Specification of George Rydill : purifying sewage, &c.;

Contributors

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A.D. 1875, 14th JANUARY. N° 150.

SPECIFICATION

OF

GEORGE RYDILL.

PURIFYING SEWAGE, &c.

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A.D. 1875, 14*th* JANUARY. N° 150.

Purifying Sewage, &c.

LETTERS PATENT to George Rydill, of 8, Quality Court, Chancery Lane, in the County of Middlesex, for the Invention of "IMPROVEMENTS IN MACHINERY AND APPARATUS IN THE CONSTRUCTION AND WORKING OF VESSELS, TANKS, RESERVOIRS, AND AREAS, AND MATERIALS USED FOR THE PURIFICATION OF SEWAGE AND OTHER POLLUTED WATERS."

Sealed the 12th March 1875, and dated the 14th January 1875.

PROVISIONAL SPECIFICATION left by the said George Rydill at the Office of the Commissioners of Patents, with his Petition, on the 14th January 1875.

I, GEORGE RYDILL, of 8, Quality Court, Chancery Lane, in the County of Middlesex, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN MACHINERY AND APPARATUS IN THE CONSTRUCTION AND WORKING OF VESSELS, TANKS, RESERVOIRS, AND AREAS, AND MATERIALS USED FOR THE PURIFICATION OF SEWAGE AND OTHER POLLUTED WATERS," to be as follows:—

This Invention of improvements is for the treatment of sewage and dye waters, and purifying and preventing the pollution of rivers and

streams by the construction of improved filter vessels, tanks, reservoirs, and areas, with chambers for the purpose of filtering polluted waters by forming a vacuum in the chamber on the under side or the top side of the filter vessel with an air pump or engine, and the atmospheric air is made to press on the polluted waters to force them through the filter beds or beds, or to form a vacuum with steam by forcing out the air in the chamber and allowing the same to become condensed, or to filter the sewage and dye waters and polluted streams under hydraulic pressure, or compressed air acting on the polluted waters in a closed vessel or vessels, these improvements being for constructing and working the aforesaid vessels, tanks, reservoirs, and areas, so that any required quantity of sewage and polluted waters may be quickly, effectually, and economically treated.

In order to describe clearly these improvements so that they may be understood I construct a vessel or vessels of iron or of other metal, or of wood, stone, brick, or any other suitable material any required height, width, or length, in which I fix iron or wood beams across, supported by pillars underneath, to form a chamber in the bottom part of the vessel to support cross pieces of iron or wood to form a floor, on which rest perforated iron plates or other metal plates or lattice work of wood which I cover with clinker or coarse ashes, and then with a coating or layer of sieved, ground, or crushed ashes; or the pierced openings may be covered with small stones or pebbles, and then with a coating of sieved, ground, or crushed coal fire ashes, or other porous substances, and I connect an air pump or engine by means of pipes and valves with the chamber or chambers for the purpose of pumping out the air to form a vacuum, so that any required quantity of polluted waters may be purified and pressed through the filter bed.

I further construct a vessel of cast or wrought iron or any other suitable material containing a chamber near its bottom, and the outlet from the chamber is through a pipe and valve, which valve can be closed at pleasure, so that on the sewage dye and polluted waters not passing through the filter beds in required quantity the valve is closed and the air is pumped out of the chamber with an air pump or engine to form a vacuum, and when the chamber is filled with water forced through the filter bed by the pressure of the atmosphere the valve in the outlet pipe is opened, also a valve fixed in a small air pipe which leads from

the chamber to the height of the vessel, so that on the air valve being opened in the small pipe the air rushes into the chamber and allows the water to run out through the outlet pipe. When the chamber is emptied the valve in the outlet pipe is closed, also the valve in the air pipe, and the air pump or engine is again set to work to pump out the air, so that the chamber may be again filled and emptied as before.

If a large stream of sewage water or a polluted stream or river has to be treated I construct a kind of reservoir or reservoirs, canal, or canal-like channels, with a chamber any required length or width, along the side of the river bank, leaving sufficient strength of embankment or support between the two. I prefer to construct the reservoir or canal-like channel near to a weir or falling ground, where the outlet could be got below the inlet to prevent the purified waters from being lifted or forced from the chamber by a pump. But to make it clearly understood I will describe the construction of this reservoir or channel as made along the side of a polluted river bank, and the whole of the purified waters requiring to be pumped from the chamber:—I excavate a reservoir or canal-like channel the depth or below the bed of the river, and I prefer to invert the bottom, or flag or pave the bottom, and wall the sides and ends any required height for a chamber area. I then construct walls across, forming arched passages, at suitable distances apart from each other along the entire length. I then turn pierced arches of brick or stone, suitably chosen and prepared, from one arched wall to the other, leaving alternate openings over the whole of the arches, forming passages to the chamber underneath, being as small and numerous as can be done with safety to the arches, structure, and successful working. Between the springing and crown of the arches I construct ribs to strengthen them, and to cause all surface possible of the pierced arches to present itself; or I construct pillars on which rest iron girders, and I turn arches, perforated or pierced, from one iron girder to another, or girders, joists, and pierced metal plates may be placed over them to form a perforated chamber covering, but I prefer to construct arches with brick or stone or any other suitable material.

In order to give some dimensions to make it clearly understood I will name this reservoir or canal-like channel as being 40 yards in length and 10 yards wide. The top and bottom ends or side are connected with the polluted river or stream by constructing substantial masonry of brick

or stone, or tubes may be used so as to connect the same to the river or stream, at each end of which I place a threshold or sill for fixing sluice or sluices, worked with suitable machinery, for supplying the reservoir or canal-like channel with polluted waters, the sluices of which I firmly secure in masonry, and I build up the sides of the reservoir or channel above the pierced arch chamber and the openings or channel sides at each end leading to the sluices with brick or stone, and I connect suitable pumps and pipes to the chamber. I then place broken stones over the chamber arches' pierced openings, then a layer of coarse clinker ashes, and then cover the same with any required thickness with sieved ground or crushed ashes.

If desirable I lay perforated plates loosely over the top of the ashes to prevent the polluted waters in passing over the surface from washing up the filter bed, and to form a bottom to enable the sewage and refuse resting on the surface of the filter bed being readily removed openings with suitable doors are placed in the side walls for the removal of the sewage and refuse when a suitable fall can be obtained. I connect an air pump or engine and pipe to the chamber, so as to pump out the air to form a vacuum to facilitate the filteration of polluted waters, and I erect a pump or pumps of any required lifting or forcing power with the chamber to raise the filtered waters from the chamber underneath the filter bed. When the same is completed as described I open or raise the sluice or valve at one or both ends, so that a small quantity of the polluted waters will flow through until the chamber underneath the filter bed is filled with filtered water, and the water in the reservoir or channel becomes level with the river or stream. I then open the sluices or valves with suitable appliances without fear of injuring the filter bed, and as the pump or pumps raises the filtered waters from the chamber other filtered water supplies its place under part vacuum.

When the filtered water in the chamber required to be raised a reasonable height within the limits of atmospheric pressure I erect large cast or wrought iron air-tight chambers or vessels above the reservoir or channel, and the said metal air-tight chambers or vessels are connected by means of pipes and valves to the chamber under the filter bed. On the top of the air-tight metal chambers or vessels valves are fixed. In order to explain their working I close the valve in the pipe connecting the elevated metal air-tight vessel with the chamber under the filter bed,

and I open the air valve on the top of the vessel. Connected to this elevated air-tight chamber or vessel is a steam pipe from a steam boiler. I open the valve in the steam pipe and the steam forces the air out through the valve on the top of the elevated air-tight metal vessel. I then close the air valve on the top of the said vessel and open the valve in the pipe leading to the chamber under the filter bed. The steam becomes condensed and a vacuum is formed which causes the atmospheric air to press upon the polluted waters in the reservoir or channel, and pressing also with force upon the filtered waters in the chamber below forces them up into the elevated air-tight metal chamber or vessel. The valve is then closed in the pipe leading to the chamber under the filter bed. On opening the air valve on the top of the air-tight metal chamber or vessel the raised filtered water is run through a valve in the elevated metal chamber or vessel to any required place. This method of raising the filtered waters may be worked to any required extent, or I pump out the air in the elevated metal air-tight chamber with an air pump or engine to form a vacuum and raise the filtered waters from the chamber under the filter bed by opening and closing the required valves when a vacuum is formed. By the aforesaid arrangement of cast or wrought iron air-tight vessels any number of such vessels may be used to form a vacuum in the chamber or chambers. The sluices are protected with suitable iron grating to prevent large floating substances from passing into the reservoir or channel.

Access for the removal of the accumulated sewage or refuse, and for the removal and renewal of the filter beds is at all times practicable when the sluices are closed and the filtered waters pumped out of the chamber.

I will further describe a vessel, tank, or area for the treatment of sewage and polluted waters constructed at small cost, which may be made of any dimensions, which I will describe as 20 yards long and 10 yards wide. I first construct a number of drains lengthways and crossways, several feet apart from each other, which may be built on a flagged or paved floor or on the ground. The sides of the drains are constructed with small openings, and the tops of the drains are covered over. I build a wall round the area with brick or stone any required height. I then place rough stones or clinker ashes between the drains and a thin coating over them. I then spread sieved, ground, or crushed ashes one, two, or more feet in thickness, and I convey the sewage and polluted

waters on to the top of the same. If such be constructed for villages where the filter bed would serve for a long period ridges may be formed on which to produce kitchen garden produce, and the sewage and polluted waters pass between the ridges for the purpose of irrigation.

The drains being all connected, should the sewage and polluted waters cover the surface of the porous filter bed I pump the air out of the drains with an air pump or engine fixed for that purpose, when the atmospheric air acts upon the polluted waters and filters the same, when the filtered waters are run off through valves or sluices.

If the quantity of sewage is but small the ashes being light and porous may filter the same as supplied, and the filtered waters run off from openings at the side or end of the area; or where large quantities of sewage and polluted waters require treating, larger areas may be constructed.

When a vacuum is formed on the top side of the filter bed for upward filteration then I arch over the top of the reservoir to form a chamber.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said George Rydill in the Great Seal Patent Office on the 14th July 1875.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE RYDILL, of 8, Quality Court, Chancery Lane, in the County of Middlesex, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fourteenth day of January, in the year of our Lord One thousand eight hundred and seventy-five, in the thirty-eighth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said George Rydill, Her special licence, that I, the said George Rydill, my executors, administrators, and assigns, or such others as I, the said George Rydill, 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 MACHINERY AND APPARATUS IN THE CONSTRUCTION AND WORKING OF VESSELS, TANKS, RESERVOIRS, AND AREAS, AND MATERIALS USED FOR THE PURIFICATION OF SEWAGE AND OTHER POLLUTED WATERS," upon the condition (amongst others) that I, the said George Rydill, 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 George Rydill, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This Invention of improvements is for the treatment of sewage and dye waters, and purifying and preventing the pollution of rivers and streams by the construction of improved filter vessels, tanks, reservoirs, and areas, with chambers for the purpose of filtering polluted waters by forming a vacuum in the chamber on the under side or the top side of the filter vessel with an air pump or engine, and the atmospheric air is made to press on the polluted waters to force them through the filter beds or beds, or to form a vacuum with steam by forcing out the air in the chamber and allowing the same to become condensed, or to filter the sewage and dye waters and polluted streams under hydraulic pressure or compressed air acting on the polluted waters in a closed vessel or vessels, these improvements being for constructing and working the aforesaid vessels, tanks, reservoirs, and areas, so that any required quantity of sewage and polluted waters may be quickly, effectually, and economically treated.

In order to describe clearly these improvements so that they may be understood, I construct a vessel or vessels of iron or of other metal or of wood, stone, brick, or any other suitable material, any required height, width, or length, in which I fix iron or wood beams across, supported by pillars underneath, to form a chamber in the bottom part of the vessel to support cross pieces of iron or wood to form a floor on which rest perforated iron plates or other metal plates or latticework of wood, which

I cover with clinker or coarse ashes, and then with a coating or layer of sieved, ground, or crushed ashes, or the pierced openings may be covered with small stones or pebbles and then with a coating of sieved, ground, or crushed coal, fire ashes, or other porous substances, and I connect an air pump or engine by means of pipes and valves with the chamber or chambers for the purpose of pumping out the air to form a vacuum, so that any required quantity of polluted waters may be purified and passed through the filter bed.

I further construct a vessel of cast or wrought iron, or any other suitable material, containing a chamber near its bottom, and the outlet from the chamber is through a pipe and valve, which valve can be closed at pleasure so that on the sewage dye and polluted waters not passing through the filter beds in required quantity the valve is closed and the air is pumped out of the chamber with an air pump or engine to form a vacuum, and when the chamber is filled with water forced through the filter bed by the pressure of the atmosphere the valve in the outlet pipe is opened; also a valve fixed in a small air pipe which leads from the chamber to the height of the vessel, so that on the air valve being opened in the small pipe the air rushes into the chamber and allows the water to run out through the outlet pipe. When the chamber is emptied the valve in the outlet pipe is closed, also the valve in the air pipe, and the air pump or engine is again set to work to pump out the air, so that the chamber may be again filled and emptied as before.

If a large stream of sewage water or a polluted stream or river has to be treated I construct a kind of reservoir or reservoirs, canal or canal-like channels with a chamber any required length or width along the side of the river bank leaving sufficient strength of embankment or support between the two. I prefer to construct the reservoir or canal-like channel near to a weir or falling ground, where the outlet could be got below the inlet to prevent the purified waters from being lifted or forced from the chamber by a pump. But to make it clearly understood I will describe the construction of this reservoir or channel as made along the side of a polluted river bank, and the whole of the purified waters requiring to be pumped from the chamber, I excavate a reservoir or canal-like channel the depth or below the bed of the river, and I prefer to invert the bottom or flag or pave the bottom, and wall the sides and ends any required height for a chamber area. I then construct

walls across, forming arched passages at suitable distances apart from each other along the entire length. I then turn pierced arches of brick or stone suitably chosen and prepared from one arched wall to the other, leaving alternate openings over the whole of the arches, forming passages to the chamber underneath, being as small and numerous as can be done with safety to the arches' structure and successful working. Between the springing and crown of the arches I construct ribs to strengthen them, and to cause all surface possible of the pierced arches to present itself, or I construct pillars on which rest iron girders, and I turn arches perforated or pierced from one iron girder to another, or girders, joists, and pierced metal plates may be placed over them to form a perforated chamber covering, but I prefer to construct arches with brick or stone or any other suitable material.

In order to give some dimensions to make it clearly understood, I will name this reservoir or canal-like channel as being 40 yards in length and 10 yards wide. The top and bottom ends or side are connected with the polluted river or stream by constructing substantial masonry of brick or stone, or tubes may be used so as to connect the same to the river or stream, at each end of which I place a threshold or sill for fixing sluice or sluices worked with suitable machinery for supplying the reservoir or canal-like channel with polluted waters, the sluices of which I firmly secure in masonry, and I build up the sides of the reservoir or channel above the pierced arch chamber, and the openings or channel sides at each end leading to the sluices with brick or stone, and I connect suitable pumps and pipes to the chamber; I then place broken stones over the chamber arches' pierced openings, then a layer of coarse clinker ashes, and then cover the same with any required thickness with sieved, ground, or crushed ashes.

If desirable I lay perforated plates loosely over the top of the ashes to prevent the polluted waters in passing over the surface from washing up the filter bed and to form a bottom to enable the sewage and refuse resting on the surface of the filter bed being readily removed. Openings with suitable doors are placed in the side walls for the removal of the sewage and refuse when a suitable fall can be obtained. I connect an air pump or engine and pipe to the chamber so as to pump out the air to form a vacuum to facilitate the filteration of polluted waters, and I erect a pump or pumps of any required lifting or forcing power with the

chamber to raise the filtered waters from the chamber underneath the filter bed. When the same is completed as described I open or raise the sluice or valve at one or both ends so that a small quantity of the polluted waters will flow through until the chamber underneath the filter bed is filled with filtered water and the water in the reservoir or channel becomes level with the river or stream; I then open the sluices or valves with suitable appliances without fear of injuring the filter bed, and as the pump or pumps raises the filtered waters from the chamber other filtered water supplies its place under part vacuum.

When the filtered water in the chamber requires to be raised a reasonable height within the limits of atmospheric pressure I erect large cast or wrought iron air-tight chambers or vessels above the reservoir or channel, and the said metal air-tight chambers or vessels are connected by means of pipes and valves to the chamber under the filter bed. On the top of the air-tight metal chambers or vessels valves are fixed. In order to explain their working I close the valve in the pipe connecting the elevated metal air-tight vessel with the chamber under the filter bed, and I open the air valve on the top of the vessel. Connected to this elevated air-tight chamber or vessel is a steam pipe from a steam boiler. I open the valve in the steam pipe, and the steam forces the air out through the valve on the top of the elevated air-tight metal vessel. I then close the air valve on the top of the said vessel and open the valve in the pipe leading to the chamber under the filter bed. The steam becomes condensed and a vacuum is formed which causes the atmospheric air to press upon the polluted waters in the reservoir or channel, and pressing also with force upon the filtered waters in the chamber below forces them up into the elevated air-tight metal chamber or vessel. The valve is then closed in the pipe leading to the chamber under the filter bed. On opening the air valve on the top of the air-tight metal chamber or vessel the raised filtered water is run through a valve in the elevated metal chamber or vessel to any required place. This method of raising the filtered waters may be worked to any required extent, or I pump out the air in the elevated metal air-tight chamber with an air pump or engine to form a vacuum and raise the filtered waters from the chamber under the filter bed by opening and closing the required valves when a vacuum is formed. By the aforesaid arrangement of cast or wrought iron air-tight vessels any number of such vessels may be used to form a vacuum in the chamber or chambers. The sluices are

protected with suitable iron grating to prevent large floating substances from passing into the reservoir or channel.

Access for the removal of the accumulated sewage or refuse, and for the removal and renewal of the filter beds is at all times practicable when the sluices are closed and the filtered waters pumped out of the chamber.

I will further describe a vessel, tank, or area for the treatment of sewage and polluted waters constructed at small cost, which may be made of any dimensions, which I will describe as 20 yards long and 10 yards wide. I first construct a number of drains lengthways and crossways, several feet apart from each other, which may be built on a flagged or paved floor or on the ground. The sides of the drains are constructed with small openings, and the tops of the drains are covered over. I build a wall round the area with brick or stone any required height. I then place rough stones or clinker ashes between the drains and a thin coating over them. I then spread sieved, ground, or crushed ashes one, two, or more feet in thickness, and I convey the sewage and polluted waters on to the top of the same. If such be constructed for villages where the filter bed would serve for a long period, ridges may be formed on which to produce kitchen garden produce, and the sewage and polluted waters pass between the ridges for the purpose of irrigation.

The drains being all connected, should the sewage and polluted waters cover the surface of the porous filter bed I pump the air out of the drains with an air pump or engine fixed for that purpose, when the atmospheric air acts upon the polluted waters and filters the same, when the filtered waters are run off through valves or sluices.

If the quantity of sewage is but small the ashes being light and porous may filter the same as supplied, and the filtered waters run off from openings at the side or end of the area, or where large quantities of sewage and polluted waters require treating larger areas may be constructed.

When a vacuum is formed on the top side of the filter bed for upward filteration then I arch over the top of the reservoir to form a chamber.

Having now described the nature of my said Invention, and the

manner in which the same is carried out, what I claim as my Invention of improvements for treating polluted waters is,—

First. The novel mode or methods herein described of constructing or forming and combining and joining together pierced arches resting on arched walls or pillars for the purpose of forming a chamber underneath tanks or reservoirs, over which is placed a filter bed so that a vacuum may be formed underneath with an air pump or steam either on the top or under sides.

Second. The formation of cast or wrought iron air-tight chambers or vessels for forming a vacuum and removing water from underneath the filter bed.

Third. The construction of irrigation area as fully set forth, and filtering the water through sieved or crushed ashes.

In witness whereof, I, the said George Rydill, have hereunto set my hand and seal, this Fourteenth day of July, in the year of our Lord One thousand eight hundred and seventy-five.

GEORGE RYDILL. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1875.