the discharge levels to cause seeds which tend to remain in suspension between said strata to selectively discharge with either stratum.

11. The method of grading peas or the like, which comprises, producing three superimposed horizontal streams of liquid flowing in the same direction and in vertically open communication with each other, introducing peas of mixed quality directly into the intermediate of said streams below the level of the upper stream and maintaining the same therein for a sufficient length of time to permit rising of the floatable peas into the upper stream and sinking of the others into the lower stream, and subsequently removing the separated grades from the upper and lower streams respectively and causing the peas which tend to remain in suspension in said intermediate stream to selectively discharge with either of the others.

12. The method of grading peas or the like, which comprises, producing three superimposed horizontal streams of liquid flowing in the same direction and in vertically open communication with each other, the intermediate of said streams being of greater transverse cross-section than the others and the lower of said streams having higher velocity than said intermediate stream, introducing peas of mixed quality directly into said intermediate stream below the level of the upper stream and maintaining the same therein for a sufficient length of time to permit rising of the floatable peas into the upper stream and sinking of the others into the lower stream, causing the balanced peas at the discharge end of said intermediate stream to selectively enter either of the others, and subsequently removing the separated grades from the upper and lower streams respectively.

13. The method of grading peas or the like, which comprises, producing three superimposed horizontal streams of liquid flowing in the same direction and in vertically open communication with each other, the velocity of the lower of said streams being higher than that of the others, introducing peas of mixed quality directly into the intermediate of said streams below the level of the upper stream and maintaining the same therein for a sufficient length of time to permit rising of the floatable peas into the upper stream and sinking of the others into the lower stream, causing the balanced peas at the discharge end of said intermediate stream to selectively enter either of the others, and subsequently elevating the lower of said streams to approximately the height of the upper stream and removing the separated grades from the upper and the elevated lower stream respectively.

14. The method of grading peas or the like, which comprises, producing superimposed horizontal streams of liquid flowing in the same direction and in vertically open communication with each other, introducing peas of mixed quality directly between said streams below the level of the upper stream and maintaining the same therein for a sufficient length of time to permit rising of the floatable peas into the upper stream and sinking of the others into the lower stream, selectively causing the balanced peas at the discharge end of said streams to pass into either said upper or said lower stream, and subsequently removing the separated grades from the upper and lower streams respectively.

15. The method of grading peas or the like, which comprises, producing superimposed horizontal streams of liquid flowing in the same direction and in vertically open communcation with each other, the intermediate portion of said streams being of greater transverse cross-section than the upper and lower portions and the lower portion of said streams having higher velocity than said intermediate stream portion, introducing peas of mixed quality directly into said intermediate stream portion below the level of the upper stream portion and maintaining the same therein for a sufficient length of time to permit rising of the floatable peas into the upper stream portion and sinking of the others into the lower stream portion, selectively causing the balanced peas at the discharge end of said intermediate stream portion to pass into either said upper or said lower stream portions, and subsequently removing the separated grades from the upper and lower stream portions respectively.

16. The method of grading peas or the like, which comprises, producing superimposed horizontal streams of liquid flowing in the same direction and in vertically open communication with each other, the velocity of the lower of said streams being higher than that of the others, introducing peas of mixed quality directly into said streams below the

level of the upper stream and maintaining the same therein for a sufficient length of time to permit rising of the floatable peas into the upper stream and sinking of the others into the lower stream, and varying the elevation of the delivery end of one of said streams to selectively cause the balanced peas at the discharge end of said streams to pass into either said upper or said lower stream.

In testimony whereof, I affix my signature.

FRANK D. CHAPMAN.