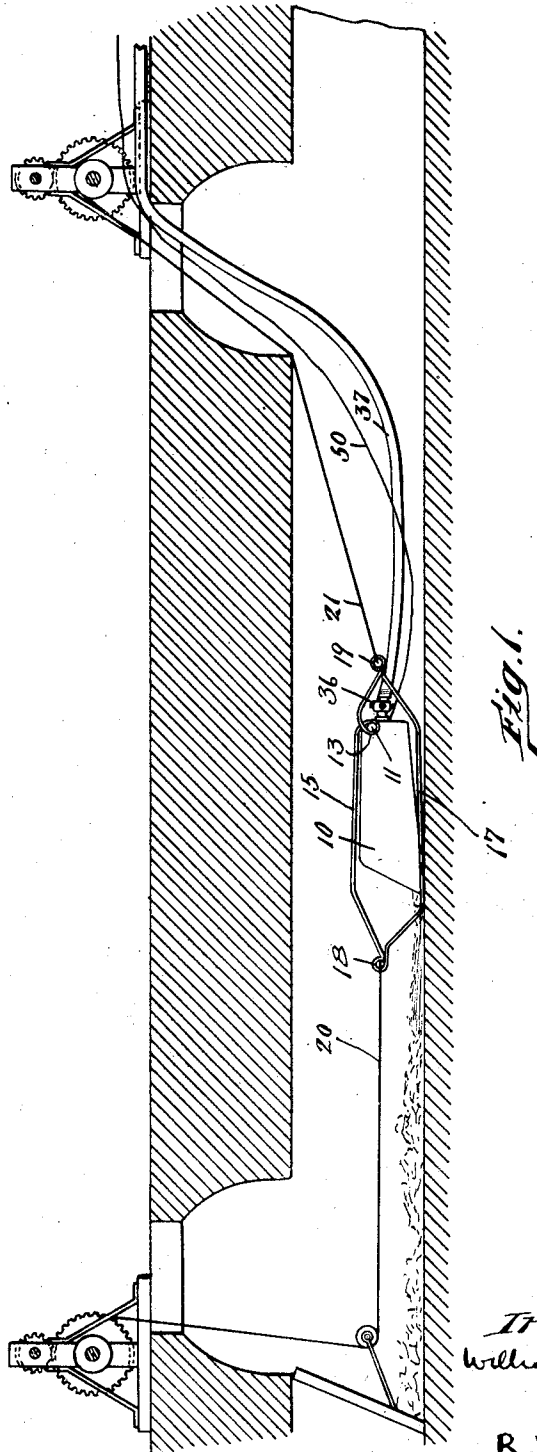


1,344,249.

W. H. STEWART.
SEWER CLEANING APPARATUS.
APPLICATION FILED JAN. 8, 1919.

Patented June 22, 1920.
3 SHEETS—SHEET 1.



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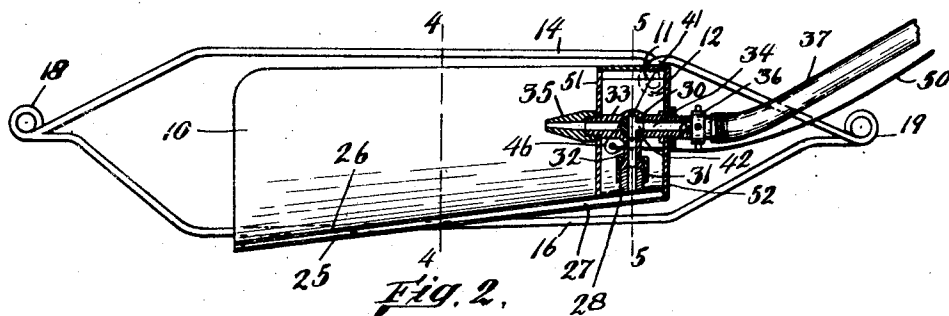


Fig. 2.

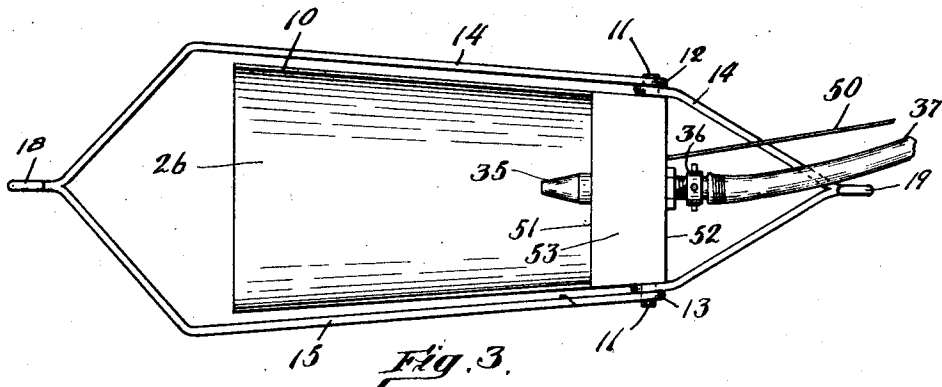


Fig. 3.

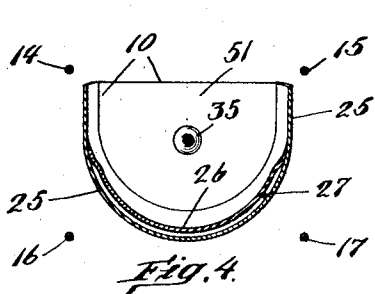


Fig. 4.

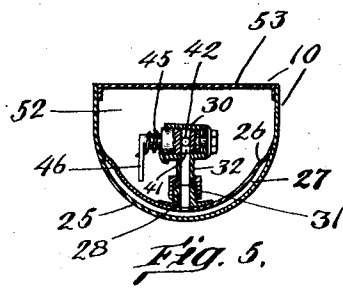


Fig. 5.

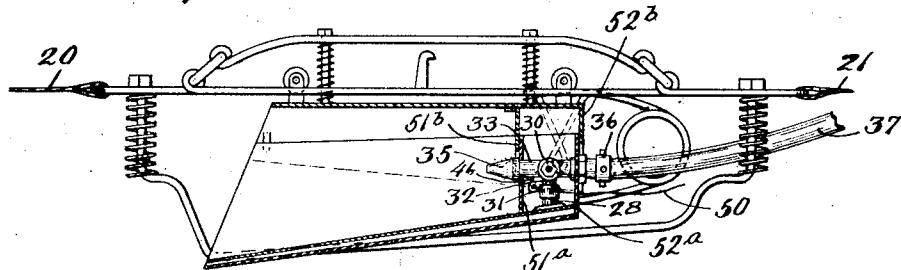


Fig. 6.

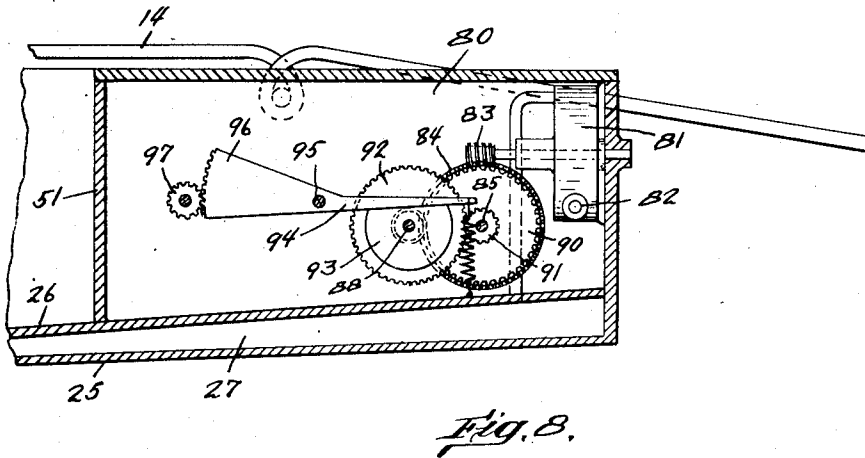
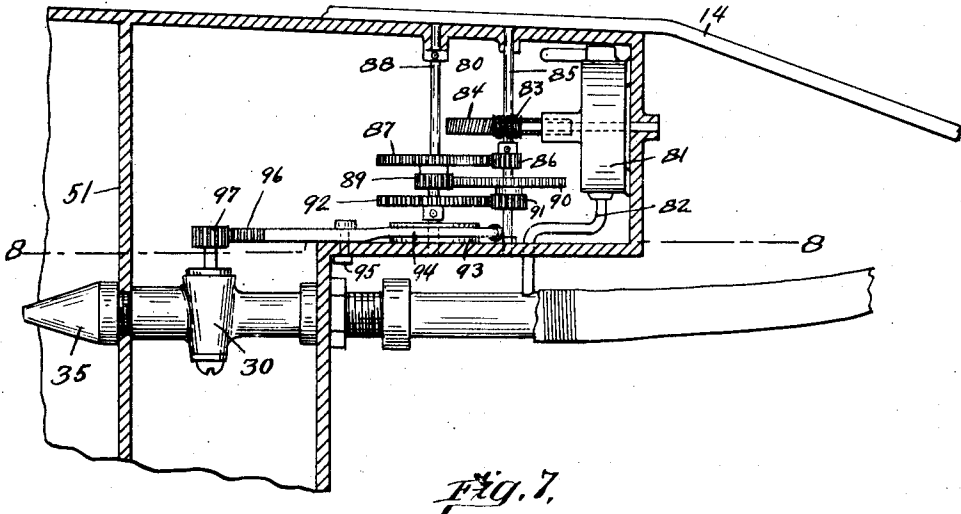
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

WILLIAM H. STEWART, OF BOSTON, MASSACHUSETTS.

SEWER-CLEANING APPARATUS.

1,344,249.

Specification of Letters Patent. Patented June 22, 1920.

Application filed January 8, 1919. Serial No. 270,227.

To all whom it may concern:

Be it known that I, WILLIAM H. STEWART, a citizen of the United States, resident of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Sewer-Cleaning Apparatus, of which the following is a specification.

My invention relates to sewer cleaning apparatus of the type shown in Letters Patent Numbers 768,867, dated Aug. 30, 1904 and 903,022, dated Nov. 3, 1908 granted to me and is designed to be an improvement on said apparatus.

It is found, in cleaning sewers with buckets of the above described type, which are adapted to be drawn through the sewer to remove the sediment that gradually accumulates at the bottom thereof, that, while the top layers of the deposit are fairly soft and may be removed by the bucket with comparative ease, the lower layers have become dry and hard and their removal by the bucket presents considerable difficulty as the cutting edge of the bucket makes but little impression on the hard and, practically speaking, petrified deposit of sediment.

An object of my invention is in the provision of means whereby this hard deposit may be rendered sufficiently soft to be cut by the cutting edge of the bucket and removed from the sewer by the bucket.

I accomplish this object of my invention in the provision of a bucket having a double wall with a space between said walls through which water is adapted to flow and issue with considerable force at the cutting edge of the bucket. The issuing stream or sheet of water may have the general shape of the cutting edge of the bucket and serves to moisten and thereby soften the hard layers of deposit in the sewer whereby they may be removed by the bucket; and the stream of water as it issues from the bucket may have such force as to detach the sediment from the walls of the sewer whereby it may be gathered by the bucket and removed from the sewer.

It often happens that the buckets become filled as they are drawn through the sewer and before they reach the discharge end and, with further movement of the bucket, such an amount of material may accumulate in front of the bucket as to plug the sewer and prevent further movement of the bucket.

A further object of my invention is in the provision of a nozzle associated with a

sewer cleaning bucket directed in the direction of movement of the bucket and from which water may be expelled with considerable force against such a plug or accumulation of sediment in front of the bucket to forcibly remove it and cause it to flow down the sewer and thereby permit the bucket to be moved along the sewer in its cleaning operation.

A two way valve is employed, by means of which the nozzle and the double walled bucket may be alternately connected with a source of water supply, which valve may be under the control of an operative at a sewer manhole and is normally so arranged that water issues from the bucket around the cutting edge, and when the movement of the bucket is obstructed, or undue resistance to its motion is encountered, the water may be diverted through the nozzle to remove the debris or obstruction, after which the valve may be conditioned to cause the discharge of water around the cutting edge of the bucket.

In some instances I may prefer to automatically and periodically alternate the flow of water between the nozzle and the bucket and for such a purpose I associate a water driven turbine with the bucket which is arranged to control, through suitable reduction gearing, the two way valve, to reciprocate or otherwise operate the same for the automatic control of the jet of water.

Figure 1 is a diagrammatic illustration representing the method of using the sewer cleaning bucket embodying my invention.

Fig. 2 is a sectional elevation of a sewer cleaning bucket embodying my invention.

Fig. 3 is a plan view of the bucket of Fig. 2.

Fig. 4 is a sectional view of the bucket along line 4—4 of Fig. 2, showing the double walls of the bucket.

Fig. 5 is a section along line 5—5 of Fig. 2, showing the water control valve.

Fig. 6 is a sectional view of the adjustable bucket described in my Patent No. 903,022 in which my invention is incorporated.

Fig. 7 is a sectional plan detail of a modified bucket incorporating my invention and showing the automatic control of the water control valve.

Fig. 8 is a sectional detail, in elevation, along lines 8—8 of Fig. 7.

As here shown, the bucket is of more or less scoop shape, having a rounded bottom, and high side walls to retain the sediment

collected from the sewer. The bucket, at its upper portion, is provided with pins 11 extended from the side walls, or it may be one pin extended through the bucket with the ends thereof protruding, which pins are journaled in eyes 12 and 13 formed in the guard bars 14 and 15 of a cage of which said bars form a part and which incloses the bucket. Other guard bars or runners 16 and 17 of the cage are disposed on each side of the bucket at the lower portion thereof, and all of said bars are extended to the front and rear of said bucket and connected or formed into the eyes 18 and 19 into which cables or ropes 20 and 21 (see Fig. 1) are adapted to be connected to draw the bucket through the sewer between two manholes or openings therein.

The bucket so far described is of more or less common construction and is as shown in my above named patents.

The bucket embodying my invention may be formed with an outer wall 25 of the above described shape, and with an inner wall 26 which is spaced a suitable distance from the outer wall to provide a space 27 between said walls to form a conduit or passage for the flow of water therethrough to be discharged at the forward or cutting edge of the bucket. The inner wall may extend as far as desirable over the inner surface of the outer wall of the bucket and at the cutting edge preferably extends over the entire curved portion of the bucket whereby a stream of water may be directed from the bucket along the entire cutting edge. The edges of the inner wall may be secured to the outer wall by any suitable means, as by welding, to form a water tight connection and a solid structure.

The water passage formed between the outer and inner walls of the bucket extends from the front, or cutting, edge thereof to the rear end, and, preferably, said passage is of greater height, or the distance between the walls is greater, at the rear end of the bucket than at the cutting edge and tapers gradually from the rear to the cutting edge. I find that good results are obtained if the distance between the two walls at the cutting edge is $\frac{1}{8}$ " and at the rear of the bucket $\frac{3}{8}$ " although these dimensions may obviously be varied on different sizes of buckets.

Connection is adapted to be made between the water passage 27 and a source of water supply and for this purpose the inner wall 26 is provided, at the rear end of the bucket, with a nipple 28 the opening in which is in communication with said passage 27, and a valve casing is secured thereon by means of the coupling 31 disposed on an extension 32 of the valve casing 30 and engaging the threads of said nipple.

Said valve casing 30 is provided with a cylindrical portion 33 at substantially right

angles to the extension 32 and extended on each side of said extension and which has a water passage 34 therein which is directed along the axis of the bucket toward the front thereof. A nozzle 35 is arranged on the forward end of said portion 33 for the purpose of directing a jet of water, when desired, into the mass of material which may accumulate in front of the bucket. Said nozzle is preferably arranged in about the central axis of the bucket.

The rear end of said cylindrical portion 33 extends beyond the end of the bucket and is provided with a connection 36 by means of which a hose 37 may be connected with said valve casing 30.

The valve comprises a tapered plug 40 of more or less common construction and fitting within the casing 30 and has a passage 41 extended diametrically therethrough which, when the plug is so rotated that said passage 41 is placed in alinement with the passage 34, permits water to flow directly from the hose 37 to and through said nozzle 35, and a second passage 42 therein at right angles to said passage 41, thereby forming a two-way cock or valve which, when said plug is so rotated as to cause passage 42 to be in communication with passage 34 in the direction from the hose 37, permits water to flow through the passage 27 between the double walls of the bucket and issue from the cutting edge thereof and prevents flow of water to said nozzle 35.

Said valve may be and is normally so set as to permit water to issue from the bucket at the cutting edge thereof and prevent a flow of water from said nozzle 35 and a coil spring 45 encircling the extended hub of said valve and engaging the arm or lever 46 secured to said valve plug 40 and a part of the valve casing 30 normally serves to maintain said valve plug in the desired position, in which position it may be held against a suitable stop, not shown.

Said valve is adapted to be controlled from the surface while said bucket is in the sewer and for this purpose a cord 50 is connected to said arm or lever 46 of the valve and extends from the bucket through the sewer and out through a manhole. By pulling said cord, the valve may be moved so as to direct the flow of water from around the cutting edge of the bucket through the nozzle 35 to remove any debris collected in front of the bucket and, as soon as the tension on the cord is relaxed, the spring 45 serves to return the valve to its original position and permit water to again flow around the cutting edge of the bucket.

The valve is inclosed in a casing formed of the front wall 51, rear wall 52 and top wall 53 with the side walls of the bucket forming the side walls of the casing to thereby protect the valve and permit its opera-

tion unobstructed by the accumulation collected by the bucket from the sewer, and openings are formed in the front and rear walls of said casing for the nozzle 35 and for the connection with the hose 37 and to permit the passage of the cord 50 there-through.

In Fig. 6 the invention is shown as applied to an adjustable bucket such as described in my Patent No. 903,022, in which the arrangement is similar to that above described with the exception that the front and rear walls of the valve inclosing casing are formed of two complementary portions, as 51^a and 51^b; and 52^a and 52^b, which are in sliding engagement to permit the necessary relative movement between the top and bottom parts of the bucket and maintain the casing substantially tight as against the entrance of solid matter.

In operation, the bucket is adapted to be pulled through a sewer in the manner shown in Fig. 1 in which the control ropes 20 and 21 are connected to winches located at manholes opening into the sewer, by which means the movement of the bucket along the sewer may be controlled. The hose 37 extends from the bucket through the rear manhole and is connected with some source of water supply at preferably considerable pressure, as a hydrant, not shown, and the flow of water therethrough may be controlled by the hydrant, or other, valve. Said hose is adapted to be paid into the sewer as the bucket is moved forward therein and, normally, the valve on the bucket is so adjusted that a jet of water is permitted to issue from the bucket around the cutting edge to thereby soften the hardened layers of sediment and facilitate the removal thereof. The valve control cord 50 is extended from the bucket through the rear manhole and is paid into the sewer as the bucket is moved forward.

When undue resistance to the forward movement of the bucket is encountered, which may be due to the accumulation of debris in front of the bucket, the valve cord 50 may be pulled, thereby adjusting said valve to direct water through the discharge nozzle 35, which water by its force serves to remove the accumulation and permit further movement of the bucket. So long as the accumulation of debris persists, the cord 50 may be maintained taut and when it has been cleared away by the jet of water, the tension on the valve cord may be relaxed and the spring 45 automatically returns the valve to its normal position to permit the further discharge of water around the cutting edge of the bucket.

In the modified form of bucket, details of which are shown in Figs. 7 and 8, mechanism is provided for the automatic and periodic operation of the control valve. The

control mechanism is inclosed in the compartment 80 of the casing and includes a water driven turbine 81, which receives its driving fluid from the branch pipe 82 tapped into the main pipe. The turbine is adapted to rotate at a comparatively high speed, which speed is considerably greater than that at which it is desired to operate the control valve to provide for the sufficient duration of flow of water alternating from either the nozzle or the bucket and therefore a suitable reduction gearing is employed which may comprise the worm 83 fixed to the turbine shaft which drives the worm gear 84 fixed to the shaft 85 journaled in the bucket. A small gear 86 is fixed to said shaft which drives the loose gear 87 on the shaft 88 which drives through a small integral gear 89 a gear 90 on shaft 85 which through a small integral gear 91 drives the large gear 92 fixed to shaft 88 thereby rotating said shaft at a slow speed as compared with the speed of rotation of the turbine shaft.

Shaft 88 has a cam 93 fixed thereto which serves to govern the lever 94 pivoted at 95 to the bucket and which is provided with a gear sector 96 in mesh with a pinion 97 on the valve shaft, the arrangement being such that the relatively small angular movement of the lever, due to movement of the cam, is multiplied into a sufficiently great angular movement of the valve, for its proper control of the flow of water.

The cam is adapted to be of such a shape that a relatively quick shifting of the valve between its two positions with a sufficiently long period of rest between its movement into one or the other of such positions.

The period of flow of water from either orifice may be regulated by properly choosing the reduction gearing, as is obvious.

I claim:

1. A sewer cleaning bucket having a curved forward cutting edge, and means to direct a stream of water conforming to the cutting edge from said cutting edge of the bucket.

2. A sewer cleaning bucket comprising an outer wall having a cutting edge, an inner wall spaced from said outer wall and walls extending adjacent the cutting edge of the bucket, the space between said walls forming a passage for the flow of water to the cutting edge, and a connection for the supply of water to said passage.

3. In a sewer cleaning bucket having a cutting edge, a nozzle to direct a stream of water from the bucket adjacent the cutting edge, a second nozzle carried by the bucket and directed toward the front of the bucket, and means to alternately connect said nozzles with a source of water supply.

4. A sewer cleaning bucket having an outer wall, an inner wall spaced from the

outer wall and extended from the rear of the bucket to adjacent the cutting edge, the space between said walls forming a conduit for the flow of water from said bucket, a
5 nozzle carried by said bucket directed to discharge water toward the front of the bucket, and a valve disposed at the rear of the bucket and arranged to alternately connect
10 said nozzle and conduit with a source of water supply.

5. In a sewer cleaning bucket having a cutting edge, a nozzle to direct a stream of water from the bucket adjacent the cutting edge, a nozzle carried by the bucket ar-
15 ranged to direct a stream of water toward the front of the bucket, and means to automatically and alternately connect said nozzles with a source of water supply.

6. In a sewer cleaning bucket having a
20 cutting edge, a nozzle to direct a stream of water from the bucket adjacent the cutting edge, a nozzle carried by the bucket

arranged to direct a stream of water toward the front of the bucket, means controlling the flow of water through said nozzles and
25 means to automatically direct a flow of water alternately through said nozzles.

7. In a sewer cleaning bucket having a cutting edge, a nozzle to direct a stream of water from the bucket adjacent the cutting
30 edge, a nozzle carried by the bucket arranged to direct a stream of water toward the front of the bucket, means controlling the flow of water through said nozzles, and
35 a water turbine to actuate said controlling means to automatically direct a flow of water alternately through said nozzles.

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

WILLIAM H. STEWART

Witnesses:

T. T. GREENWOOD,
H. B. DAVIS.