No. 730,588. PATENTED JUNE 9, 1903.

E. VIAL.

METHOD OF EXTRACTING THE RESIDUARY MATTERS FROM SEWER WATER.

APPLICATION FILED JUNE 11, 1902.

NO MODEL. 6 SHEETS—SHEET 1.

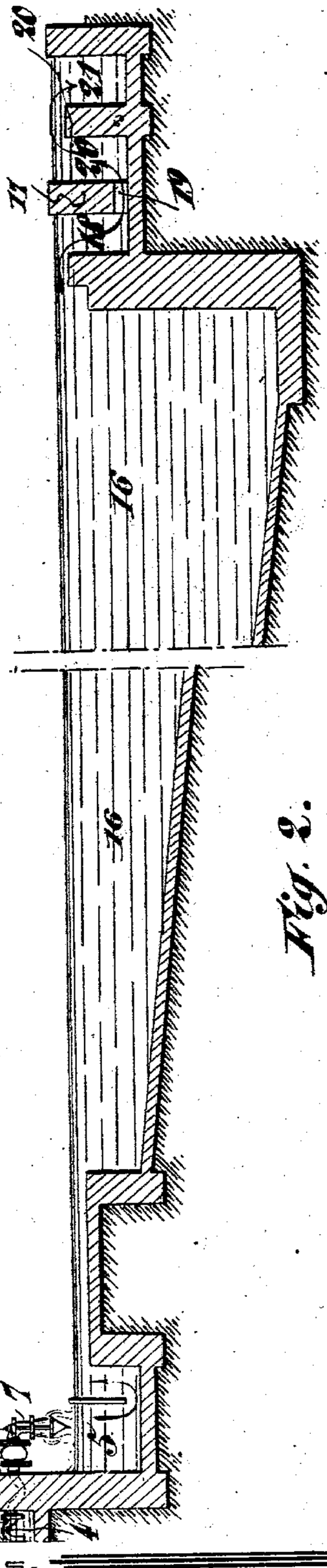

Fig. 1.

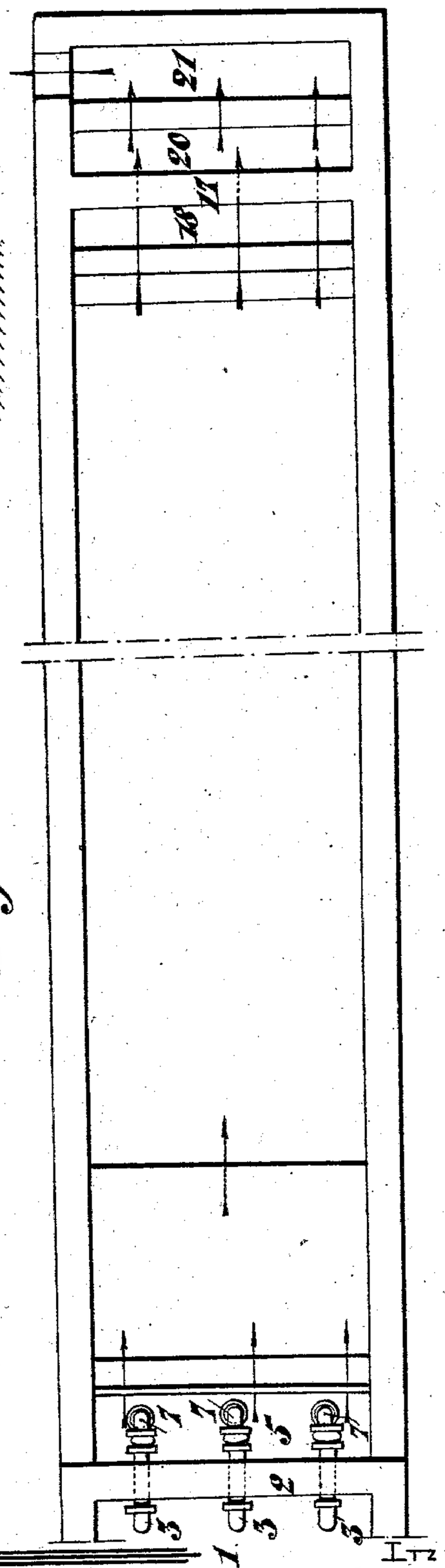

Fig. 2.

Witnesses.
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NO MODEL. 5 SHEETS—SHEET 2.

Fig. 4.

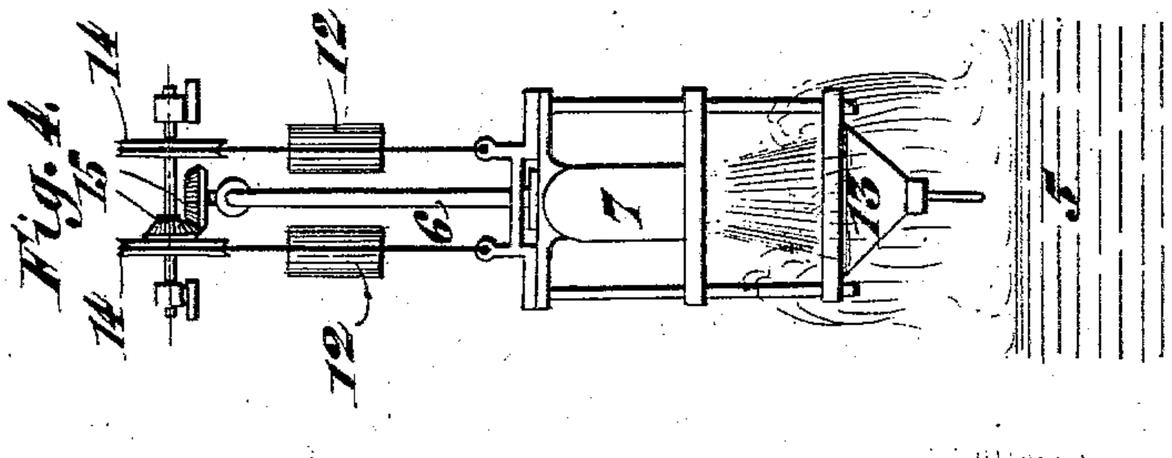
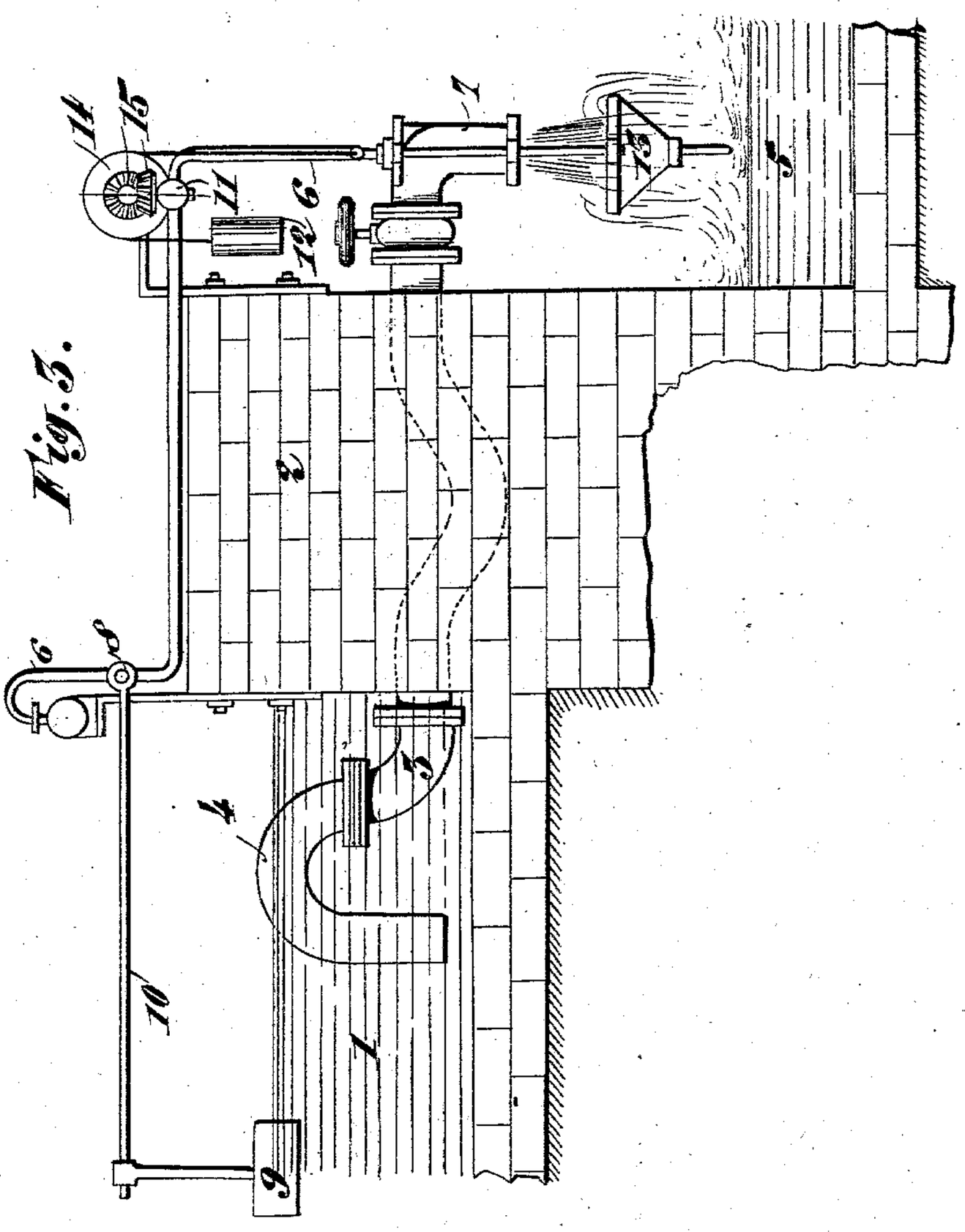


Fig. 5.



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NO MODEL. 5 SHEETS—SHEET 3.

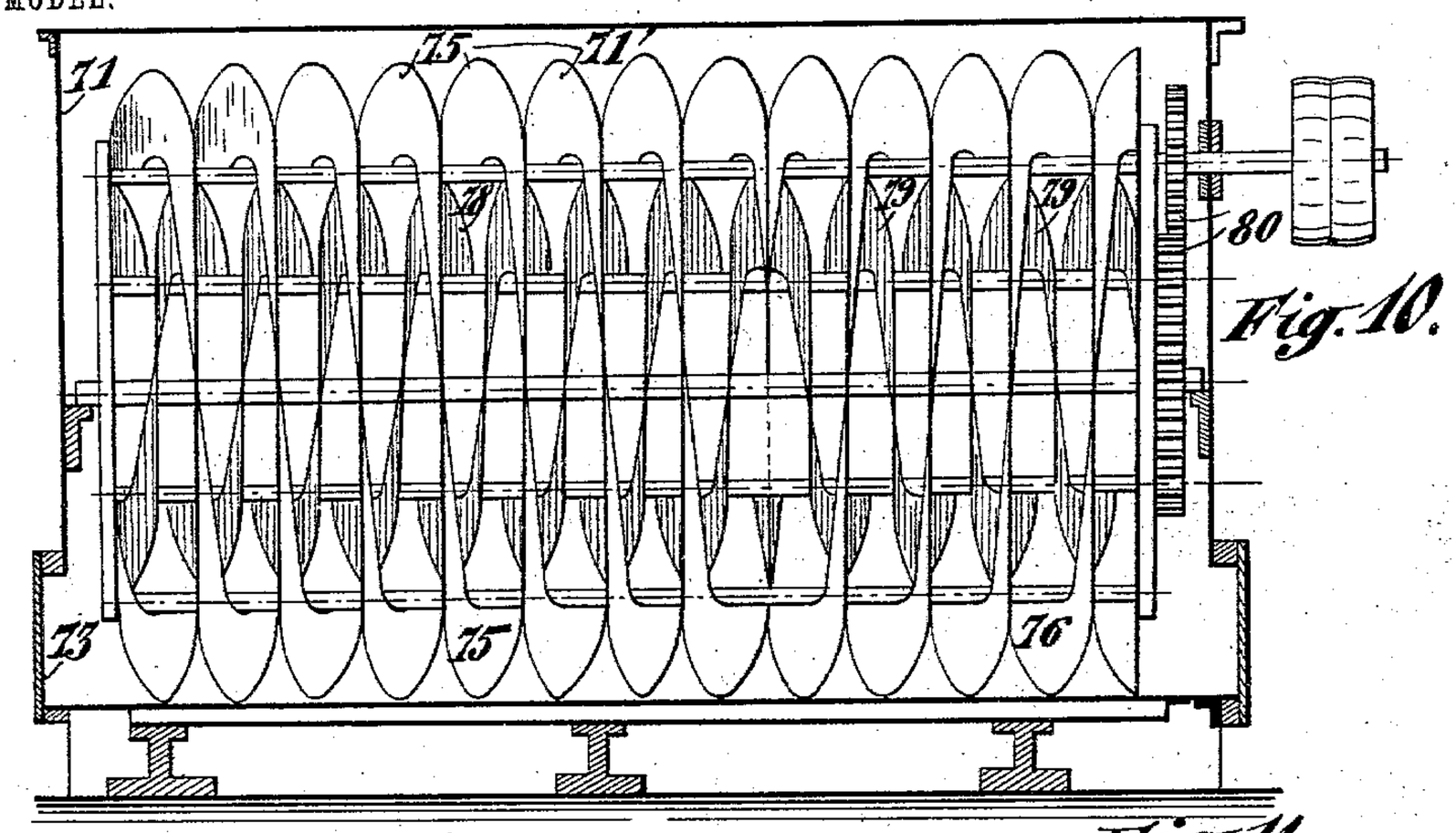

Fig. 10.

Fig. 11.

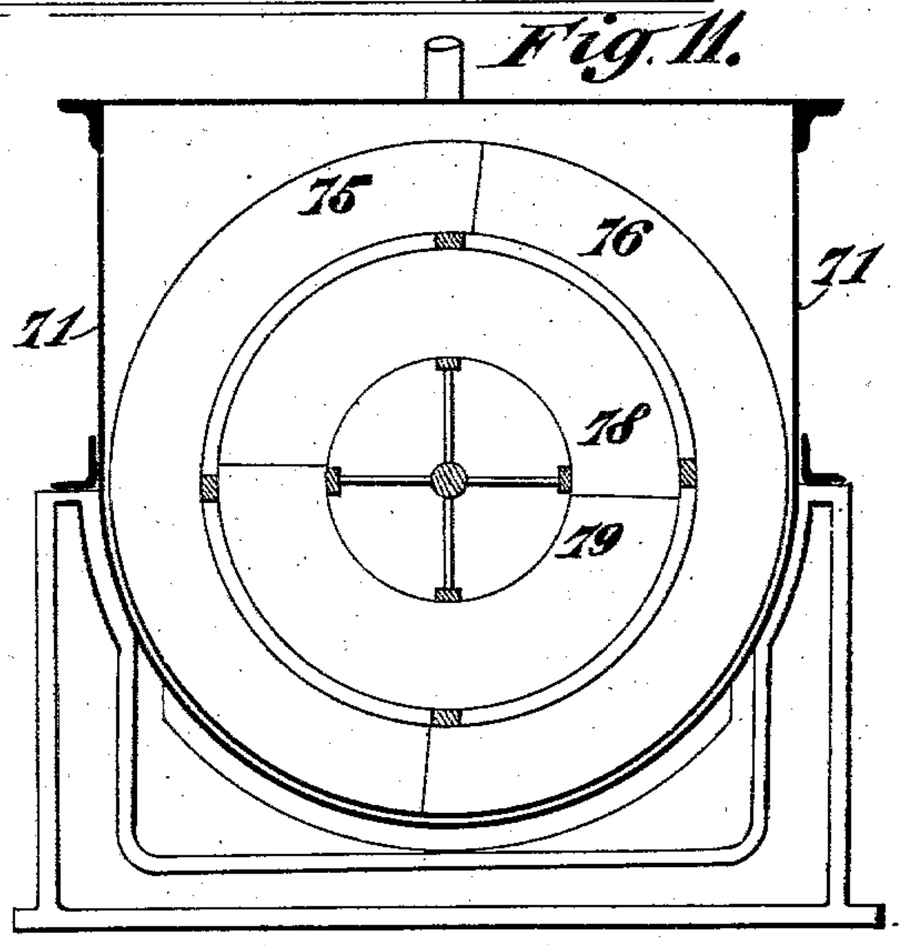

Fig. 6.

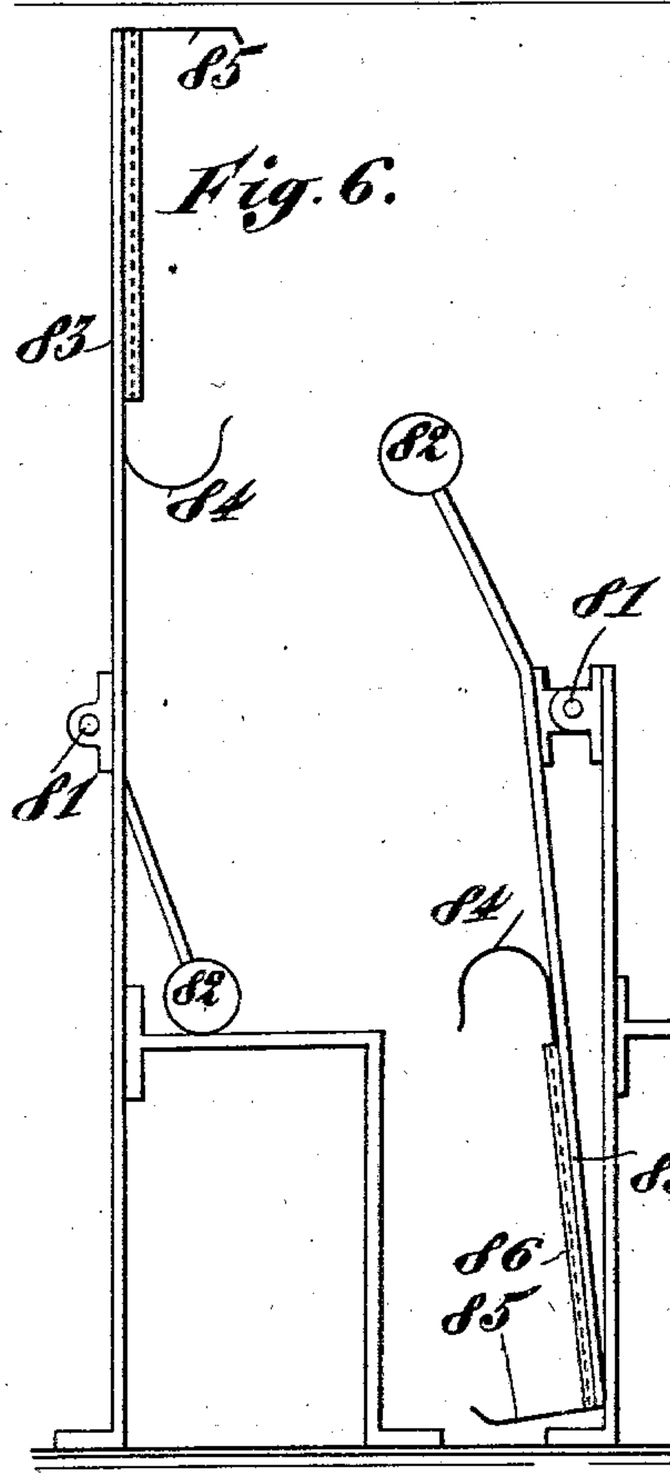

Fig. 5.

Witnesses.

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NO MODEL. 6 SHEETS—SHEET 4.

Fig. 1.

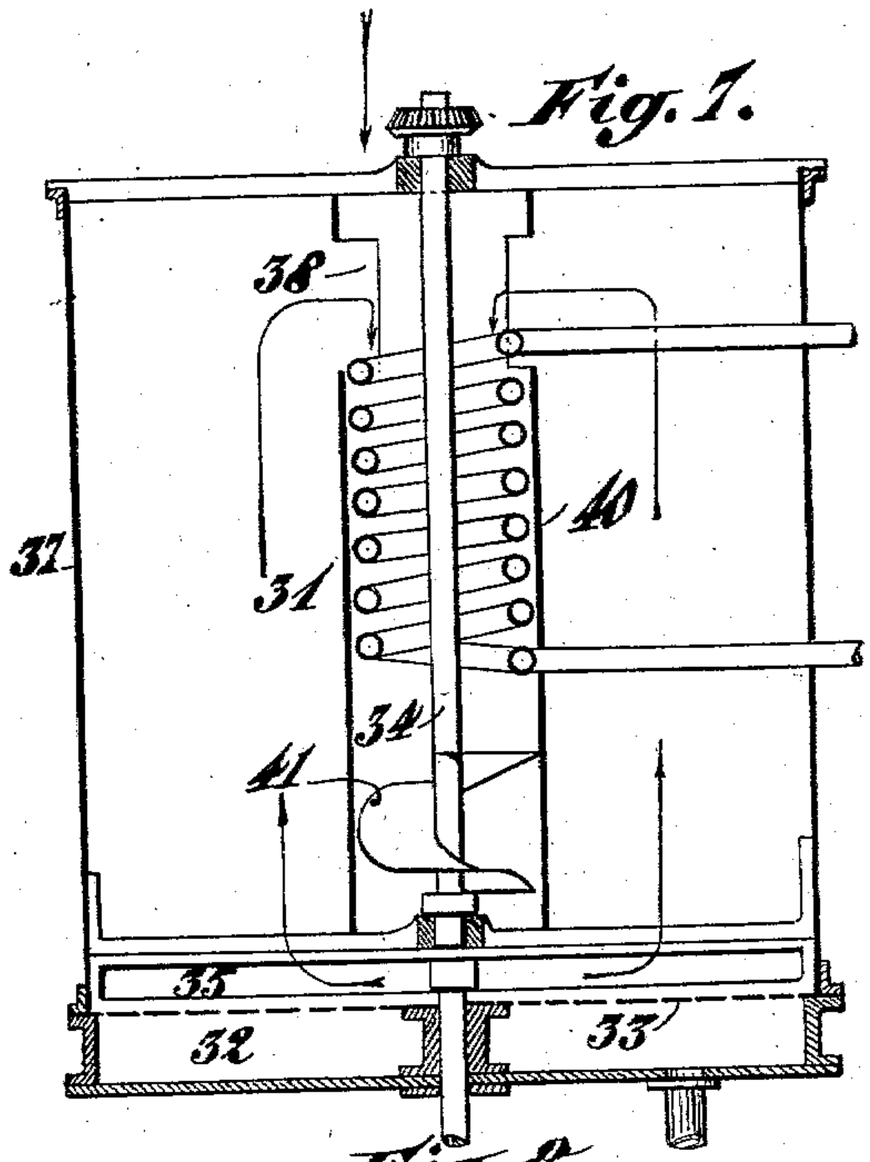
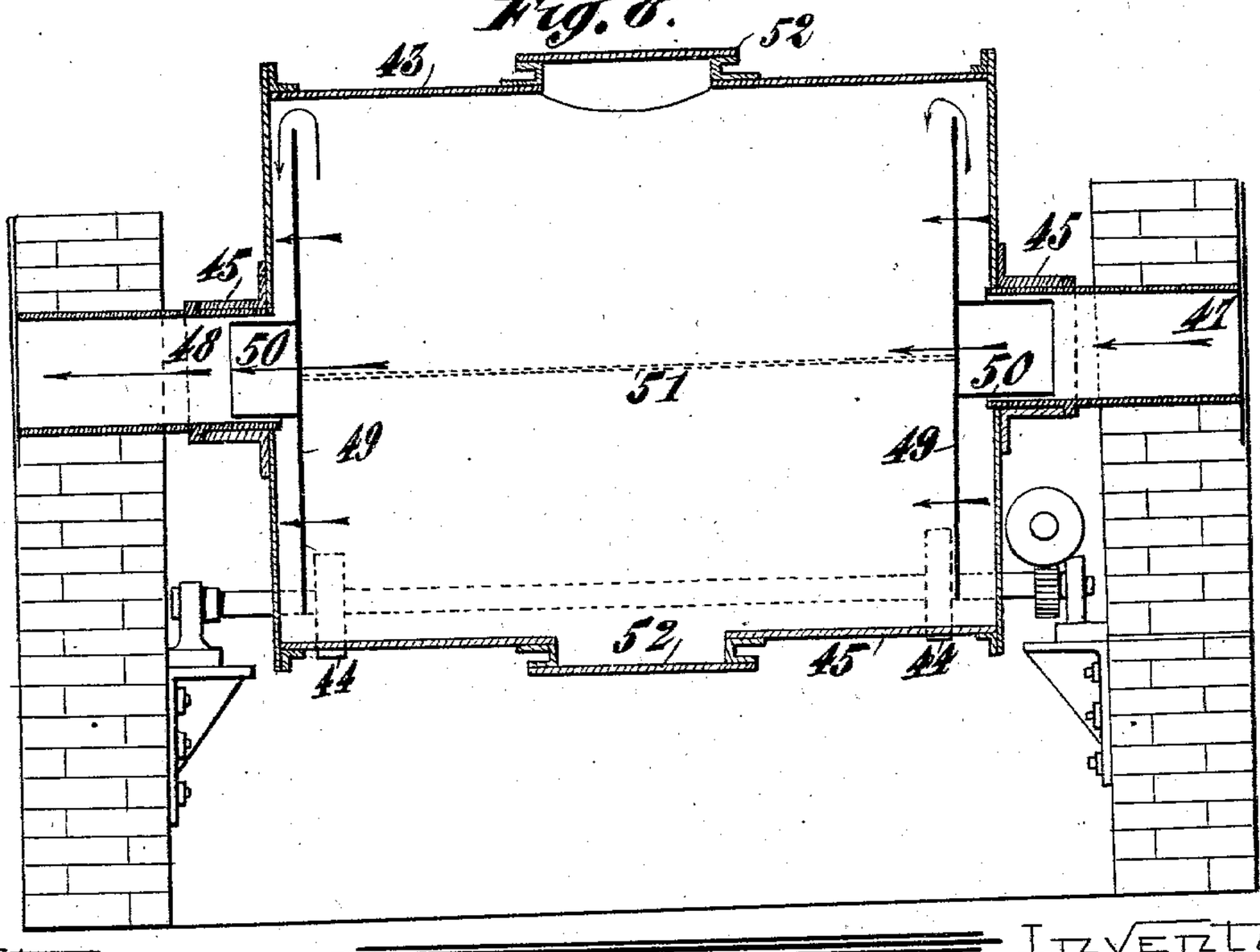


Fig. 8.



WITNESSES.

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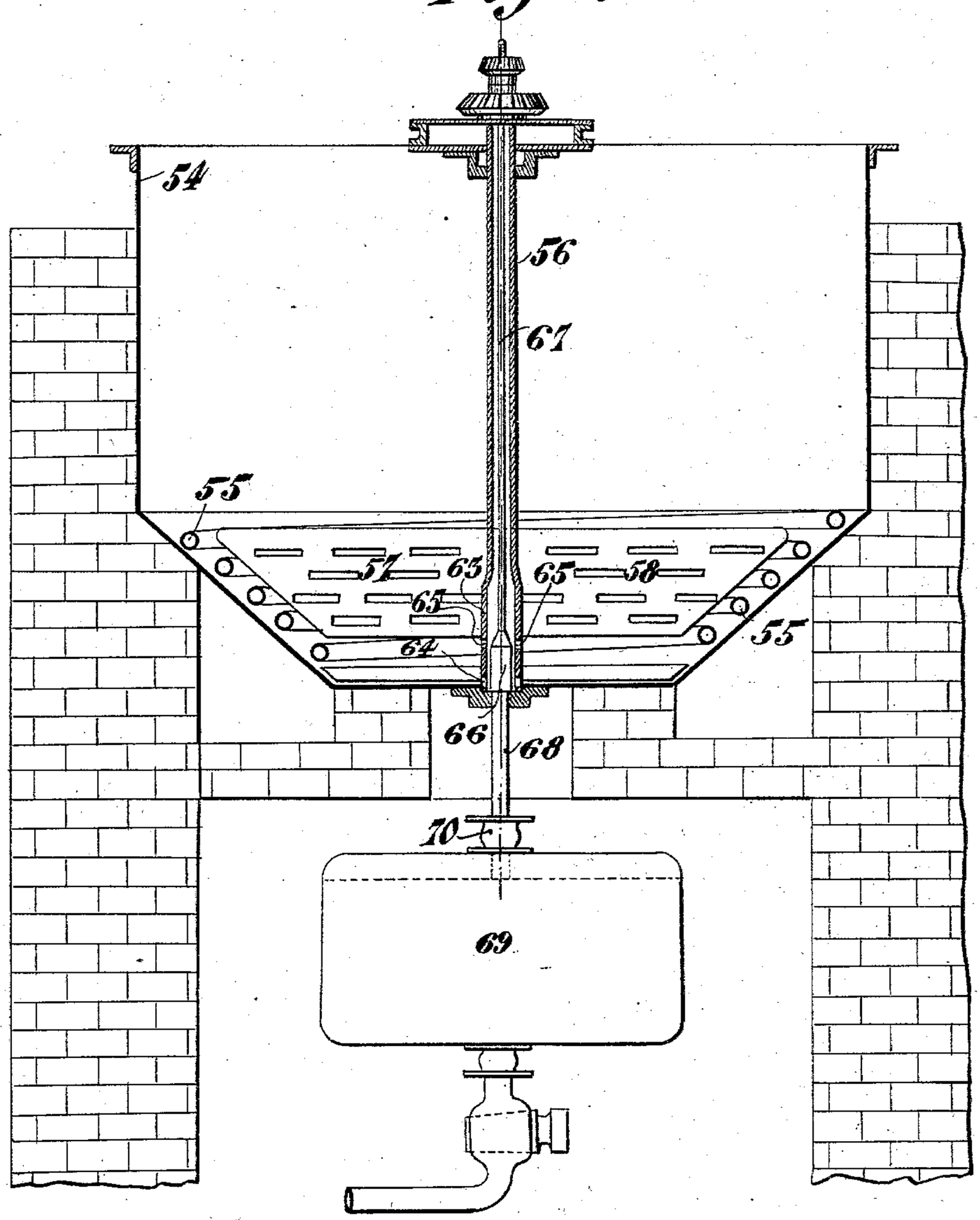
NO MODEL. 5 SHEETS—SHEET 5.

Fig. 9.



Witnesses.

Wm. D. Bell.

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No. 730,588. Patented June 9, 1903.

UNITED STATES PATENT OFFICE.

EMILE VIAL, OF BRUSSELS, BELGIUM.

METHOD OF EXTRACTING THE RESIDUARY MATTERS FROM SEWER-WATER.

SPECIFICATION forming part of Letters Patent No. 730,588, dated June 9, 1903.

Application filed June 11, 1902. Serial No. 111,117. (No specimens.)

To all whom it may concern:

Be it known that I, EMILE VIAL, engineer, a citizen of the French Republic, residing at Rue Belliard 142, Brussels, in the Kingdom of Belgium, have invented a new and useful Method of Extracting the Residuary Matters from Sewer-Water and Polluted Water in General; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to a method of collecting in a dry and pulverulent condition, with a view to rendering them wholesome and employing them, the different matters contained in water which has been used.

This method consists, substantially, in first mechanically extracting the detritus suspended in the water by means of a grated frame furnished in the middle with a transverse gutter and two pivots on which it can be turned by placing the grating across the current in order to raise it vertically above the water, and thus to cause the detritus with which it is charged to fall into the gutter; in then precipitating the organic matters in solution or in suspension by introducing automatically into the polluted water a chemical reagent, preferably sulfuric acid, in a quantity exactly proportioned to the rate of flow and the time during which the flowing continues; in rendering insoluble by means of subsequent reaction the hydrosulfurets indifferent to the direct action of the reagent, effecting the separation of all matters thus precipitated by depositing them in a "decanting-reservoir" with a continuous circulation, the parts of which are combined with a view of preventing the formation of internal-impulsion currents; finally, in completely drying and pulverizing the residuary muddy matters previously concentrated by exposing them to the direct action of the hot combustion-gas coming from any kind of furnace.

The annexed drawings show by way of example and for the purposes of the specification a practical arrangement of an installation illustrated diagrammatically and employed for carrying out operations in tanks which are used in this method.

Figure 1 is a longitudinal vertical section of the decanting-reservoir, of which Fig. 2 is a plan. Figs. 3 and 4 are respectively longitudinal and transverse vertical sections, on a larger scale, of a part of the installation. Figs. 5 and 6 are side views of the grating, showing the same in the lowered and the raised positions. Figs. 7 and 8 are vertical sections, respectively, of an apparatus for concentrating and of a drying-drum for muddy substances containing but little fatty matter. Figs. 9 and 10 are vertical sections of the apparatus for drying muddy substances containing large quantities of fatty matter and for removing such fatty matter. Fig. 11 is a transverse section of the apparatus for eliminating the fatty matters, as represented in Fig. 10.

The method is as follows: The polluted water, deprived of floating substances, is collected in a receiver 1, one side of which is furnished with a series of siphons 3, which only act when the level of the liquid reaches the height of the upper bend 4 in the siphon. The water then flows into an external compartment 5 until the moment when the fall of the water below the siphon-inlet produces a sudden stoppage of the siphon action. The result of this arrangement is that, however irregularly the water may enter the receiver, the flowing thereof out of the latter always takes place under identical conditions between the limits of two levels which a waste-pipe prevents from being exceeded, and this renders possible the automatic introduction into the water taken up by each siphon of the chemical reagent in a quantity exactly proportioned to the rate at which and the time during which it is flowing. This reagent, delivered by a distributing-pipe, Figs. 3 and 4, flows into the external compartment 5 through a tube 6, which runs through the outlet-junction 7 of each siphon. In its passage it first meets a regulating-cock 8, which opens to a greater or less extent, accordingly as the level of the water in the receiver 1 causes a float 9, attached to a controlling-lever 10, to rise or fall. Then a discharging-cock 11 opens completely as soon as the water flows and closes entirely when the siphon is put out of action. This alternate opening and closing is regulated by two counterweights 12 and by a hopper 13, suspended below the outlet-opening of each siphon, which are connected by two chains passing over two tooth-wheels

14, that actuate the discharge-cock 11 through the medium of gearing 15.

As long as the water is not flowing the counterweights, being heavier than the hopper, keep the cock 11 closed by the effect of their weight; but as soon as the water begins to flow the hopper fills, and thus, becoming heavier than the counterweights, brings about a rotation of the tooth-wheels, whereby the cock is fully opened. The discharge-cock 11 then allows the necessary quantity of the reagent, regulated by the float 9, to flow freely until the moment when, the water ceasing to flow, the hopper empties and allows the cock 11 to close under the predominant action of the counterweights.

The external compartment 5 contains either fragments of iron or a mineral which in partially dissolving under the action of the acidified water converts the hydrosulfurets not yet precipitated into insoluble sulfur.

The separation of the matters precipitated by chemical action is effected in a decanting-reservoir, the parts of which are combined with the view of obviating internal-impulsion currents.

From Figs. 1 and 2 it will be seen that the water in rising from the bottom of the compartment supplied by the siphons and which occupies the whole width of the "basin" circulates as a thin sheet over a collected liquid mass 16 and is arrested at the end of its course by a wall 17, which forces it to descend into a second compartment 18, like the first, in order to pass through openings 19 in the bottom into a second external compartment 20, from which it flows finally into a collector 21, always preserving the same level as in the basin.

The mud drawn up from time to time from the bottom of the decanting-reservoir by a pump is first concentrated in a cylindrical receptacle, Fig. 7, divided into two sections 31 and 32 by a filtering-cloth 33 and furnished with a central shaft 34, which terminates at the bottom in curved paddles 35, rotating above the cloth. This shaft 34 is seated in a cylinder 37, open at its two ends and drilled with lateral openings 38 in the upper part.

In the cylinder 37 is a steam-coil 40, and a helical screw 41 is fixed to the shaft 34, which in rotating forces the mud poured into the cylinder down on the filtering-cloth 33. The double movement of the paddles 35 and the screw 41 thus causes the mud to circulate continuously, whereby it is carried back into the cylinder through the holes 38 in the upper part, during which time the water is drawn off through the cloth 33 by a pump in communication with the false bottom 32. This extraction of the water is rendered very easy by the fact that the false bottom is always completely filled with water, so that there is neither a vacuum nor a trace of air between the muddy mass and the pump-body. The steam-coil is intended for liquefying the mud in circulation and heating it. After this concentration the residuary matters are completely dried in a drying-drum, Fig. 8, which consists of a large closed cylinder 43, rotating horizontally by means of rollers 44. Its two ends communicate by sockets 45, fitted, on the one hand, at 47 to a fireplace and, on the other hand, at 48 with a draft-flue or any other suction organ. In the interior two circular sheets of metal 49, held vertically by the fixed sleeves 50 at a short distance from the openings, compel the gases from the fireplace which enter the drum to circulate against its sides, which are always covered with mud, owing to the rotation. A horizontal fixed scraper 51, supported by the sheets of metal 49, detaches the mud, which tends to form on the rotating sides. When the water has become dry, the manholes 52 are opened in order to remove it, and the operation recommences.

The many substances containing too great a quantity of fatty matters to be dried by the direct action of a fireplace are poured into a large vat or tank containing a fatty body and heated with this latter until completely dehydrated. This tank 54, Fig. 9, is furnished with a steam-coil and a stirrer consisting in a hollow shaft 56, which is furnished with stirring organs 57 and 58 and terminates at the bottom in a sleeve 59, likewise hollow, which engages in a socket 64. This sleeve is furnished with curved paddles 60 and 61, which are on a level with the bottom of the receptacle. It is drilled laterally with a series of small holes 65, intended for introducing into the liquid mass, through the medium of a box 63, superheated gas, which is forced into the hollow shaft. Below these small holes large openings 64 are formed on the level of the bottom of the tank. These openings are usually covered by a large plug 66, sliding with friction in the interior of the sleeve. A long rod 67, seated in the hollow shaft, enables this plug to be displaced vertically, either for covering the lower openings 64 and reposing the upper holes 65, or, on the contrary, for closing this latter and at the same time freeing the lower openings, which by means of a central emptying-pipe 68 put the interior of the tank in communication with a closed receptacle 69, lying below and capable of being shut off by the action of valves or cocks 70. Under the double effect of the stirring and the heat the mud, the fatty matter in which is very finely divided, soon passes into the anhydrous state and forms at the bottom of the tank a deposit, which is forced by the curved paddles 60 and 61 into the underlying receptacle 69, the capacity of which has been calculated for receiving it. The residue thus separated must necessarily be deprived of its fatty matters. I effect this by forcing it into a closed case 71, Figs. 10 and 11, the semi-cylindrical bottom of which is heated by steam and pierced at the hands with two openings 73 in the lower part, the whole being closed

hermetically. This case contains a large helical screw rotated horizontally in either direction by the internal gearing 80. This screw is formed by two concentric rows of blades which "wind" inversely from the center toward the extremities. It will thus be seen that there is a double row of large external spires 75 and 76, having contrary directions, and a double row of small internal spires 78 and 79, likewise having contrary directions, but arranged inversely to the preceding, when it follows that if a moving matter be introduced into the case, the necessary consequence is that the shaft rotating in one direction this matter is removed from the center toward the extremities by the large spires and from the extremities toward the center by the small spires and that if the shaft be rotated in the other direction the same matter will at once move in reverse direction. The residue thus mixed with petroleum, spirit, benzin, or other volatile solvent is easily relieved of its fatty matters and remains simply impregnated with this solvent, which is finally got rid of by distillation. The removal of the residue intended to be used as manure is effected by the action of the screw, which pushes the matter toward the openings formed in the ends of the receptacle.

I claim—

The method, of reclaiming residuary matter from sewer-water which consists in first causing the water to fall precipitously into a reservoir having appreciable surface measurement and comparatively little depth and simultaneously treating the water, during the fall thereof, with a chemical reagent, so as to effect a thorough impregnation of the water into the reagent, then treating the water after its inflow into the reservoir with another reagent so that by the action of said reagents the residuary matter will be precipitated, then permitting the unprecipitated portion of the liquid mass in said reservoir to flow off, and then withdrawing and dehydrating the precipitated substance remaining collected in the reservoir, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EMILE VIAL.

Witnesses:
CHARLES HOWARD,
GREGORY PHELAN.