No. 828,175. PATENTED AUG. 7, 1906.

L. A. ASPINWALL.

LIQUID SPRAYER.

APPLICATION FILED JUNE 4, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

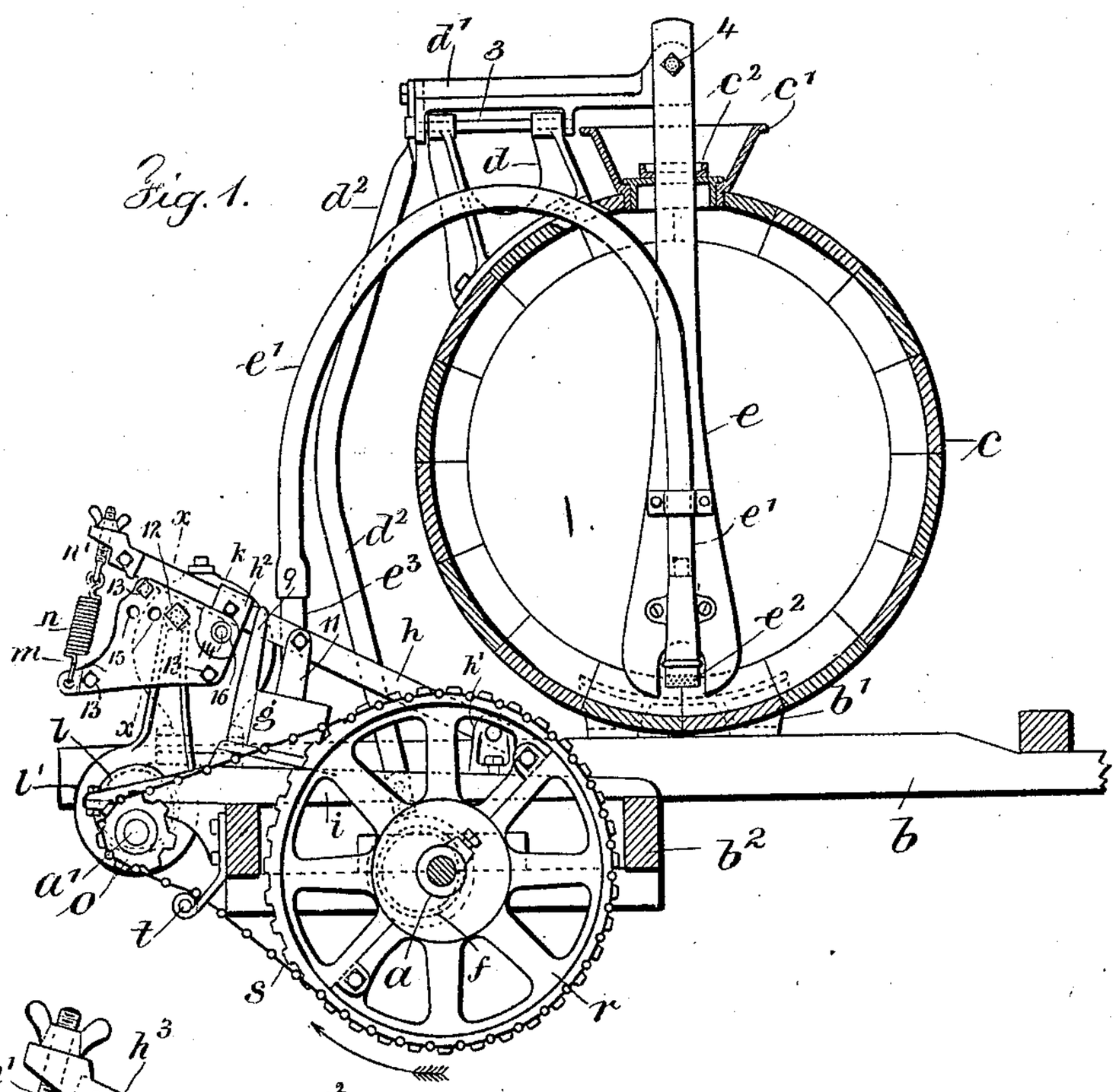
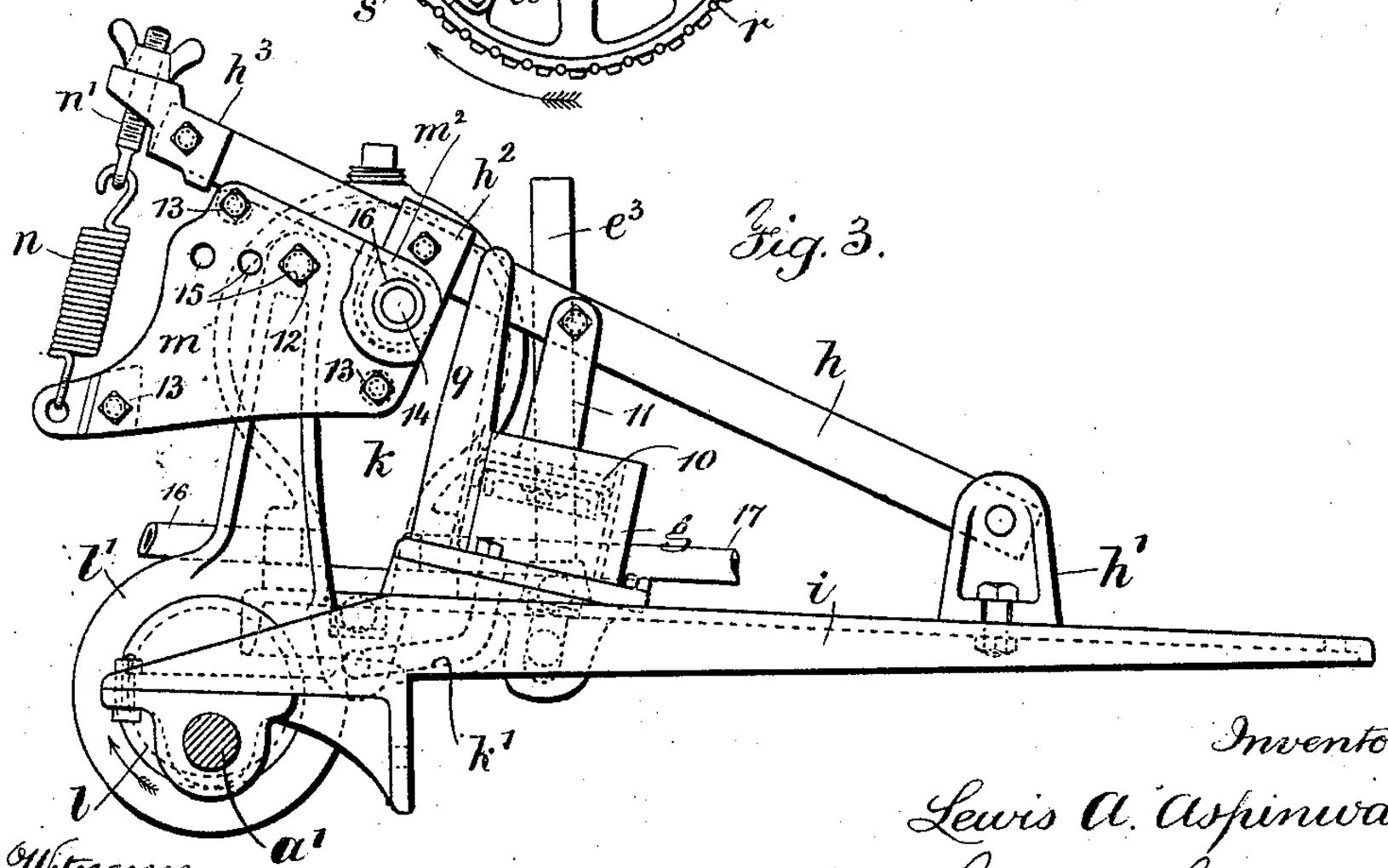


Fig. 3.



Witnesses
Chas. F. Smith
Leopold Kerr

Inventor
Lewis A. Aspinwall
per Harold Serrell
atty

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2 SHEETS—SHEET 2.

Fig. 2.

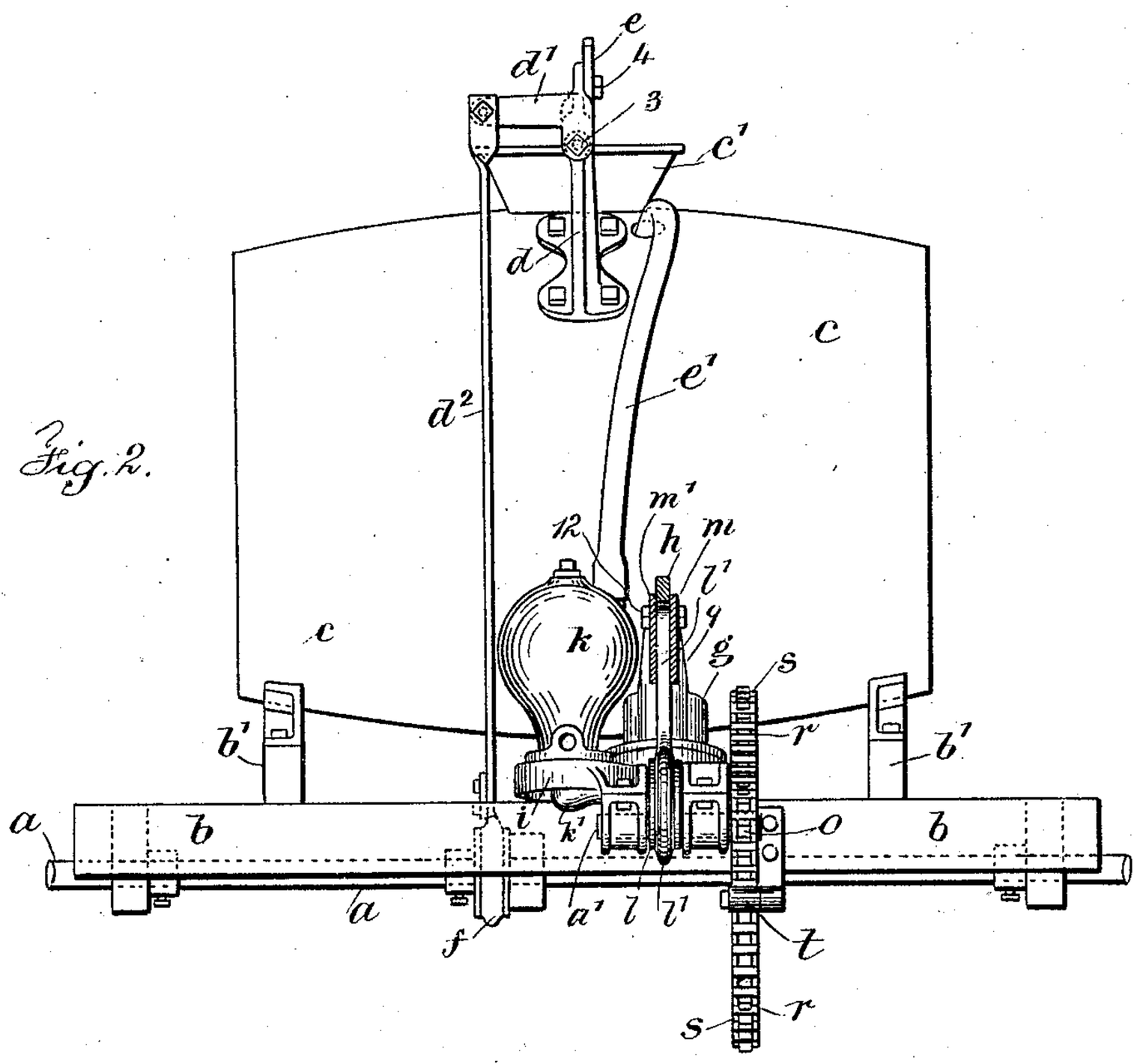


Fig. 4.

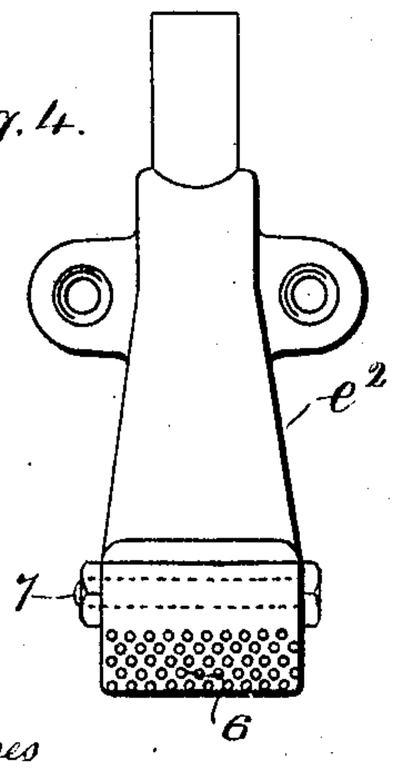
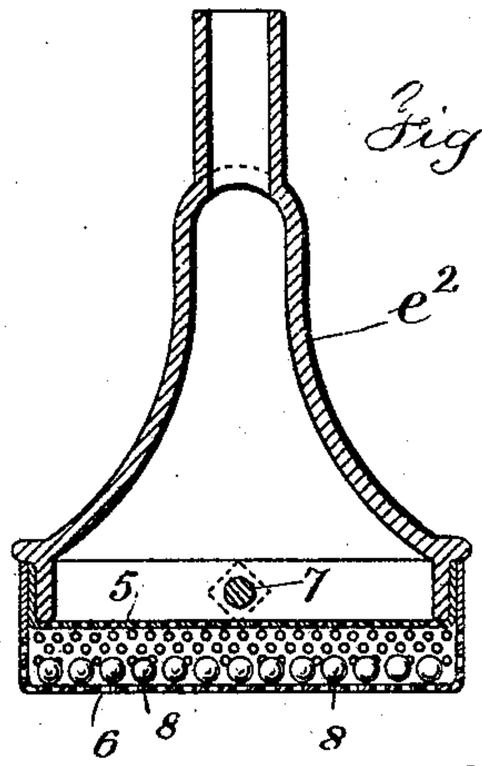


Fig. 5.



Witnesses

Chas. A. Smith

Leopold Sells

Inventor

Lewis A. Aspinwall

per Harold Serrell

Atty.

UNITED STATES PATENT OFFICE.

LEWIS AUGUSTUS ASPINWALL, OF JACKSON, MICHIGAN, ASSIGNOR TO ASPINWALL MANUFACTURING COMPANY, OF JACKSON, MICHIGAN, A CORPORATION OF MICHIGAN.

LIQUID-SPRAYER.

No. 828,175. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed June 4, 1904. Serial No. 211,105.

To all whom it may concern:

Be it known that I, LEWIS AUGUSTUS ASPINWALL, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented an Improvement in Liquid-Sprayers, of which the following is a specification.

My invention relates to a device adapted to be moved about from place to place and employed for spraying liquid upon growing plants or vines in rows, such plants or vines as potatoes, tomatoes, strawberries, cotton, and the like.

The liquid employed is a solution of a poisonous material—such as paris-green, Bordeaux mixture, &c.—and the purpose thereof is to kill the insects that infest such plants; and my invention relates to improvements upon the devices shown and described in Letters Patent granted to me July 10, 1900, No. 653,333, and June 3, 1902, No. 701,668, and to which patents reference is hereby made for a more full and complete description of the parts and their operation.

The special features of my present invention relate to a novel form of strainer or suction-screen having automatically-acting means for keeping the same free and preventing the perforated metal screen-plates clogging and to an adjustable pivotal connection between the pump-beam and axle by which the relation of said parts may be varied so as to regulate the pressure in the air-cylinder upon the outflowing liquid to a marked degree. The devices are also of a yielding character in one direction of their movement and unyielding in the opposite direction of their movement. The yielding action is in evidence when the pump is forcing the liquid into the air-cylinder, and the extent of this yielding action is in proportion to the accumulated pressure, and the length of the stroke of the piston is decreased thereby in an effort to maintain the pressure constant and to deliver a steady flow of liquid.

In the drawings, Figure 1 is a vertical section transversely of the liquid-holding barrel and axle of the machine and an elevation of the parts forming my present invention. Fig. 2 is a section at the dotted line *x x* of Fig. 1 and an elevation from the left hand of the parts shown in Fig. 1 and at right angles thereto. Fig. 3 is an elevation, in larger size, of the special features forming my present invention, together with a section of an axle forming part of the said mechanism. Fig. 4 is an elevation, and Fig. 5 a vertical section at right angles to the elevation, Fig. 4 showing the form of strainer or suction-screen according to my invention. Figs. 4 and 5 are of enlarged size for clearness.

I have not herein shown the wheels, the details of the supporting-frame, the whiffletree, the foot-rests, the pipes from the air-cylinder to and terminating in the spraying-nozzles, or some other parts shown and described in my aforesaid patents, as the same form no part of my present invention.

The main axle *a* of the machine, and to the ends of which the usual wheels are connected, carries a frame *b*, which in turn supports the liquid-holding barrel *c*, there being between the frame and the barrel bracket frames or supports *b'*. This frame also supports an auxiliary axle *a'*, carrying a sprocket-wheel *o*, the main axle *a* carrying a sprocket *r*, between and passing around which is a chain *s* for communicating the power and the rotation of the main axle *a* to the auxiliary axle *a'*. A bracket-supported roller *t* applies a tension to this chain *s*.

The liquid-holding barrel is provided with a filling-hopper *c'* and preferably with a removable sliding top c^2. A bracket *d* is secured upon the liquid-holding barrel, and it has an axis 3. A rocking support *d'* is pivotally connected to this axis 3, and it is formed at one end for connection with the paddle *e*, which extends down through the filling-hopper *c'* and removable sliding top c^2 into the liquid-holding barrel *c*, the connection being formed by a bolt 4. To the opposite end of the rocking support *d'* is connected an arm d^2, which passes down to and is connected with an eccentric *f* on the main axle *a*, the rise and fall of which swings the rocking support *d'*, and through it the paddle *e*, within the liquid-holding barrel, as described in my aforesaid patents.

A hose *e'* of any desired flexible character passes through an opening in the liquid-holding barrel, is supported at one end by a strap secured to the paddle *e* and connected to a strainer device e^2, secured to the paddle, and the lower end of which is in proximity to the lower portion of the barrel. The other end

of the hose e' is secured to a pipe e^3, extending from the pump-body g. This strainer device e^2 (shown especially in Figs. 4 and 5) is of flaring character at its base distant from its connection with the flexible hose e', and I provide screen-caps 5 and 6, of perforated metal, the flanged edges of which fit tightly over the edge of the strainer-body and are advantageously connected and held firmly to the strainer-body by a transverse or crossing bolt 7. The perforated portions of the screen-caps are separated an appreciable distance, and they are parallel with one another. The perforations of the screen-caps may vary—that is to say, the perforations in the cap 5 may be finer than those in the cap 6, or vice versa, and in the space between said supports I prefer to place a number of balls or buck-shot 8, which, with the swinging movement of the paddle and the suction action of the liquid, are agitated and moved about between the plates of the screen-caps.

I prefer to make the smaller perforations or apertures in the inner of the screen-caps and the larger perforations in the spraying-nozzles employed in this class of devices, so that what passes through the screen-caps 5 and 6 will certainly pass through the spraying-nozzles. The swinging action of the paddle and the suction act upon these shot or the balls to not only vibrate the same, but to lift them from one screen to the other, the lifting action and the vibration serving to constantly clean the openings and keep them from clogging.

The pump is single-acting and comprises a pump-body g, a piston 10, and piston-rod 11. It is secured to a frame i, mounted upon an axle-frame b^2, connected with the main frame b of the machine. The pump-beam h is pivotally connected to the piston-rod 11 and is pivotally mounted upon the bracket h', secured to the pump-frame i, said beam being advantageously guided by projections 9 of the pump-body.

k is an air-cylinder, and k' a passage-way from the air-chamber to the pump-body g. This air-cylinder is also supported upon the pump-frame i.

l represents an eccentric upon the auxiliary shaft a', and l' an eccentric ring frame or driving member surrounding the eccentric and rising therefrom.

I provide a clip h^2, surrounding and bolted to the pump-beam h, and at the extreme end of the pump-beam I provide a cap h^3, bolted thereto.

$m\,m'$ are frame-plates, and m^2 represents reinforcing-bosses. These frame-plates are connected by bolts 13. They are perforated with a series of perforations or apertures 15, and at one of these apertures 15 they are connected by a pivot-bolt 12 with the upper end of the eccentric ring frame l'. These frame-plates are also pivotally connected to the pump-beam at its clip h^2 by a pivot-pin 14, which preferably passes through a sleeve 16—that is to say, the sleeve 16 and the pivot-bolt 14 coact as a pivotal connection between the said frame-plates and the clip h^2 of the pump-beam, it being a fact that I do not limit myself to the precise details of this pivotal connection. In action the said connected frame-plates $m\,m'$ constitute substantially a lever of the third class.

I provide a spring n with hook ends, the lower hook end being connected to the free end of the frame-plates $m\,m'$ and the upper hook end connected to an adjustable screw and nut n', which passes through the cap h^3, and to which spring a tension can be applied by the adjusting-screw and nut n'.

Referring particularly to Figs. 1 and 3, the operation of the parts shown therein, and which form part of my present invention, is as follows: The rotation of the main axle a turns the sprocket r, causing a movement of the chain s, which turns the sprocket o and the auxiliary axle a'. The eccentric l is moved thereby, and with it the eccentric ring frame l'. In the position of the parts, Fig. 3, the eccentric is at its highest point, and the continued movement in the direction of the arrow moves down this eccentric-frame, acting upon the frame-plates $m\,m'$, the pivot 14 to pull down the pump-beam h and to move the piston 10 down into the pump-body, forcing the liquid therein into the air-cylinder. The reverse or upward movement of these parts brings the frame-plates $m\,m'$, with their uppermost connecting-bolt 13, against the beam h to raise the same, the piston-rod, and piston and draw the liquid through the strainer or suction-screen from the liquid-holding barrel into the base of the pump-body, the said movements being continuously repeated. With the upward movement of the parts into the position Fig. 3 the uppermost bolt 13 bearing upon the pump-beam positively with the pivotal connection 14 provides for an unyielding structure having a fixed power for drawing the liquid simply from the liquid-holding barrel into the pump; but the reverse or downward movement advantageously provides a yielding action, because in this downward movement the liquid is forced by the pump into the air-cylinder to flow from there into and away by the pipes 16 and 17 to the ordinary spraying devices shown in my aforesaid patent, and it is desirable in connection with this movement to vary the pressure according to the work to be performed. This pressure may be varied in one or both of two ways—first, by increasing the tension upon the spring n, which causes the same to yield less with the downward movement and the leverage produced by the pivotal connection of the frame-plates $m\,m'$ with the pump-beam, and in the second way this pressure

may be increased or lessened by the point of pivotal connection of the eccentric ring frame l' with the frame-plates m m' by the bolt 12 at the apertures 15, because it will be noticed, especially from Fig. 3, that the several apertures 15 vary in their distance from the pivot-bolt 14, and consequently with a change in position of this bolt 12 in connecting the eccentric-frame to the frame-plates, there must be a difference in the leverage, and consequently a difference in the pressure produced in the air-cylinder by the action of the parts.

It will be apparent that when the parts are connected, as shown in Fig. 3, at the nearest of the apertures 15 to the pivot-pin 14 more power can be exerted because of the nearness of the pivotal relation of the parts and the distance of the tension-spring and that the farther away the pivotal connection is between the eccentric ring frame l' and the frame-plates m m' and the nearer to the tension-spring n the less will be the power exerted. It will be also apparent that if the pivotal connection of the eccentric-frame l' with the frame-plates m m' at the three apertures shown be taken as fixed points of pressure intermediate points of pressure will be governed and controlled by the tension applied to the spring n by the action of the adjusting-screw n', and in this connection it is claimed that it is possible to vary the pressure in the air-cylinder upon the outflowing liquid from, say, twenty pounds to one hundred and upward.

I claim as my invention—

1. In a liquid-spraying device, the combination with a liquid-holding barrel, a paddle, and means actuated by the operation of the device for swinging the said paddle, of a suction-pipe secured to said paddle and moving therewith a strainer or suction-screen connected to the lower end of said pipe and comprising screen-caps suitably spaced apart, and devices located between the same adapted to be agitated by the movement of the paddle for keeping the screen-caps clear of obstruction.

2. In a liquid-spraying device, the combination with a liquid-holding barrel, a paddle and means actuated by the operation of the device for swinging the said paddle, of a suction-pipe secured to said paddle and moving therewith a strainer or suction-screen connected to the lower end of said pipe and comprising an inner and outer screen-cap, the perforated plates of which are parallel and spaced apart, and a quantity of buck-shot or small balls between the said plates, the agitation of which, with the swinging of the paddle, performs the function of keeping the apertures of the screen-plates clear of obstruction.

3. In a liquid-spraying device, the combination with a liquid-holding barrel, a paddle and means actuated by the operation of the device for swinging the said paddle, of a suction-pipe secured to said paddle and moving therewith a strainer or suction-screen connected to the lower end of said pipe and comprising an inner and an outer screen-cap, the perforated plates of which are parallel and spaced apart, the inner screen-plate having small apertures and the outer screen-plate larger apertures, and a quantity of buck-shot or small balls between the said plates, the agitation of which with the swinging of the paddle performs the function of keeping the apertures of the screen-plates clear of obstruction.

4. In a liquid-spraying device, the combination with a liquid-holding barrel, a pump, an air-cylinder, connections for liquid between the parts, a pump-beam connected to the piston-rod of the pump and the main axle, of an auxiliary axle, sprockets of varying sizes upon the main and auxiliary axles, a chain or equivalent device passing around said sprockets and for communicating the rotation and power of the main to the auxiliary axle, an eccentric upon the auxiliary shaft, an eccentric ring frame connected to said eccentric and actuated thereby, a frame structure pivotally connected to the pump-beam, a bolt for pivotally connecting the said frame structure to the eccentric-frame at one of several predetermined points distant from the pivotal connection of said frame structure to the pump-beam, and an adjustable spring device to which tension may be applied, said parts together regulating and controlling the pressure in the air-cylinder upon the outflowing liquid.

5. In a liquid-spraying device, the combination with a liquid-holding barrel, a pump, an air-cylinder, connections for liquid between the parts, a pump-beam connected to the piston-rod of the pump, and the main axle, of an auxiliary axle, sprockets of varying sizes upon the main and auxiliary axles, a chain or equivalent device passing around said sprockets and for communicating the rotation and power of the main to the auxiliary axle, an eccentric upon the auxiliary shaft, an eccentric ring frame connected to said eccentric and actuated thereby, frame-plates, means for connecting the same together, said frame-plates extending at opposite sides of the upper end of the said eccentric-frame, a bolt for pivotally connecting the eccentric-frame at predetermined points to the frame-plates, a pivot-pin for connecting the frame-plates with the pump-beam at a point appreciably distant to the connection of said frame-plates with the eccentric-plate, a spring at one end connected to the free end of the frame-plates and at the other end to the free end of the pump-beam and to which tension may be applied, substantially as set forth.

6. In a liquid-spraying device, the combi-

nation with a pump, of a pump-beam pivoted at one end to the spraying device and at an intermediate point to the pump, an auxiliary axle and eccentric device upon said axle, a frame structure of spaced-apart plates, a variable pivotal connection of the eccentric device to and between the plates of the frame structure, a pivotal connection of the frame structure to the pump-beam at one side of the first-named pivotal connection and a yielding device connecting the frame with the end of the pump-beam at the other side of the said pivotal connection.

7. In a liquid-spraying device, the combination with a pump, of a pump-beam pivoted at one end to the spraying device and at an intermediate point to the pump, an auxiliary axle, an eccentric device upon said axle, a frame structure of spaced-apart plates, a variable pivotal connection of the eccentric device to and between the plates of the frame structure, a pivotal connection of the said frame structure to the pump-beam at one side of the first-named pivotal connection, a spring and an adjustable device for applying tension to the spring connecting the frame with the end of the pump-beam at the other side of the pivotal connection.

8. In a liquid-spraying device, the combination with a pump, an air-cylinder, a liquid-holding barrel and connections for the liquid between said parts, of an auxiliary axle and power devices for rotating the same from a main axle of the spraying device, a pump-beam, a frame of plates *m*, a pivotal connection therefor to the pump-beam, a yielding connection from the free end of said frame of plates to the pump-beam, an eccentric upon the auxiliary shaft, an eccentric-frame mounted thereon and an adjustable pivotal connection between the free end of the said eccentric-frame and said frame of plates.

9. In a liquid-spraying device, the combination with a pump, an air-cylinder, a liquid-holding barrel and connections for the liquid between said parts, of an auxiliary axle and power devices for rotating the same from the main axle of the spraying device, a pump-beam, a frame of plates *m*, a pivotal connection therefor to the pump-beam, an adjustable yielding connection for the free end of said frame of plates to the pump-beam, an eccentric upon the auxiliary shaft, an eccentric ring frame mounted thereon and passing between the plates of said frame, and an adjustable pivotal connection between the free end of said eccentric-frame and said frame of plates offset from the pivotal connection thereof to the pump-beam.

Signed by me this 27th day of May, 1904.

LEWIS AUGUSTUS ASPINWALL.

Witnesses:

GEO. N. WHITNEY,

W. C. SHANAFELT.