No. 702,491. Patented June 17, 1902.

L. SERPOLLET.

AUTOMATIC PROPORTIONAL FEEDING DEVICE.

(Application filed Sept. 5, 1901.)

(No Model.) 3 Sheets—Sheet 1.

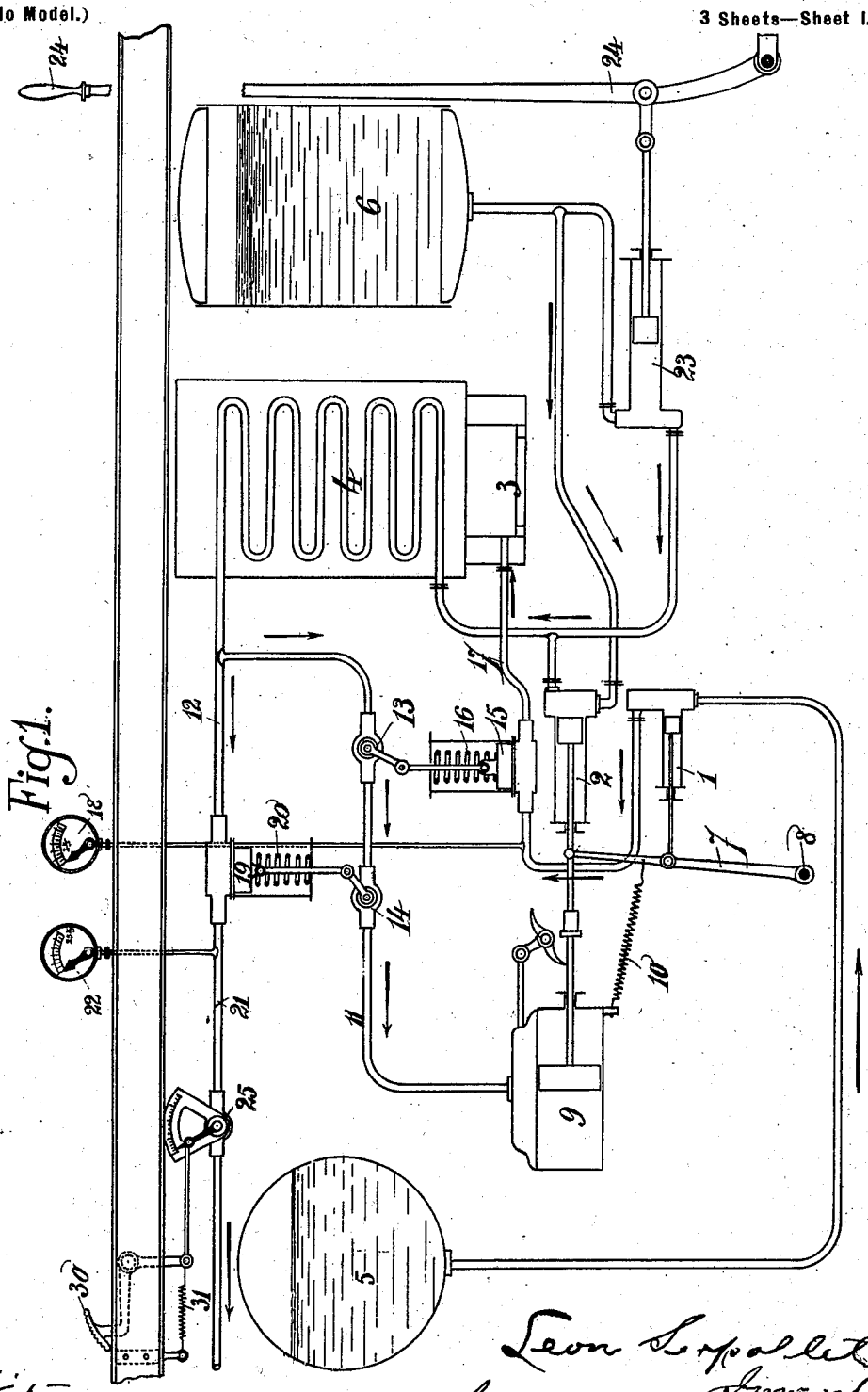

Fig. 1.

Witnesses:—
[illegible]
[illegible]

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(No Model.) 3 Sheets—Sheet 2.

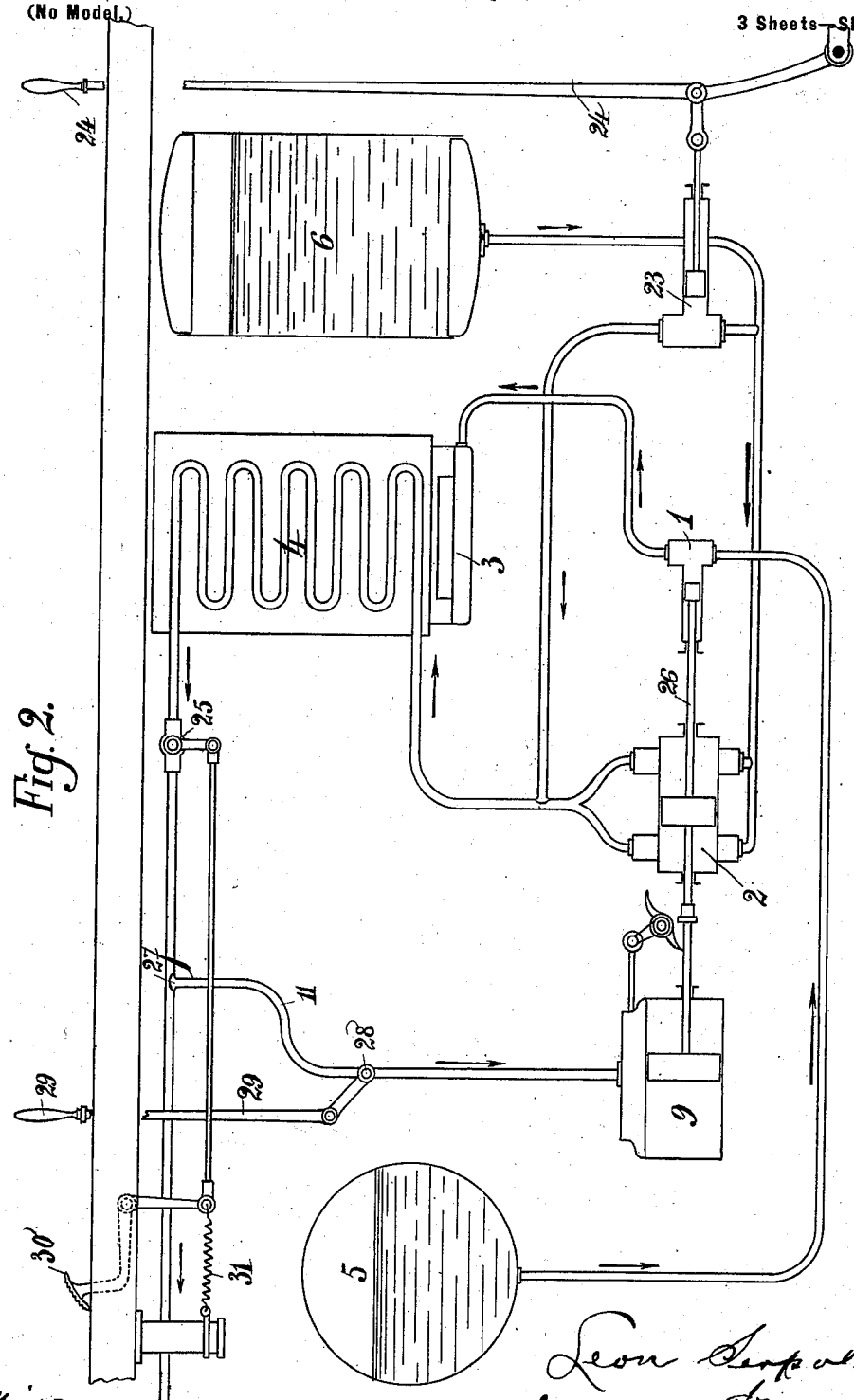

Fig. 2.

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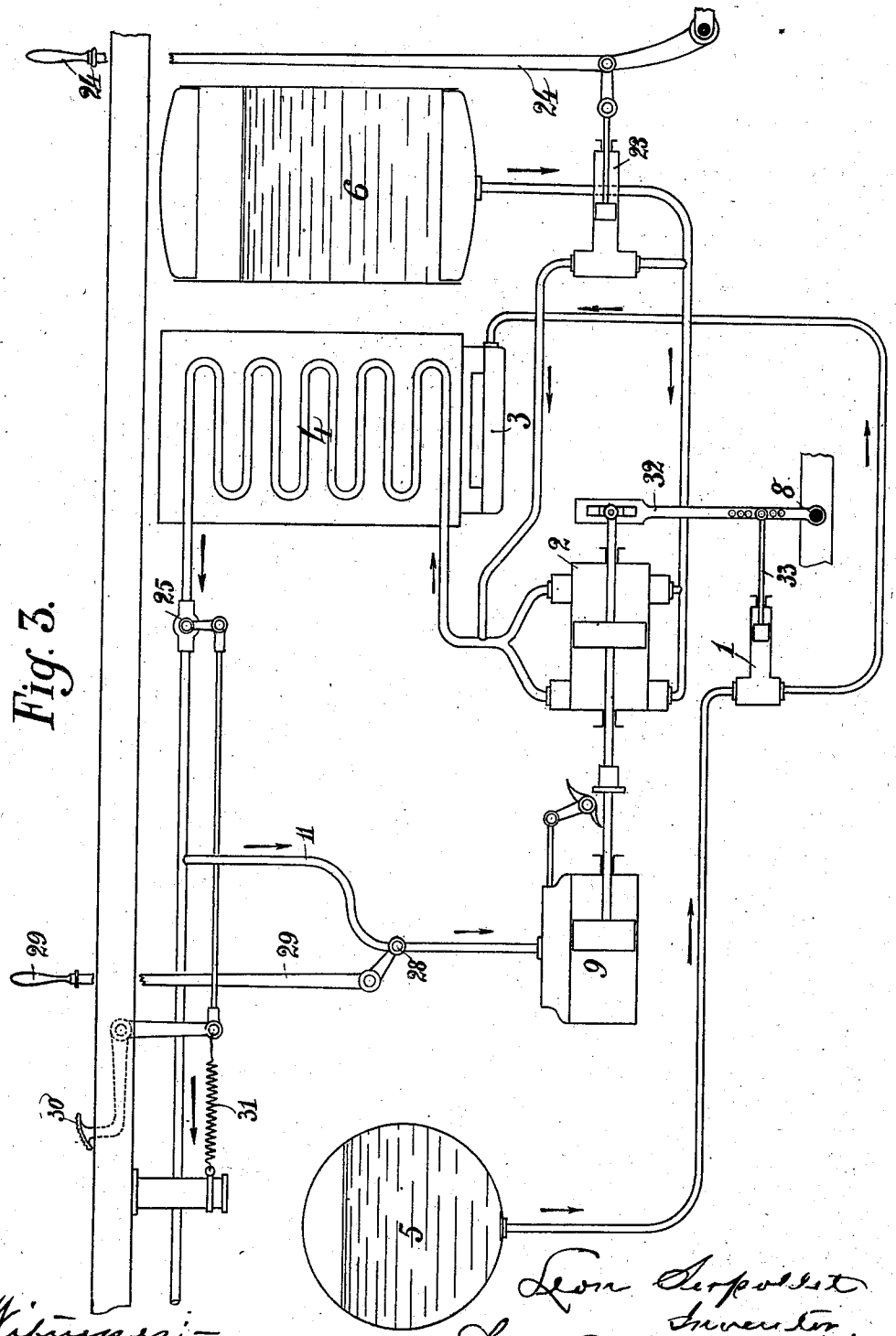
(No Model.) 3 Sheets—Sheet 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

LEON SERPOLLET, OF PARIS, FRANCE.

AUTOMATIC PROPORTIONAL FEEDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 702,491, dated June 17, 1902.

Application filed September 5, 1901. Serial No. 74,472. (No model.)

To all whom it may concern:

Be it known that I, LEON SERPOLLET, civil engineer, of Paris, France, have invented new and useful Improvements in and Connected with Automatic Proportional Feeding Devices, which improvements are fully set forth in the following specification.

Apparatus according to the specification of Letters Patent No. 666,704, dated January 29, 1901, give excellent results when applied to automobiles driven by skilful persons. When a carriage provided with such apparatus ascends a hill, the motor-shaft and the pump-driving cams connected therewith rotate more slowly, so that the strokes of the pumps that send water and combustible to the boiler and the burner, respectively, become less frequent, and therefore the pressure decreases. In order to compensate for this reduction in the number of strokes of the pumps, the driver moves a cam-carrying shaft by means of a lever which he has in his hand, so as to bring the more eccentric portions of the cams into contact with the rollers by means of which the pumps are operated. This causes the lengths of the strokes to be increased and approximately an equal quantity of water and liquid combustible to be supplied with a fewer number of strokes, so that the pressure rises and enables the motor to continue to run at a low speed and drive the carriage up the hill. Unfortunately it sometimes happens that in the hope of increasing the speed of the motor, so as to climb a hill faster, the driver pushes the handle of the controlling-lever into such a position that the quantity of combustible supplied to the burner becomes too large, so that it floods the burner and ceases to be completely consumed, causing the burner to smoke and to be finally incapable of vaporizing the quantity of water supplied, which also becomes too great. Even though the driver have in front of him a gage for indicating the pressure of the petrol, provided with a red mark to indicate the pressure (two kilograms) that must not be exceeded if the burner and consequently the boiler are to work properly, he, if inexperienced, will disregard the red mark and will attempt to force the feed of the burner and of the generator in the hope of obtaining greater power. Now, according to this invention, for the purpose of obviating the results of such action apparatus for feeding steam-generators is constructed as shown diagrammatically in the accompanying drawings, in which—

Figures 2 and 3 show modifications of the apparatus shown in Fig. 1.

As will be seen from Fig. 1, the two feed-pumps 1 and 2, that feed the burner 3 and the boiler 4 with petrol and water drawn from a petrol-tank 5 and a water-tank 6, are connected to a common lever 7, which is mounted on a fixed pin 8 and is operated by the piston-rod of a donkey-engine 9. A spring 10, attached to the donkey-engine cylinder and to the lever 7, draws back the piston when it has reached the end of its outstroke. The donkey-engine is fed through a branch pipe 11, connected to the steam-pipe 12. Two cocks 13 and 14 are adapted to shut off the steam in this branch pipe. The cock 13 is controlled by a piston or diaphragm 15, held by a spring 16 against the pressure in the pipe 17, into which the pump 1 forces the liquid combustible, which it draws from the tank 5 and delivers to the burner. The spring 16 is such as to maintain equilibrium at a certain pressure, which may be fixed empirically at two atmospheres. The pressure in the pipe 17 is indicated by a gage 18, located between the pump 1 and the piston 15. When this pressure exceeds two kilograms, the piston compresses the spring 16 and more or less closes the cock 13. The cock 14 is controlled by a piston or diaphragm 19, held by a spring 20 against the pressure of the steam in the pipe 21, through which the steam passes from the boiler to the motor. The spring 20 is adapted to effect equilibrium at a maximum pressure of, say, twenty-five kilograms. The pressure in the pipe 21 is indicated by means of a gage 22, connected thereto. When the pressure in the pipe 21 exceeds the predetermined limit, which may be empirically fixed at twenty-five kilograms, the piston compresses the spring 20 and its rod more or less closes the cock 14. A feed-water pump 23, operated by hand by means of a lever 24, may be used for enabling the pressure to be rapidly raised for a short time in particularly difficult places or for starting quickly, &c., and any other suitable hand-actuated pump-

ing means may be provided for use in the event of an accident preventing the use of the donkey-engine.

25 is a graduated cock on the steam-pipe. This cock may be operated by hand before the stop-valve, which is kept closed by means of a spring and is opened by the driver's foot when steam has to be supplied to the motor. The cock 25 may be foot-controlled, if necessary.

The apparatus acts as follows: In normal working on the level the branch pipe 11 feeds the donkey-engine 9, which operates simultaneously the feed-pumps 1 and 2, which are adapted to supply the generator with proportional quantities of liquid combustible and water. When the vehicle ascends a hill, the motor revolves more slowly and the pressure rises, so that the donkey-engine supplies the generator with larger quantities of combustible and water; but these quantities must not exceed the limit beyond which the liquid combustible would cease to be burned in a proper manner. In fact, when the pressure in the pipe 17, that supplies petrol to the burner, exceeds the predetermined limit the piston or diaphragm 15 compresses the spring 16, as hereinbefore described, and consequently partially or wholly closes the cock 13, which prevents the steam in the branch pipe from reaching the donkey-engine or reduces the amount so supplied. Consequently the donkey-engine stops working until the pressure in the pipe 17 drops below this limit. The diaphragm or piston 19 acts in a similar manner as regards the pressure of steam issuing from the generator. On the level or on a descent it prevents the pressure from exceeding the limit fixed as a maximum.

The arrangement shown in Fig. 2 is a simpler method of using a donkey-engine for feeding the boiler with water and liquid combustible. It will be seen from Fig. 2 that a rod 26, which is operated by the piston of the donkey-engine 9, moves the piston of the double-acting water-pump 2 and constitutes the plunger for the petrol-pump 1. The ratio of the volumes of the pumps 1 and 2 determines the relative quantities of water and petrol supplied to the generator. The pistons or diaphragms 19 and 15 (shown in Fig. 1) are omitted in this case; but the steam-pipe for the donkey-engine instead of being placed between the boiler 4 and the cock 25 is connected at 27 behind the cock 25, so that when the cock is closed the steam for the donkey-engine is shut off and the water and the liquid combustible feed-pumps cease working. The quantity of steam required for feeding the donkey-engine is regulated by means of a small cock 28, Fig. 2, which is operated by hand through a lever 29, placed in a convenient position for the driver. This apparatus acts in a manner similar to that already described. In order to start the vehicle, the driver opens the cock 28 by means of the lever 29 and then presses down a pedal 30, so as to open the cock 25 against the action of a spring 31. The quantity of steam remaining in the boiler or formed under the combined action of the feed-pump 23 and the burner, the flame of which has been turned down, passes to the donkey-engine and sets it in motion, thereby supplying the proper quantities of water and petrol to the generator. This causes the pressure to rise, so that the vehicle can be started. Variations in the power can be then obtained by means of the cock 28. In order to stop the motor, all that is required is to allow the cock to close under the action of the spring 31, so as to cut off the steam to the motor and at the same time to the donkey-engine, thereby obviating a useless consumption of water and petrol and a superfluous rise in pressure in the generator without the use of any diaphragm or regulating-piston. It will be seen that in the case of this second arragement the relative proportions of water and liquid combustible supplied to the generator at each stroke of the piston are fixed once for all by the ratio of the volumes of the water and the petrol-pumps. In certain cases it may be advantageous to alter this ratio. In a third arrangement (shown in Fig. 3) this alteration can be effected by placing the petrol-pump underneath the water-pump and connecting the piston-rod of the said petrol-pump to a lever 32, similar to the lever 7 of the arrangement according to Fig. 1, but provided with holes in which the head of the piston-rod 33 of the petrol-pump can be held by means of a pin. It will be understood that by altering the position of the head of the piston-rod on the lever 32 the length of the stroke of the piston of the petrol-pump 1 can be varied, thereby altering the ratio of the quantities of water and petrol supplied to the generator. It will also be understood that in the event of an accident preventing the donkey-engine from acting the water can be supplied by means of a hand-pump 23, the supply of liquid combustible being effected by the pressure of air on the surface of the petrol contained in the reservoir 5.

What I claim is—

1. The combination with a steam-generator heated by a liquid-fuel burner, of a pump and connections for supplying liquid fuel to said burner, a pump and connections for supplying water to the generator, a steam-engine for actuating said pumps; a pipe or conduit conducting steam from the generator to said engine, and a valve and actuating means therefor controlling the passage of steam through said pipe to the pump-engine.

2. The combination with a steam-generator heated by a liquid-fuel burner, of a pump and connections for supplying liquid fuel to said burner, a pump and connections for supplying water to the generator, a steam-engine for actuating said pumps; a pipe or conduit conducting steam from the generator to said engine, and a valve and automatic actuating

means therefor controlling the passage of steam through said pipe to the pump-engine.

3. The combination with a steam-generator heated by a liquid-fuel burner, of a pump and a pipe or conduit leading therefrom to the burner for supplying the latter with liquid fuel, a pump and connections for supplying water to the generator, a steam-engine for actuating said pumps, a pipe or conduit conducting steam from the generator to said engine, a valve in said steam-pipe, and actuating means for opening and closing said valve automatically controlled by the pressure of steam from the generator.

4. The combination with a steam-generator heated by a liquid-fuel burner, of a pump and a pipe or conduit leading therefrom to the burner for supplying the latter with liquid fuel, a pump and connections for supplying water to the generator, a steam-engine for actuating said pumps, a pipe or conduit conducting steam from the generator to said engine, a valve in said steam-pipe, actuating means for opening and closing said valve automatically controlled by the pressure of steam from the generator, a second valve in said steam-pipe, and actuating means for automatically controlling said second valve by the pressure of the liquid fuel passing from the liquid-fuel pump to the burner.

5. The combination with a steam-generator heated by a liquid-fuel burner, of a pump and a pipe or conduit leading therefrom to the burner for supplying the latter with liquid fuel, a pump and connections for supplying water to the generator, a steam-engine for actuating said pumps, a main pipe leading from the steam-generator, a branch pipe leading from said main pipe to the pump-engine, a valve in the branch pipe and actuating means therefor controlling the passage of steam to the pump-engine, a valve in the main steam-pipe between the generator and branch pipe, and actuating means for said valve under control of the operator.

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

LEON SERPOLLET.

Witnesses:

ANTONIO FERNANDO DE LA CALLE,

EDWARD P. MACLEAN.