

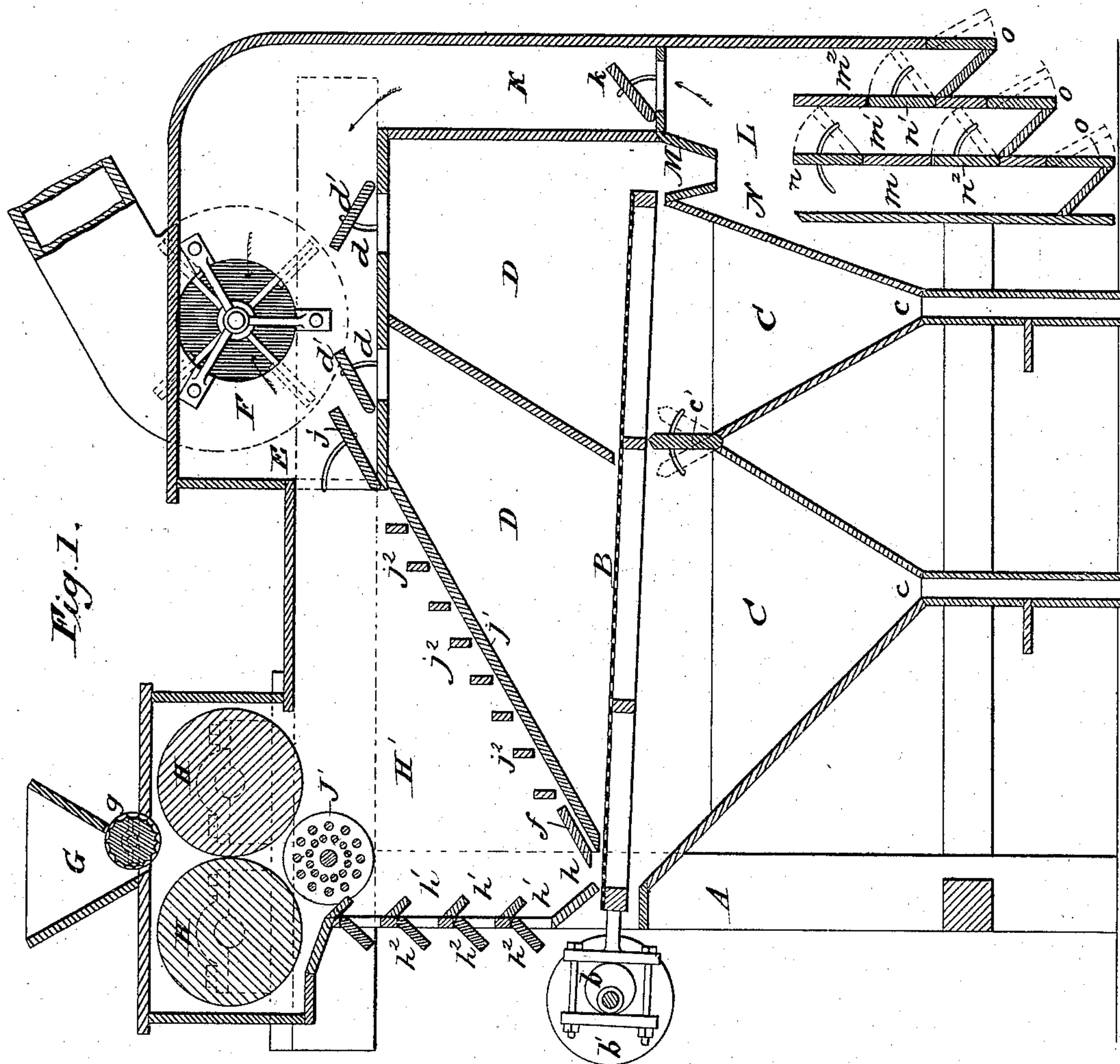
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3 Sheets—Sheet 1.

J. R. DAVIS, Jr.
CHOP GRADER AND PURIFIER.

No. 372,015.

Patented Oct. 25, 1887.



Attest.

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(No Model.)

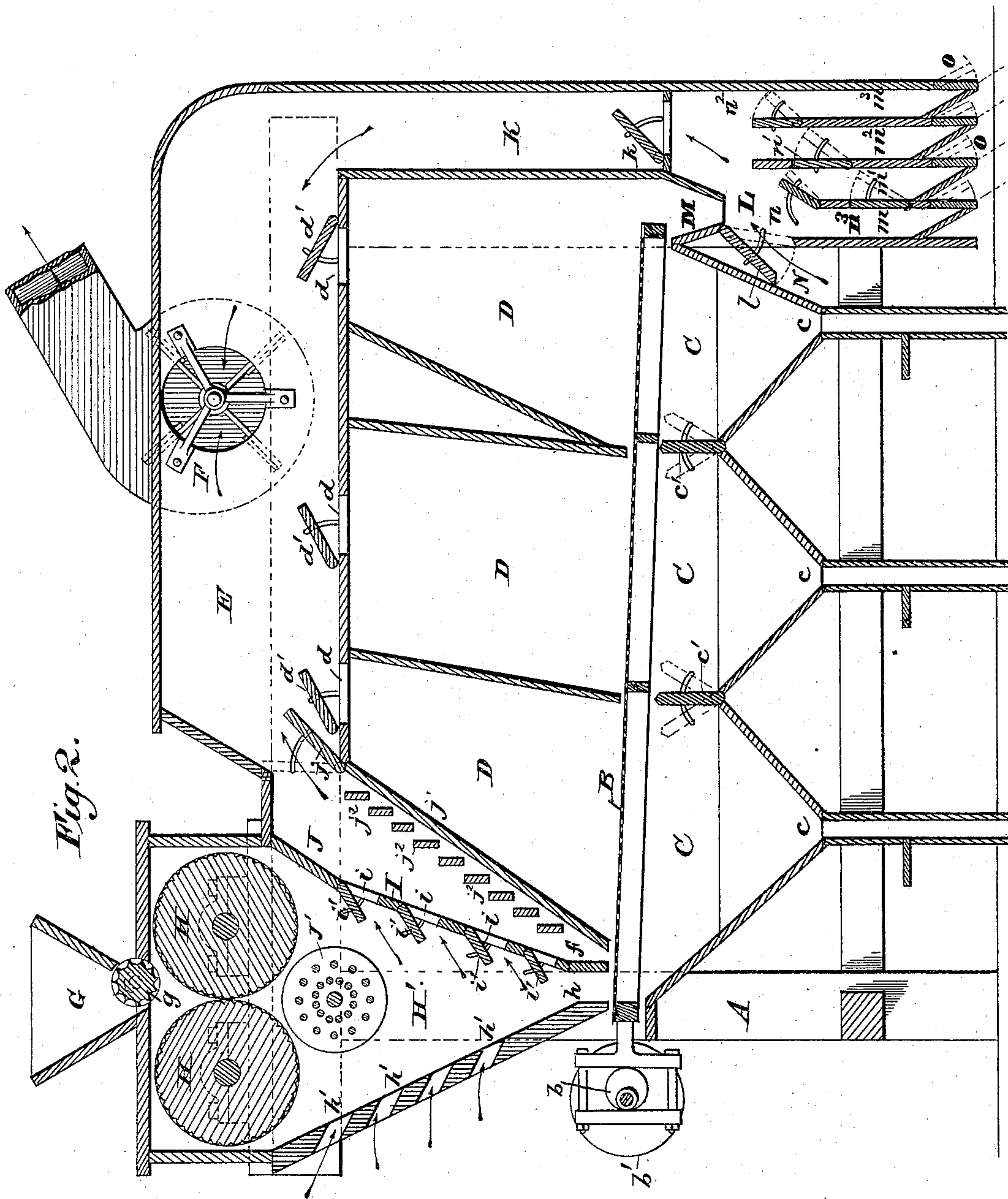
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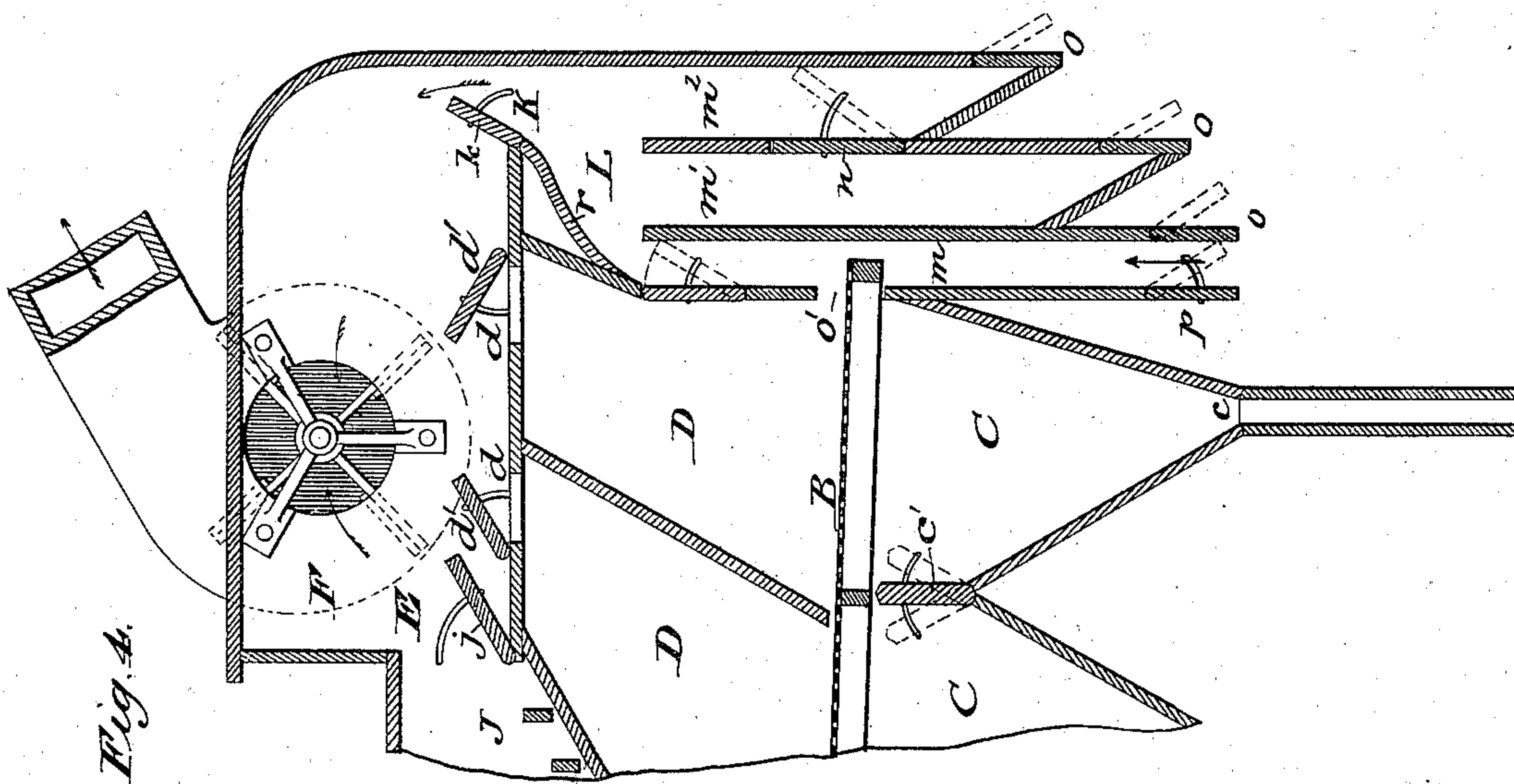
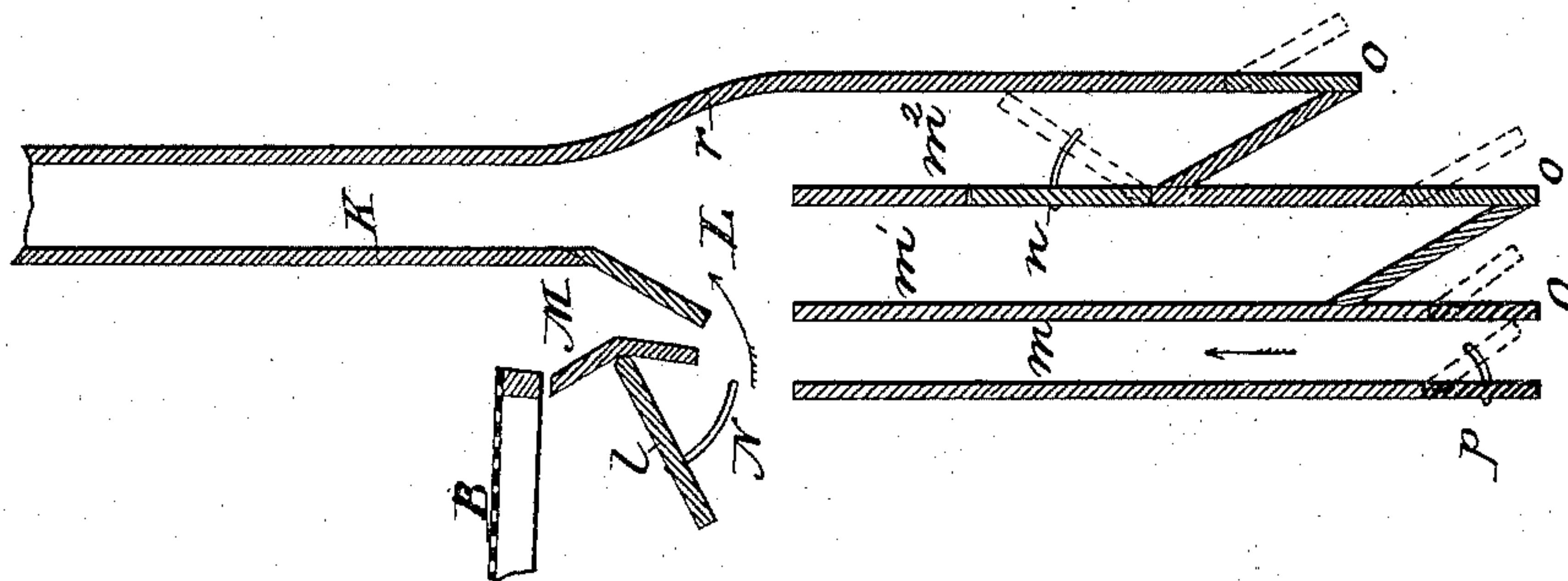


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN R. DAVIS, JR., OF NEENAH, WISCONSIN.

CHOP GRADER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 372,015, dated October 25, 1887.

Application filed December 21, 1880. Serial No. 22,631. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. DAVIS, Jr., of Neenah, in the county of Winnebago and State of Wisconsin, have invented certain new and
5 useful Improvements in Chop Separators and Purifiers and in the Process of Grading Chop, of which the following is a specification.

My invention has for its object to effect a more thorough and perfect separation and
10 grading of chop or meal as it comes from the reducing apparatus and to attain greater compactness and simplicity in the mechanism by which this separation is accomplished.

Heretofore it has been customary to run the
15 chop or meal—that is, the gross product of the break on reduction—directly from the reducing apparatus to a bolting-reel, by which the flour is taken out, while the middlings pass on to the purifier. The construction of such
20 reels is well known. In passing through them the chop or meal is repeatedly tumbled together and against their sides, and its particles are brought in constant and violent frictional contact and concussion, not only with the in-
25 ternal surface of the reel, but among themselves. In consequence, a large amount of dust is worn from these particles, both from the good and the impure, and passes into the flour and the middlings, lowering their standard.

To avoid this and incidental objections and
30 disadvantages, I separate the flour from the middlings by means of air blasts or drafts between the reducing apparatus and the reel, sending only the flour and particles of like
35 gravity to the reel, and sending the middlings direct to the purifier. This relieves the reel of the heaviest part of its previous burden, and by so much diminishes the frictional contact and grinding among the particles therein,
40 while at the same time it absolutely removes the middlings from all exposure to this frictional contact and grinding and to the dust and other impurities already existing or evolved by the tumbling together in the reel.
45 The particles both of flour and of middlings will be preserved in better condition with less loss from abrasion, and the quantity and percentage of yield will consequently be greater.

In the drawings, Figure 1 is a section verti-
50 cally and lengthwise of a machine embodying

my invention. Fig. 2 is a like vertical and lengthwise section of an equivalent or alternative embodiment of said invention. Figs. 3 and 4 represent details and modifications of the tailings-spout.

A is the frame of the purifier, provided with any suitable casing. 55

B is the shaker, covered with graded bolting-cloth and actuated by means of the cam *b* and pulley *b'*, or in any other ordinary and desirable manner. Beneath the shaker are pockets C for the respective grades of middlings passing through, and from these pockets lead the usual spouts, *c*. Adjustable plates or deflectors *c'* may also be provided to turn more
60 or less of the material from the shaker into any given pocket. 65

Above the shaker are compartments D, practically one to each underlying pocket, communicating by means of ports *d* and adjustable gates *d'* with the air-chamber E at the top of the machine, through which a strong current is induced by the suction-fan F discharging into the dust-room. 70

As thus far described, the parts are of an
75 ordinary and well-approved type chosen for the purpose of illustrating the principle of my invention.

At the head of the machine, and upon the upper side timbers of its frame, I mount a set
80 of rolls, H H, with their appropriate adjusting devices. The active width of these rolls should be the width of the shaker, or thereabout, so as to discharge a stream of that width. The best for the purpose I consider the round-
85 ribbed rolls covered by Letters Patent No. 228,001, granted John Stevens, May 25, 1880, since they discharge the material in a condition eminently favorable to the action of the subsequent mechanism; but other grooved rolls
90 driven at differential surface speeds will also work well.

Smooth-surfaced rolls have a tendency to cake the meal, forming it into wafers, which
95 can neither be disintegrated by an air-blast nor by the shaker, and for this reason will not be found so efficient as those above named; but, as will hereinafter appear, I have provided for their use, and deem it within the principle
100 of my invention.

The rolls are covered by a casing, above which is placed the hopper G and its feed-roll *g*, such as are commonly found in roller-mills. Beneath the rolls the casing is continued into
 5 a wind-trunk and settling chamber, H', having converging sides and vertical end pieces terminating in a spout, *h*, at the head of the shaker and extending practically the whole width thereof. The outer side of this trunk,
 10 which also forms an end piece to the purifier, is built up with slats or formed with air-ports *h'*, one above another, slanting inwardly and downwardly, so as to prohibit the escape of the falling material, while admitting air-
 15 currents freely, and these air-ports are adjustable in size or closed at will by means of gates *h*².

At its inner side the trunk communicates, by means of a throat controlled by the gate *j*,
 20 with the air-chamber E at the top of the machine, and thence with the suction-fan F, so that a draft controllable as to intensity may be induced across it and through the falling stream of meal therein and up through said
 25 settling-chamber. This draft will be so graduated as to take out all of the flour, the fine dust, and some of the finest middlings, and carry them up through the fan-case and into the dust-room, whence, as they settle, they are
 30 run off by a conveyer and conducted to the reel or other bolt. The middlings, unaffected by the air-current, or released from it before its exit from the chamber H', fall upon the shaker through spout *h*, or are conveyed back
 35 thereto by means of the inclined board or chute *j'*, forming the inner wall of the chamber, and are subjected to the operation of said shaker and to the other air-currents passing therethrough, which take up flour and fine
 40 dust released by the shaking action and carry them up through the ports *d* to the fan and dust-room. The gates *h*² enable the attendant to shut off or moderate the air-currents in chamber H' at any point in the height of the
 45 stream of chop falling from the rolls, and thereby apply it to produce the best effects.

Over the board *j'*, I place a series of slats, *j*², leaving a free space between the bottom of the slats and the surface of the board. These ad-
 50 mit the settlings to the board and allow them to pass down toward the shaker, but form a barrier to the blast, which otherwise would impinge upon them. At its bottom it is provided with a spout, whereby the settlings are
 55 kept distinct from the material delivered through the spout *h* until the moment they reach the shaker.

The chamber H' may be divided by a partition, I, as in Fig. 2, into two compartments,
 60 one of which will form the wind-trunk proper for the stream of chop falling from the rolls and the other a semi distinct settling-chamber, J, the communication between the two compartments being by means of air-ports *i*, corresponding with the air-ports *h'* in the outer cas-
 65 ing, and these ports may be adjustable at will

to control or shut off the air-currents by means of gates *i'*, which will have the same function as and thus supersede the gates *h*² over the outer ports.

In some cases, particularly where the reducing mechanism is such as to tend to cake or flatten the chop as well as the germ, a beater or disintegrator may be used at the head of the wind-trunk, or directly beneath
 75 said reducing mechanism, with or without a case around it, to shake up or lighten the chop, so that the flour may be thoroughly taken out by the air-blasts and the middlings and germ reach the shaker in proper condi-
 80 tion for separation. Such a beater I have shown at J'. It is composed of a central shaft carrying disks at its ends, in which are mounted a series of rods so placed that the inner rods alternate with the outer and interrupt the
 85 spaces between them. This beater is to be so geared that its speed may be controlled or it may be stopped altogether, according to the state of the material to be operated upon, the rods when at rest still serving to break the
 90 descent of the chop and scatter it.

At the tail of the machine is a vertical air-trunk, K, opening at the top into the chamber E and at its bottom into the spout L, the connection with the latter being controlled by
 95 the gate *k*, so that a draft of any desired intensity may be induced in the spout. The tailings as they fall from the shaker are delivered into the spout through a hopper, M, or other suitable opening. Through the side
 100 of the spout, upon that side of the hopper or stream of tailings opposed to the air-trunk K, is an aperture, N, communicating with the external air, and provided, if desirable, with a gate, *l*, for adjustment, and the spout is
 105 otherwise practically closed, so that the line of draft shall be transverse to the stream, as indicated by the arrows. Beneath the pathway of the air-current the spout M is divided by lengthwise partitions into a number of
 110 compartments or sub-spouts, *m m'*, &c., the inner one, *m*, being directly beneath the tail of the shaker or the mouth of the tailings-hopper, and each having its individual valve
 115 *o*, that its contents may be properly discharged.

At the top or at a point along their length the partitions are provided with movable gates or gather-boards *n n'*, &c., in order that the
 120 tailings may be cut off from any one or more of the sub-spouts in case it should be desired to lessen the number of grades into which they are distributed. I have shown such an arrangement of gather-boards that the tailings may all be thrown into the single sub-spout *m*
 125 without interrupting the air-current, if it should at any time be desirable.

The air blast or draft as it strikes the stream of tailings deflects the particles composing it according to gravity, so that the heaviest only
 130 fall into the sub-spout *m*, the next heaviest into the sub spout *m'*, and thus on, while any

remaining dust is carried up the air-trunk with the draft and through the fan-case to the dust-room. The different grades as they escape from their respective sub-spouts are led away to appropriate mechanism, as to sets of rolls differing in fineness of dress or gage, or to bran-dusters, to undergo other operations usual in milling.

The sub-spout *m*, or that one immediately beneath the falling stream of tailings, may communicate with the external air in such manner as to form the port, so that the air-current can be drawn directly up through it, as represented in Fig. 3, instead of through the port *N*, and this spout may be provided with a gate, *p*, to moderate or shut off the current. This arrangement may be used in connection with the port *N* and its gate, as shown, so that the current may be drawn through the spout or through the port at the will of the attendant.

In order to create an eddy over the sub-spouts, I propose in some cases to form the side of the main spout with a bulge or curve, *r*, against which the air-current impinges and is deflected before it ascends the trunk.

A modified form of the spout is shown in Fig. 4. In this the sub-spouts are carried up above the shaker and nearly to the air-chamber at the top of the machine, and the tail of the shaker enters the sub-spout *m* through an aperture, *o'*, in its side. This gives a longer traverse to the tailings and increases the interval for settling.

I have described the machine as constructed with a single suction-fan; but it is evident that more than one may be used, or that a blast fan or fans, although less convenient and beneficial, may be substituted. I have also referred only to roller-mills; but a concave and cylinder, discharging, like them, the meal in a long shallow stream the width of the shaker, may be employed. These latter, however, are more generally used in preliminary operations.

So much of my invention as relates to the combination, in a purifier, of the reducing instrumentalities, shaker, and intermediate air-trunk or scalper is capable of use with good, but less complete, results without the presence of the subdivided spout and draft through the tailings, and the latter elements will likewise produce beneficial results when used in this or analogous separating machines, irrespective of the presence of the former.

I claim—

1. The improvement in the art of separating and grading chop, consisting in taking out the flour by means of air-blasts as the chop passes from the reducing mechanism to the middlings-shaker and conveying it to a bolt, while the middlings are passed on to the shaker.

2. The combination, in a middlings-purifier, of one or more sets of grinding or reducing rolls mounted vertically over the head of the shaker and discharging their product in a stream thereon, a wind-trunk extending directly from said rolls to said head and through

which the stream falls, and a fan or fans arranged to induce air-currents transversely through said trunk to take out the flour and fine dust from the falling material.

3. The combination, in a middlings-purifier, of a shaker, one or more sets of grinding or reducing rolls mounted vertically over the head of the shaker and discharging their product in a stream thereon, a wind-trunk extending directly from the rolls to said head, air-ports through the sides of said trunk, a fan or fans arranged to induce air-currents through said ports transversely to the stream of chop to take out the flour and fine dust, and a discharging-trunk from the fan-case leading to the bolting apparatus.

4. The combination, in a middlings-purifier, of a shaker, grinding or reducing mechanism vertically over the head of the shaker and discharging thereon in a shallow stream of a width corresponding to the width of said shaker, a wind-trunk extending directly from said mechanism to the head of the shaker through which said stream falls, air-ports on the outer side of said trunk, through which air-currents of a width commensurate with the width of said stream are driven transversely to the stream, a fan for inducing said currents, and adjustable gates to each port, whereby any one or more of all the currents may be moderated or shut off irrespective of the others.

5. The combination, in a middlings-purifier, of one or more sets of grinding or reducing rolls mounted vertically over the head of the shaker and discharging their product in a stream thereon, a wind-trunk extending directly from said rolls to the head of the shaker and through which this stream falls, vertical series of air-ports through the opposing sides of said trunk, a fan or fans for inducing air-currents through said ports transversely to the trunk and passing stream, and adjustable gates over the ports of one of said series, whereby the air-currents may be moderated or shut off at any point in the height of the stream.

6. The combination, with the rolls at the head of the wind-trunk and with the air-ports and valves in the side of said trunk below the rolls, of a fan inducing air-currents through the trunk transversely to the stream of chop, and a beater beneath the rolls so placed as to intercept said stream and lighten it for the action of the air-currents.

7. The combination, in a separator or purifier, with the shaker, of a wind-trunk above the head of said shaker, into which the chop is discharged and through which it falls upon the shaker, adjustable air-ports through the side of the trunk, a spout beneath the tail of the shaker, into which the tailings fall therefrom, a wind-trunk at one side of said spout, an air-port at the other side, a controllable gate over said port, an air-chamber common to both trunks, and a fan exhausting from said chamber, whereby air-currents may be drawn

through both trunks across the falling streams therein and the intensity of the currents be increased or modified in one locality or the other.

5 8. The combination, in a separator or purifier, of a shaker, a wind-trunk above the head of said shaker, into which the chop is discharged and through which it falls, adjustable
10 air-ports through the side of the trunk, a spout beneath the tail of the shaker, into which the tailings fall therefrom, a wind-trunk at the outer side of said spout and an air-port at the inner side, partitions in the spout between the port and the trunk forming distinct sub-spouts
15 into which the tailings may be distributed in grades, an air-chamber communicating with both trunks, and a fan whereby air is exhausted from said chamber.

20 9. The combination, in a separator or purifier, of a spout beneath the tail of the shaker, into which the tailings fall therefrom, a wind-trunk at one side of said spout, an air port at the other side, a fan whereby a current of air is drawn or forced through the port across the
25 falling stream of tailings and up through the trunk, partitions in the spout beneath the line of the air-current, forming distinct sub spouts into which the tailings may be distributed in grades by the air-current in its passage, and
30 movable gates or gather-boards whereby any one or more of the sub-spouts may be cut off or closed and the material directed into another or others.

35 10. The combination, in a separator or purifier, of a spout beneath the tail of the shaker, into which the tailings fall therefrom, partitions in the spout forming distinct sub-spouts into which the tailings may be distributed in grades, a wind-trunk at one side of the main
40 spout, and a gate in the sub-spout on the side away from said trunk, whereby air-currents may be drawn through the stream of tailings across said sub-spouts and up the wind-trunk.

45 11. The combination, in a separator or purifier, of a spout beneath the tail of the shaker, into which the tailings fall therefrom, partitions in the spout forming distinct sub-spouts into which the tailings may be distributed in grades, a wind-trunk at one side of the main
50 spout, a gate in the sub-spout on the side away from said trunk, an independent air-port also at that side of the main spout and above the line of the sub-spouts, and a gate to said air-port, whereby the air-current may be ad-
55 mitted at one point or another in said side.

12. The combination of the shaker, the fan, the grinding or reducing rolls mounted upon the purifier-frame vertically above the head

of the shaker, the wind-trunk H, with its lateral air-ports extending directly from said rolls to the head of the shaker, the air-chamber E, communicating with the fan, and the settling-chamber J, intermediate between said wind-trunk and air-chamber, with a return to the head of the shaker. 60 65

13. The combination of the shaker, the fan, the grinding or reducing rolls mounted upon the purifier-frame vertically above the head of the shaker, the wind-trunk H, with its lateral air-ports extending directly from the head of the rolls to the head of said shaker, the air-chamber E, communicating with the fan, the settling-chamber J, intermediate between said wind-trunk and air-chamber, with a return to the head of the shaker, and the adjustable gates over the air-ports between said trunk and settling-chamber, whereby the air-currents may be shut off or moderated at any point in the height thereof. 70 75

14. The combination of the shaker, the fan, the grinding or reducing rolls mounted upon the purifier-frame vertically above the head of the shaker, the wind-trunk H, with its lateral air-ports *h* extending directly from said rolls to the head of said shaker, the air-chamber E, communicating with the fan, the settling-chamber J, intermediate between said wind-trunk and air-chamber, with a return to the head of the shaker, the adjustable gates over the air-ports between said trunk and settling-chamber, whereby the air-currents may be shut off or moderated at any point in the height thereof, and the adjustable gate between said settling-chamber and air-chamber, whereby the main blast or draft itself may be shut off or moderated. 80 85 90 95

15. The combination, with the subdivided main spout and with the wind-trunk and air-port arranged relatively thereto, as set forth, of the bulge or eddy-board *r*, substantially as described. 100

16. The combination of the hopper M at the tail of the shaker, the main spout into which it delivers, the air-port N at one side of said hopper, the wind-trunk K at the other side, the fan for inducing an air-current through said port and up the wind-trunk, the partitions forming sub-spouts beneath the course of the air-current to receive different grades of the tailings, and the adjustable gates or gather-boards to cut off the material from any one or more of said sub-spouts. 105 110

JOHN R. DAVIS, JR.

Witnesses:

JOHN SHIELLS,

ALEX. McNAUGHTON.