

(No Model.)

3 Sheets—Sheet 1.

J. M. CASE.

SCOURING, DISINTEGRATING, AND SEPARATING MACHINE.

No. 601,728.

Patented Apr. 5, 1898.

Fig. 2.

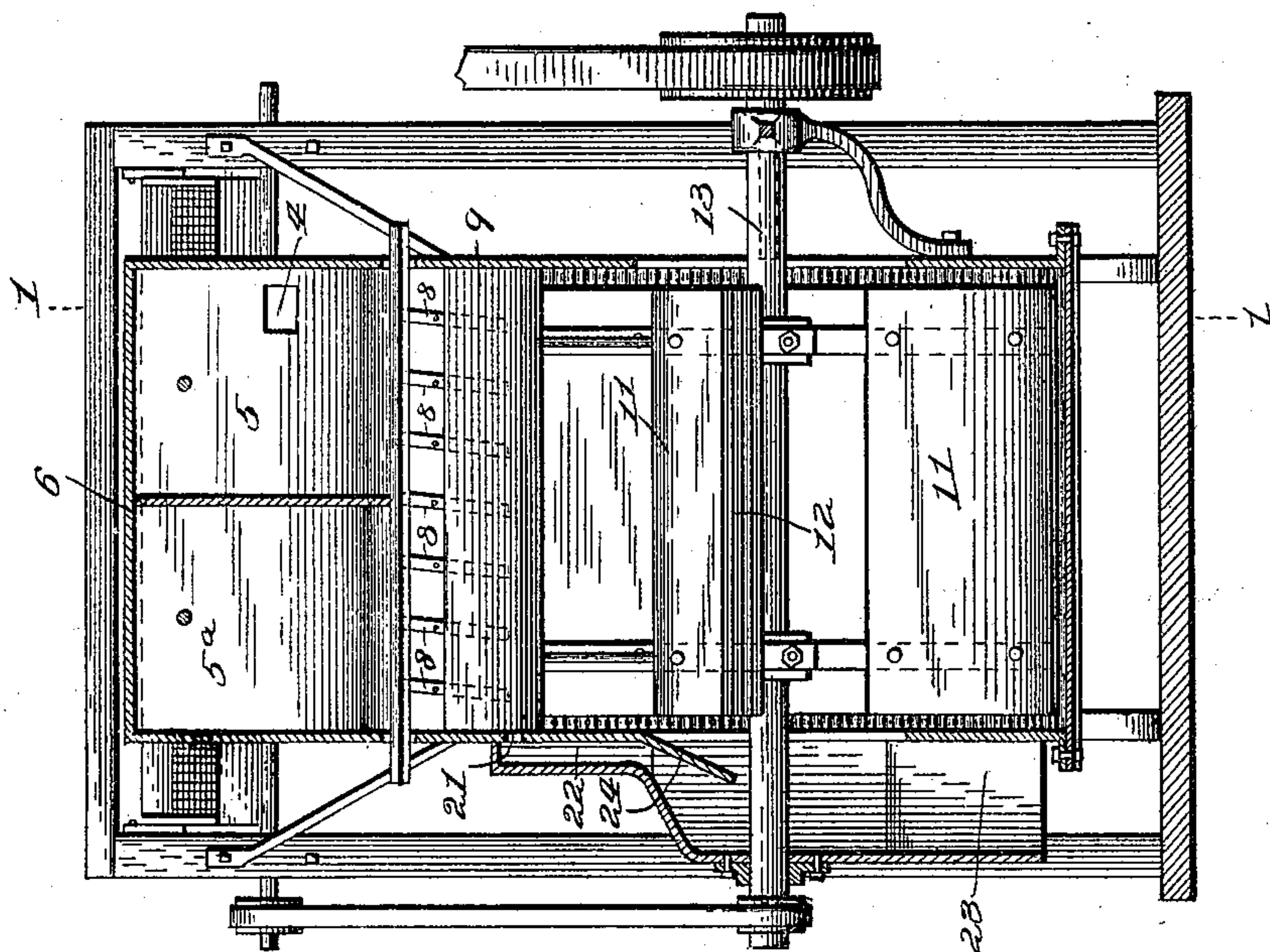
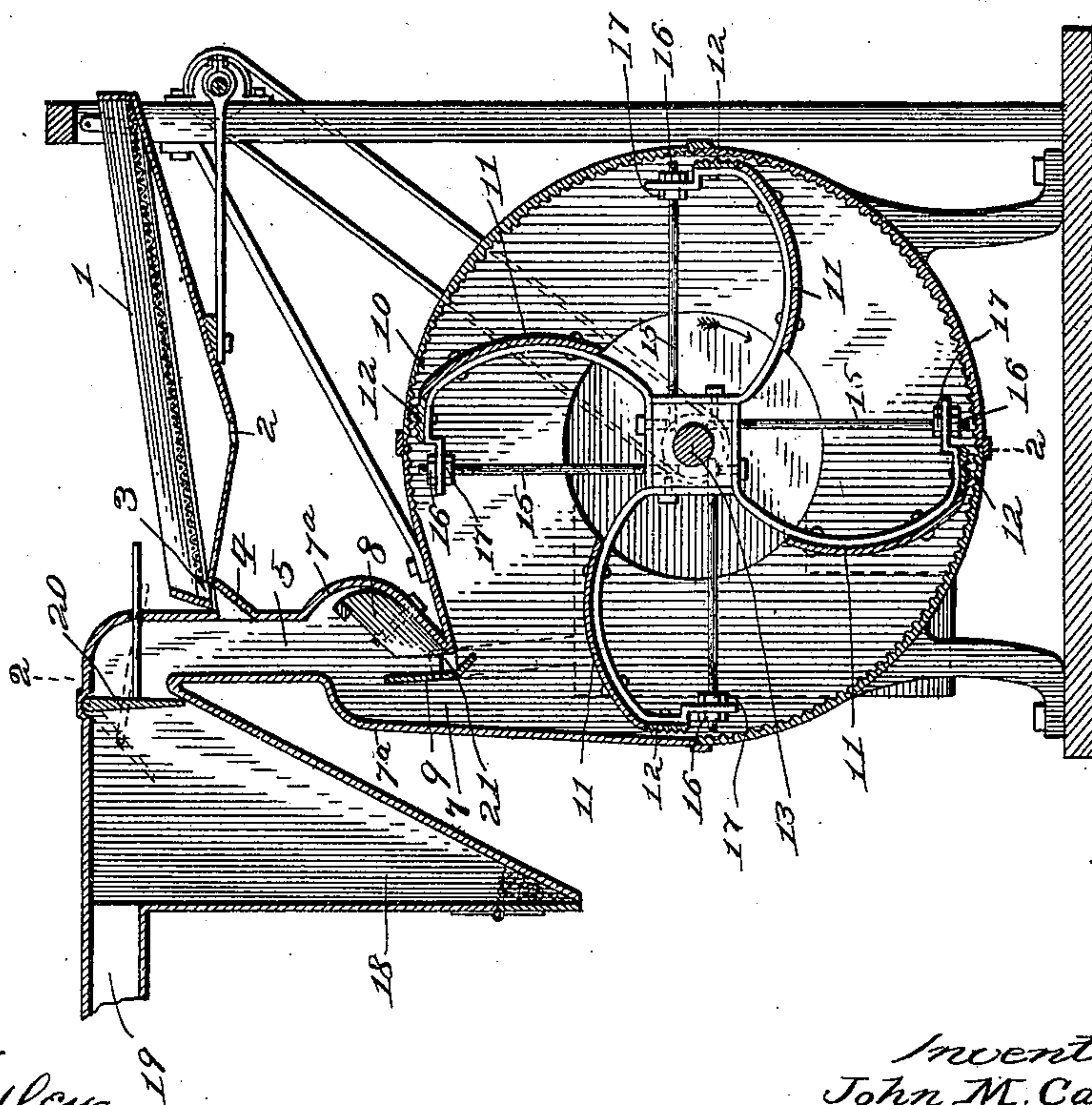


Fig. 1.



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(No Model.)

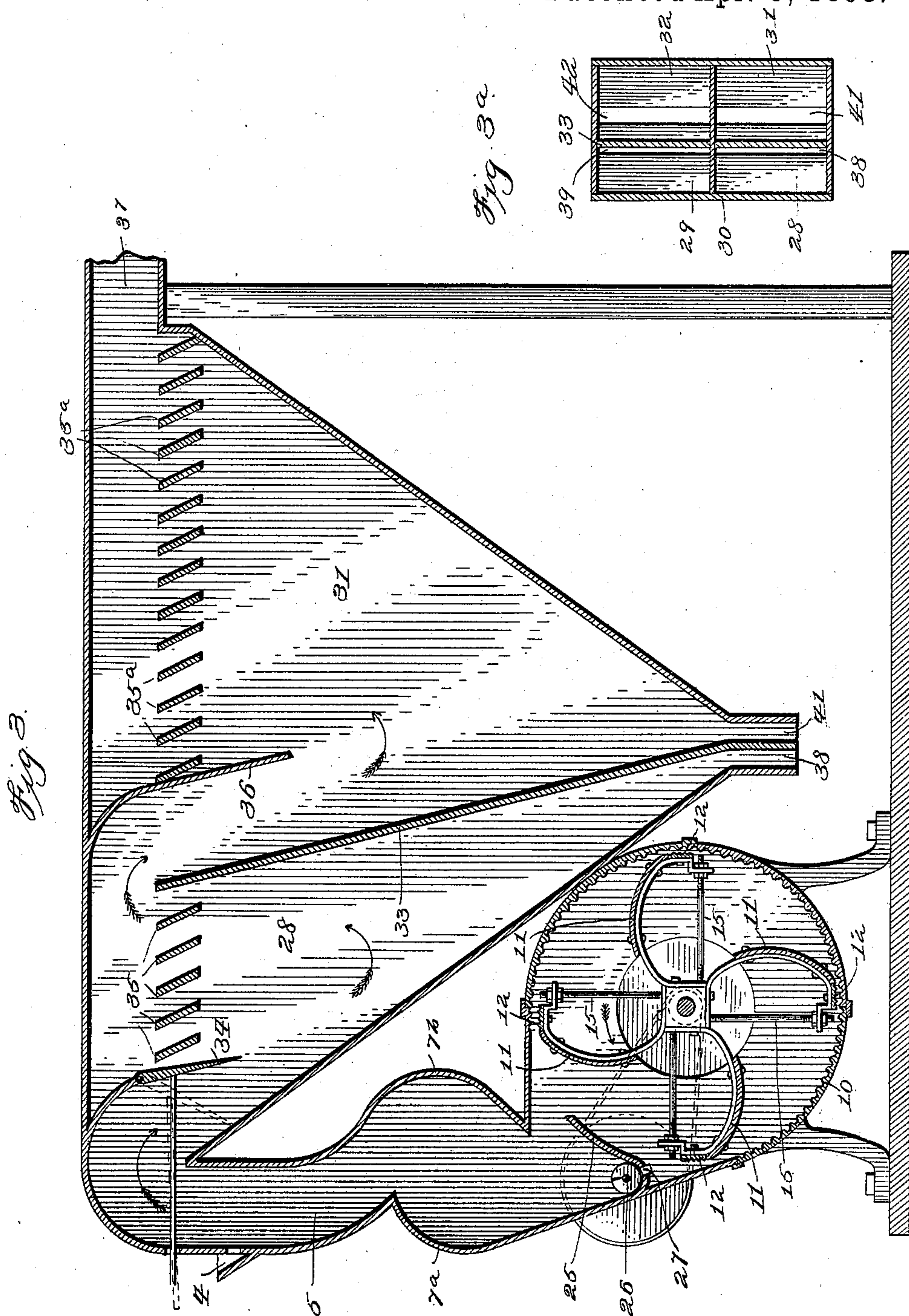
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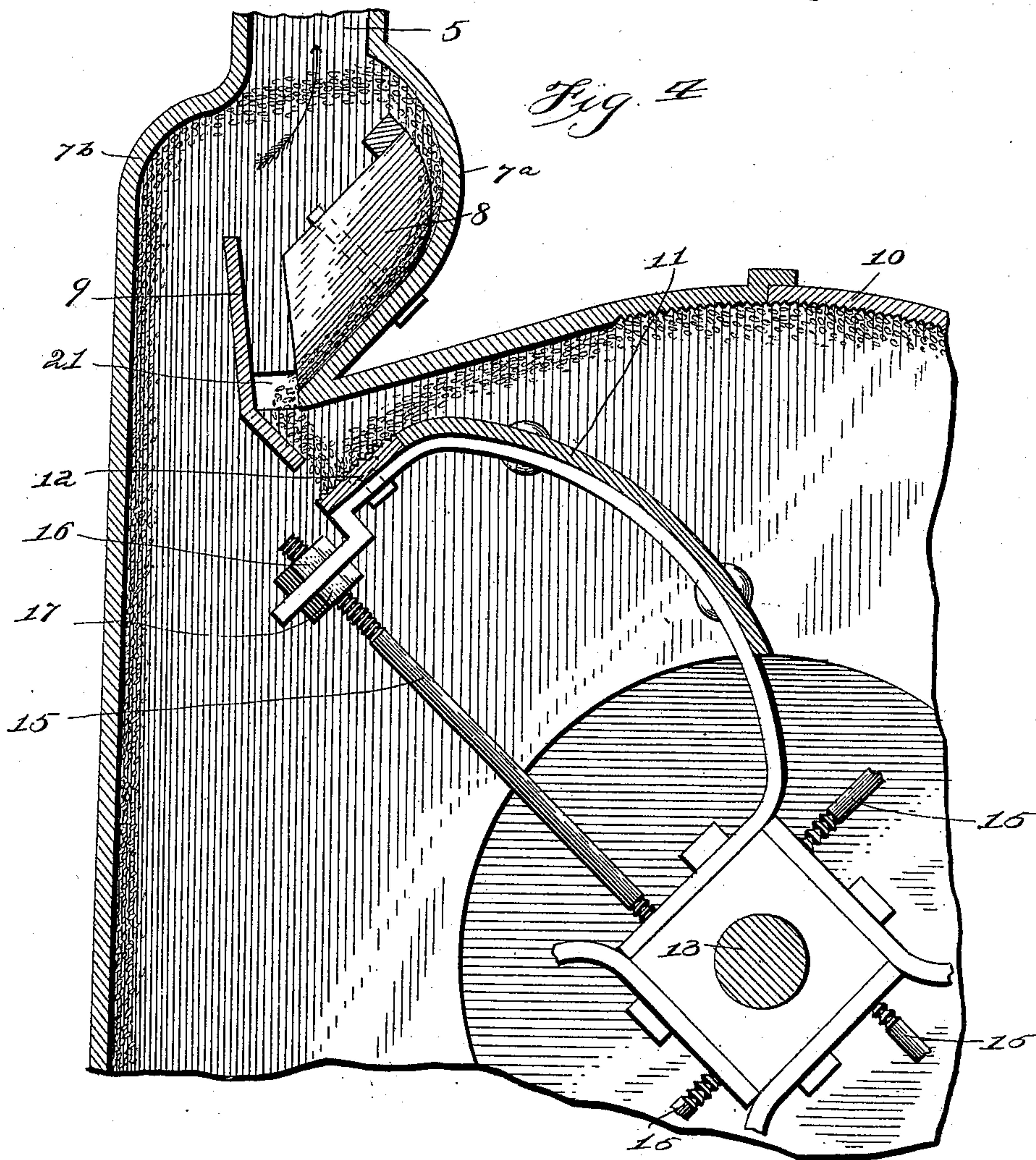
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J. M. CASE.

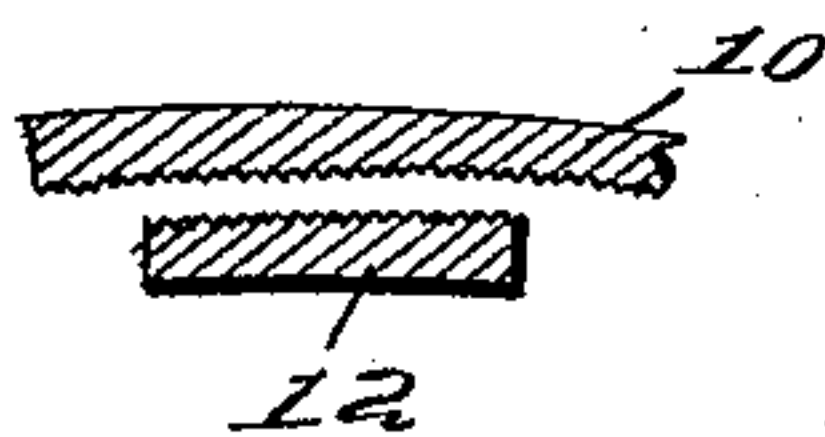
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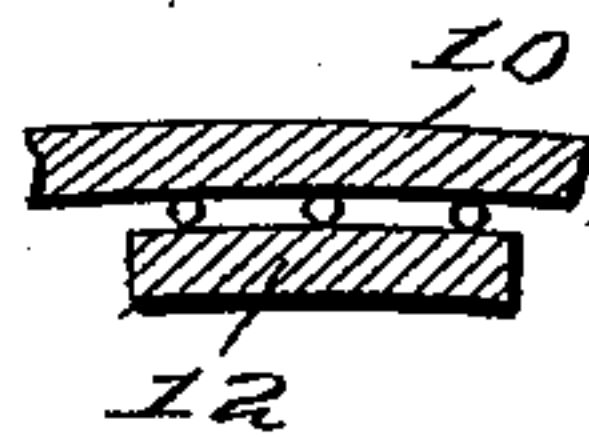
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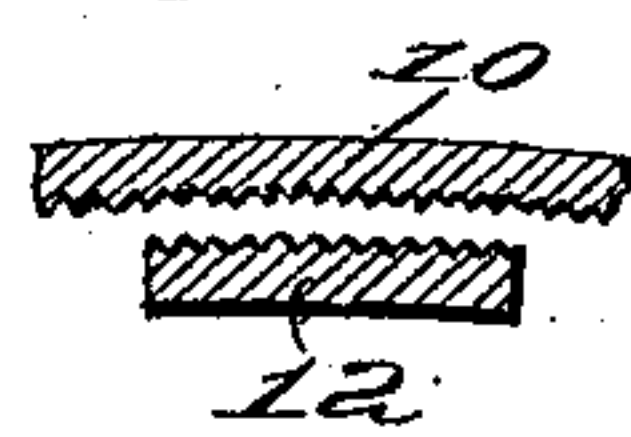
*Fig. 5.*



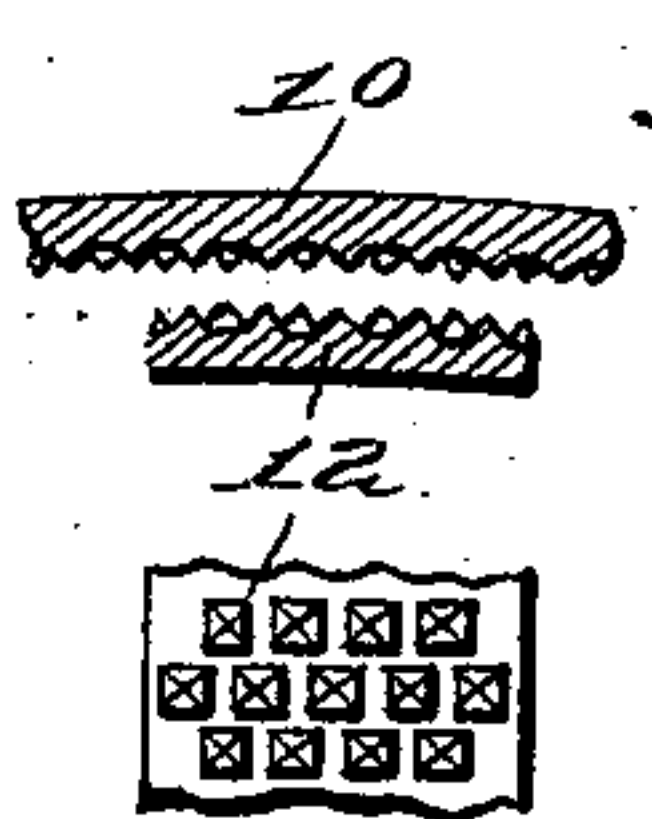
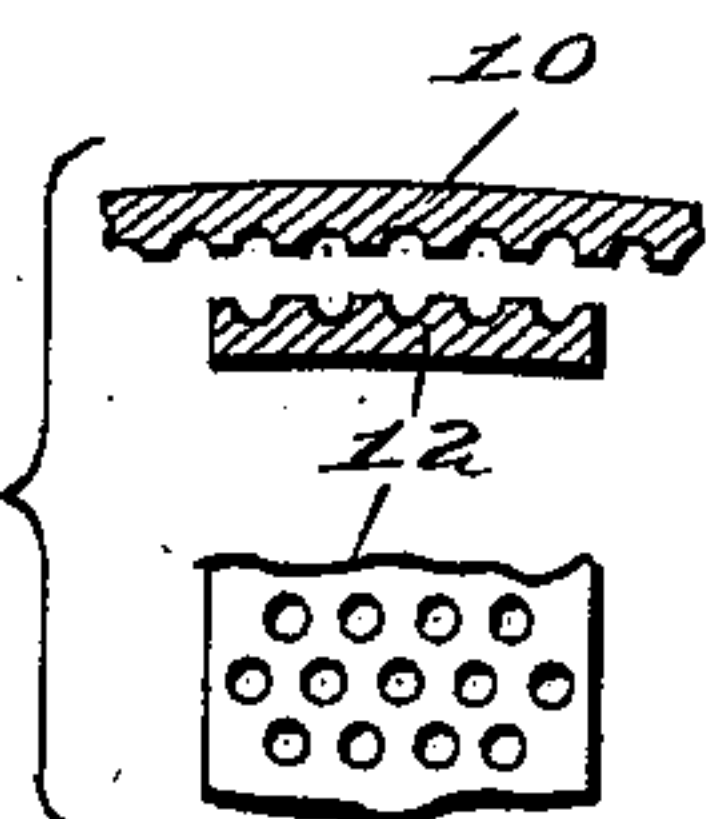
*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



*Fig. 9.*

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# UNITED STATES PATENT OFFICE.

JOHN M. CASE, OF CINCINNATI, OHIO.

## SCOURING, DISINTEGRATING, AND SEPARATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 601,728, dated April 5, 1898.

Application filed April 15, 1896. Serial No. 587,655. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN M. CASE, a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Universal Scouring, Disintegrating, and Separating Machines, of which the following is a specification.

My machine has for its objects to provide an effective means for scouring substances of various kinds, such as grain, or for separating impure or light material from heavier or pure material—such, for instance, as in the process of milling—or for separating flour, middlings, or other granular substances into grades of fineness according to their specific gravity, or for cleaning the fiber from cotton-seed and separating the same from the grain and collecting it, or for grinding grain or middlings and continuously removing the ground product during the process of reduction, or for milling hominy and separating the detached bran, germ, and grits from the hominy during the process of milling. In carrying out these various objects for which my machine is adapted I make slight modifications in the surfaces, the fan, and the settling-chambers; but the general principle of the machine and mode of operation remain the same for all the different uses to which it may be put.

The leading feature of this invention consists in causing the air-current from the fan to continuously cross the path of the material being operated upon in such a manner that the lighter material is carried away into settling-chambers, while the heavier material returns for further treatment without again coming in contact with any of the substances which have been separated from it. I find it impracticable to separate by throwing the mixed material into a vertical chimney or tube in which the air-current is delivered, because the momentum of the heavy material causes it to pass many feet beyond the light material to be separated, and in its return it drives back the light material which has become separated instead of permitting it to pass off with the air. Moreover, when the fan is run up to a sufficient speed to produce an air-current for removing cheat and smut-balls from wheat unless the tube is obstructed the wheat

will be thrown not less than thirty feet high. These difficulties render the unobstructed vertical-tube machines impractical. In my machine I do not depend upon throwing the material upward or in any special direction, but I provide a means for deflecting the material, so as to arrest its momentum and direct it across the outgoing current of air in a thin sheet and cause it to return by another path for further treatment, as hereinafter more fully described.

In the accompanying drawings, Figure 1 is a vertical transverse section, on the line 1 1, Fig. 2, of one form of a machine adapted for cleaning, scouring, or disintegrating wheat or other material. Fig. 2 is a longitudinal section of the same on the two planes indicated by the broken line 2 2, Fig. 1. Fig. 3 is a transverse section of a machine embodying the invention adapted for grinding and separating products into four grades, the lower ends of the four settling-chambers being shown by the section represented at 3<sup>a</sup> and which is taken on the line 3<sup>a</sup> 3<sup>a</sup>, Fig. 3. Fig. 4 is a detail view illustrating the operation of the machine when in operation, the material being thrown out of the mouth of the fan and deflected across the outgoing current of air, whereby the light material is removed and the heavier returns for further treatment. Figs. 5 to 9, inclusive, represent fragments of the concave lining and the operating-surface of the machine for treating the grain or other material. Fig. 5 represents surfaces adapted for reducing wheat to middlings. Fig. 6 represents such parts constructed with an abrading-surface, such as emery, and adapted for delinting cotton-seed. Fig. 7 shows surfaces adapted for reducing wheat to flour. Fig. 8 shows surfaces suitable for cleaning wheat and removing the smut-balls, and Fig. 9 surfaces suitable for manufacturing hominy.

The material to be scoured, disintegrated, or separated may be introduced from a hopper or spout upon a riddle 1, Figs. 1 and 2, which separates small refuse and discharges this through an opening 2, the material to be treated in the machine passing over the tail of the riddle 1, through a lateral opening 3, into a spout 4 near one end of the machine, by which it is delivered in a vertical chute and air-trunk 5, which trunk extends longi-



tudinally of the machine, but is divided by  
 a vertical partition 6 into two compartments  
 5 5<sup>a</sup>. The front wall 7<sup>a</sup> of the trunk 5 5<sup>a</sup> is  
 curved at its lower part, as shown in Fig. 1,  
 5 forming a cavity, in which are arranged a se-  
 ries of oblique partitions 8 8 8 for the pur-  
 pose of gradually forwarding the material  
 from end to end of the machine as it is suc-  
 cessively thrown upwardly by the scouring  
 10 and aspirating apparatus, now to be described.  
 At the back of the chutes formed between the  
 deflecting-partitions 8 is a vertical longitudi-  
 nal deflecting-board 9, inclined at the lower  
 edge, as shown in Fig. 1, for the purpose of  
 15 directing into the fan-case 10 material pass-  
 ing through the chutes between said parti-  
 tions 8. The interior surface of the fan-case  
 10 is suitably corrugated or roughened, as  
 shown in Fig. 1, to adapt it for scouring or  
 20 disintegrating purposes. The rotary fan con-  
 sists of a series of curved blades 11, mounted  
 upon a shaft 13, upon the outer edges with  
 concentric scouring-surfaces 12. The outer  
 edges of the blades 11 12 are connected to the  
 25 hub of the fan by radial brace-rods 15 through  
 the medium of a pair of nuts 16 and 17, by  
 the adjustment of which the scouring-sur-  
 faces 12 may be set at any desired proximity  
 to the scouring interior surface of the fan-  
 30 case 10. The fan being rotated in the direc-  
 tion indicated by the arrow *a* in Fig. 1, its  
 centrifugal action causes a forcible current of  
 air up through the trunk 7, and the centrifu-  
 gal force of the blades likewise projects up-  
 35 wardly into the trunk the material subjected  
 to the scouring action. The rear wall 7<sup>b</sup> of  
 the trunk 7 is curved forward above the de-  
 flecting-partition 9, as shown in Fig. 1, so as  
 to act in conjunction with the front wall 7<sup>a</sup>  
 40 in deflecting and returning to the fan-case  
 the heavier materials which are thrown up-  
 wardly into the chute 7 by the centrifugal ac-  
 tion of the fan.

From the description it will be apparent  
 45 that the material projected upwardly into the  
 chute 7 will be impelled in a thin sheet across  
 the ascending air-current in the cylindrical  
 chamber formed between the curved walls 7<sup>a</sup>  
 7<sup>b</sup>, from which the heavier material will be  
 50 returned over and over into the interior of  
 the fan-case, while the lighter particles will  
 be carried by the air-current into the receiv-  
 ing-chamber 18, the lightest portions being  
 carried out through the discharge air-spout  
 55 19, while all refuse, excepting the light dust,  
 is deposited into the receptacle 18. Valves  
 20, one for each of the compartments into  
 which the trunks 5 5<sup>a</sup> are divided by parti-  
 tions 6, are employed to regulate the capacity  
 60 of the openings between the trunks 5 5<sup>a</sup> and  
 the receiving chamber or chambers 18, as re-  
 quired. By regulating the velocity of the air  
 through the respective trunks by setting the  
 valves it is apparent that the grain may be  
 65 relieved of cheat or other impurities as it is  
 fed in, and this, together with smut, may be  
 collected in trunk 5, while the material sub-

jected to the scouring action of the blades 11  
 is driven up into the trunk 5<sup>a</sup>, and the lighter  
 portions being removed by the scouring ac- 70  
 tion being continuously carried out by the ac-  
 tion of the air-blast, while the heavier por-  
 tions return by their own gravity through the  
 chambers formed by the curved rear wall 7<sup>a</sup>  
 of the chute and by the oblique position of 75  
 the partitions 8 are gradually forwarded lon-  
 gitudinally through the scouring apparatus.  
 On reaching the farther end of the spaces  
 through which the material is introduced the  
 heavier material gradually escapes through 80  
 an opening 21 into the vertical chute 22 and  
 from thence to the inlet-trunk 23, through  
 which air is admitted to the eye of the fan.  
 A deflector 24 turns the descending current  
 of scoured and cleaned material away from 85  
 the eye of the fan, so as to prevent the heavier  
 portions being drawn into the fan-case and  
 at the same time to cause any light impuri-  
 ties which may still remain in the material  
 to be carried back into the fan-case by the in- 90  
 flowing air.

An important principle in the operation of  
 this apparatus is that the materials under  
 treatment are subjected to aspiration by the  
 action of an air-blast forced through the ma- 95  
 terial in a direction transverse to the latter's  
 movement, while the material itself is con-  
 stantly returned for further action of the fan  
 by the curved form of the walls of the cham-  
 ber into which the material is projected by 100  
 the impact of the fan-blades.

In Fig. 3 I have shown in vertical section,  
 on a plane taken near the receiving end of  
 the machine, an apparatus which is well adapt-  
 ed for reducing middlings to flour and for all 105  
 disintegrating operations. As here shown and  
 as further illustrated by the detail horizontal  
 section, Fig. 3<sup>a</sup>, which is taken on the plane  
 near the lower end of the settling or flour-re-  
 ceiving chambers, the apparatus is adapted 110  
 for the gradual and complete reduction of  
 middlings to flour and delivering the ground  
 product in four grades.

The rotary fan is constructed and operated  
 as described with reference to Figs. 1 and 2, 115  
 the interior surface of the fan-case 10 being  
 suitably roughened and the outer disintegrat-  
 ing-surfaces of the blades 11 12 being ad-  
 justed as close as desired to the roughened  
 interior surface of the fan-case. The fan be- 120  
 ing rapidly rotated in the direction indicated  
 by the arrow *b*, Fig. 3, material fed in spout  
 or hopper 4 near one end will be sent through  
 the trunk 5, the interior of the fan-case, pass-  
 ing first into a trough 25 and thence through 125  
 the first of a series of openings 27, which ex-  
 tend along the bottom of said trough from  
 end to end, or the passage 27 may consist,  
 practically, of a continuous longitudinal slot  
 in the bottom of the trough 25. The material 130  
 is ground between the roughened surfaces 10,  
 and as it is carried up through the top of the  
 fan-case the centrifugal force of the fan-blades  
 drives the material with great force through



the tangential passage above the trough 25 and upward against the curved front wall 7<sup>a</sup> 7<sup>b</sup>, in which it receives the vertical or rapid motion as above described, while the finer particles of the material are carried upward by the force of the air-blast through the trunk 5 and over into the first settling-chamber 28. The larger particles, whose weight adapts them to overcome the weight of the blast, fall back into the trough 25 and thence into the fan-case through the apertures 27, while the continuous screw conveyer 26 gradually forwards the material received by the trough 25 longitudinally in the machine, so that at each return the unfinished heavy particles reach the fan-case at different points. The receiving and settling chambers may be divided into any number of compartments. I have shown in Fig. 3<sup>a</sup> two compartments 28 29 longitudinally of the machine, divided by a transverse partition 30, and these subdivided into compartments 31 32 by longitudinal compartment 33. It is apparent that the heaviest particles, which longest resist the upward current of the air-blast in the trunk 5, so as to be returned the oftener to the fan-case, will be delivered into the second receiving and settling compartment 29. The entrance to each of the compartments 28 29 is guarded by a choke-valve 34 to regulate the force of the blast. From the settling-compartments 28 29 the air-blast passes upward between deflecting-slats 35 over the top of the longitudinal partition 33 and is then carried downward by a curved deflector 36 into the respective chamber 31 32, in the top of which are deflecting-slats 35<sup>a</sup>, between which the air passes on its way to the outlet 37. The function of the oblique deflecting-slats 35 35<sup>a</sup> is to prevent direct drafts between the introduction and outlet passages and distribute the air-currents uniformly over the area of the respective settling-chambers 28 29 31 32.

From the above description it will be clearly understood that the heaviest and most valuable parts of the ground or finished material will be arrested in the settling-chambers 28 29, from which they will be discharged from the spouts 38 39, while any valuable material which is light enough to be carried over to the second settling-chambers 31 32 and light enough to be carried off to the final discharge-spout 37 by the air-current, which is reduced in force by the larger area of the chambers 31 32, will be arrested in these chambers and discharged through the spouts 41 42.

This machine is especially valuable for reducing maize to hominy, since by its construction the detached bran, starch, and germ is immediately separated from any heavier material. By this immediate separation I am enabled to take out the germ substantially whole and in such a condition as to be used for distilling oils therefrom. It is also true that by the instantaneous removal of starchy particles as they are scoured off from the

grains they do not become intermingled or conglomerated with the germ and disintegrated bran, but pass out so free and pure that by a suitable separating-reel the starch may be removed from the grain and germ in a substantially pure condition, whereby the value of the products commonly called "offal" or "feed" is very materially increased. In adapting my machine to the manufacture of hominy I use sharp cutting-surfaces upon the periphery of the revolving fan and preferably cone-shaped projections from the inner surface of the fan-case; but any mode that will produce a retarding of the material so that the cutting-surfaces on the periphery of the fan must come continuously in contact with the grain performs the same function as the projecting cone-shaped teeth.

In the operation of all classes of material to be scoured my machine removes the material in more granular and merchantable condition, owing to the continuous separation the instant that the reduction is produced. As a machine for reducing wheat to middlings, I am enabled to accomplish the same in this one machine that is ordinarily produced in from three to six reductions in the present system of milling, and also to dispense with separating-screens and to produce a much higher grade of middlings.

In my drawings I have shown that the fan may be operated in opposite directions. The construction whereby the material is thrown upward and then deflected across the ascending air-current is the preferable form for all heavy materials; but the construction of the fan showing the material thrown horizontally operates well in the reduction of middlings and other fine material to flour; but I do not confine myself to either mode of construction or to any special angle or direction to the mouth of the discharge-fan.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. The combination of a fan-casing having an abrading inner surface, a combined fan and abrader comprising air-blast-producing blades and abrading-surfaces, an approximately circular chamber and a straight outer wall provided with an overhanging upper portion which deflects the material upward and forward into said chamber across the air-blast, said chamber and wall being located on the upgoing side of the fan, the deflecting-board 9 and the adjustable partitions 8 which receive the descending material in the dead-air space formed by the curvature of the chamber and the said deflecting-board 9.

2. The combination of a combined fan and disintegrator comprising blast-producing blades, outer scouring, abrading or grinding surfaces, a fan-case having an inner scouring, abrading or grinding surface, and a tangential outlet and an approximately curved chamber provided with an outer straight wall having an overhanging upper portion situ-



ated on the upgoing side of the fan, the adjustable partitions, and the dead-air space formed by the deflecting-board 9.

3. The combination of a fan-casing having  
5 an abrading inner surface, and a combined fan and abrader comprising blast-producing blades, and abrading-surfaces, both in said casing, radial brace-bars connecting the outer  
10 ends of the blades to the hub of the fan, adjusting-nuts on said rod adapted to engage the blades whereby the fan-arms may be adjusted to variable distances to the fan-case to simultaneously vary the abrading and fan  
15 action; said fan-casing having a tangential discharge-opening, and a chamber formed with a front straight wall provided with an overhanging upper portion, and a curved rear wall, adjustable partitions, and a deflecting-board 9 arranged in said chamber, the cur-  
20 vature of the chamber and the deflecting-board forming a dead-air space whereby the material is continuously deflected across the upgoing blast of air delivered by said fan simultaneously with the material.

25 4. In a combined disintegrating and sepa-

rating machine, the combination of a combined fan and reducer having adjustable arms provided with fan-blades and abrading or grinding surfaces, a fan-casing surrounding  
30 said fan and also provided with disintegrating surfaces, in which both the separating blast and reduction take place, a tangential outlet in said fan-casing, an approximately circular chamber provided with a straight  
35 outer wall having an overhanging upper portion, said chamber communicating with the said tangential outlet, a return-passage consisting of a dead-air space formed by a deflecting-board 9 and the curved rear wall of  
40 said chamber, also making communication between the fan-casing and the said circular chamber, an escape-passage for the air-blast and light materials beyond said circular chamber, and settling-chambers; all substantially as set forth.

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Witnesses:

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