No. 765,438. PATENTED JULY 19, 1904.

G. J. MURDOCK.

PUMPING APPARATUS.

APPLICATION FILED MAY 18, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

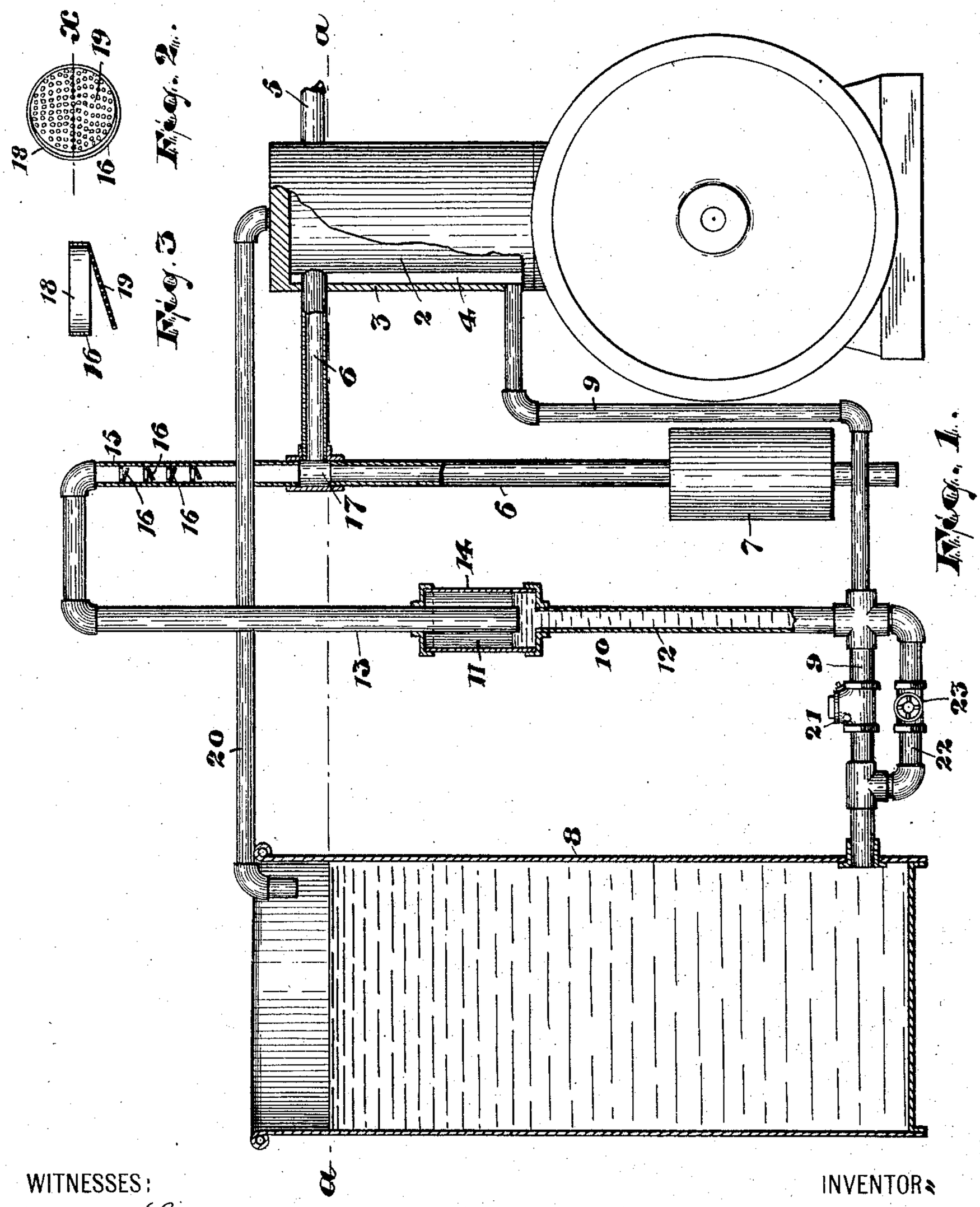

Fig. 1.

Fig. 2.

Fig. 3

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NO MODEL. 3 SHEETS—SHEET 2.

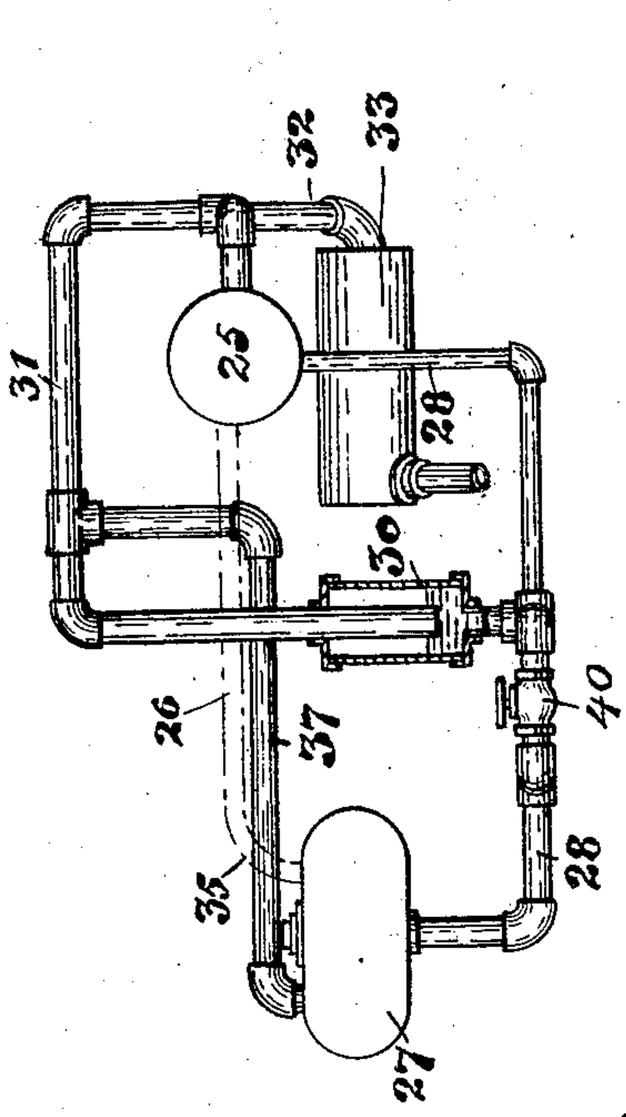

Fig. 5.

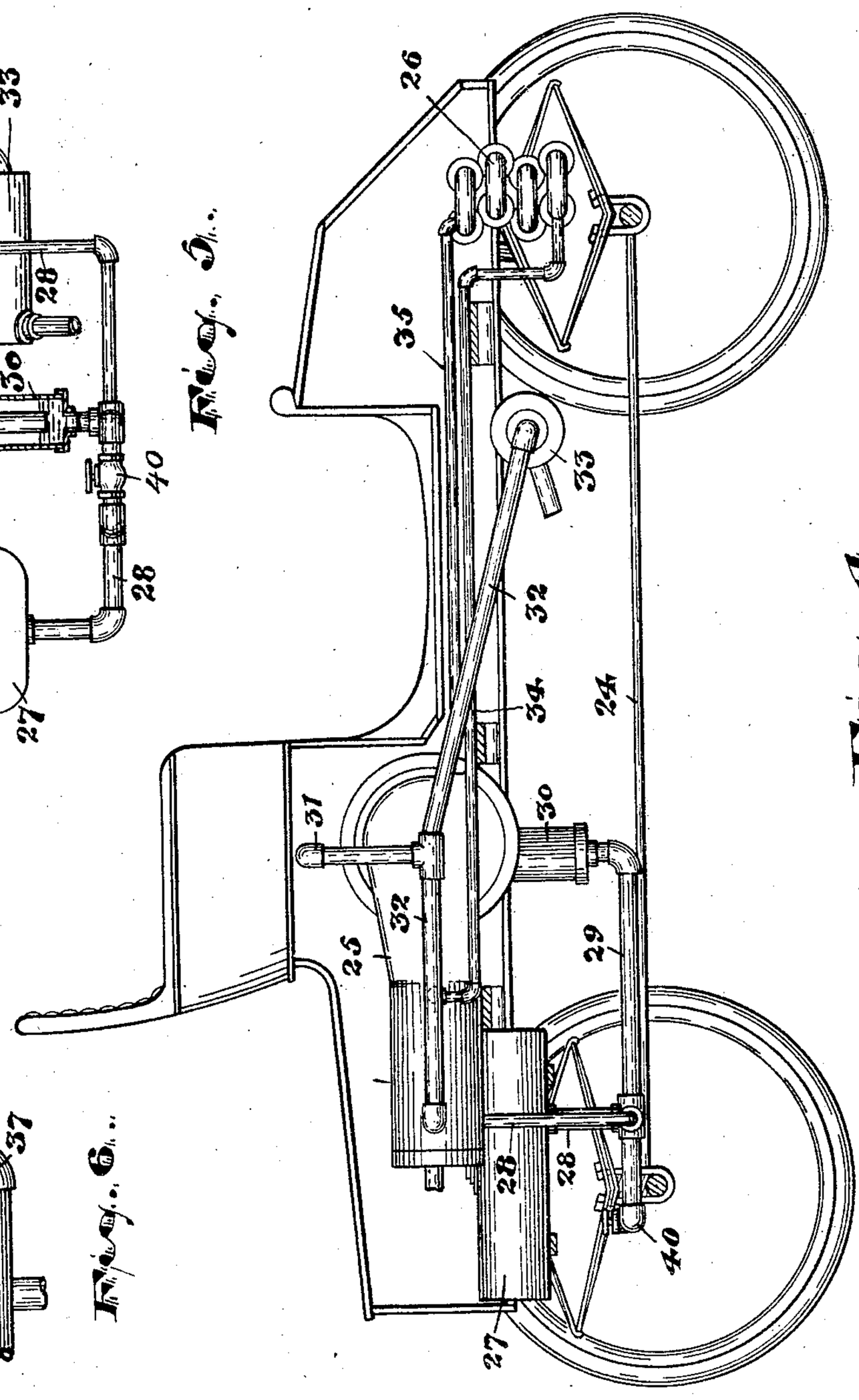

Fig. 4.

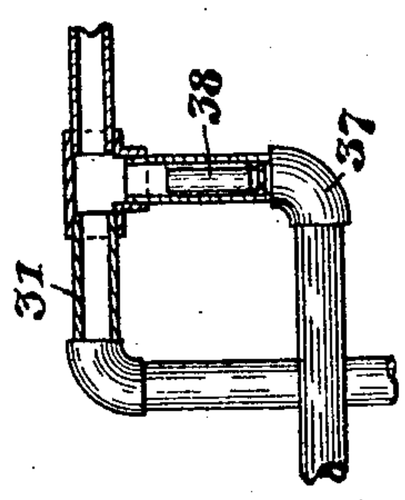

Fig. 6.

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NO MODEL. 3 SHEETS—SHEET 3.

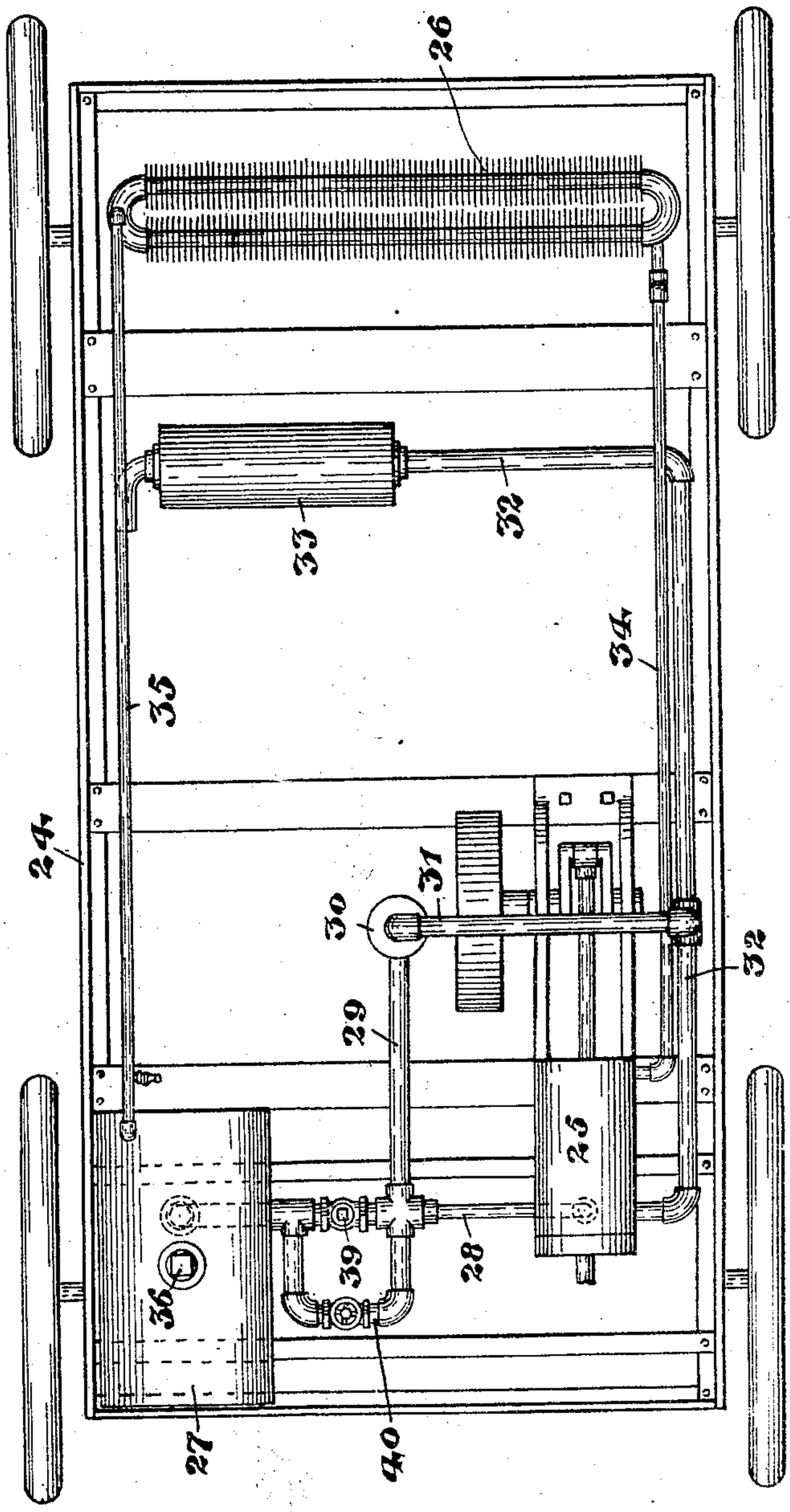

Fig. 7.

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No. 765,438. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

GEORGE J. MURDOCK, OF NEWARK, NEW JERSEY.

PUMPING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 765,438, dated July 19, 1904.

Application filed May 18, 1903. Serial No. 157,528. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. MURDOCK, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented and produced new and original Improvements in Pumping Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

This invention relates to that class of pumping apparatus operated by the intermittent flow of a fluid, and especially by the exhaust from engines or motors driven by the expansion of gases; and the objects of the invention are to obtain means in connection with such gas-engines for forcing a circulation of water through the water-jacket surrounding the cylinder more positively than can be secured by thermosiphon means, to utilize for forcing such circulation the exhaust of the engine, and thus employ power which would otherwise be wasted, to obtain a simple construction having a minimum number of moving parts, to secure a strong, uniform, and constant flow of water through the water-jacket, to prevent oil and carbon from the engine passing over into the water-supply, to employ such circulating means upon automobiles, and to obtain other advantages and results, some of which may be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved pumping apparatus and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like figures of reference indicate the same parts in each of the several figures, Figure 1 shows my improved apparatus in connection with a gas-engine, certain of the parts being in section to more clearly illustrate the same. Figs. 2 and 3 show in plan and central cross-section, respectively, one of the screens employed to exclude foreign matter from a certain pipe or tube of my apparatus. Fig. 4 illustrates in side elevation my apparatus applied to an automobile, the side of which is removed to disclose the construction more clearly. Fig. 5 is a diagrammatic view of the parts as they appear in rear end elevation of the automobile. Fig. 6 is an enlarged detail of a certain float-valve-controlled connection, and Fig. 7 is a plan of the automobile with the seat and upper parts removed.

In Fig. 1 of said drawings I have shown my invention in connection with a gas-engine of any ordinary type, the exhaust-pipe of said engine furnishing the intermittent fluid-pressure necessary to effect an action of my apparatus, although it will be understood that any other means of securing such pressure could be used equally well. In said general construction 2 indicates the cylinder of the engine surrounded by a jacket 3, forming an annular water-space 4 between. Into said cylinder a supply of hydrocarbon explosive mixture is admitted in any suitable manner, as by a pipe 5, and exhaust takes place through a second pipe 6, which preferably has at or near its end a muffler 7 of any approved type.

In applying my invention to the gas-engine a tank 8 or equivalent means of supplying water is provided, from which a lower tube 9 leads to a lower point of the water-jacket, and intermediate of its ends the said tube 9 is provided with a vertical stand-pipe 10, extending upward therefrom. Preferably said stand-pipe 10 is at a point below the top of the water-supply provided with an air-chamber 11, formed in any suitable manner by enlarging the top of a lower section 12 of the stand-pipe and introducing an upper section 13 through the top of the said enlargement 14 nearly to its bottom. Said stand-pipe 10 is carried upward sufficiently higher than the water-supply to prevent water flowing over into the engine-cylinder under any conditions and is then connected, as by tube 15, with the exhaust-pipe 6 of the engine. Preferably the said connecting-pipe enters the exhaust-pipe

from above or at its upper side, as shown in the drawings, so that none of the oil passing over from the said engine will be carried into the connecting-pipe 15. Furthermore, in said tube 15 is arranged a series of screens 16, adapted to arrest any particles of carbon or other foreign matter carried over from the engine, and preferably the exhaust-pipe 6 branches downward, as at 17, in alinement with the connecting-tube 15, whereby the arrested particles of carbon fall down toward the muffler. The water-supply is thus kept clean and free from impurities. One or more screens may be employed of any suitable construction, either entire or perforated, and being disposed in any desired relation to the tube; but preferably each screen is formed of a piece of thin sheet metal pressed or stamped into a dished form, with a peripheral flange 18, adapted to fit in the tube, and a bottom portion 19, which is nearly cut out and pressed into an inclined position and perforated, as shown. These screens are then arranged in the tube in a series, with the inclined and perforated portion 19 directed alternately in opposite directions, so that a tortuous passage is formed through the tube past the free or depending edges of said portions 19. A free air-passage is thus afforded, and yet all carbon and other matter will be strained out.

A connecting-tube 20 leads from the upper part of the water-jacket to the water-supply tank 8, and in the lower water-pipe 9 between the stand-pipe and water tank or supply is a check-valve 21 of any well-known construction, preferably of the swinging type, and opening toward the stand-pipe. Furthermore, the flow-conduit 9 is of smaller size on the side of the stand-pipe next the water-jacket than it is between the stand-pipe and the supply, as shown, the reduction being made adjacent to the stand-pipe and suitably tapered. The upper or return pipe 20 from the water-jacket to the tank 8 may end either beneath the surface of the water in said tank or above, as shown in the drawings, and, furthermore, my improved means for securing forced circulation may operate either alone or in conjunction with thermosiphon or other means now known and used. Preferably a by-pass 22 is formed around the check-valve 21 in the lower pipe 9, in which a hand-valve 23 is placed, so that by opening said valve when desired the water can be drained from the water-jacket back into the supply-tank in cases where their levels permit, or said by-pass may be opened to a greater or less extent to regulate the flow of water being circulated through the water-jacket, as will be understood by one familiar with pumps.

While my invention can obviously be employed with any engine of the internal-explosive type, either stationary or otherwise, it will be understood by those skilled in the art that it possesses great advantages for use in connection with automobiles, and in Figs. 4, 5, 6, and 7 I have shown the same as applied to an automobile-chassis. In said views 24 indicates the frame of said chassis, 25 the engine thereof, and 26 the radiator at the front. Preferably at the rear of the chassis and to one side of the engine I locate a water-supply tank 27, from which a tube 28 leads downward and then horizontally across the chassis and upward to the engine-cylinder. From the horizontal portion of the tube 28 extends a horizontal extension 29 of the stand-pipe 30, the top of which is in communication by a pipe 31 with the exhaust-pipe 32 of the engine, said exhaust-pipe having near its end a muffler 33. An outlet-pipe 34 leads from the water-jacket of the engine-cylinder forward to the radiator 26 on one side of the vehicle, and a similar pipe 35 leads back from said radiator to the supply-tank 27 on the other side of the vehicle. A complete circuit is thus established, as described in connection with Fig. 1, and through which upon operating the engine a circulation of water will be similarly forced to keep the engine-cylinder cool. Remembering that it has been a great difficulty to secure proper cooling in automobiles on account of limited space and inefficient pumps, it will be seen that my invention, by securing a vigorous circulation of water, attains new and important results in this art. Furthermore, the construction of my device precludes any possibility of dust or mud reaching the working parts, which is very important in vehicles. It will be understood that between the stand-pipe connection 29 and the water-tank 27 the tube 28 is provided with a check-valve 39, opening away from the tank, and a valved by-pass 40, as described in connection with Fig. 1 above. The water-tank 27 preferably has a small perforation or vent in its top, as shown at 36 in Fig. 7, and, furthermore, it may be necessary under some conditions to apply in automobiles a safety-drain to prevent water ever being drawn from the stand-pipe over into the engine-cylinder. This is done by extending from the under side of the pipe 31 a connecting-tube 37, which leads back to the water-tank 27. In the mouth of said tube where it leaves the exhaust connection 31 is a float-valve 38, which is normally seated at its lower end against any passage of the exhaust-gases, but which, if any water is carried over from the stand-pipe, will rise to permit such water to drain back into the tank 27.

It will be understood that the piping or tubular connections of the different parts of my improved apparatus can be varied to suit different conditions under which it may be desired to connect up the device, and this without destroying its efficiency or departing from the spirit or scope of the invention—as, for instance, the stand-pipe instead of extending vertically up from the flow-conduit, as shown in Fig. 1, may have at its bottom a horizontal

extension enabling the upright portion to be located wherever desired, as shown in Figs. 4 and 7.

In practice, it may be noted, the exhaust impulses are transmitted to the water in the stand-pipe through the intervening column of air or vapor in the pipes, thus preventing any impregnation of the water with gases.

Having thus described the invention, what I claim as new is—

1. The combination with a pipe or duct and means for securing therein an intermittent flow of fluid under pressure, a liquid-supply and a flow-conduit leading therefrom to a point higher than said supply, a stand-pipe communicating at a lower part of itself with said flow-conduit and at an upper part with the said pipe or duct in which intermittent flow of fluid under pressure is produced, and means for retarding backflow through the said conduit toward the liquid-supply, of a chamber adapted to permanently contain a quantity of entrapped air, arranged in open connection with said stand-pipe below the lowest level at which fluid is adapted to stand therein and adjacent to said level.

2. The combination with an engine, a liquid-supply and a flow-conduit leading therefrom, of a stand-pipe comprising a lower section branching from said conduit and having a closed enlargement at its other end, and an upper section projecting through the top of said enlargement nearly to its bottom and being connected at the other end to the exhaust-pipe of the engine, and a check-valve in said flow-conduit between the stand-pipe and liquid-supply preventing backflow to said supply.

3. The combination, with an explosive or internal-combustion engine, of a liquid-supply and a flow-conduit leading therefrom, a stand-pipe in communication at a lower part with said flow-conduit and at an upper part with the exhaust-pipe of the engine, means in said conduit between the stand-pipe and supply preventing backflow to said supply, and means preventing passage of oil from the engine over into the stand-pipe.

4. The combination with an explosive or internal-combustion engine, of a liquid-supply and a flow-conduit leading therefrom, a stand-pipe in communication at its lower part with said flow-conduit, means in said conduit between the stand-pipe and supply preventing backflow to said supply, and a duct connecting an upper part of the stand-pipe with the exhaust-pipe of the engine and having an upwardly-extending portion adapted to obstruct the passage of oil from the engine over into the stand-pipe.

5. The combination with an explosive or internal-combustion engine, of a liquid-supply and a flow-conduit leading therefrom, a stand-pipe extending upward from said flow-conduit in communication therewith, means in said conduit between the stand-pipe and supply preventing backflow to said supply, a duct connecting an upper part of the stand-pipe with the exhaust-pipe of the engine, and means in said connecting-duct preventing the passage of carbon from the engine over into the stand-pipe.

6. The combination with an explosive or internal-combustion engine, of a liquid-supply and a flow-conduit leading therefrom, a stand-pipe extending upward from said flow-conduit in communication therewith, means in said conduit between the stand-pipe and supply preventing backflow to said supply, a duct connecting an upper part of the stand-pipe with the exhaust-pipe of the engine and having an upwardly-extending portion, and a screen in said upwardly-extending portion of the connecting-duct adapted to arrest the passage of carbon from the engine over into the stand-pipe.

7. The combination of an engine, a liquid-supply and a flow-conduit leading therefrom, of a stand-pipe communicating at a lower part of itself with the flow-conduit and at an upper part with the exhaust-pipe of the engine, a check-valve in said flow-conduit between the stand-pipe and liquid-supply, and a valved by-pass in open communication with said flow-conduit on opposite sides of the check-valve.

8. The combination of an engine, a liquid-supply and a flow-conduit leading therefrom, of a stand-pipe communicating at a lower part of itself with said flow-conduit, a check-valve in said flow-conduit between the water-tank and stand-pipe and adapted to open toward the latter, a connecting-duct joining an upper part of said stand-pipe to the exhaust-pipe of the engine, a drain-passage extending from the lower side of said connecting-duct to the water-tank, and a float-valve in said drain-passage.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of May, 1903.

GEORGE J. MURDOCK.

Witnesses:
RUSSELL M. EVERETT,
CHARLES H. PELL.