Specification of Thomas Walker : utilizing sewage.

A.D. 1862, 21st NOVEMBER. N° 3132.

SPECIFICATION

OF

THOMAS WALKER.

UTILIZING SEWAGE, &c.

LONDON:
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A.D. 1862, 21st *November*. N° 3132.

Utilizing Sewage, &c.

LETTERS PATENT to Thomas Walker, of Birmingham, in the County of Warwick, Engineer, for the Invention of "IMPROVEMENTS IN UTILIZING SEWAGE MATTERS, AND IN THE MEANS OR APPARATUS EMPLOYED THEREIN, PART OF WHICH IMPROVEMENTS IS ALSO APPLICABLE TO RAISING AND FORCING OTHER FLUIDS."

Sealed the 15th May 1863, and dated the 21st November 1862.

PROVISIONAL SPECIFICATION left by the said Thomas Walker at the Office of the Commissioners of Patents, with his Petition, on the 21st November 1862.

I, THOMAS WALKER, of Birmingham, in the County of Warwick, Engineer, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN UTILIZING SEWAGE MATTERS, AND IN THE MEANS OR APPARATUS EMPLOYED THEREIN, PART OF WHICH IMPROVEMENTS IS ALSO APPLICABLE TO RAISING AND FORCING OTHER FLUIDS," to be as follows:—

The improvements relate to means by which sewage matters may be collected, and the more solid or heavier fertilizing parts thereof retained by subsidence, and then distributed over a district for agricultural or horticultural purposes. For this purpose I form a conduit from the sewer or drain to the lower part of a well or reservoir, which I call the pump well or reservoir, with the side or sides thereof by preference inclined; whilst the heavier particles will by gravitation descend to the lower part of such well or reservoir, the

more liquid portion thereof may flow over by a suitable passage back into the sewer or drain again, or into another or other secondary subsiding well or reservoir, or wells or reservoirs. These latter subsiding wells or reservoirs may have a communication from their lower parts to the lower part of the first or pump well or reservoir, to be opened when required to allow the finer subsidence therein to pass into the pump well or reservoir, or they may be separately pumped. The matter as collected by subsidence in the pump well or reservoir referred to I draw from the lower part thereof by means of a pump through suitable piping, and thence by other pipes I conduct it to other tanks or receivers, which I call field tanks or receivers, at distances apart as may be required. These latter tanks or receivers are formed deep at one end inclining upwards to the opposite, and the fluid matters from the first wells or reservoirs are caused to flow into these field tanks or receivers, and to overflow at the shallowest end into troughs or gutters, laid so as to distribute the fluid matters over the district for irrigation. In the passage of the highly charged liquid matters through these field tanks or receivers subsidence takes place, and when desired the matters subsided may be removed therefrom to be distributed. The bottom of each field tank or receiver may be provided with a passage capable of being opened to a drain when desired to drain it before taking out the solid matter.

The pumping apparatus I prefer to employ, and which may be worked by a steam engine or other suitable power, is formed with a chamber connected to one end, or one to each end of the working barrel of a pump, having a flexible diaphragm across each chamber to prevent the sewage matters coming in contact with the clean water or oil in the working barrel on one or both sides of the piston. Pumping apparatus similarly arranged is also applicable to other cases where it is desirable to keep the working barrel and piston free from injurious effects of the matters to be raised or forced. Where circumstances may render it desirable, the subsidence may be obtained by the use of three or more reservoirs, each reservoir being of sufficient size in relation to the quantity of flow in a given period to leave time for the contents of one reservoir becoming solid, or partially solid, whilst one of the others is being filled by subsiding matter. Sluices or stopways are provided to regulate the direction of the various flows, or to close the passage by any of them as required.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Thomas Walker in the Great Seal Patent Office on the 21st May 1863.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, THOMAS WALKER, of Birmingham, in the County of Warwick, Engineer, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-first day of November, in the year of our Lord One thousand eight hundred and sixty-two, in the twenty-sixth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Thomas Walker, Her special licence that I, the said Thomas Walker, my executors, administrators, and assigns, or such others as I, the said Thomas Walker, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN UTILIZING SEWAGE MATTERS, AND IN THE MEANS OR APPARATUS EMPLOYED THEREIN, PART OF WHICH IMPROVEMENTS IS ALSO APPLICABLE TO RAISING AND FORCING OTHER FLUIDS," upon the condition (amongst others) that I, the said Thomas Walker, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Thomas Walker, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say :—

The improvements relate to means by which sewage matters may be collected, and the more solid or heavier fertilizing parts thereof retained by subsidence, and then distributed over a district for agricultural or horticultural purposes. For this purpose I form a conduit from the sewer or drain to the lower part of a well or reservoir, with the side or sides thereof inclined; whilst the heavier particles will by gravitation descend to the lower part of such well or reservoir, the more liquid portion thereof may flow over by a suitable passage into the sewer or drain again, or into another reservoir or reservoirs.

The matter collected by subsidence in the first well or reservoir I draw from the lower part thereof by means of a pump through suitable piping, and thence by other pipes I conduct it to other tanks or receivers, which I call field or mud tanks or receivers, at distances apart as may be required. These latter field or mud tanks may be formed deep at one end, inclining upwards to the opposite, to facilitate emptying them. The fluid matters from the first well or reservoir may be caused to flow into troughs or gutters, laid so as to distribute the fluid matters over the district for irrigation.

The pumping apparatus I prefer to employ, and which may be worked by a steam engine or other suitable power, is formed with a chamber connected to one end, or one to each end of the working barrel of a pump, having a flexible diaphragm across each chamber to prevent the sewage matters coming in contact with the clean water or oil in the working barrel on one or both sides of the piston. Pumping apparatus similarly arranged is also applicable to other cases where it is desirable to keep the working barrel and piston free from injurious effects of the matters to be raised or forced. Sluices or stopways are provided to regulate the direction of the various flows, or to close the passage by any of them as required.

But that the improvements may be better understood, I will proceed by the aid of the accompanying Drawings more fully to describe the means pursued by me.

Description of the Drawings.

Figure 1 shews a plan, and Figures 2 and 3 two sectional views, of apparatus arranged according to one part of my Invention. *a*, *a*, is a well or reservoir, the sides of which are inclined from the upper surface a^1 to the bottom a^2; *b* is a conduit from the sewer, by which the sewage matters are conducted to the lower part of the reservoir. And as the object of the improvements is to take advantage of the law of subsidence, I prefer to form the outlet of the conduit *b* into the reservoir *a* at b^1, and in order to reduce as much as possible the amount of disturbing influence exerted by the continual flow of the sewage matters into the reservoir *a*, I form the passages from the conduit *b* into the reservoir at b^1 on opposite sides thereof from 1 to 2. The size of the reservoir *a* will depend materially upon the quantity of sewage matters flowing therein in a given time, and also upon the quality of such sewage matter in relation to the character of the matters contained therein. But supposing the sewage matter to be of the average quality, and the quantity thereof flowing therein to be about 1,000,000 gallons per hour, I prefer the reservoir *a* to be about 180 feet in diameter, and about 60 feet deep; but I do not confine myself to

these proportions. The sewage matter entering the reservoir a at b^1 will gradually distribute itself first in the lower part of that reservoir, and then rise to the upper part thereof, but during the time of this rising subsidence will be taking place, and the more dense or heavier parts will have a tendency at once to settle to the lowest part, whilst the more liquid part separating therefrom will rise until it flows over the edge a^1 of the reservoir a into the surrounding trough c, which I prefer to be formed with an inclined bottom inclining from the point c^1 each way to the outlet c^2, when such fluid matter is thence conducted into a trough, channel, or gutter, by which it is conveyed through the district, where it may be used for irrigating and fertilizing purposes. This trough, channel, or gutter I have not thought it necessary to shew by Drawing, but it will, in fact, become a continuous reservoir or canal, and may be of many miles in length, depending upon the amount of sewage at command and the extent of country to be benefited by it; and it will traverse the country in a direct or irregular course, depending upon the character of the surface of the land and other causes. In order that this liquid portion of the sewage matter may be available at various points, as for separate farms or parts of farms or other lands, I, at the points desired, apply pipes opening from near the bottom of this channel or continuous reservoir, with taps or valves, and to these pipes may be added other elastic or non-elastic pipes or conductors, by which the supply may be distributed at will over the particular portions of districts; or it may be allowed to overflow at the different farm lands lying below such channel. In some cases such liquid sewage matter may, by hydraulic apparatus, be raised to other suitable channels at higher elevations, there to be used in like manner for irrigating higher levels, and in this manner may several such channels or continuous reservoirs, one above the other, be supplied for the purpose of irrigating various districts of different elevations. The more solid matters obtained by the subsidence in the reservoir a may be drawn from the lower part thereof by suitable hydraulic apparatus through the pipe d, and thence forced through suitable pipes or conduits over districts to be used in like manner for manuring purposes. In some cases it may be desirable to employ several receivers or reservoirs a, of progressively increasing dimensions, when the overflow from the first will, by the passage c^2, be conducted by a passage b^1 into the lower part of the second, and so on, by which means a series of subsidings of different qualities may be obtained. Considerable annoyance and injury to the health of the inhabitants of a town is now often experienced by the escape of the foul gases from the sewers through the ventilators and street gratings. To remedy this evil, I recommend that the main sewer be trapped near its outlet to prevent the air,

as now, passing into the sewer at such outlet, and thereby forcing back the lighter and obnoxious gases generated in the sewer up such ventilators or gratings, and that in order to ventilate the sewer or drains thereof, there be provided a tall chimney or stack in communication with such sewers. In this chimney, and near its bottom, gas may be kept continually burning to insure an upward draught as well as an inward in place of an outward current through such ventilators or gratings, and a destruction of the gases rising from the sewer. In place of a chimney or stack, a similar effect may be obtained by the use of a fan or other exhaust apparatus operated by steam or other motive power.

Apparatus adapted to be used for raising sewage matter, either of the more solid kind from the lower part of reservoirs *a* to a higher level, or in order to its being forced to distant places, or for raising the more fluid portions from one level to another, is indicated by the sectional view in Figure 4. And I would here state that in the use of ordinary hydraulic apparatus in lifting not only sewage matters but other fluids containing particles of foreign matters considerable difficulty is experienced by the more solid particles held in suspension in the fluid injuriously wearing the working parts.

By the adaptation of apparatus such as indicated by Figure 4, although a piston, which may be of the ordinary construction working in a cylinder is used as the exhausting means, such piston and cylinder are not acted upon by the fluid to be raised or forced, but is separated therefrom by a flexible diaphragm, which becomes the medium for acting on the fluid to be raised or forced. *e* is the cylinder of the pump ; *f* is the piston, the rod f^1 of which is worked by a steam engine or other suitable power ; *g* is the flexible diaphragm, which is firmly secured around its edge in the chamber *h*, and may be formed of leather or other suitable flexible and by preference of slightly porous material, in order to facilitate the clearance of the lower portion of the chamber *h* of the air therein, and likewise to fill it and the delivery pipe with clean water from above such diaphragm on first setting the pump in motion. In some cases I apply a tap to the lower portion of the chamber *h*, just below the part to which the diaphragm is secured, in order that air may escape by it from such lower portion of the chamber *h*. The chamber A formed above this diaphragm *g*, and between it and the piston *f*, is filled with water, oil, or other fluid, and to facilitate the supply of such fluid to this chamber A, the piston rod f^1 is formed hollow, with a tap f^2 at its upper end to close such passage, and a piece of india-rubber or other flexible tube may be attached to such tap. On first setting the piston *f* in motion the tap f^2 should be open, with the end of the flexible tube connected to the tap f^2, opposite to such

connection, dipping in a vessel containing the fluid to be introduced into the chamber A, such fluid will then in the ascent of the piston flow into that chamber, and in the descent of the piston the air contained in such chamber will be forced out; when this chamber A has by this means been filled with fluid, and the piston f is at its lowest position in the cylinder e, then the tap f^2 must be closed, when by continuing the motion of the piston f with the pipe from the under side of the diaphragm in connection with the fluid to be raised on each ascent of the piston f, such fluid will flow therein through the valves j, and on each depression of the piston f it will be forced out by the valves k and passage k^1.

To insure the proper and continuous action of the apparatus, I prefer to employ two or more inlet and two or more outlet valves, and I do not confine myself to the particular form of valve shewn.

Figure 4* shews a modification of Figure 4, particularly applicable as a hand pump. In this case the outlet passage k^1 is raised to a position above the tap f^2, in order that there may always be a column of fluid in the outlet passage above the diaphragm g to counterbalance the weight of fluid in the cylinder and piston rod, so that if the tap f^2 were opened air would not enter, as the pressure in the piston rod and cylinder would be less than that upon the delivery valve; m is an air hole to allow of the escape of air from the chamber k^2, or in the event of the pump being required for a force pump, by this air hole being closed, the chamber k^2 will serve as an air chamber to regulate the flow.

Figure 5 shews a modification of this description of pump, in which the cylinder containing the piston is separated from the chamber containing the flexible diaphragm by a pipe or channel l, and the outlet passage k^1 is above the tap f^2 of the piston rod, as explained in respect of Figure 4*. The same letters of reference are used in this case to represent similar parts to those indicated in Figure 4. In this case the flexible material may be water-tight, and air in the chamber immediately under the diaphragm g will escape through the small opening h^1 into the passage to the delivery valve k. Pumps thus arranged are also applicable to raising and forcing other fluids, and when the chamber containing the diaphragm is separated from the pump cylinder by a channel or passage, several of such diaphragm chambers may be employed in connection with the same pump, so as to operate at different times to raise or force different fluids through the respective diaphragm chambers. In such case each passage of communication between the upper part of a diaphragm g and the pump cylinder will be provided with a tap n, as indicated by dotted lines in Figure 5, or by other valves capable of closing such passage, and then

all of such taps or valves must be closed except that in the passage between the upper side of the diaphragm over the passage for the time to be in operation and the pump barrel; and when another fluid is to be raised, the tap *n* in the passage to the diaphragm last in operation must be closed, and the corresponding tap of the passage to the diaphragm now to be in operation opened, and so on with each change.

Having thus described the nature of my said Invention, I would have it understood that I do not confine myself to the precise details referred to, as these may be varied; but what I do claim is, the adaptation or combination of means and method or system of working for the utilization of sewage matters, substantially as explained.

And also I claim the adaptation or combination of means for raising and forcing fluids, substantially as explained.

In witness whereof, I, the said Thomas Walker, have hereunto set my hand and seal, this Twenty-first day of May, in the year of our Lord One thousand eight hundred and sixty-three.

THO^{S}. WALKER. (L.S.)

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FIG. 2.

Section through the lines 1 1. of Figure 1.

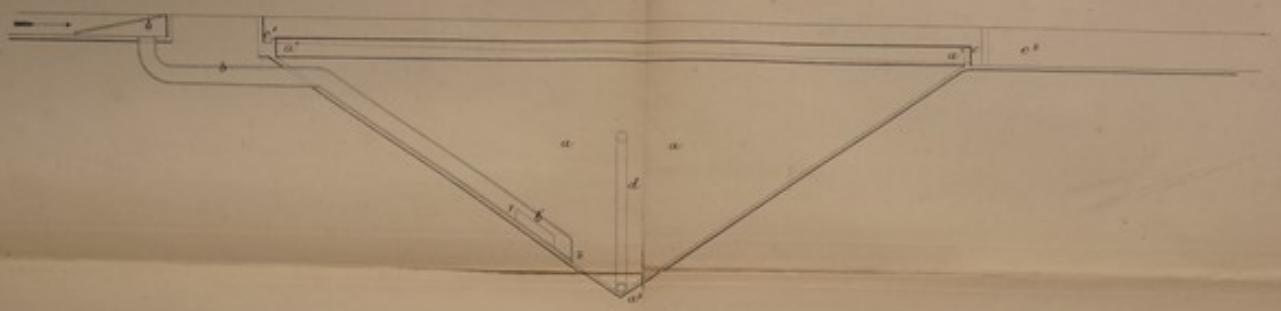


FIG. 3.

Section through the lines 2. 2. of Figure 1.

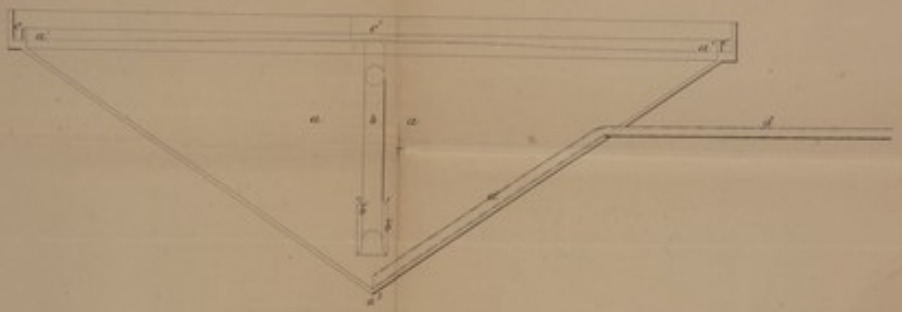
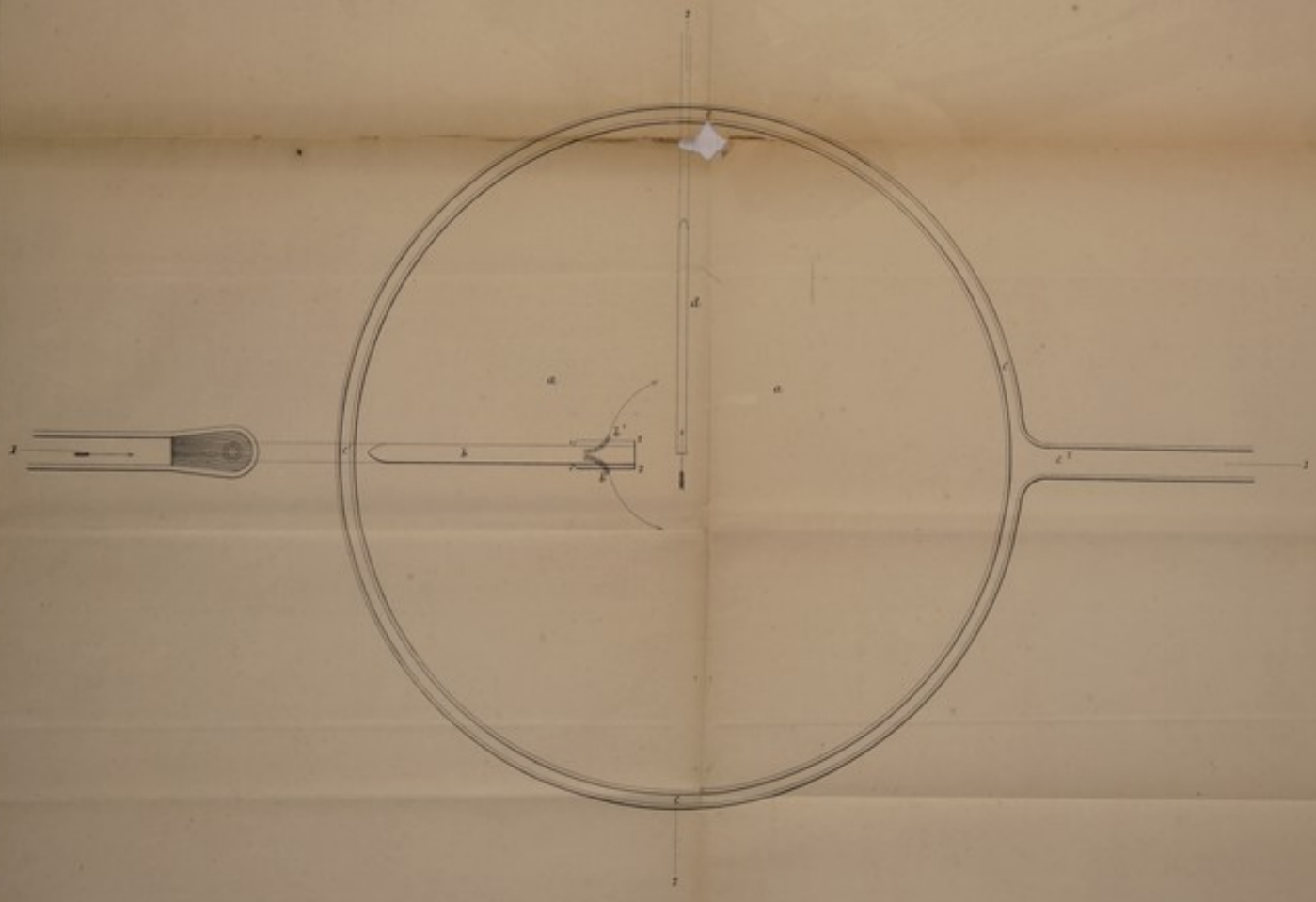


FIG. 1.



The Red drawing is colored.

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FIG. 2.

Section through the lines 1 1. of Figure 1.

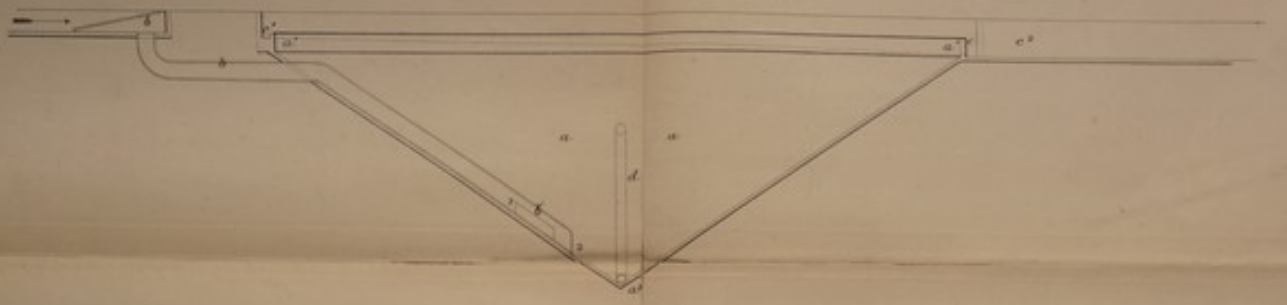


FIG. 3.

Section through the lines 2. 2. of Figure 1.

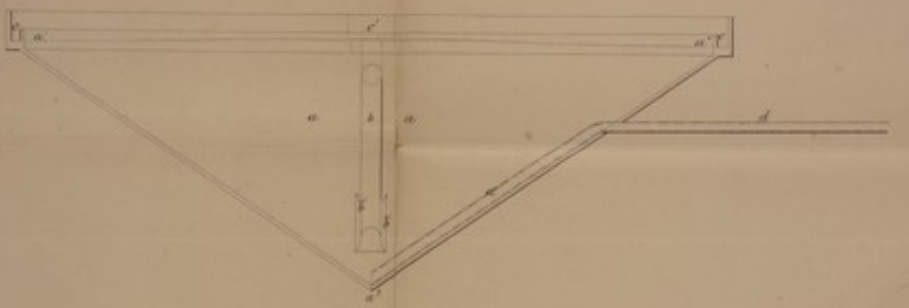
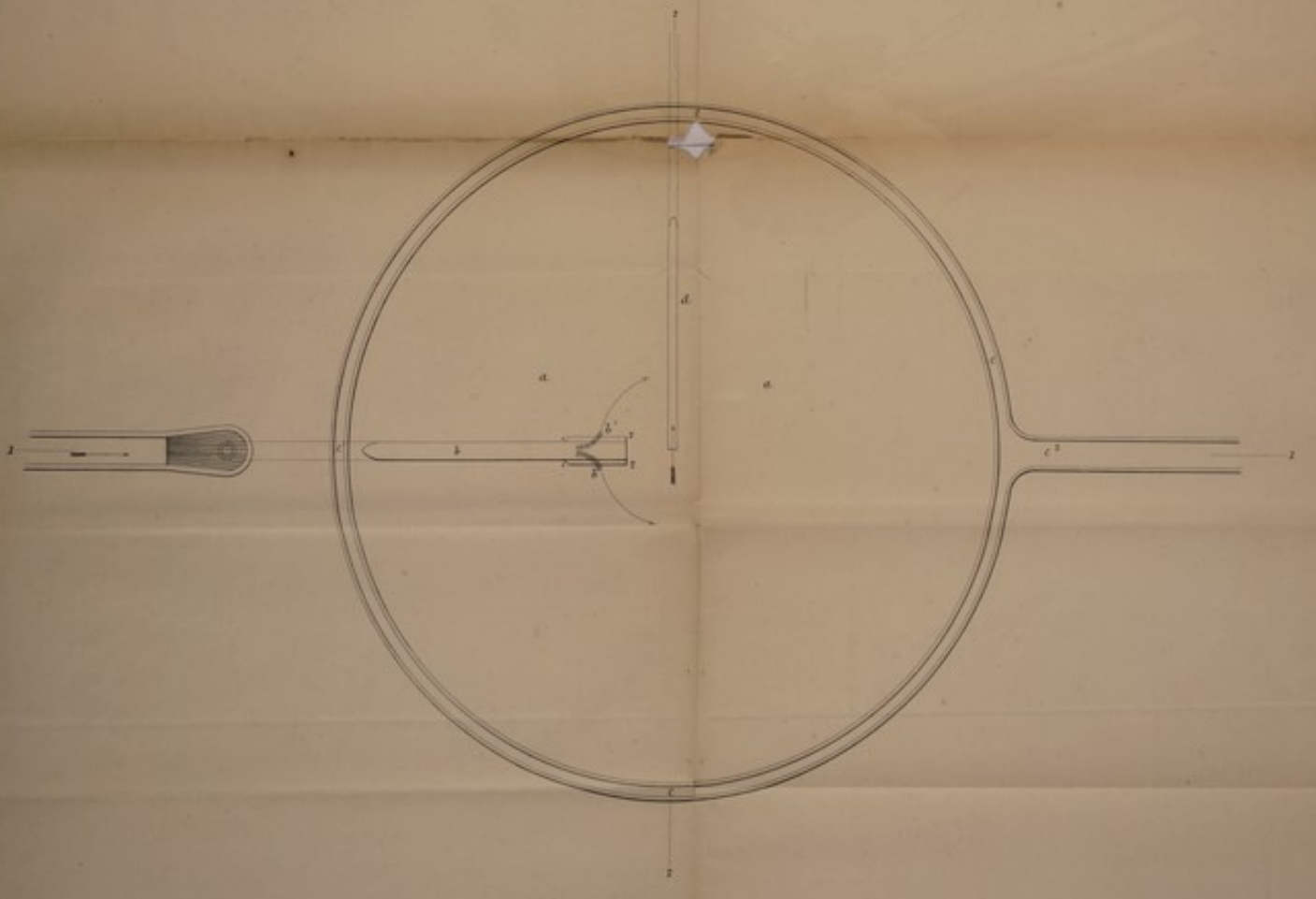


FIG. 1.



The filed drawing is altered.

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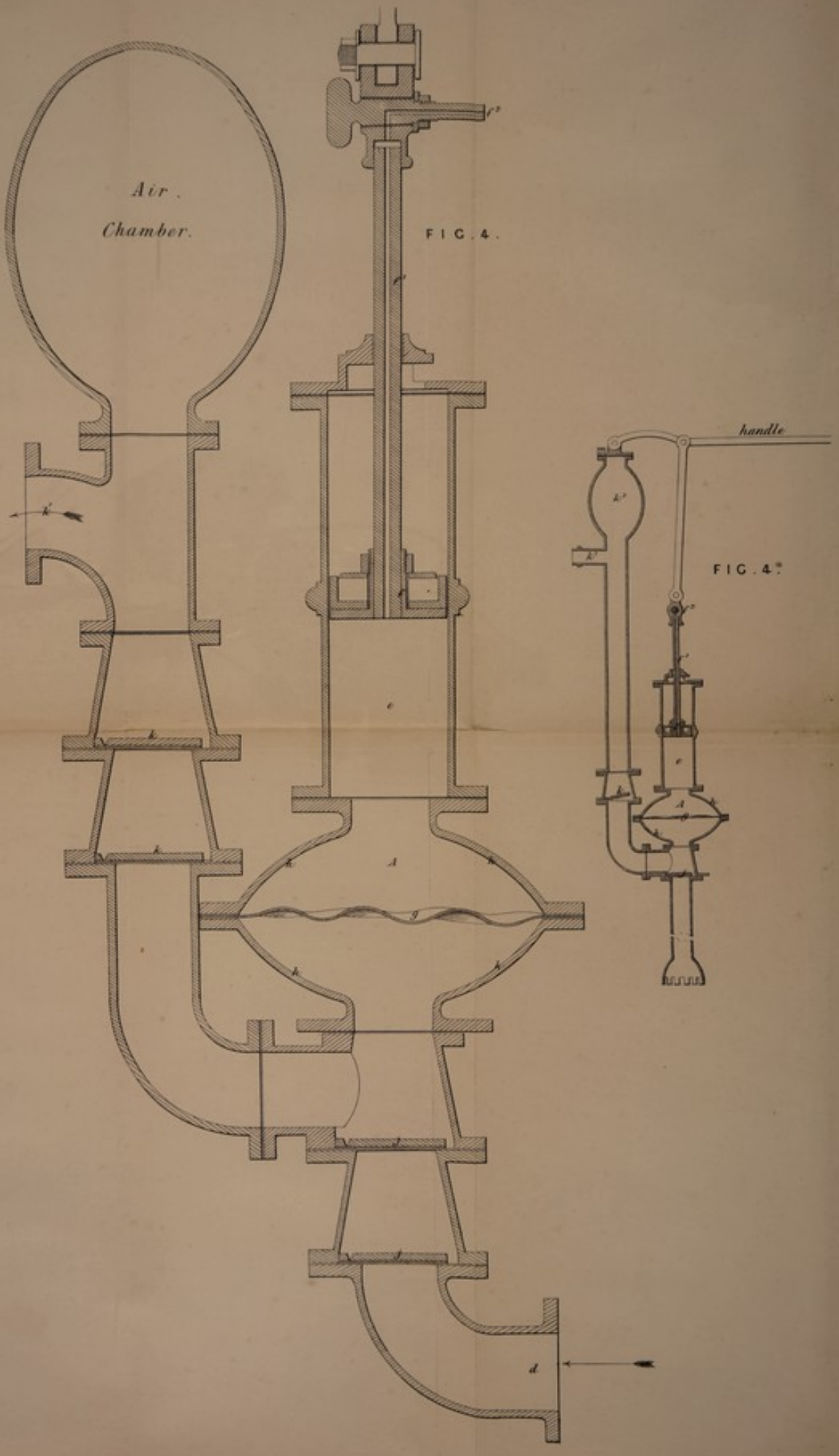

The filed drawing is not colored.

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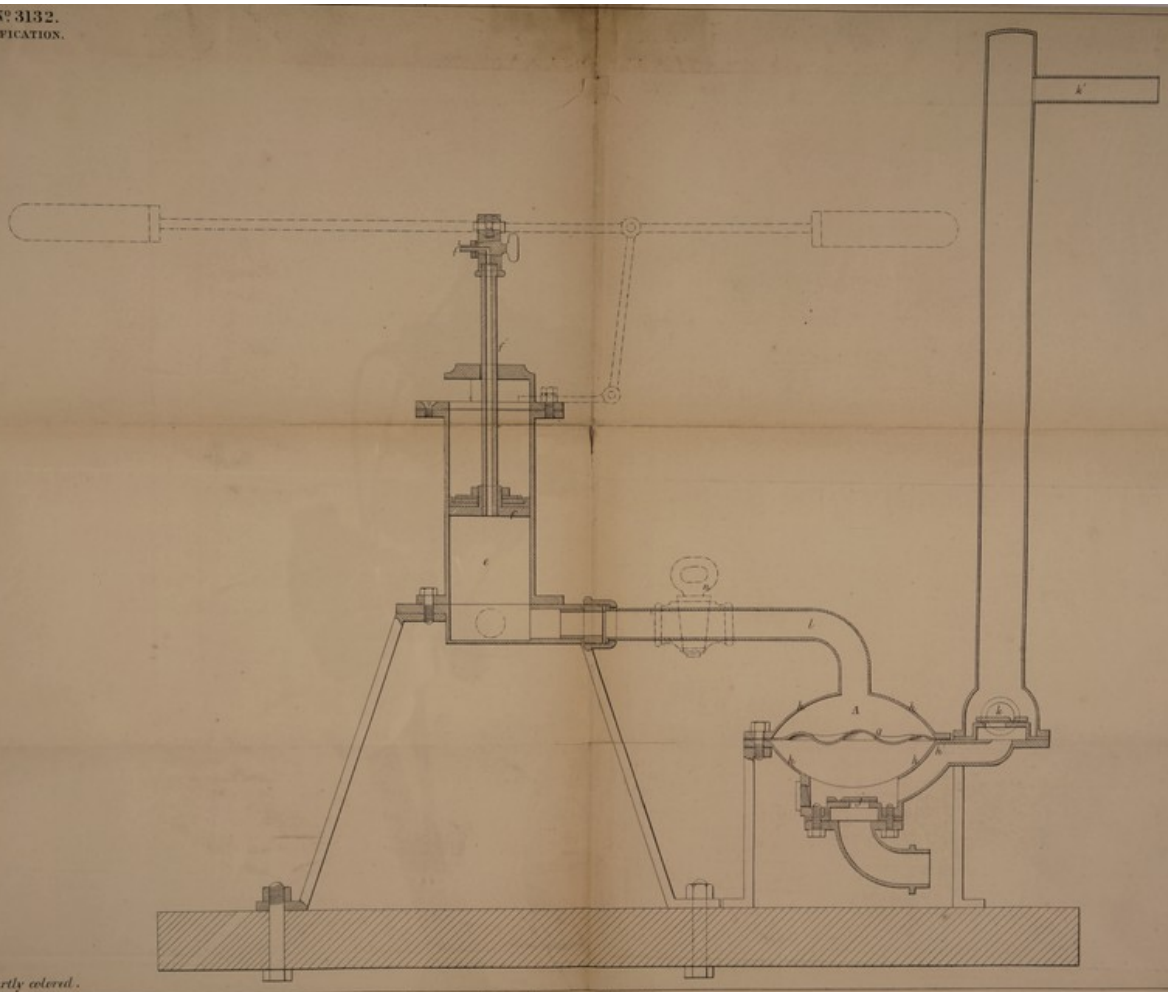
WALKER'S SPECIFICATION.

SHEET 2.
(3 SHEETS.)



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