(No Model.) 3 Sheets—Sheet 1.

E. R. DRAVER.

SIFTER OR CHOP GRADER.

No. 562,592. Patented June 23, 1896.

Fig 1.

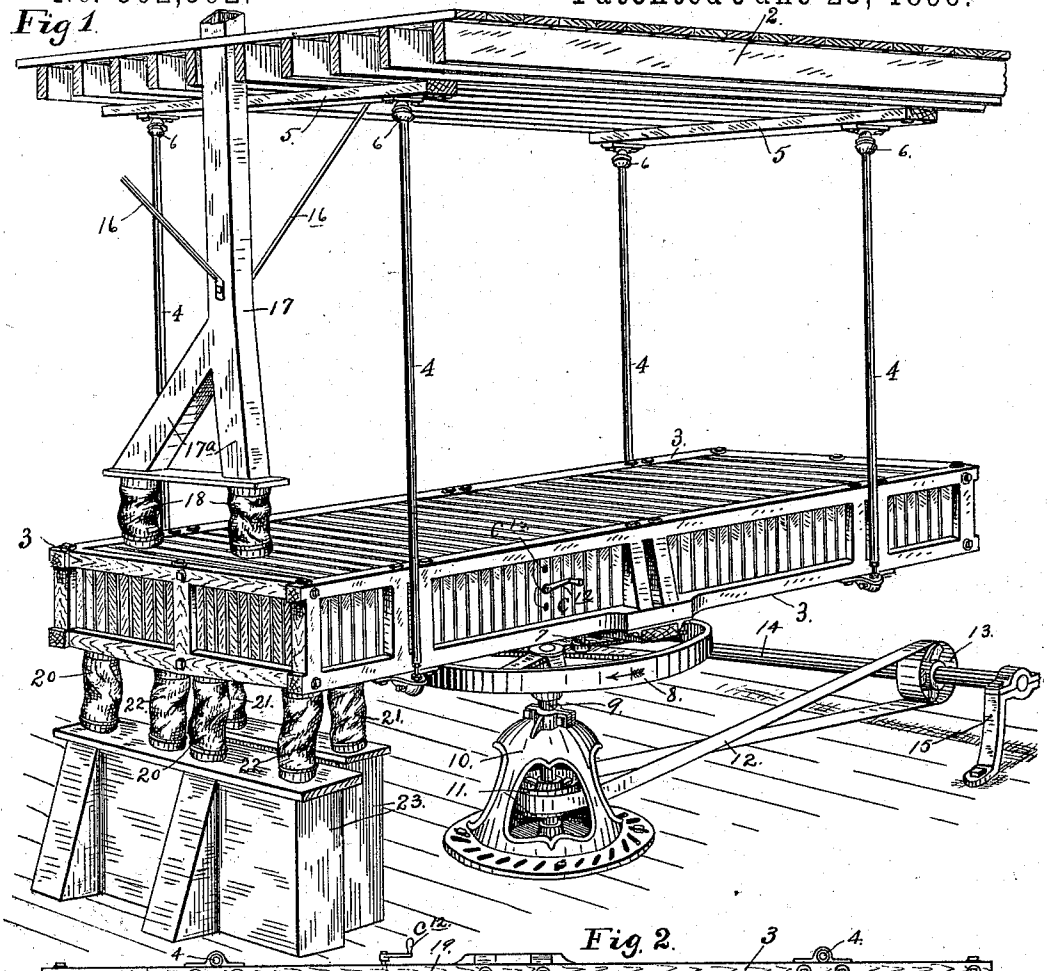
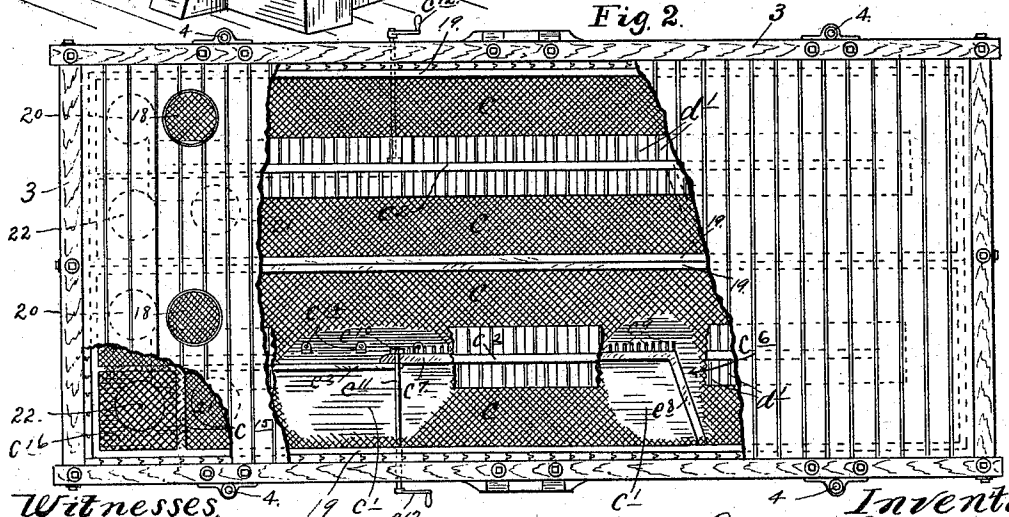


Fig. 2.



Witnesses.
C. F. Kilgore
R. D. Merchant.

Inventor.
Emil R. Draver
By his Attorney
Jas. F. Williamson

(No Model.) 3 Sheets—Sheet 2.

E. R. DRAVER.

SIFTER OR CHOP GRADER.

No. 562,592. Patented June 23, 1896.

Fig. 3.

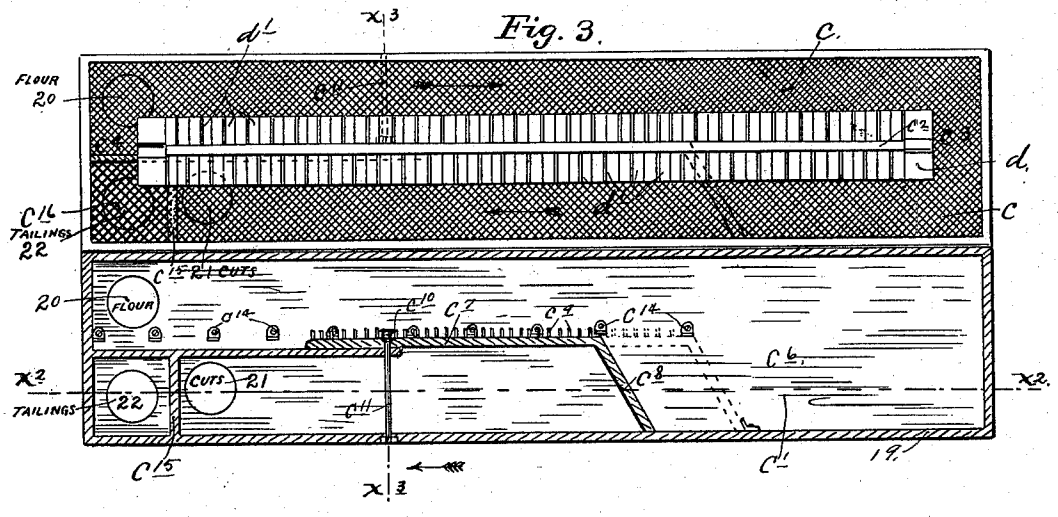


Fig. 4.

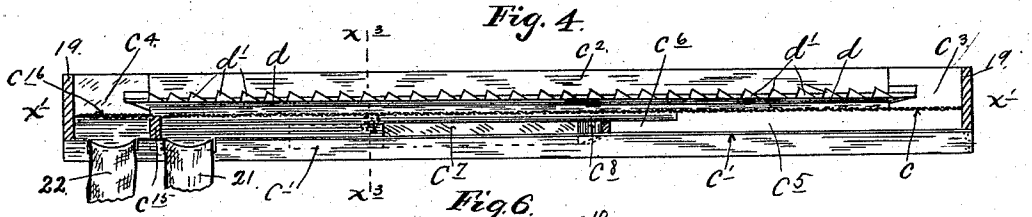


Fig. 6.

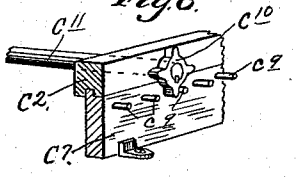


Fig. 5.

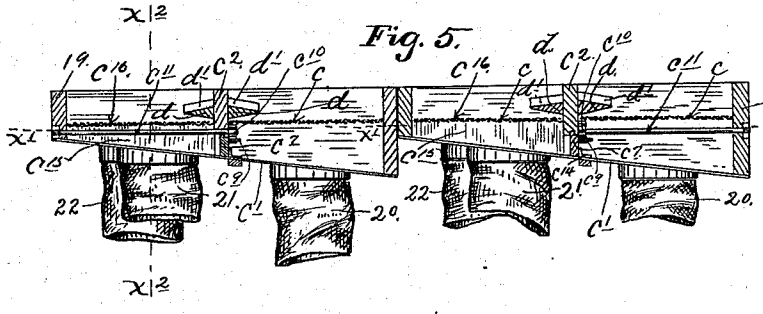
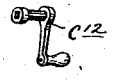


Fig 7.



Witnesses.

C. F. Kilgore

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(No Model.) 3 Sheets—Sheet 3.

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SIFTER OR CHOP GRADER.

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Fig. 8.

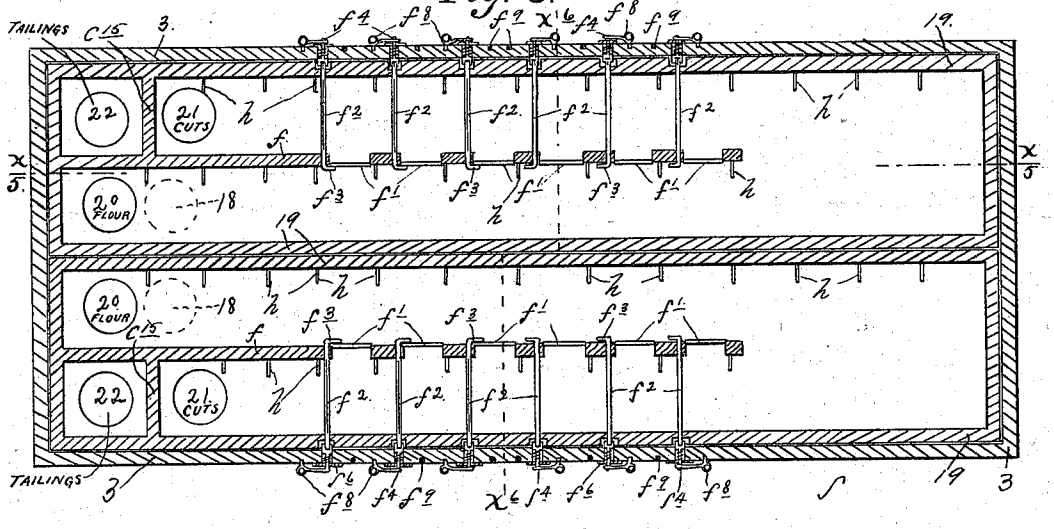


Fig. 9.

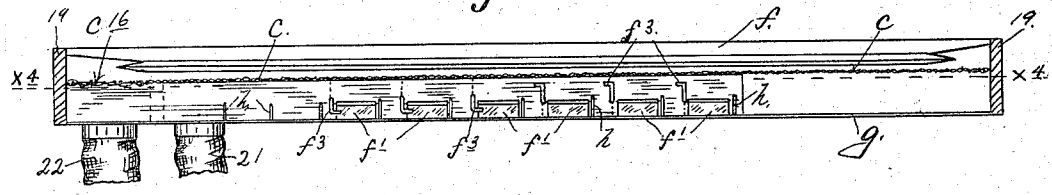


Fig. 10.

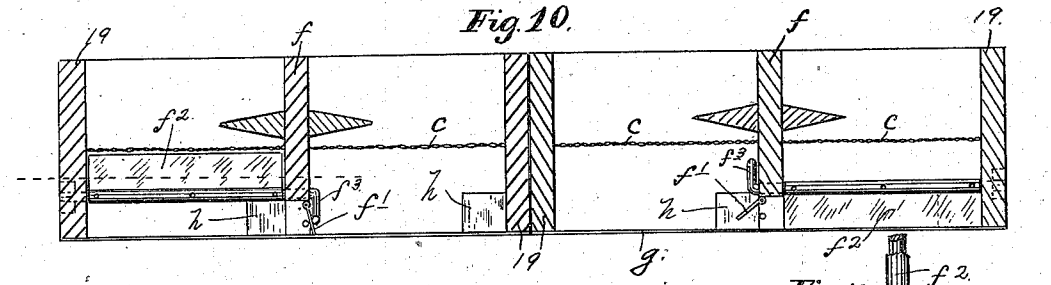


Fig 11.

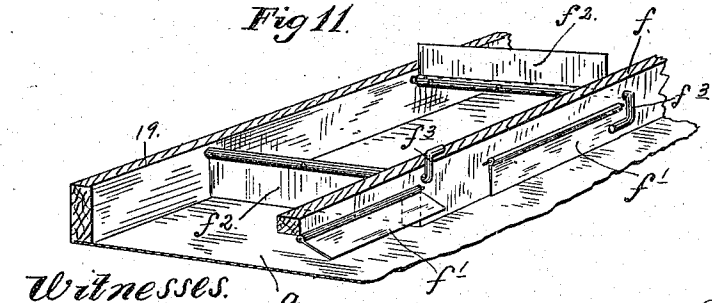
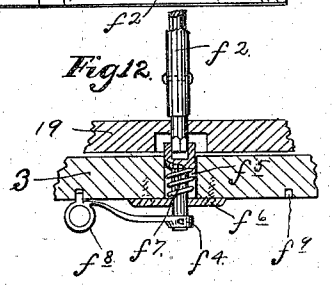


Fig 12.



Witnesses.
C. F. Kilgore
R. D. Merchant,

Inventor
Emil R. Draver,
By his Attorney.
Jas. F. Williamson.

UNITED STATES PATENT OFFICE.

EMIL R. DRAVER, OF ALLIANCE, NEBRASKA.

SIFTER OR CHOP-GRADER.

SPECIFICATION forming part of Letters Patent No. 562,592, dated June 23, 1896.

Application filed October 7, 1895. Serial No. 564,869. (No model.)

To all whom it may concern:

Be it known that I, EMIL R. DRAVER, a citizen of the United States, residing at Alliance, in the county of Boxbutte and State of Nebraska, have invented certain new and useful Improvements in Sifters or Chop-Graders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention, generally stated, relates to sifters or separators for effecting the various separations required in the manipulation of mill-stock; but, more specifically stated, relates especially to that class of sifters or chop-graders wherein the stock is made to travel, in various desired directions, over a substantially plane surface, by a proper arrangement of partitions or channel-walls and propelling-surfaces, under a gyrating or other proper motion on the machine.

A type of the said class of machines is shown in my prior United States patent, No. 536,781, issued to me of date April 2, 1895.

The machine herein shown and described discloses some of the features of construction set forth and claimed in my said prior patent.

My present invention is directed to two features of improvement.

One feature is directed to an improvement in the propelling-surfaces, with a view of more quickly relieving the bolting-cloth, or sifting-surface, from the impure stock or tailings, so as to render a larger area of the bolting-cloth more quickly effective on the pure stock, and thereby greatly increase the capacity of the sieve.

The other feature of my invention is directed to an improvement in the general construction of the machine, whereby the collecting-channel for the flour and the collecting-channel for the cuts may be increased or decreased, relative to each other, at will, for varying, at will, the point of cut-off on the cloth which marks the separation of the sifted material into the said two classes of flour and cuts, respectively, according to the character and condition of the stock.

To the ends above stated, my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The said invention is illustrated in the accompanying drawings, wherein, like letters referring to like parts throughout the several views—

Figure 1 is a perspective view showing a working machine in operative position with some parts broken away. Fig. 2 is a plan view of the sieve-box with some parts broken away. Fig. 3 is a view of a pair of sieves detached from the sieve-box, one of the said sieves being shown in plan and the other in horizontal section on the line x' x' of Fig. 4. Fig. 4 is a vertical longitudinal section on the line x^2 x^2 of Figs. 3 and 5, looking from the left toward the right with respect to Fig. 5. Fig. 5 is a vertical cross-section on the line x^3 x^3 of Figs. 3 and 4, looking from the right toward the left with respect to said views or toward the front of the machine. Fig. 6 is a detail in perspective, showing the device for operating the variable cut-off. Fig. 7 is a detail in perspective, showing the crank-handle for operating the star-wheel shaft shown in Fig. 6. Figs. 8 to 12 illustrate a modification in the construction of the variable cut-off devices. Said Fig. 8 is a view showing a pair of detached sieves in horizontal section on the line x^4 x^4 of Fig. 9. Fig. 9 is a longitudinal section on the line x^5 x^5 of Fig. 8, looking from the front toward the rear. Fig. 10 is a vertical cross-section on the irregular line x^6 x^6 of Fig. 8, looking from the right toward the left. Fig. 11 is a detail in perspective for showing the action and the controlling devices for the cut-off gates. Fig. 12 is a detail in section, showing a part of one of said controlling devices.

Having regard, first, to Fig. 1, the numeral 1 represents the floor, and 2 represents the ceiling or overhead structure of a room in a mill or other building.

The numeral 3 represents the sieve-box, shown as of the form generally used in the class of sifters and chop-graders which are subjected to a gyrating motion. In practice said sieve-boxes are usually equipped with a series of sieves and imperforate collecting-surfaces, one above the other, at different levels. The said box 3 is suspended by hang-

ers 4 from overhead timbers 5, secured to the ceiling 2 or other support. The said hangers 4 connect to the timbers 5 and to the box 3 by ball-and-socket or other universal joints 6, so as to permit the gyrating motion. A crank-pin 7 on the crank-disk 8 connects with the box 3 in any suitable way. The crank-disk 8 is fixed to the top of the vertical shaft or spindle 9, which is seated in the bearing-pedestal 10, fixed to the floor 1. The shaft 9 is provided with pulley 11, which is connected, as shown, by cross-belt 12 with a pulley 13 on the line-shaft 14, one bearing for which is shown at 15.

With the mountings and driving connections above described it is obvious that the sieve-box 3 will receive a gyrating motion substantially in the horizontal plane. Rods 16, depending from the overhead structure, support the main feed-spout 17 with branches 17^a, which connect with the sieve-box 3, by flexible feed-bags 18, at the proper points for the supply of the chop or untreated stock to the sieves 19.

The numeral 20 represents the flour-delivery bags. 21 represents the cuts-delivery bags, and 22 represents the tailings-delivery bags. The inlets or mouths of the said delivery-bags, wherever shown in the other views, are marked with the same numbers as the bags themselves. The said several delivery-bags 20, 21, and 22 connect with suitable chutes for directing the material wherever desired. The said chutes are not shown, but the upper ends of the same are assumed to be inclosed by the casing 23. (Shown in Fig. 1.)

Directing attention now to the construction of the sieves 19, the same will be best understood from an inspection of Figs. 2 to 7, inclusive. A pair of companion sieves 19 stand abreast or in a common plane within the sieve-box 3, and are supported thereon in any suitable way. The bolting-cloth or sifting-surface c is supported in the skeleton frame 19 at the proper level in the customary way. Supported by the sieve-frame 19, below the bolting-cloth c, is an imperforate collecting-surface c', of canvas or other suitable material. In the form shown in the main views the collecting-surface c' is set on an incline sidewise, as best shown in Fig. 5. The walls of the sieve-frame 19 are of the proper construction to so support said collecting-surface c'.

A longitudinal vertical partition c^2, supported from the end walls of the sieve-frame, divides the sieve-frame 19, both above and below the bolting-cloth c, into longitudinal compartments or channels. The two upper channels, above the bolting-cloth c, communicate, at their opposite ends, through passages in the partition c^2, as shown at c^3 and c^4, respectively, for purposes which will presently appear. The said partitions c^2, below the bolting-cloth c, are cut away, as shown at c^5 and c^6, respectively, in Fig. 4. A sliding partition-section c^7 c^8 is applied to the fixed part of the partition c^2 below the cloth c, as shown in Figs. 3, 4, and 5, to control the passage c^5 through the partition c^2, and operate as a cut-off for increasing or decreasing the flour and cuts collecting channels on the surface c' in respect to each other.

The longitudinal section c^7 of the cut-off c^7 c^8 is provided with pins c^9, adapted to be engaged by the teeth of a star-wheel c^{10}, on the inner end of a hand-shaft c^{11}, journaled in the sieve-frame 19 and the partition c^2 below the bolting-cloth. The hand-shaft c^{11} extends to the exterior surface of the outside wall of sieve, and is of angular form in cross-section, for the application of the crank-handle wrench c^{12} thereto, through holes c^{13}, provided for that purpose in the sieve-box 3. Angle-iron keepers c^{14} prevent the lateral displacement of the cut-off c^7 c^8. By the said parts c^9 to c^{12}, inclusive, it is obvious that the cut-off device c^7 c^8 may be moved in either direction, lengthwise of the collecting-surface c', and be thereby made either to extend or to close the passage c^6 in the partition c^2 below the cloth c. By noting the location of supply or feed inlets 18 to the channels above the cloth c, and the location of the respective outlets 20, 21, and 22 for the flour, the cuts, and the tailings, respectively, as best shown in Figs. 1 and 3, it will be obvious that the cut-off c^7 c^8 will operate to increase or decrease the flour-channel part or the cuts-channel part of the collecting-surface c' below the bolting-cloth c. Hence, by moving the said cut-off one way or the other, the point of cut-off on the bolting-cloth may be varied at will, so as to throw more or less of the stock, sifted through the cloth c, into the flour-channel, or into the cuts-channel, at will. This is a great convenience, because the amount of sifted stock suitable for flour will vary, according to the character and the condition of the chop, the motion or condition of the sieve, &c. Hence, for the greatest efficiency of the sieve, some kind of variable cut-off must be provided for throwing more or less of the pure sifted stock into flour or into cuts, as may be desired.

A modified form of cut-off device is shown in Figs. 8 to 12, which will be described later on.

Directing attention now to the devices for propelling the stock over the cloth or sifting-surface c, it has already been noted that by the partition c^2 the sifting-surface is divided into two channels, which communicate, at their opposite ends, through the passages c^3 c^4. To the said partitions c^2 are fixed shelves d, above the level of the bolting-cloth c, but below the loading-level of the sieve. The said shelves d project outward toward the centers of the channels, and are wedge-shaped in cross-section, as shown best in Fig. 5. The said shelves d are so applied to the partition c^2 that they will project from the said partition into all of the channels through which the stock passes in traveling around the said partition. The said shelves d are preferably

provided with transverse corrugations or raised propelling-surfaces d' on their upper surfaces, which are shown of angular form of unequal slope, with their steepest surface facing in the direction of the stock's travel. With the said shelves d applied to the said partition c^2, as shown, and with the crank-disk 8, turning in the direction shown by the arrow thereon in Fig. 1, the stock will travel in the direction shown by the arrows in Fig. 3, under the gyrating motion on the sieve.

The position of the feed-bag or inlet 18 marks the head, and the position of the tailings bag or outlet 22 marks the foot of the channel on the sifting-surface c, through which channel the stock, or more or less of the same, travels under the gyrating motion on the sieve. The cloth or sifting-surface c is, of course, made of coarser mesh toward the tailings-delivery end of the same, or throughout that portion of the channel on the cloth c which overlies that part of the collecting-surface c' leading to the cuts-outlet 21. The tailings-outlet 22 is separated from the flour-channel by the partition c^2 and from the end of the cuts-channel by a vertical cross-partition c^{15}. At a point directly over the tailings-outlet 22 the sifting-surface c is composed of a screen-section c^{16}, of sufficiently coarse mesh to pass all of the tailings, but to hold the locust-seeds, peas, beans, grain, or other material which is used for keeping clean the bolting-cloth c.

Operation: Having regard now to the operation, let it be assumed that the sieve is in motion and supplied with chop or untreated stock. Then, under the gyrating motion on the sieve, with the crank turning in the direction shown by the arrow in Fig. 1, and the said shelves d located on the particular channel-wall formed by the partition c^2, as shown in Figs. 2 to 5, the stock will travel in the direction shown by the arrows in Fig. 3, and, throughout its travel, will be subjected to the sifting action of the bolting-cloth or surface c. The pure stock of proper fineness, such as the flour and the cuts, will thereby be successively sifted through the bolting-cloth and be collected by the proper portions of the underlying imperforate surface c' and directed to the proper outlets 20 and 21, provided for the flour and cuts, respectively, while the bran, coarse stock, &c., will be carried forward to the coarse screen-section c^{16} and be delivered therethrough into the tailings-outlet 22. The locust-seeds, grain, or other cleaning materials will pass onward, over the screen-section c^{16} and through the passage c^4, into the receiving end of the channel and continue to travel, in an endless circuit, over the sifting-cloth or surface c.

In the above-noted action of the collecting-surface c' the sifted stock received thereon is propelled lengthwise thereof, through the proper channels, for the flour and the cuts, respectively, in virtue of being set on an incline, so as to make the imperforate surface itself act to propel the material, as fully disclosed in my prior patent hereinbefore identified.

The action of the cut-off device c^7 c^8 has already been fully stated.

The above statement gives the general action of the machine.

Having regard now to the special action peculiar to my improvement in the propelling-surfaces, or as resulting from the shelves d, let it be assumed that the sieves were supplied with sufficient chop or untreated stock to load the same to a point above the level of the shelves d. Let it also be assumed that the stock has been subject to the motion of the sieve for sufficient time to permit the finer and heavier particles or purer stock to have collected, by gravity, into a lower strata on the face of the bolting-cloth, and the lighter, coarser, and less pure stock to have collected into an upper strata at and near the top of the whole body of stock. The said lower strata may, for further distinction, be assumed to be sufficiently fine to be siftable through the given bolting-cloth, if given a chance, and the said upper strata may be assumed to be so coarse or light, or both, as to be non-siftable or tailings stock for the given cloth. Hence, the quicker the tailings or non-siftable stock is disposed of the quicker the pure or siftable stock can be brought into contact with the cloth and be sifted. This is just exactly the result obtained by my shelf d, in coöperation with the channel-walls of the sieve.

As near as I can make out the action is as follows: Under the gyrating motion on the sieve-box the said shelf d will tend to horizontally split apart the upper and the lower stratas of the stock, and will, I know, as a matter of fact, propel the upper strata at a much more rapid rate than the lower strata. As the shelf swings outward into the body of the stock in the channels b the upper strata will tend to pile up or get on top of the shelf d, on account of inertia, while the under strata will tend to crowd or wedge into the space between the shelf and the top of the cloth. At the limit of the outward throw of the shelf d it will tend to throw the stock above the same upward and forward in the line of travel, while the under surface of the shelf will tend to throw the stock below the same downward and forward against the face of the cloth. This retards the lower strata and accelerates the upper strata. The wedge shape of the shelf heightens the action, inasmuch as it affords a more ready clearance from the stock both above and below the shelf at the backward or releasing throw of the shelf, but produces a greater wedging action from the under surface of the shelf on the stock between the shelf and the cloth at the outward throw. Otherwise stated, the wedge shape enables the shelf d to increase the resistance on the lower strata and increase the acceleration on the upper strata, while at the same time af-

fording sufficient increased clearance or ease of release of the stock between the shelf and the cloth to avoid clogging. Hence, under this peculiar action, both stratas may, possibly and probably, move faster than they otherwise would; but the upper strata moves much more rapidly than the lower. The under strata is made to hug the cloth, and the upper strata is given the utmost freedom to advance under the propelling action of the shelf. The shelf not only thus tends to propel the upper strata more rapidly than the lower, but also tends to prevent the upper strata from becoming remixed with the lower strata of the stock. Hence, the general effect is to separate the impure from the pure stock and advance or propel the upper strata or impure stock much more rapidly than the lower strata or pure stock. The impure stock is therefore more rapidly eliminated and carried off as tailings, while the pure stock, being thus unimpeded and comparatively uninterfered with by the impure stock, more rapidly collects onto the cloth or sifting-surface and becomes more rapidly and thoroughly subjected to the sifting action. Hence, the efficiency of the bolting-cloth or other sifting-surface is greatly increased; or, in other words, any given area or amount of sifting-surface will do much more work in any given time. The above statement as to the action will apply whether or not the shelf is provided with the corrugations or ribs d' on its face; but the addition of the said corrugations or ribs d' heightens or increases the propelling action, especially on the upper strata or impure stock.

By actual usage I have demonstrated the efficiency of the improvement in propelling-surfaces above described, and I know that the general effect is to propel the top strata or impure stock much more rapidly than the lower strata or so-called "pure" stock, and that the capacity of the sieve is greatly increased. I do not, however, undertake positively to say that the exact philosophy of the peculiar action has been stated with absolute precision or correctness. When in motion, the general effect can be readily seen; but the exact action of the shelf on the particles of the stock within the channels, whereby that effect is reached, cannot well be seen by the eye. I believe, however, that the explanation herein given is substantially correct.

The proper height of the shelf d, above the cloth a^4, for any given desired load, or depth of stock, on the sieve, and the proper lateral extension of the said shelf, toward the center of the channel, must all be determined by experiment, with respect to any given channel. I have found, however, that good results can be secured with a shelf of from one and three-quarters to two inches in lateral extent, and height of from one-half to three-quarters of an inch above the level of the cloth.

The shelf has been shown as coöperating with a horizontal cloth or sifting-surface, and as occupying a horizontal position; but its angle to the cloth may probably be varied to a considerable extent. Such a shelf can also be made to coöperate with a cloth or sifting-surface, which is set on an incline, as shown in my prior patent, No. 536,781, hereinbefore noted, provided it be set to project from the proper wall of the channel or sieve. The said shelves d may be disposed in a great many different ways, relative to the channel-walls, for the proper coöperation with said walls, under the gyrating or other proper motion on the sieve, to propel the stock in any desired direction. The shelf may itself vary in construction.

Modification in cut-off devices.—In the modification shown in Figs. 8 to 12, inclusive, the central partitions f of the sieve-frames are provided, below the bolting-cloth, with a series of pivoted doors f', opening from the cuts-channel into the flour-channel of the imperforate collecting-surface g, and a corresponding series of coöperating transverse pivoted partitions or dampers f^2, with crank-arms f^3, which arms operate, when the damper is up, to lock the coöperating doors f' in their closed position, as best shown in Figs. 10 and 11. When the damper f^2 is down, so as to operate as a transverse partition in the cuts-channel, the crank-arm f^3 will be up, away from the coöperating door f', and the door f' will then be free to open, under the motion on the sieve, as shown in Fig. 11, thereby affording a passage from the cuts-channel into the flour-channel. The damper-shafts extend through the outside wall of the sieve-frame, as shown in Figs. 8, 10, and 12, and are of angular form in cross-section at their outer ends. A corresponding series of wrench-action cranks f^4 work through holes f^5 in the sieve-box 3, and are held in engagement with the damper-shafts by means of keeper-plates f^6 and springs f^7, applied to the sieve-box 3, as shown best in Fig. 12. The lever-arm of the crank-wrench f^4 is in the form of a spring-latch f^8, which may be made to engage with either of a pair of notches f^9, on opposite sides of the damper-shaft axis, to hold the damper either in its closed or open position.

With the construction above described it is obvious that more or less of the dampers f^2 may be closed or opened from the head toward the delivery end of the cuts-channel, and that thereby the coöperating doors f' in the partition or channel wall f will either be left free to open, or be locked shut. Hence, more or less of the collecting-surface g and of the bolting-cloth or sifting-surface c may be appropriated to flour or to cuts, as may be needed, to best meet the condition of the stock, motion on the sieve, &c. The general effect is therefore the same as with the form of construction shown in the principal views. This variable cut-off, operative at will, to vary the appropriation of the collecting-sur-

face for making the cut-offs or separations come earlier or later in the travel of the stock, is a new departure in this class of machines.

The sieves, as shown in Figs. 8 to 12, have walls of equal depth; or, otherwise stated, the collecting-surface *g* is horizontal. The stock is made to travel in the proper direction, through the said collecting-channel, by means of propelling-surfaces *h*, in any suitable form applied to the proper channel-walls, in any proper way, with due regard to the motion on the sieve.

In respect to both features of the invention herein disclosed, it will be understood, of course, that many changes or modifications in the details of the construction might be made without departing from the spirit of my invention.

It must also be understood that a gyrating motion on the sieve is not absolutely essential. An oblique or shaking motion, at an angle to the line-guides, will answer the purpose. The gyrating motion, however, is the one generally used.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a sieve mounted to swing in substantially a horizontal plane, the combination with channel-walls extending transversely of the sieve's movement, of a shelf which is wedge-shaped in cross-section and projects laterally inward from one of said walls, above the sifting-surface, with its main dimension also extending transversely of the sieve's movement, whereby, under the motion of said sieve, said shelf will be moved laterally against the stock to split and to propel the strata of the same at different rates of speed, substantially as described.

2. In a sieve, mounted to swing substantially in a horizontal plane, the combination with the sieve-walls, bolting-cloth and collecting-surface, of an upper partition dividing the cloth into parallel communicating channels, through which the stock travels over the surface of the cloth, an under partition dividing the collecting-surface into parallel collecting-channels, for different separations, as one for flour and the other for cuts, and a cut-off device operative on said under partition, to vary the division or relative appropriation made thereby, of said collecting-surface, for appropriating more thereof to any given separation, as more to flour and less to cuts, or vice versa, substantially as described.

3. In a sieve, mounted to swing substantially in a horizontal plane, the combination with the sieve-wall, bolting-cloth and collecting-surface, of the upper partition dividing the cloth into two parallel communicating channels, the under partition dividing the collecting-surface into two parallel collecting-channels, one for flour and the other for cuts, one or more passages in said under partition, and one or more cut-off devices, arranged to open or close more or less of said passage or passages in said partition and stop the entrance, to the cuts-channel, from the collecting-surface, substantially as and for the purpose set forth.

4. The combination with the sieve 19, having the central partition c^2 extending above and below the cloth, as described, and provided with the passage c^3 through its under portion, the supply-inlet 18 and the delivery-outlets 20, 21 and 22, arranged relative to each other and the said partitions, as described, the cut-off device c^7 c^8, movable lengthwise of the collecting-surface, and means for controlling or operating said cut-off device from the exterior of the sieve and the sieve-box, substantially as and for the purpose set forth.

5. The combination with the sieve 19, having the partition c^2 extending above and below, the bolting-cloth and provided, in its underneath portion, with the passage c^6, of the feed-inlet 18 and the outlets 20, 21 and 22, arranged relative to each other and said partition, as described, the cut-off device c^7 c^8, applied, as described, the pins c^9 on the cut-off section c^7, the star-wheel and shaft, and the crank-handle wrench, all arranged and operating substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EMIL R. DRAVER.

Witnesses:
JAS. F. WILLIAMSON,
E. F. ELMORE.