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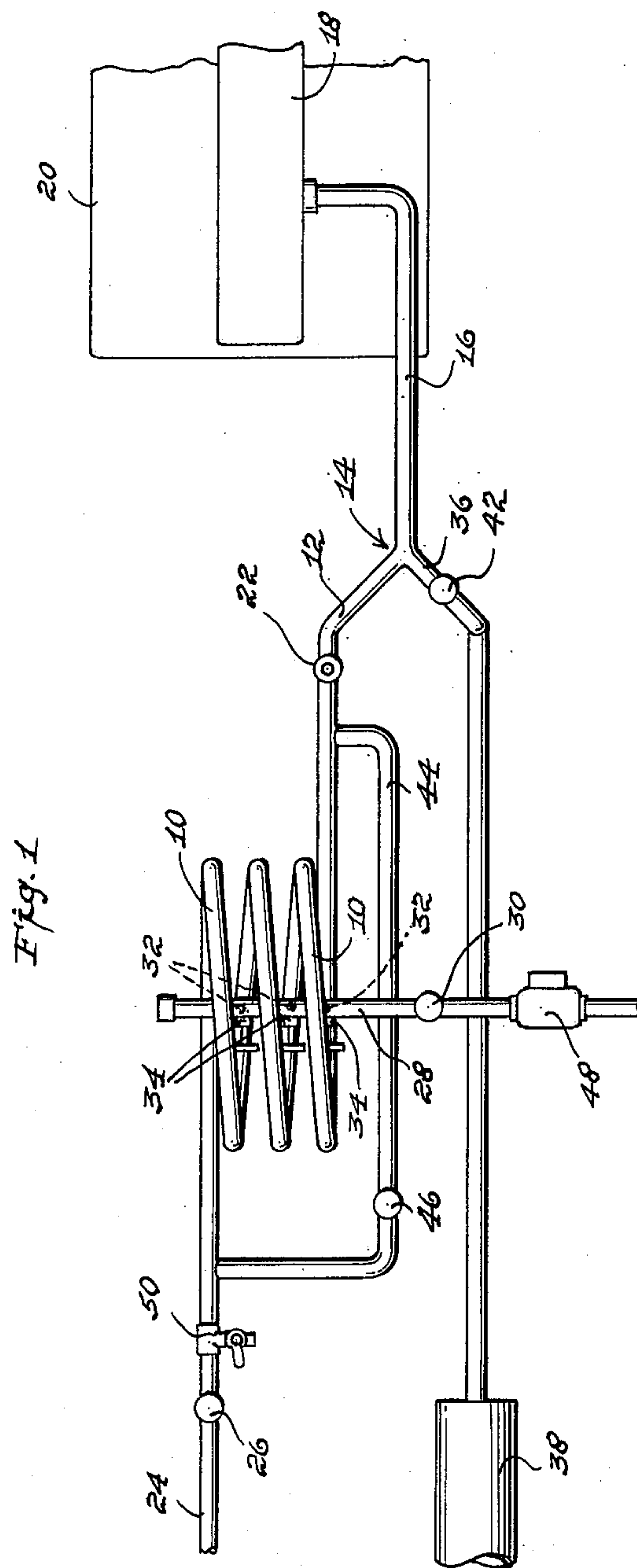
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3,101,588

STEAM GENERATING APPARATUS

Filed July 16, 1962

2 Sheets-Sheet 1



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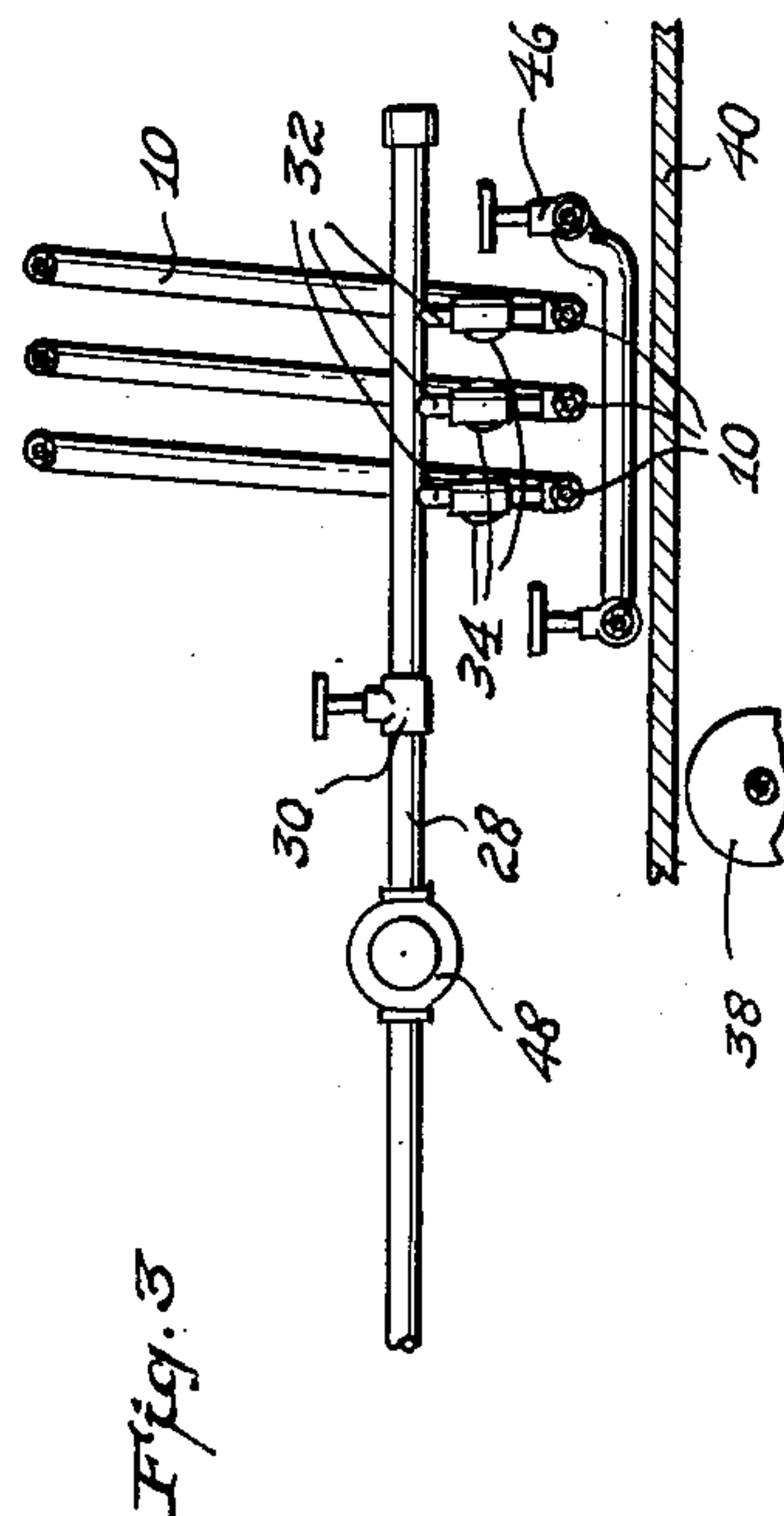
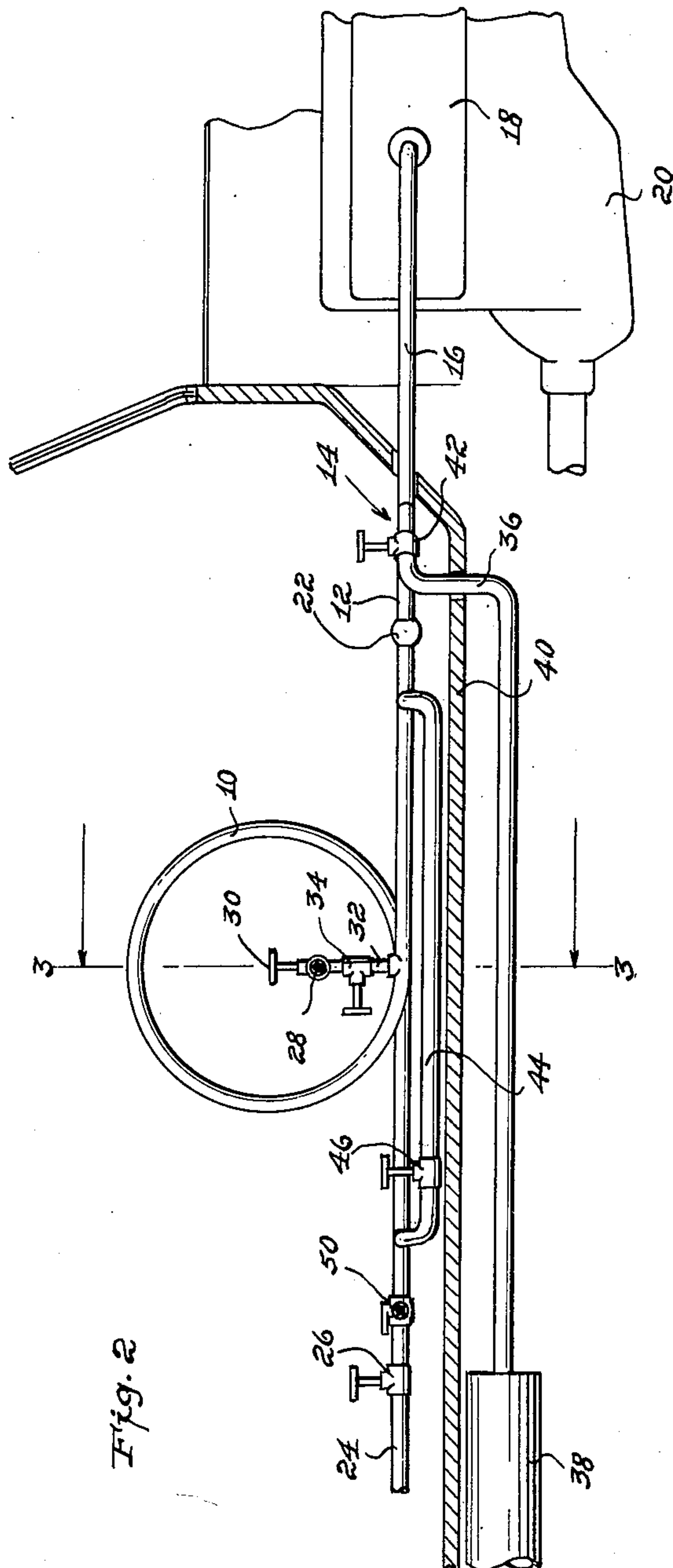
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## STEAM GENERATING APPARATUS

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3 Claims. (Cl. 60—31)

This invention relates to the generation of steam in pipe coils of small diameter by forcing through the coils a continuous flow of exhaust gases from an internal combustion engine or motor, and converting small quantities of water or other suitable liquid injected or sprayed into the coils into steam.

One of the principal objects of the present invention is to provide in combination with an internal combustion engine or motor a coil of pipe into which water or other suitable liquid is injected or pumped in small increments into each or certain of the coils through which the hot exhaust gases are moving at a high velocity, the water or other liquid being instantly converted into steam.

Another object of the present invention is to provide such a coil with means for recirculating a portion or all of the steam through the coil to increase the pressure in the coil and thereby produce a continuous flow of steam.

A further object of this invention is to provide means for distribution and various advantageous uses of the steam produced in the coil, which may consist of a single coil or several coils connected together in communicating relation.

Although any exhaust source of heated gases under pressure may be employed in the apparatus referred to, in the form of my improved steam generating apparatus illustrated and described herein, the coil is connected to the exhaust pipe of a conventional internal combustion engine to utilize the heated exhaust gases in the generation of steam for various purposes or uses.

Other objects and advantages of the improved apparatus of my present application will be apparent or pointed out in the following specification in which reference is had to the accompanying drawing, and in which

FIG. 1 is a top plan view, in partially schematic illustration showing one embodiment of my improved steam generating apparatus, in which the circulating coil is connected with the exhaust pipe of an internal combustion engine;

FIG. 2 is a side elevation of the apparatus shown in FIG. 1; and

FIG. 3 is a section taken on the line 3—3 of FIG. 2.

Referring to the drawing, in which like numerals designate like parts in the three views, 10 designates a pipe coil connected at its front end through a branch 12 of a Y connection 14 into an exhaust pipe 16 which communicates with the exhaust manifold 18 of an internal combustion engine or motor 20. The branch 12 is provided with a check valve 22 to prevent back flow of the exhaust gases. The outlet pipe 24 leading from the coil 10 is provided with a gate or other suitable type of control valve 26 by means of which the flow of steam from the coil 10 may be regulated as desired, or entirely shut off.

Extending transversely through the coil 10 is a water supply pipe 28, under pressure, and having a control valve 30. Connected at spaced intervals along the pipe 28 are small branch outlet pipes 32 connected also into the coil 10 and provided with control valves 34, which may be electrical or automatic, for spraying small increments of water into the coil.

Another branch 36 of the Y connection 14 is connected at its front end to the exhaust pipe 16 and at its other

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end to the conventional muffler 38 located below the floor 40 of the vehicle carrying the engine 20. The branch 36 is provided with a control valve 42, by means of which the flow of exhaust gases is shut off from the muffler 38 when the coil 10 is to be in operation.

For the purpose of recirculating the steam in coil 10, to increase its pressure, a return pipe 44 is connected into each end of the coil 10 between the check valve 22 and the control valve 26, thereby forming a loop around the coil. A control valve 46 is installed in the return pipe. With valves 26 and 42 closed and valve 46 open all the steam produced in coil 10 will be recirculated until the valves referred to are readjusted. For example, if valve 26 be partially opened a corresponding amount of steam will be discharged through pipe 24 for such uses as may be desired. If valve 42 be partially opened a corresponding volume of exhaust gases will flow to the muffler 38. It will also be seen that with valve 42 open the exhaust gases from manifold 18 will be free to escape through muffler 38.

Since it is essential that the pressure of the increments of water forced into the coil 10 will be greater than that in the coil, such pressure may be provided by means of a high pressure pump 48 in the pipe 28. Also, if desired, the valves 34 controlling the flow through the small pipes 32 into the coil may be of a conventional injector type.

A T valve 50 through which steam can be drawn off into a water tank to prevent freezing, for example, or for other uses, may be installed in front of valve 26.

Although for purposes of illustration I have shown my steam generating apparatus connected to the exhaust pipe of a conventional vehicle, which may be of the wheeled type, it should be understood that it may be connected to the exhaust of an internal combustion engine in any type of conveyance and that the steam produced therein may be used for various purposes.

For example, in certain types of conveyances the outlet pipe 24 may be curved upwardly over the top of the conveyance to create a negative atmospheric pressure, or vacuum, on top of the conveyance, thereby causing it to be partially or wholly lifted from the ground or water. The steam may also be used to heat the conveyance, or other adjacent spaces; or to provide steam for the operation of a power machine.

Also high pressure steam generated in the coils as described may be utilized through branch pipes connected with pipe 24 in the propulsion of a vehicle or other conveyance in which it is installed in a manner similar to jet propulsion.

Since various changes or modifications may be made in my improved steam generating apparatus without departing from the spirit and scope of my invention it should be understood that the embodiment of my improved apparatus shown and described is intended to be illustrative, only and restricted only by the appended claims.

I claim:

1. In combination with an internal combustion engine having an exhaust manifold for receiving exhaust gases from said engine and an exhaust pipe in communication therewith, steam generating apparatus comprising a Y branch connection in communication at the juncture of its two branches with said exhaust pipe, one of said branches being extended rearwardly and having therein a control valve, the second of said branches also extending rearwardly and having therein a check valve to prevent backflow therethrough of exhaust gases, a multiple coil in communication at its inlet end with said second branch and having an outlet pipe provided therein with a control valve, a liquid supply pipe having means for creat-



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ing and maintaining a liquid pressure therein greater than the fluid pressure in said coil, and said liquid supply pipe also having a plurality of longitudinally spaced small radial pipes in communication with said coil, said small pipes having therein control valves for admitting limited small quantities of liquid into said coil. 5

2. Steam generating apparatus as in claim 1 and including a return pipe communicating the outlet end of the coil with the inlet end for the purpose of recirculating steam generated therein to increase the pressure thereof, said return pipe having therein a control valve for regulating the flow through said pipe. 10

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3. Steam generating apparatus as in claim 1 in which the liquid supply pipe extends transversely through the coil.

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