

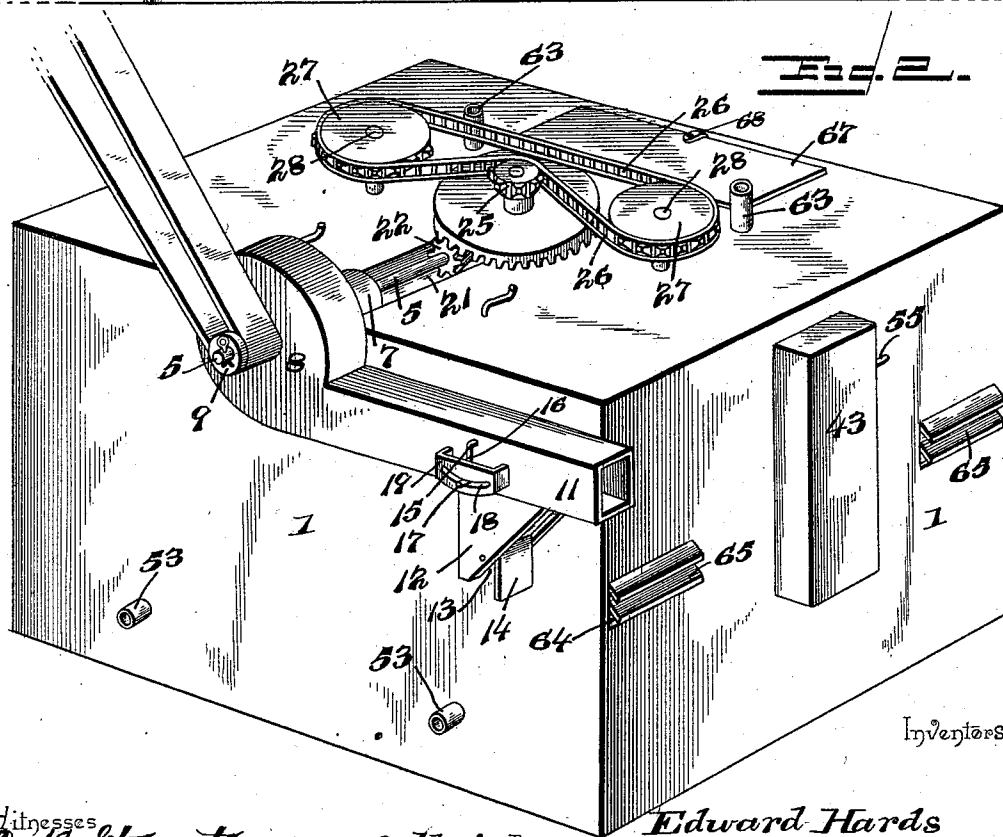
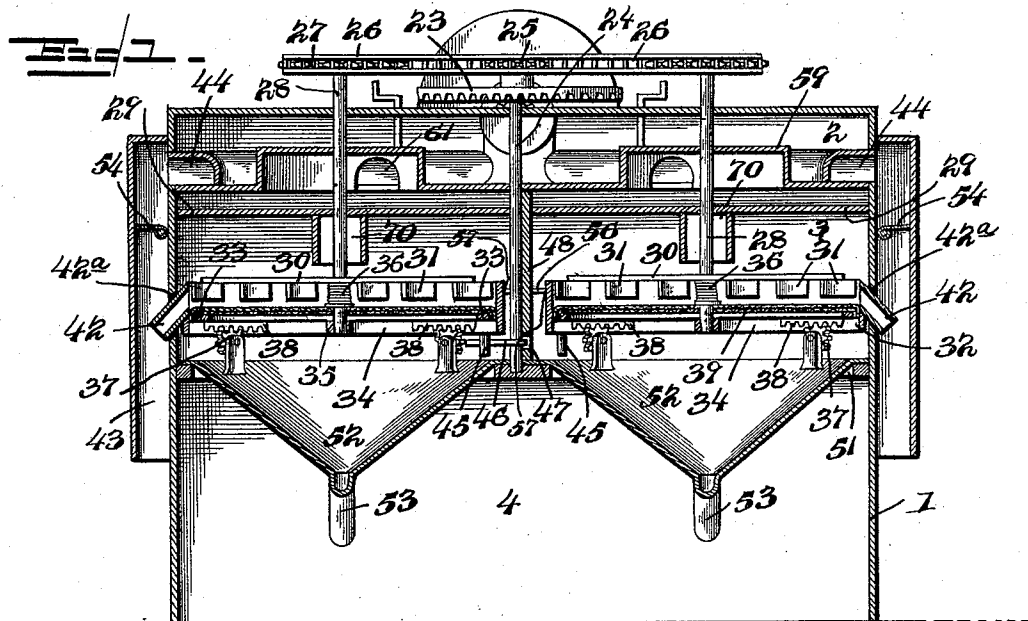
(No Model.)

3 Sheets—Sheet 1.

E. HARDS & W. A. WOODARD.
COMBINED PURIFIER AND SEPARATOR.

No. 529,788.

Patented Nov. 27, 1894.



Inventors

Witnesses
E. H. Stewart
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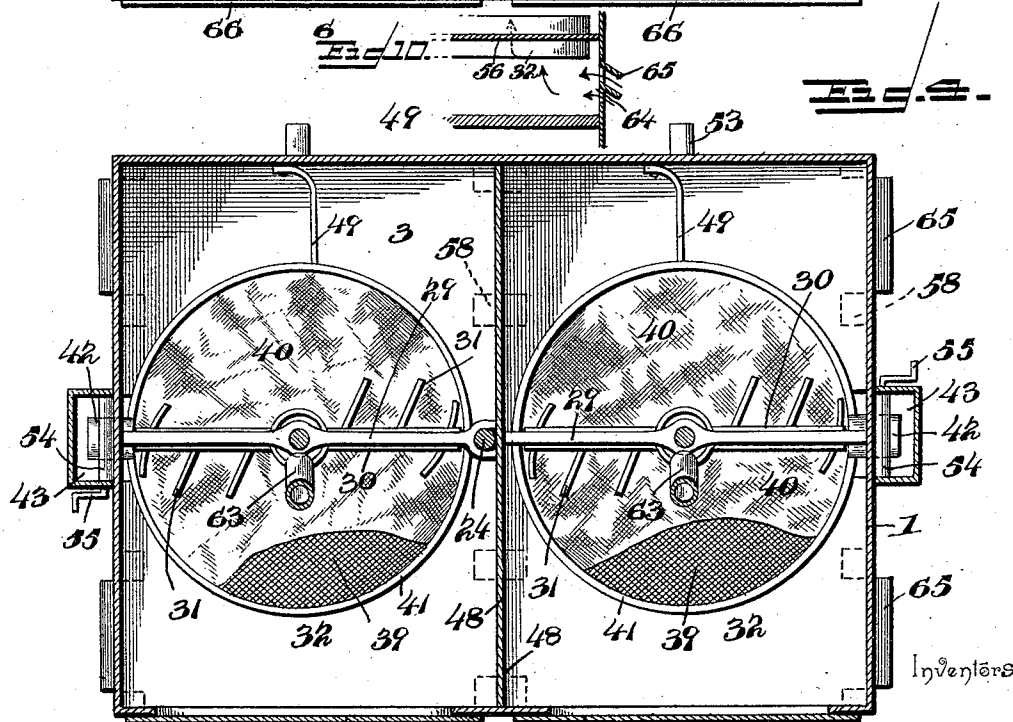
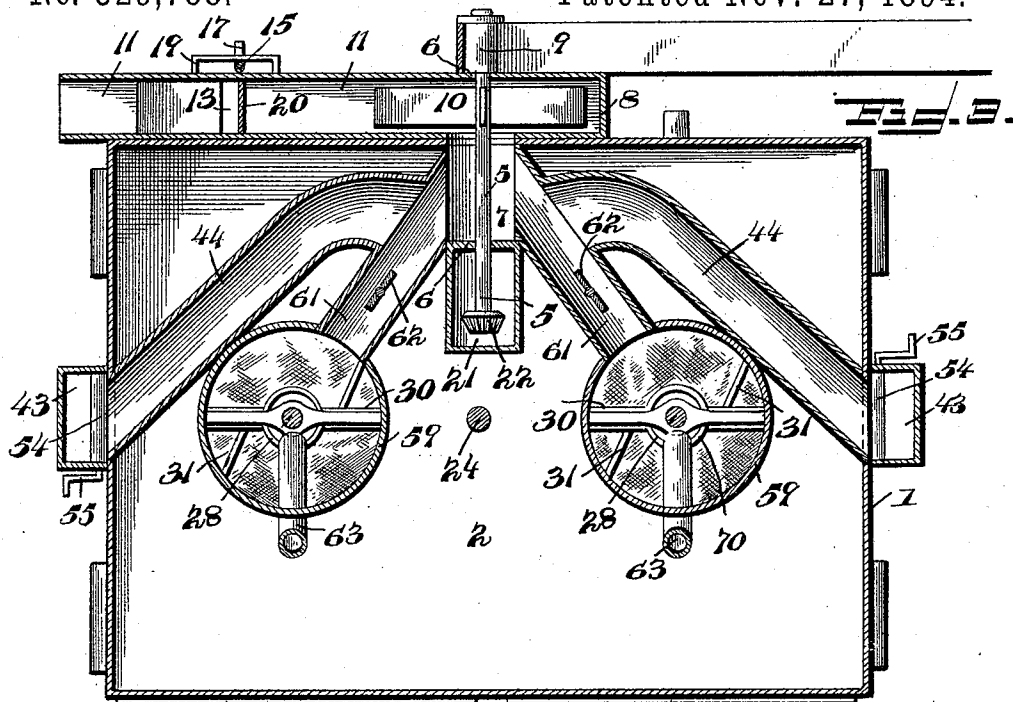
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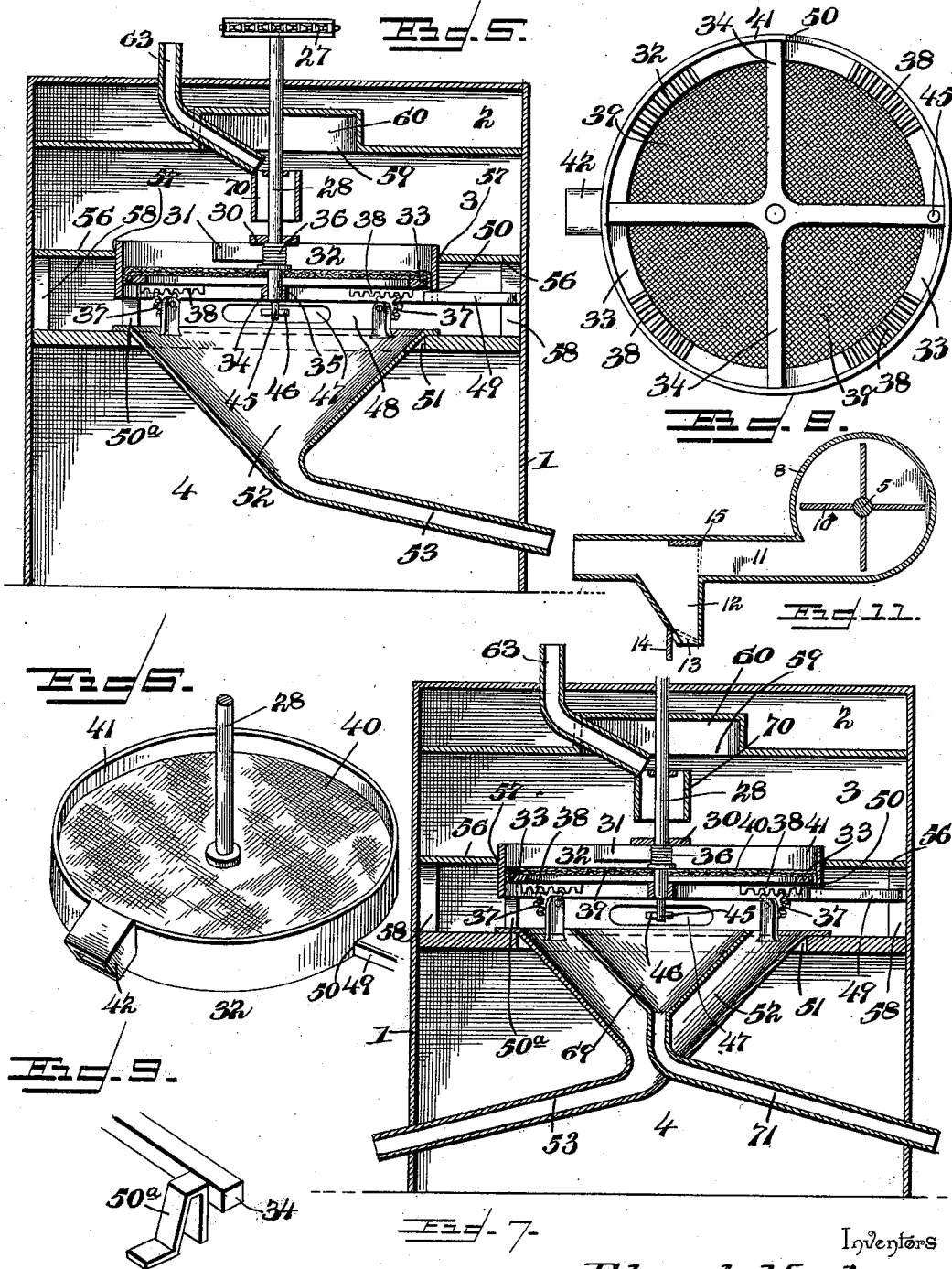
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UNITED STATES PATENT OFFICE.

EDWARD HARDS AND WILLIAM A. WOODARD, OF SUPERIOR, NEBRASKA,
ASSIGNORS OF ONE-THIRD TO WILLIAM P. BATES, OF SAME PLACE.

COMBINED PURIFIER AND SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 529,788, dated November 27, 1894.

Application filed April 12, 1894. Serial No. 507,284. (No model.)

To all whom it may concern:

Be it known that we, EDWARD HARDS and WILLIAM A. WOODARD, citizens of the United States, residing at Superior, in the county of Nuckolls and State of Nebraska, have invented a new and useful Combined Purifier and Separator, of which the following is a specification.

Our invention has specific relation to those middlings purifiers which operate by a blast of air forced through a sieve containing the matter treated and carrying away with it the lighter portion thereof; and the invention lies in certain improved features of construction and combination and arrangement of parts, which will be more fully described hereinafter and finally embodied in the claims.

In the accompanying drawings: Figure 1 represents a longitudinal section of a machine constructed after our invention. Fig. 2 represents a perspective view of the same; Fig. 3, a horizontal section taken through the air-ducts; Fig. 4, a horizontal section taken just below the air-ducts of the exhaust fan; Fig. 5, a cross-section taken vertically through the machine; Fig. 6, a detail perspective of the sieve frame; Fig. 7, a sectional view of a modification; Fig. 8, a plan view of the sieve frame; Fig. 9, a detail perspective, showing the devices for limiting the movements of the sieve frame. Fig. 10 is a sectional view illustrating the arrangement of the air-inlet openings; Fig. 11, a detail section of one of the air-tubes.

The reference numeral 1 indicates the casing or framework of our machine, which is constructed, preferably, of wood and with three vertically-aligned compartments, 2, 3, and 4. These compartments are designed for the reception of the several parts of our machine, and occupy the entire space within the frame 1.

5 indicates the main or primary moving shaft of the machine, and this is journaled in the boxes 6, of the air-duct 7, and of the fan box 8. The shaft 5 is provided with the pulley 9, whereby movement is imparted to it, and with the exhaust fan 10, which operates in the box 8, fixed to the side of the machine.

The box 8 communicates, at its inlet opening, with the duct 7, which enters the box at

or about its center, and at its outlet opening with the pipe 11. The pipe 11 enters box 8 at its lower extremity and proceeds along the side of the casing to a point slightly beyond one end, where it communicates with the atmosphere. Midway between the ends of the pipe 11 the downwardly-extending and triangularly-shaped nozzle 12 is located, and this is provided with an open lower end 13, through which the contents of the nozzle are emitted, subject to the swinging plate 14. Located in the upper portion of the pipe 11, and directly over the nozzle 12, is the shaft 15, which extends beyond the pipe and is formed with the downwardly-extending crank-arm 16, the wrist-pin 17 of which proceeds laterally and through the segmental slot 18, on the guide-plate 19, affixed to the upper end of the nozzle 12.

Secured to the shaft 15, within the pipe 11, is the valve-plate 20, which is adapted to swing with the shaft so as to lie parallel with the upper side of the pipe 11, or diagonally therein, whereby the matter passing out pipe 11 will be allowed free passage or deflected down the nozzle 12, according to the will of the operators. Shaft 5 has its inner end arranged in the semicircular depression 21, of the top of the casing 1, and is provided at such end with the beveled gear 22, which meshes with the corresponding gear 23, fixed in its turn to the vertical shaft 24. This latter shaft is journaled in the three horizontal partitions comprising the several compartments 2, 3, and 4, and extends to the lowest of the same, as may be seen by reference to the drawings. The upper end of the shaft 24 is extended above the gear 23, and provided with the sprocket-wheel 25, by which the sprocket-chain 26 passes, engaging said wheel in its passage. From the wheel 25 the chain 26 passes to the sprocket-wheels 27, fixed to the vertical shafts 28.

The shafts 28 are two in number and are mounted in the several partitions above the top of compartment 4, and extend down to a point very near such top. The cross-bars 29 are also provided, in which the shafts 28 are journaled, whereby they are made to retain their rigidity and place.

Fixed to the lower ends of the shafts 28,

are the bars 30, which are secured thereto at their middles, and which extend horizontally, one in each end of the compartment 3. These arms are each provided with the diagonally-disposed agitator-blades 31, which are extended in opposite directions on the several sides of the shafts 28, and which operate to stir or agitate the middlings, as will more fully appear hereinafter.

32 indicates the sieve frames of our invention, and these are one for each shaft 28, and consist of the circular rims 33, connected to the radial arms 34. Formed at the juncture of the arms 34 is the axial opening 35, through which the lower ends of the shafts 28 are respectively passed, and by which the sieve frames 32 are mounted so as to be capable of a rotary movement on the shafts. Interposed between the arms 34 and the bars 30, of each shaft 28, are the spiral springs 36, and these are one for each shaft and serve to give the frames 32 a tendency downward and upon the toothed carrying-wheels 37. The rim 33 of each sieve frame is formed with the short sections of cogs or gearing 38 on their under side, and these are one for each of the wheels 37 and adapted to mesh therewith, the wheels being similarly cogged to complete the connection.

Arranged over the rims 33 is the metallic sieve 39, which is secured to the rims and which co-operates with the cloth or gauze sheet 40, and this is arranged over the rims 33 and is clamped between the peripheries thereof and the circular band 41, whereby it is held in place. The band 41 is secured to the rims 33, at its lower edge, and projects some distance above the same, or to about the level of the bars 30, thus forming a circular receptacle or vessel having the sieve 39 and cloth 40 for a bottom and the band 41 for its sides. These receptacles are adapted to contain the matter to be separated, and are each provided with the spouts or nozzles 42, which are formed on the outer periphery of the band 41, and which are adapted to fit into the horizontally-elongated slots 42^a of each end of the casing 1.

The slots 42^a are horizontally elongated to permit the oscillations of the frame 32, as will be better described hereinafter, and communicate with the vertical passages 43, of each end of the casing. The passages 43 are two in number, one for each sieve frame, and are formed with their lower ends open, while their upper ends communicate with the horizontally-extending ducts 44. Ducts 44 are arranged on the floor of compartment 2, and proceed diagonally and toward each other, to the common or central duct 7, with which they communicate, and, owing to such communication, the passages 43 are attended by an upward current of air during the operations of the machine. The passages or ducts 43 are each provided, at a point between the ducts 44 and the slots 42, with the valve-plates 54, secured to spindles 55. By these

means the upper part of the passages 43 and the ducts 44 may be disconnected from the lower part of the passages, to attain a result which will be described hereinafter.

Secured to, or formed integral with, the adjacent peripheries of the rims 33 are the downwardly-extending studs 45, which are both within the stroke of the arm 46, fixed to the lower end of the shaft 24, and operating in the opening 47 of the partition 48, located in compartment 3. Thus, as the shaft 24 revolves, studs 45 are alternately engaged and the sieve frames 32 made to perform a fragmentary or partial revolution, continuing during the engagement of the arm and stud.

49 indicates two spring-arms which are secured to the interior of the casing 1 and which project inwardly to the bands 41. These arms are one for each sieve frame, and have a connection therewith by means of the shouldered notches 50 in the bands 41, and the arms 49 are so disposed that the movements of the frames 32, under the influence of the arm 46, will be against the tendency of the arms 49, whereby, when arm 46 disengages the studs 45, the frames 32 will be returned to their normal position.

Secured to the floor of the compartment 3, and one for each of the sieve frames 32, are the upwardly-projecting studs 50^a, which are adapted to engage the outer ends of the arms 34, which are directly adjacent and by which the movements of the frames 32, under the influence of arms 49, are suppressed and limited. By this construction the sieve frames 32 are given a fragmentary or partial revolution and a quick return to a normal position, together with an abrupt stop by engagement with the studs 50^a, causing the matter contained by the frame to be violently agitated, and all for a purpose which will hereinafter appear.

Formed in the floor of the compartment 3, and on each side of the partition 48 are the circular openings 51, in which the conical hoppers 52 are placed, with their upper ends open for the reception of such matter as passes the frames 32. The hoppers 52 are one for each of the sieve frames, and have their lower ends communicating with the horizontal tubes 53, which extend laterally to one side of the casing 1, and slightly beyond, and are designed to carry off the refined grain and middlings. The carrying-wheels 37 are four for each frame 32, and mounted upon the verge of these hoppers. Arranged in the compartment 3, and on each side of the partition 48, are the plates or platforms 56, which are formed with the matching semicircular openings 57 therein. These openings are adapted for the reception of the sieve frames 32, and the platforms are arranged flush with the upper edges of the bands 41.

The platforms 56 serve to close all passages to the hoppers 52, except by way of the sieves and cloth of frames 32, and the platforms are supported by the brackets 58, secured to the

sides of the casing 1. Formed in the floor of compartment 2, and concentric with the frames 32, are the circular openings 59, which are one for each of the frames 32, and provided with the vertical and horizontal walls 60, which form substantially a dome communicating with the openings 59. Communicating with the vertical walls of the dome 60 are the air ducts 61, and these are one for each dome, and extend diagonally and inwardly to the common duct 7.

62 indicates two valves, which are one for each duct 61, and by which the ducts may be opened or closed. Arranged in the top of the casing 1, and arising a suitable distance above the same, are the feed-tubes 63, which are one for each dome 60, and which extend downwardly and longitudinally to their respective domes. From here the tubes 63 proceed through the domes and down parallel with the shafts 28 to the nozzle 70, at which point they empty into the frames 32. By these means the sieve frames 32 are supplied with the matter treated.

Formed in the ends of the casing 1, and communicating with the compartment 3, are the openings 64, which are provided with the diagonal shutters 65. Through these openings the air passes, under the influence of the exhaust fan 10, on its way to the ducts 61 and 7, all of which will be more fully described hereinafter. In order that the interior parts of the machine may be inspected from time to time, and the mechanism reached for repair or otherwise, we provide the swinging doors 66 and 67. The door 67 is located in the top of the casing 1, and affords access to the compartment 2; while the doors 66 are two in number and open into compartment 3, and one on each side of partition 48. These doors may be held closed by any suitable fastening devices 68.

The use of our invention will be well understood, since its principle does not differ from other separating or purifying machines.

In using the machine the matter to be separated is introduced into the casing 1 by way of tubes 63, and the shaft 5 started to revolving. This will cause the fan 10 to create a continual draft through the openings 64 and ducts 61, and through the passages 43 and ducts 44, and finally out by way of the common duct 7 and the pipe 11. As the middlings or other matter is passed through the feed-tubes 63, it proceeds, by way of the nozzles 70, into the sieve frames 32. As the sieve frames are operated in the manner before described, the finer particles of the middlings are sifted through the sieve and cloth and down into the hopper 52, from whence they pass by way of the emitting tubes 53, in a refined state. The heavier and inferior portion of the matter fed into the frames 32 is gradually worked to the periphery of the frames and out into the passages 43. From here the heavier portions fall out the lower end while the dust, hulls, &c., are forced upwardly by the blast

and to the duct 7, by way of the ducts 44. Thus the machine separates the hulls from the middlings and other grades of meal, and the blast carries off the hulls and other useless and objectionable matter.

During the operation of the machine the ducts 61 are operating to draw off the dust and other impurities by way of the domes 60, and all of the matter drawn off by the blast is passed out the tube 11. The valve-plate 14 is provided, and arranged normally diagonally, in the nozzle 12, so that any light grain which may have been accidentally drawn up by the blast will strike it, and be deflected downwardly and out the nozzle 12, while the blast proceeds out the proper opening of the tube 11. It will be necessary in some cases to operate the valves of the ducts 61 and 44, according to the material operated upon, but since all persons acquainted in the art will readily understand the necessity for this and the time it should be done, it will not be necessary for us to describe in detail the various positions which these parts may assume.

It will be seen that the platforms 56 are arranged above the openings 64, so that air passing in from such openings will be forced to pass under the platforms and up through the sieve frames 32, thereby carrying off with it the light and objectionable portions of the matter being treated in the sieve frames.

The modification of Fig. 8 consists of an appliance whereby the middlings of the sieve frames 32 may be classified or divided into a greater number of grades. This end is attained by supplying, in place of the one hopper 52, the series of hoppers 69, which are so graduated in size that they can fit one within the other and which are each connected to a separate emitting tube 71. Thus the material upon first entering the frames 32 is placed in the center, and the finest of such material will fall through immediately into the smallest hopper 69, while the larger material, taking more force to put it through the frames, will not fall through until over the larger hopper. Thus the middlings are graduated, and, if so desired, the number of hoppers 69 may be increased according to the conditions under which the machine operates.

It will be understood that the bars 30 are revolving continuously during the operation of the machine and operate to assist in forcing the proper degree of middlings through the sieve frames. It will also be understood that while we have shown two sieve frames and attendant parts, this is not an essentiality, because they could be decreased to one or increased to any number, this being merely a question of multiplicity rather than substance.

Having described our invention, what we claim is—

1. A middlings purifier, comprising the combination of a hopper, a sieve frame arranged above the same, a platform surrounding the sieve frame and snugly engaging the

edges of the same, and an exhausting apparatus arranged above the sieve and operating to draw air from below and through the same, openings being formed in the machine-casing and below the platform, through which the air enters the machine, substantially as described.

2. A middlings purifier, comprising the combination of two sieves, a vertical shaft arranged above each of the sieves, agitator-arms on the shafts, sprocket-wheels on the upper ends of the shafts, a horizontal drive-shaft, an exhaust-fan thereon, a sprocket-wheel operated by the drive-shaft and connected with the chain of the vertical shafts and air ducts leading from the sieves to the fan, substantially as described.

3. A middlings purifier, consisting of a closed casing, a horizontally-extending floor or partition therein and formed with a circular opening therein, a hopper arranged with its upper end in said opening and with its remainder below said floor or partition, a series of carrying-wheels arranged on horizontal axes at the upper end of the hopper, a circular sieve-frame mounted on said carrying-wheels, means for imparting to the sieve-frame an oscillatory movement, a continuously-revolving shaft located above the sieve-frame and axially coincident therewith, and an arm secured to the shaft at a point directly above the sieve-frame and capable of sweeping over the upper surface thereof, substantially as described.

4. A middlings purifier, comprising the combination with an enveloping casing, of a hopper arranged therein, a sieve-frame arranged above the hopper and adapted to primarily receive the matter to be treated and to discharge the finer particles thereof into the hopper, the frame being adapted to have an oscillatory movement on its mountings, a chute on the periphery of the sieve-frame and

projecting into a horizontally-elongated slot in the machine casing, a passage or duct on the exterior of the casing, and communicating with the slot therein and adapted to receive the matter discharged by the chute, a second duct communicating with the upper end of the first and extending horizontally across the top of the casing, and an air-exhausting apparatus for creating a draft in the passage or duct and in direct communication with the horizontally-extending or second duct whereby the lighter portions of its contents are separated from the heavier, substantially as described.

5. A middlings purifier comprising the combination of an enveloping casing, a horizontal floor or partition extending across the interior of the same and formed with two circular openings therein, two hoppers arranged with their respective upper ends in each opening, a vertically-extending driven shaft axially coincident with each hopper, an oscillatory sieve-frame mounted on each shaft and directly above the upper ends of the hoppers, an agitator-arm on each shaft whereby the contents of the sieve-frame are agitated, a vertical shaft arranged between the two sieve-frames and adapted to be revolved continuously, an arm fixed to the shaft and capable of revolving with the shaft so as to alternately engage each sieve-frame and so as to impart thereto a fragmentary or partial revolution, and a spring on each sieve-frame whereby they are returned to their respective normal positions, substantially as described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

EDWARD HARDS.

WILLIAM A. WOODARD.

Witnesses:

CHAS. GLEMBITZ,

JOSEPH H. COCHRANE.