(No Model.)

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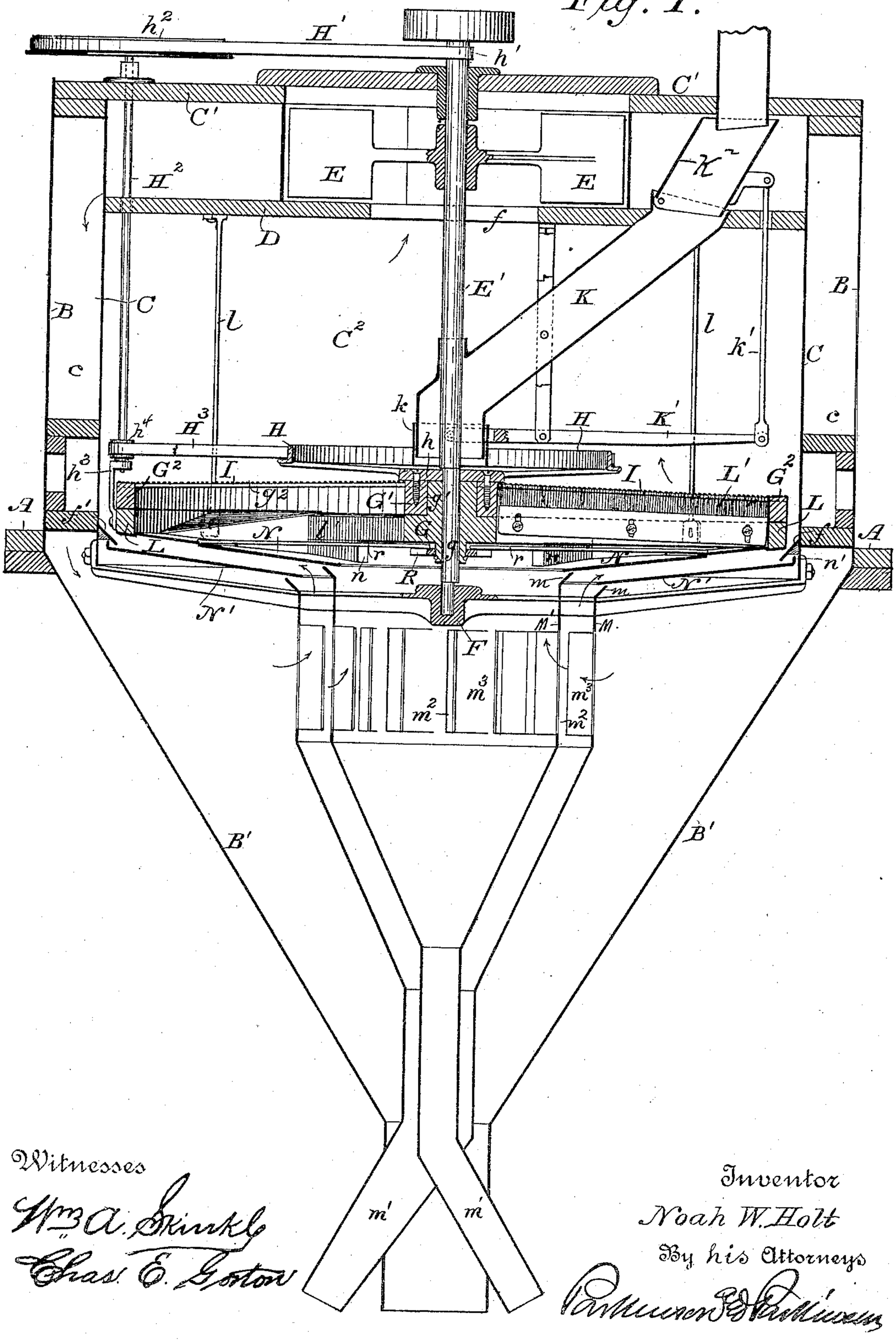
N. W. HOLT.

SEPARATOR MACHINE.

No. 440,634. Patented Nov. 18, 1890.

Fig. 1.



Witnesses

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(No Model.) 5 Sheets—Sheet 2.

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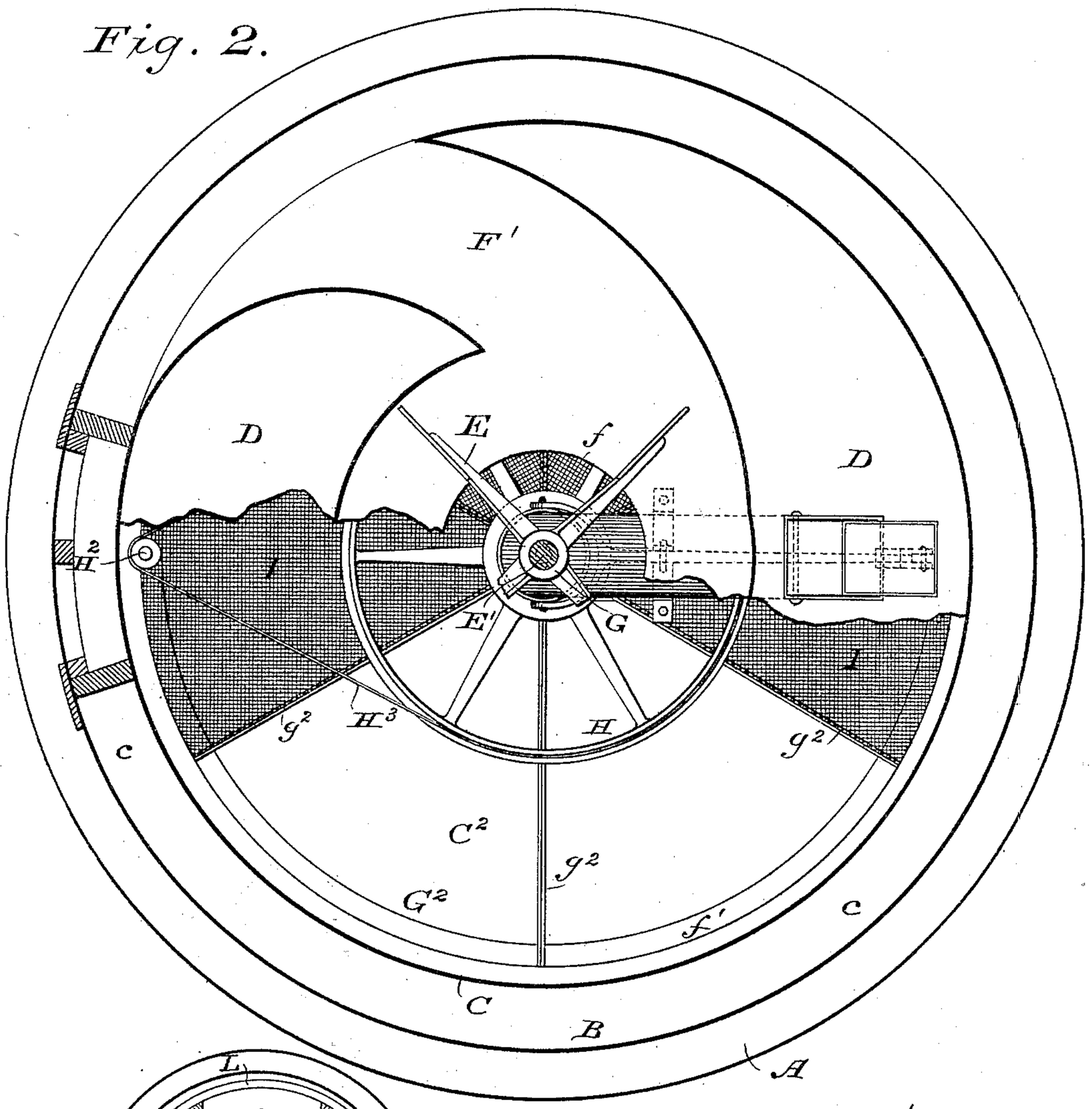
SEPARATOR MACHINE.

No. 440,634. Patented Nov. 18, 1890.

Fig. 2.



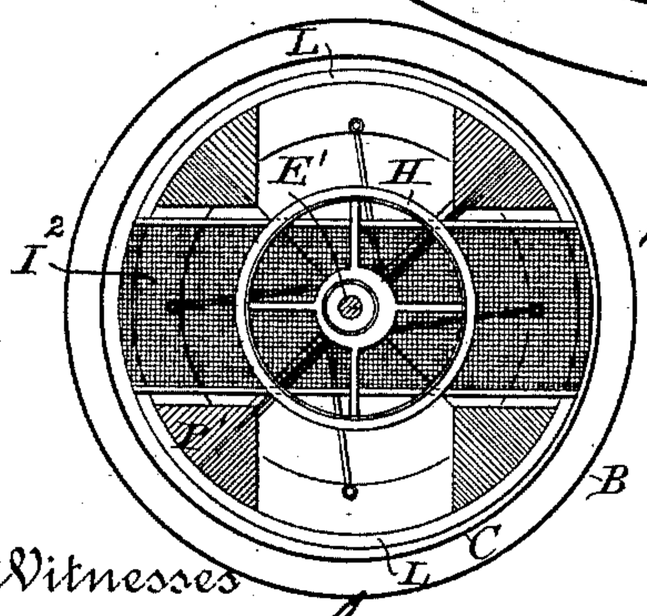
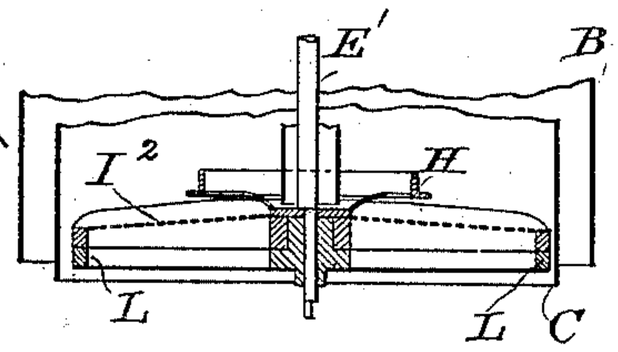


Fig. 8.



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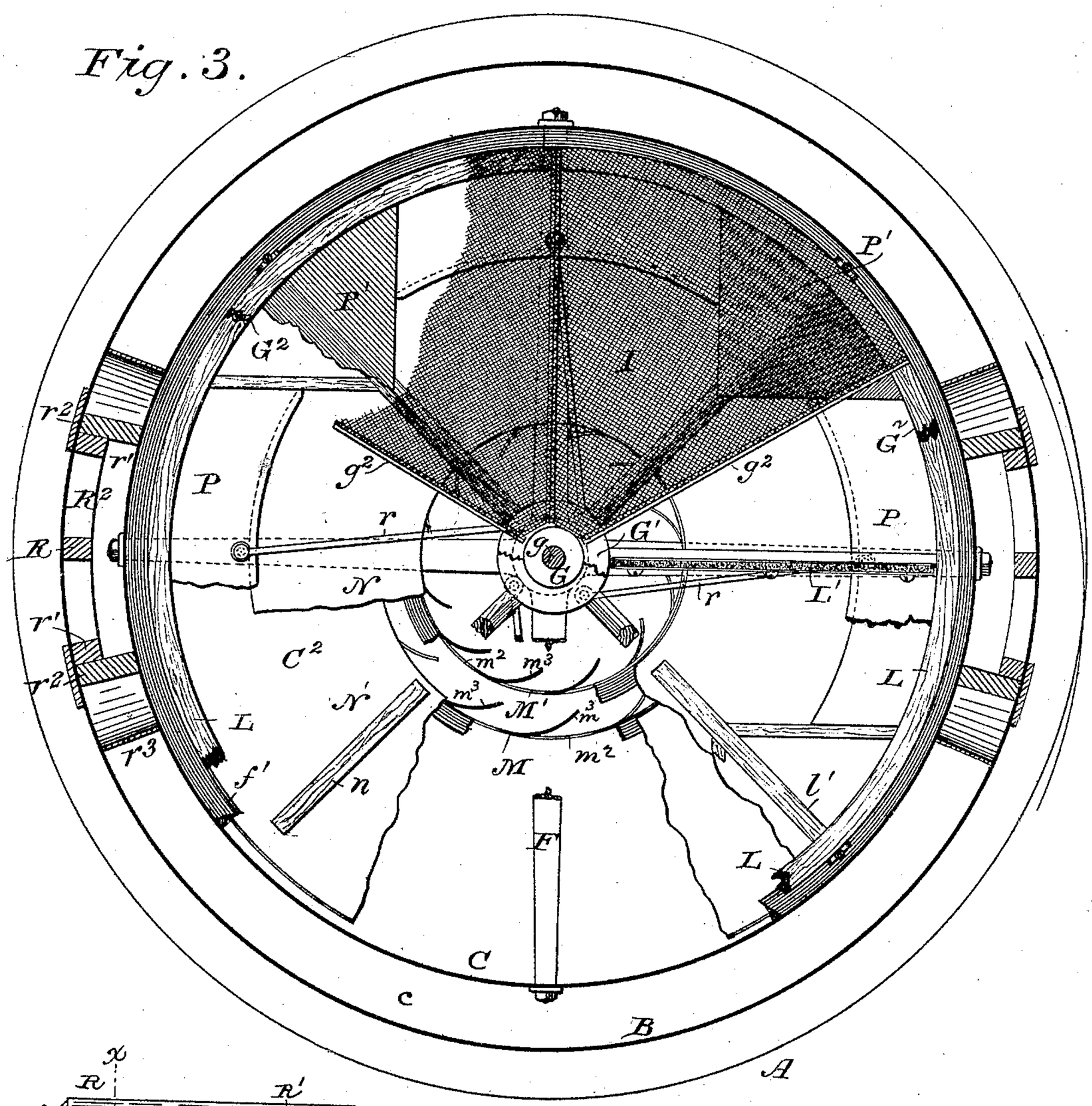
SEPARATOR MACHINE.

No. 440,634. Patented Nov. 18, 1890.

Fig. 3.



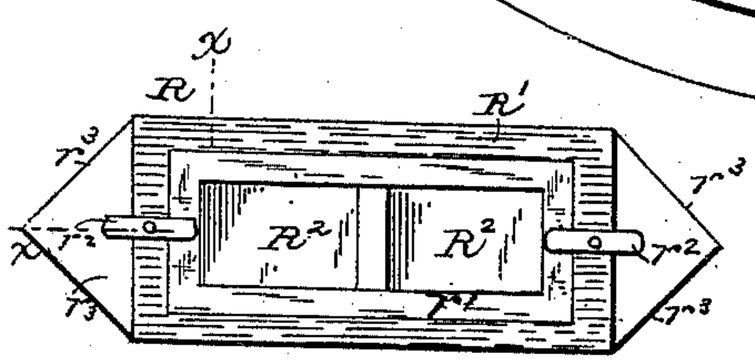


Fig. 9.

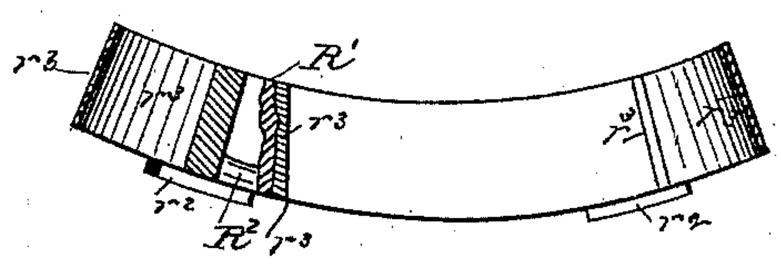


Fig. 10.

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SEPARATOR MACHINE.

No. 440,634. Patented Nov. 18, 1890.

Fig. 4.

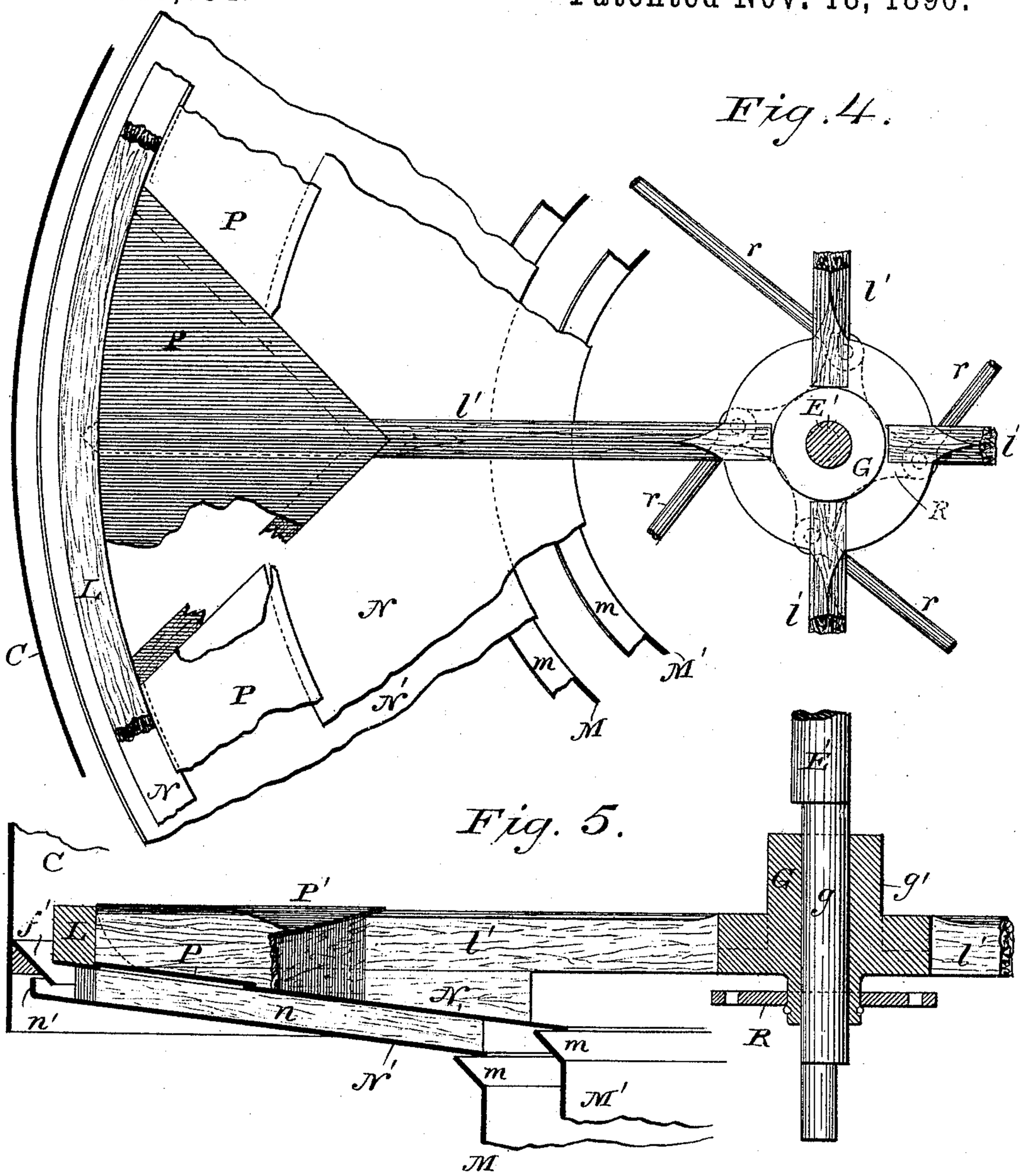

Fig. 5.

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SEPARATOR MACHINE.

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Fig. 6.

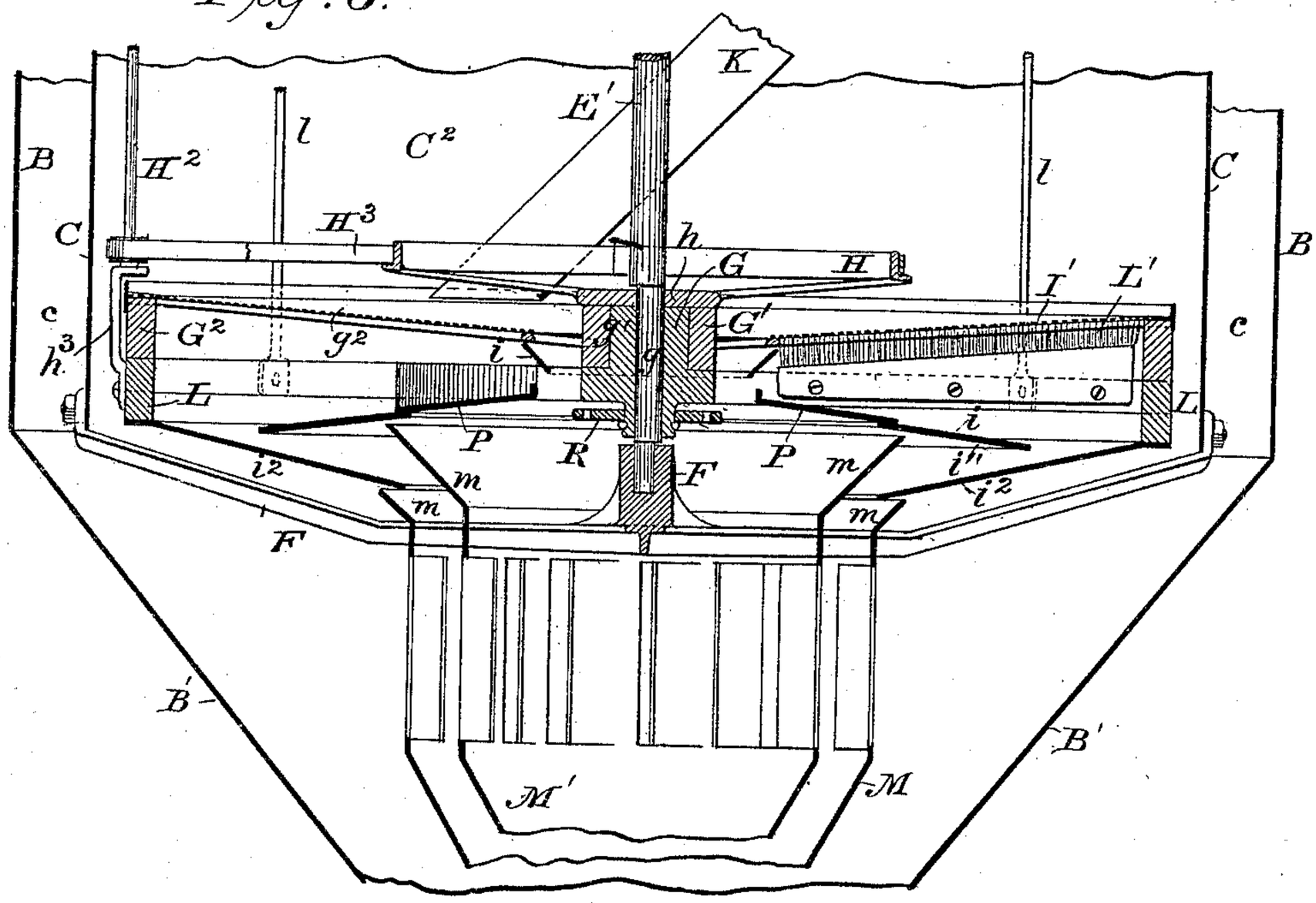
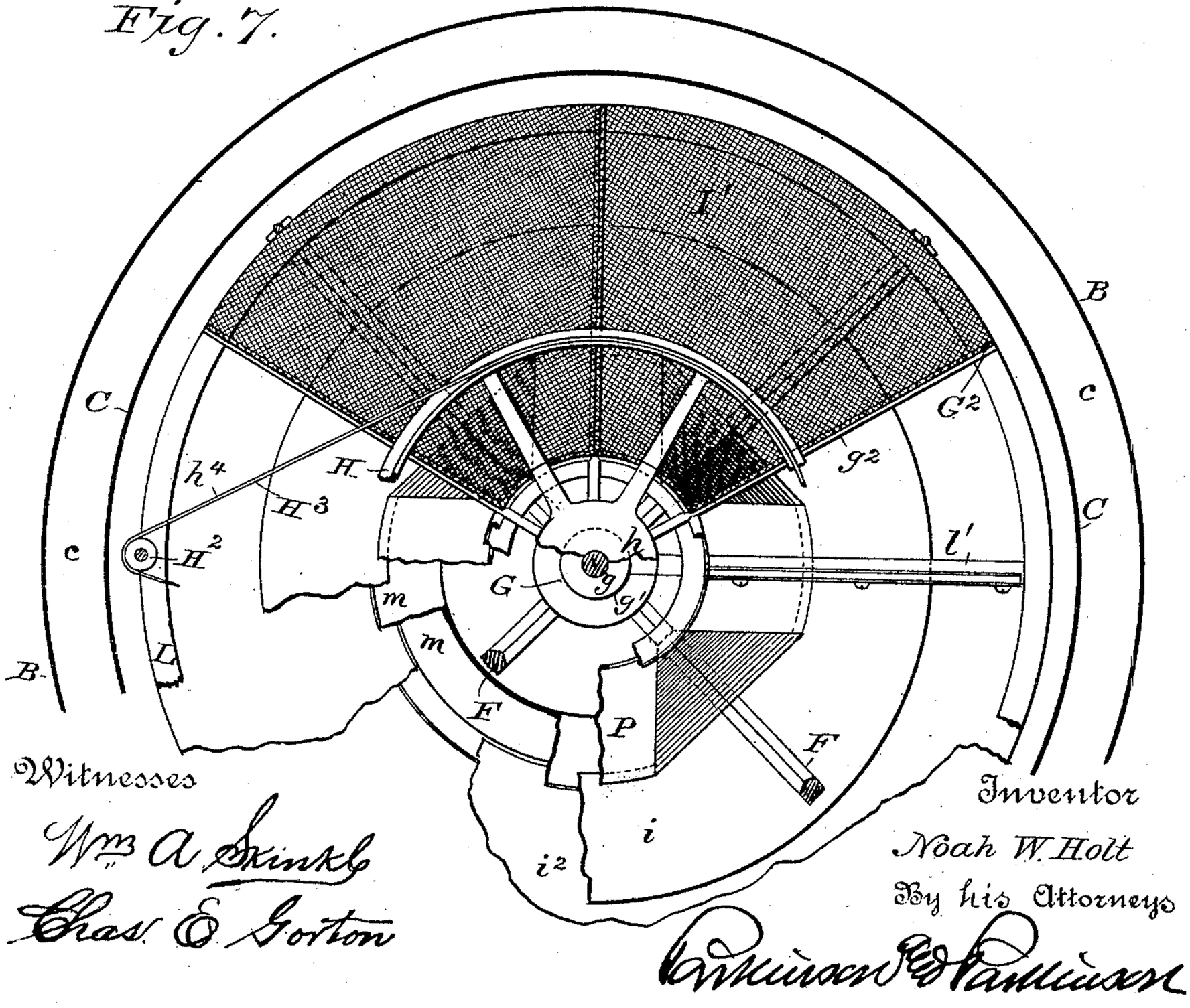


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

NOAH WILLIAM HOLT, OF MANCHESTER, MICHIGAN.

SEPARATOR-MACHINE.

SPECIFICATION forming part of Letters Patent No. 440,634, dated November 18, 1890.

Application filed January 14, 1889. Serial No. 296,349. (No model.)

To all whom it may concern:

Be it known that I, NOAH WILLIAM HOLT, a citizen of the United States, residing at Manchester, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Separator-Machines, of which the following is a specification.

In an application filed by me in the Patent Office of the United States on the 26th day of October, 1888, Serial No. 289,248, I have described and claimed an improvement wherein a sieve-purifier is inclosed within the walls of a centrifugal dust-collector, and a current of air is caused to circulate through the purifier and dust-collector, returning from one to the other without change, depositing its load within the collector, and then passing up again through the sieve to take on a fresh load of dust. In said machine a peculiarly-constructed shaking device was employed, clothed in the usual manner with graduated cloths, the finest at the head and the coarsest at the foot.

In my present invention I propose to employ a revolving sieve having imparted to it continuously throughout its revolving movement an oscillatory movement, delivering the material at the center of the sieve and graduating the cloths from the center toward the periphery, or else delivering adjacent to the periphery and graduating toward the center. A further purpose is to automatically control the feed by connecting a hinged section of the inclosed feed-spout with the feed-tube in such manner that the accumulation of material in the spout shall depress such section and raise the feed-tube, that the material may flow more freely until the glut is relieved.

Various other subordinate features of my invention will appear from the ensuing description.

In the drawings, Figure 1 is a central vertical section through a separator embodying my invention. Fig. 2 is a top plan view thereof with the covering-disk removed and the casing partly broken away to more clearly expose the mechanism. Fig. 3 is also a top plan view of part of the interior mechanism of the separator, broken away at successive stages to exhibit different tiers of the structure. Fig. 4 is an enlarged detail in top plan view of the deflectors and gather-boards, explaining the arrangement of the deflectors, the tailings, gates, and devices for controlling the latter. Fig. 5 is also an enlarged detail, on the same scale as the preceding, but in vertical section. Fig. 6 represents in central vertical section, and Fig. 7 in top plan view, partly broken away, a modification of the purifier device wherein the circular revolving sieve is concave from the edges toward the center, instead of convex from the center to the edges, as in the first form, and the material is delivered close to the periphery thereof. Fig. 8 represents a second modification wherein the sieve is intended to revolve, but is rectangular, or nearly so, instead of circular; and Figs. 9 and 10, respectively, are details in front elevation and top plan view, partly broken away, of one of the ports and the sash which closes it.

A represents a supporting-frame; B and B′, the exterior shell or casing of the dust-collector proper, whereof the upper part B is preferably cylindrical and the lower part B′ conical or funnel-shaped, converging from its junction with the cylindrical portion and terminating in a spout *b* at the foot, which will discharge to any suitable conveyer or receptacle.

C is a second concentric shell or casing, which may be called the "purifier-casing," set within the other, so as to form therewith an annular chamber *c*, closed above by any suitable decking C′, of wood or metal, as may be preferable, covering the entire top of the machine. The upper part of the purifier-casing is partitioned horizontally by a diaphragm D at a sufficient distance from the top to afford a fan-chamber, wherein revolves a horizontal fan E, mounted upon a vertical shaft E′ and stepped in a bridge F, extending from one side to the other of said casing and supported thereby or in any other suitable manner. The eye of the fan-case is formed through the diaphragm, as at *f*, so that it receives its air from the space inclosed by the purifier-casing—that is, from the purifier-chamber C^2—and therefore the air is constantly drawn up through the bottom of this chamber. The fan-casing is practically circular, its walls being vertical, except at the point of delivery, where, instead of having a straight tangential

spout, it has a curved or scroll spout F′, starting as a tangent, but curving back and entering the annular chamber between the two concentric casings almost tangential thereto. Owing to its curve, the blasts from the fan will therefore sweep round and round this chamber, and finding no escape above will gradually pass downward into the funnel, where, as the latter converges, it will sweep round quicker and quicker. The proportion of area of the annular chamber to that of the eye of the fan-chamber is such, however, that the current will be relatively slower therein than at such eye, and therefore matter held in suspension as the current is drawn through the eye will be dropped as it sweeps through the chamber, and, collecting in the funnel, will fall to the bottom and be spouted away.

The lower part of the cylindrical purifier-casing is practically open, so far as its own construction is concerned. Near its bottom it has an annular inset sloping rim f', which serves to deflect any falling material at that point upon a suitable chute or gather-board, as presently explained, and keep it from entering the dust-collecting chamber. Near the foot of the fan-shaft it has an eccentric-journal g, upon which is mounted a sleeve G, having an exterior bearing g', upon which is journaled the hub G′ of the sieve-frame, the latter consisting of the circular rim G^2 and radiating-arms g^2, which support the rim from the hub. The latter carries a feed-disk h and a belt-pulley H, as shown. A belt H′ leads from a suitable pulley h' on the fan-shaft above the machine to a second pulley h^2, mounted upon a vertical counter-shaft H^2 near the side of the machine, but extending downward inside of the inclosed cylindrical casing and stepped, finally, in a bracket h^3, supported as hereinafter explained. This counter-shaft has near its foot a pulley h^4, connected by a belt H^3 with the pulley on the before-mentioned hub, so that as the fan-shaft revolves this hub shall be driven upon its journal, and being speeded differently shall have both a vibratory movement, due to the eccentric, and a rotary movement around its journal.

The sieve-frame is highest at the hub and slopes therefrom toward the casing which the periphery of the frame nearly reaches, but not so entirely as to interfere with the vibrations incident upon the gyrations of the hub. This frame is clothed with graduated sieve-cloths I from the center toward the circumference, so that the finer material shall pass through immediately after leaving the feed-disk, and the coarser through each successive grade of cloth.

K is the feed-spout, which may enter the top of the machine, as shown, and reaches therefrom diagonally downward until it terminates just above the feed-disk to which it is continued by the feed-tube k, that may be adjusted up and down through the instrumentality of the lever K′ and link k' to regulate the amount of feed. In order that this may be done automatically, the link is connected at its upper end to an inclosed section K^2 of the feed-spout, which is hinged to the lower or main section to which it delivers and fits loosely around the overhead section from which it receives. Supposing now that the feed should be too slow for the quantity of material coming in, the chop or middlings will gradually accumulate in the spout until they rise to the height of the hinged section which their weight will depress, thus through the link and lever raising the feed-tube and enlarging the feed-space until the accumulated load passes off of the hinged section, when the weight of the feed-tube will restore it to place, narrowing the feed-space with the diminution of the load upon the hinged section.

Beneath the sieve-frame is a second frame having annular rim L, supported from the overhead diaphragm by flexible bars or hangers l and connected rigidly by radial arms l' with the sleeve upon which the sieve-frame is journaled, so that it will oscillate with said sieve, but will not partake of the rotation of the sieve-frame, the rim of which it supports. Upon the radial arms of this lower frame are mounted brushes L′, that may be set up against the meshes of the sieve. Since this "brush-frame," as it may be called, does not revolve, but partakes of the vibration imparted by the eccentric-journal on the fan-shaft, the brushes are kept in their proper relation to the sieve which is revolving over them and sweep its under surface and keep its meshes clear.

In order that the vibrations of the sieve and brush frames may not disturb the relation of the pulley on the sieve-frame to the pulley by which it is driven, the bracket which carries the latter is mounted upon the brush-frame, as shown, that it may partake of its vibration, sufficient play being allowed to the shaft in its bearing to permit of the slight lateral movement that will thus be imparted to its lower end.

Beneath the sieve and brush frames are placed concentric spouts M and M′, the upper parts of which are preferably cylindrical, flaring at the top, as at m, to properly catch the material, and the lower parts conical or funnel-shaped, terminating in conductors m', the inner one of which eventually passes through the side of the other to lead away the different grades of material received to suitable conveyers or receptacles. The cylindrical upper sections of these spouts are provided with ports m^2, having curved insetting-wings m^3, which serve to break the current and also to shield the material from the ports, thus forming an aspirator, through which the air is drawn after it has deposited its burden of dust in the exterior collecting-chamber.

To the bottom of the brush-frame is secured an annular gather-board N, sloping from the

periphery toward the center and opening above the inner spout, and beneath this gather-board is a second N′, likewise secured to the brush-frame by means of spacing-bars *n*, inserted between it and the superior gather-board underneath the radial arms of said brush-frame, and therefore secured to said arms by fastenings passing through the first gather-board. The second gather-board, like the first, is annular and parallel with or about parallel with the overlying board, and is extended out close to the walls of the purifier-chamber and there flanged upwardly, as at *n′*, to rise into the space beneath the flange at the foot of said walls and playing in such space as the brush-frame vibrates. In this way a very effective cut-off is formed at this point, so that none of the material may escape; but whenever it falls over the periphery of the sieve-frame or settles along the walls of the purifier-chamber it will be directed upon the gather-board and by it conveyed to the exterior spout of the aspirator. Another consequence of this arrangement is that the gather-boards vibrate or oscillate concurrently with the sieve and therefore quickly discharge their loads, but yet are prevented from rotating with the sieve.

It will frequently happen that some of the coarser material passing through the sieve near its edges will not come up to the fineness of the grade required or desired. Therefore gates or valves P are formed in the upper gather-board, or that for the finest grades of material, and other gather-boards, if more than two are used, at or near the periphery of such board or boards, so that they may be drawn inward and allow the coarser grade or grades to pass through to the gather-board beneath and mingle with the grade that is carried off thereby. As it is not practical to form these gates so as to leave an unbroken annular opening all around the periphery of the gather-board, they are located at suitable intervals, and between each two is formed a bridge P′, sloping from a central line toward the gate on either hand to direct the material falling from the sieve directly overhead to the ports closed by these gates.

In order that all of the gates may be operated simultaneously and open equally from the periphery of their gather-boards, each is connected by a link *r* with a ring or disk R, mounted upon a depending journal of the sleeve on the lower end of the fan-shaft, so that if one gate is pushed open more or less all of the others will be equally moved. This ring or disk may be connected by a rod and handle with the exterior of the machine, so that the gates may be controlled from the outside; but I prefer to form an incased port R′, extending through from the exterior cylindrical shell to the cylindrical purifier-casing, and open at each end, the outer end being closed by a glass plate R^2, set in a sash *r′*, which fits into the mouth of the port and is held in position by buttons r^2 or other suitable means, so that it can be readily removed. That side or edge of the port-casing where it meets the blast will be prolonged by a false head r^3 of wedge shape to more readily and smoothly divide the air-current, and the opposite side may also have a similar false head to avoid eddies. This arrangement enables me not only to operate the gates, but also to test the material in the purifier, and to watch the action of the machine.

In the modification shown in Figs. 6 and 7 the casing of the dust-collecting chamber and purifier-chamber are unaltered. The fan and fan-shaft are mounted as previously described. The fan-shaft has an eccentric-journal carrying the sleeve supporting the sieve and brush frames and the ring or disk for controlling the gather-board gates, as before. The sieve I′, however, is graded from the periphery toward the center, and there has a short chute *i* to direct the tailings into the central aspirator and spout. The gates and their corresponding bridges are also located at the center, and the gather-board *i′* is inclined outwardly toward the periphery of the brush-frame and at its tail delivers to a return-board *i*, which is directed inward and delivers to the exterior chamber of the aspirator. Although I have described the sieve herein as circular in form, it is obvious that it may be made as in Fig. 8, where I^2 represents the sieve with straight sides and curved ends sloping from the center and receiving the material to be separated and graded at such center. It should be of sufficient length to practically reach the sides of the purifier-chamber, allowing for the vibrations imparted, but will of course be rib-framed laterally to prevent the material from falling over their edges at any point except the tails at each end, and they will revolve and have the same vibratory movement as in the construction above described, and the arrangement of gather-boards will follow that first indicated.

In operation, when material is fed to the machine and the fan set in motion the sieve will begin to revolve and at the same time be oscillated with a tremulous motion. Air will be drawn from the lower part of the chamber through the ports in the aspirators, as indicated by the arrows, and thence up through the sieve, part of the air from the outer aspirator passing between the gather-boards and up through the ports in the first gather-board, while another part will enter the inner aspirator and go up therethrough, the whole current being finally drawn through the sieve and passing from the purifier-chamber into the fan-case, whence it is ejected into the surrounding dust-collecting chamber, and whirling round and round and lower and lower it parts gradually with its burden of dust, until reaching the lower conical chamber and contracting its circles until entirely

freed of its load it is again drawn up through the aspirator and sieve and into the fan-casing with a new load of dust to be deposited as before, thus making a continuous circuit through the machine from collecting-chamber to aspirator and purifier-chamber and back again to collecting-chamber without ceasing.

I claim as my invention—

1. In a separating-machine, the combination of a fan, a purifier-chamber beneath said fan, an oscillatory revolving sieve in said purifier-chamber, vibrating or oscillating chutes or gather-boards beneath said sieve, and spouts to convey away the different grades of material.

2. In a separator-machine, the combination, substantially as hereinbefore set forth, of the fan, a purifier-chamber beneath said fan, an oscillatory revolving sieve in said purifier-chamber, a non-revolving brush-frame beneath said sieve and oscillating therewith, brushes mounted in said frame in contact with the under surface of the sieve, chutes or gather-boards beneath said brushes, and spouts to convey away the different grades of material.

3. In a separating-machine, the combination of a fan, a purifier-chamber beneath said fan, an oscillatory revolving sieve arranged in said chamber, a brush or brushes beneath said sieve and oscillating therewith, gather-boards beneath said sieve and brush, and spouts to which said gather-boards deliver.

4. In a separating-machine, the combination, substantially as hereinbefore set forth, of a fan, a fan-shaft having an eccentric-journal at its foot, a graded sieve revolving independently around said journal and oscillated by the revolution of the fan-shaft, a chute or gather-board beneath said sieve, and a spout to which said chute delivers.

5. In a separator-machine, the combination, substantially as hereinbefore set forth, of a fan, a fan-case, a purifier-chamber beneath said fan-case, provided with a discharge-spout, an oscillatory revolving sieve in said purifier-chamber, a settling-chamber leading from above the fan-case to the bottom of the purifier-chamber, and air-ports opening from the purifier-chamber into the settling-chamber beneath said sieve, whereby a continuous circulation of the same identical air-current is established through the sieve by the action of the fan.

6. In a separating-machine, the combination, substantially as hereinbefore set forth, of the fan, the purifier-chamber beneath said fan, an oscillatory revolving sieve arranged within said purifier-chamber, the surrounding dust-collecting chamber, to which the fan delivers, and the aspirators through which the current is drawn up into and past the sieve after depositing its dust.

7. In a separating-machine, the combination, substantially as hereinbefore set forth, of a fan, the purifier-chamber beneath said fan, the oscillatory revolving sieve mounted thereon, the non-revolving brush beneath said sieve and oscillating therewith, the dust-collecting chamber to which the fan delivers, the concentric aspirators, and the chutes or gather-boards delivering from the sieve to said aspirators.

8. In a separating-machine, the combination, substantially as hereinbefore set forth, of the fan, the purifier-chamber beneath said fan, the oscillatory revolving sieve therein, the brush-frame suspended by flexible links and supporting the sieve-frame and oscillating therewith, the surrounding dust-collecting chamber, the gather-boards, and the spouts to which they deliver.

9. The combination, substantially as hereinbefore set forth, with the sieve and its gather-boards, of a fan, a dust-collecting chamber, and an aspirator or aspirators having ports and insetting wings.

10. The combination, substantially as hereinbefore set forth, with the revolving sieve and its chutes and gather-boards, of the valves or gates in said gather-boards, the central disk, and the links connecting said gates to the disk, whereby they are simultaneously adjusted.

11. The combination, substantially as hereinbefore set forth, of the fan, the fan-shaft having an eccentric-journal at its foot, the sleeve within which said journal revolves, the sieve and sieve-frame journaled upon such sleeve and oscillated by the revolution of the fan-shaft, and the independent driving-wheel for said sieve-frame, whereby it is revolved while oscillating.

12. The combination, substantially as hereinbefore set forth, of the fan, the fan-shaft having an eccentric journaled near its foot, the sleeve mounted thereon, the sieve and sieve-frame journaled on said sleeve, the brush and brush-frame supported rigidly from said sleeve, and the wheel whereby the sieve-frame is revolved over the brush-frame as the two are concurrently oscillated by the revolution of the fan-shaft.

13. The combination, substantially as hereinbefore set forth, with the fan-shaft having an eccentric-journal, of the sleeve, within which said journal revolves, the sieve-frame revolving on said sleeve, the gather-boards beneath said sieve-frame, the valves, their links, and the disk to which said links are connected mounted also upon the sleeve.

14. The combination, substantially as hereinbefore set forth, of the fan, the fan-shaft, the purifier-chamber, the sleeve journaled eccentrically upon the fan-shaft, the brush-frame supported by links from the top of the purifier-chamber and rigidly connected with said sleeve, whereby the latter is sustained, the sieve-frame journaled upon said sleeve, the wheel for revolving the sieve-frame, and the shaft whereby such wheel is driven

stepped upon the brush-frame, whereby it partakes of the vibrations of the sieve and brush frames.

15. The combination, substantially as hereinbefore set forth, of the feed-disk, the feed-tube, the feed-spout having an inclined hinged section, a lever connected with the feed-tube, and a link connecting the lever with the hinged section of the feed-spout.

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