

(No Model.)

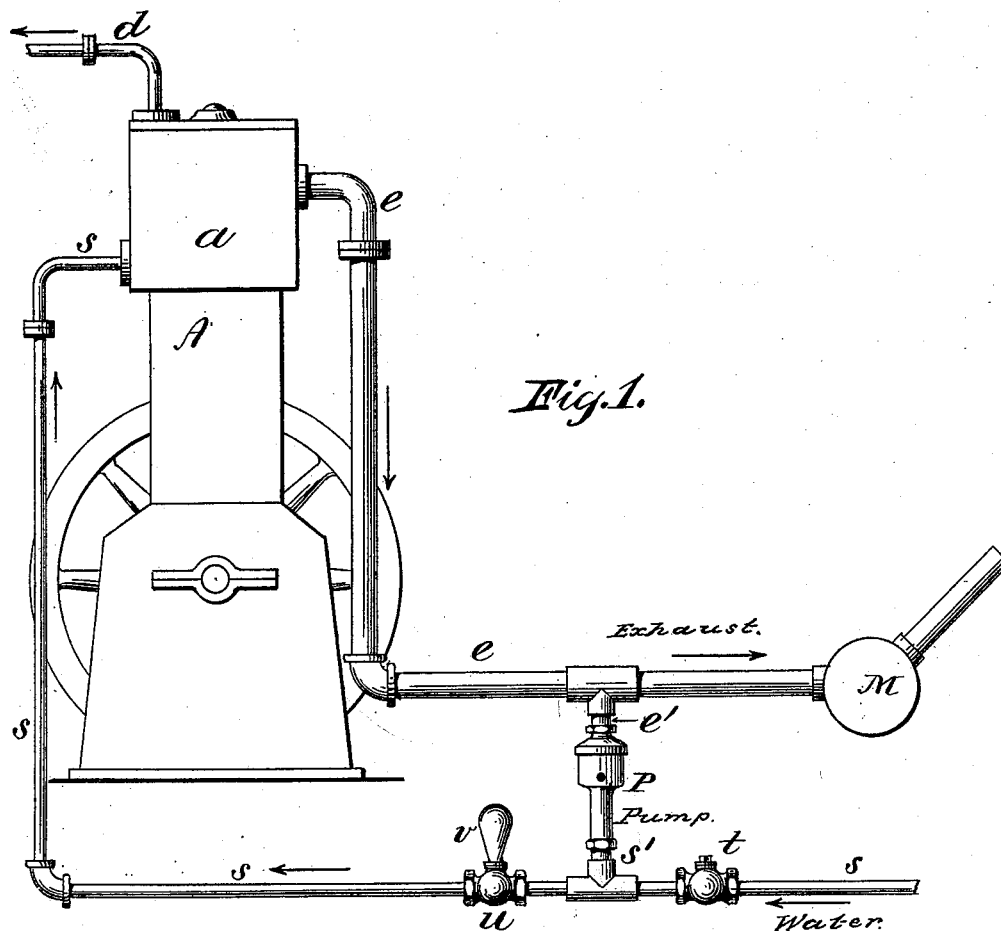
2 Sheets—Sheet 1.

F. HIRSCH.

APPARATUS FOR SUPPLYING JACKETS OF GAS ENGINES WITH
WATER OR OTHER COOLING LIQUIDS.

No. 523,706.

Patented July 31, 1894.



Witnesses:

D. W. Gardner.
J. H. Prentiss.

Inventor:

Feodor Hirsch
By his Attorney

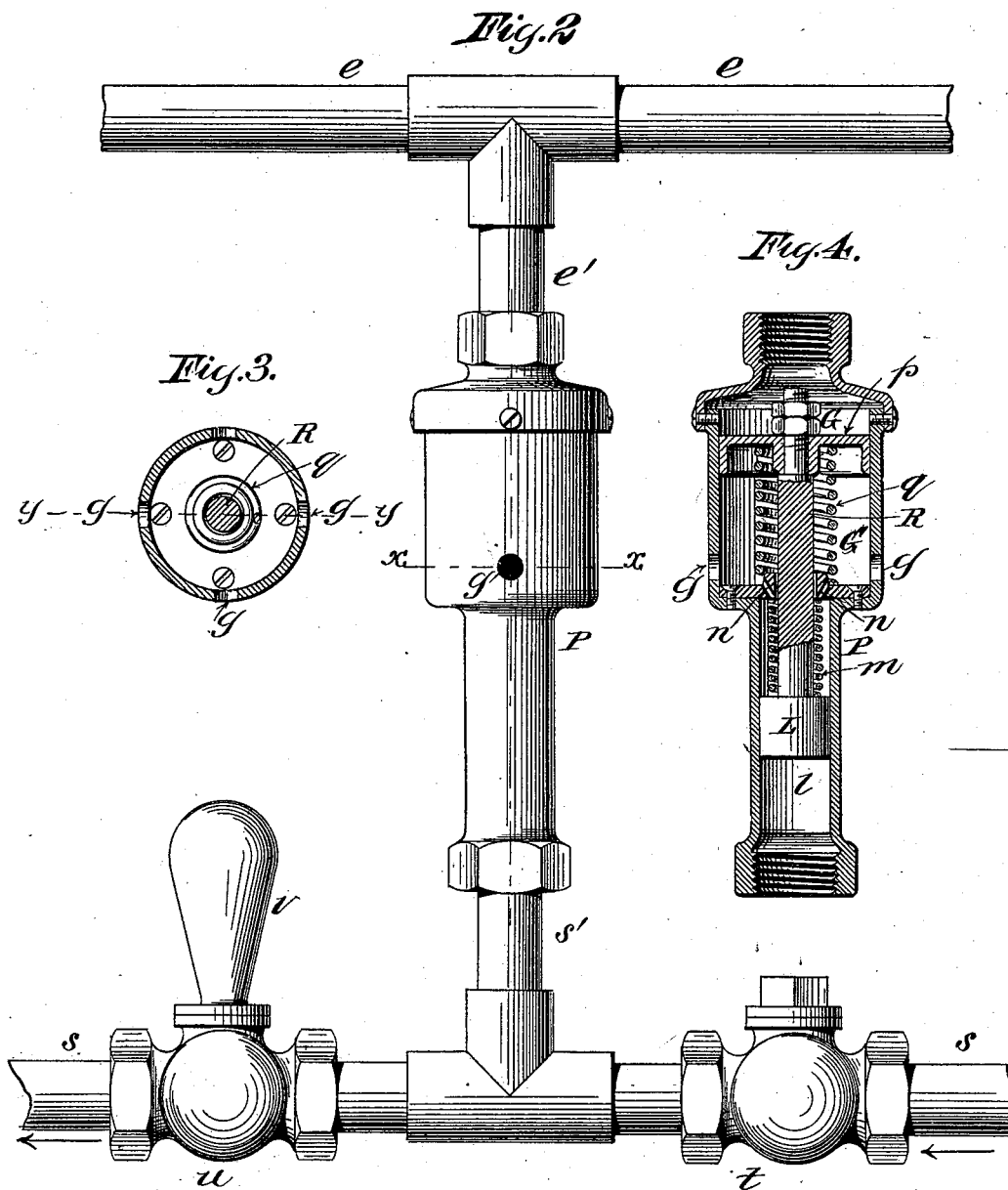
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UNITED STATES PATENT OFFICE.

FEODOR HIRSCH, OF STEINWAY, ASSIGNOR TO HIMSELF, AND EUGENE M. JEROME, OF NEW YORK, N. Y.

APPARATUS FOR SUPPLYING JACKETS OF GAS-ENGINES WITH WATER OR OTHER COOLING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 523,706, dated July 31, 1894.

Application filed April 12, 1893. Serial No. 470,086. (No model.)

To all whom it may concern:

Be it known that I, FEODOR HIRSCH, a citizen of the United States, residing at Steinway, in the county of Queens and State of New York, have invented certain new and useful Improvements in Apparatus for Supplying the Jackets of Gas-Engines with Water or other Cooling Liquids, of which the following is a specification, sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My improvements relate to means for forcing water or other cooling liquid into and through the jackets surrounding the cylinders of gas engines by means of the exhaust therefrom. This has heretofore been attempted by direct contact of the exhaust gases with the water supply, the pulsation of the exhaust being relied upon to effect the forwarding of the water, but it has been found that this system will not work practically for the reason that the direct contact, with the cool water supply, of the hot gases heats the water so rapidly and to such an extent that the apparatus is rendered practically useless.

My invention consists in interposing between the exhaust pipe of a gas engine and the pipe supplying the cooling liquid to the cooling jacket thereof, a device which may be designated as a pulsometer, having a comparatively large piston for receiving the impulse from the products of combustion discharged and transmitting it to a comparatively small piston arranged between two check valves in such manner that cooling liquid is forwarded to the jacket at every discharge of the engine cylinder.

My invention also includes certain special features of construction and arrangement hereinafter described and claimed.

In the accompanying drawings, Figure 1, represents diagrammatically the general arrangement and relation of my improved device with a gas engine. Fig. 2, is an elevation of the pulsometer and adjoining parts; Fig. 3, a transverse section upon plane of line *x, x*, Fig. 2; Fig. 4, a central vertical section of the pulsometer upon plane of line *y, y*, Fig. 3.

A, represents a gas engine of any construction provided with the usual water or cooling jacket *a*, through which a circulation of water

or other cooling liquid is maintained, the supply entering through the pipe *s*, and escaping through the discharge pipe *d*.

The gas engine discharges through the pipe *e*, the products of combustion being forced out of the cylinder intermittently in the usual way, and escaping through the said pipe *e*, and a muffler *M*.

Interposed between the discharge pipe *e*, and the liquid supply pipe *s*, is the pulsometer *P*, connected to the discharge pipe *e*, at top by the branch pipe *e'*, and at the bottom with the liquid supply pipe *s*, by the connection *s'*. The pulsometer consists essentially of a gas cylinder or chamber *G*, in which a comparatively large piston *p*, is situated, and a smaller liquid chamber or cylinder *l*, in which a smaller piston or plunger *L*, is situated,—the two pistons *p*, and *L*, being connected rigidly together by a piston rod *R*, or equivalent means.

The chamber *G*, communicates through the pipe *e'*, with the discharge pipe *e*, above, and is sealed below by the piston *p*, the portion *G'*, of the cylinder below the piston *p*, being formed with perforations or openings *g, g*, which allow air to escape from or enter the chamber *G'*, as the piston *p*, pulsates under the influence of the discharged products of combustion through the pipe *e*. The piston *p*, is held up normally and sustained against the impulse or pressure generated in the chamber *G*, by the discharge of the products of combustion by a spring *g*, resting between the lower side of the piston *p*, and the bottom *g'*, of the cylinder *G, G'*.

The piston *L*, in the liquid cylinder *l*, is in like manner counterpoised by a spring *m*, between its upper surface and the bottom plate *g'*, before referred to. Provision is also made for the admission of air above the piston *L*, by means of perforations *n, n*, formed either in the plate *g'*, or in the upper side walls of the cylinder *l*.

The connection *s'*, between the supply pipe *s*, and the lower end of the cylinder *l*, is situated between two check valves *t*, and *u*, the first, *t*, preventing back pressure in the supply pipe, and the latter *u*, preventing retractile movement of the liquid when the piston *L*, rises. The check valve *u*, is preferably

provided with an air chamber *v*, for equalizing and distributing the pressure imparted to the liquid.

In operation each discharge of the gas engine cylinder causes a pulsation in the chamber *G*, depressing the piston *p*, with considerable force owing to its comparatively large surface and causing the comparatively small plunger *L*, to eject and return the liquid in the chamber *l*, below the piston *L*, with considerable force through the connection *s'*, into the supply pipe *s*. As a result the check valve *t*, closes and a corresponding quantity of liquid is forced through the check valve *u*, and its passage through the cooling jacket *a*, insured.

The springs *q*, *m*, are constructed and arranged to balance each other, preventing pounding or shock, while admitting of and insuring the return of the pistons to their normal positions as the pressure above decreases.

By my arrangement of a comparatively large piston to receive the pulsation of the products of combustion, as discharged I am enabled to force the cooling liquid forward positively with considerable pressure. I thus utilize the exhaust to effect automatically a circulation of the cooling liquid through the cooling jacket of the gas engine in cases in which a supply of running water is not available,—as for instance on boats and on other movable structures, or in the case of stationary gas engines where there is not sufficient head to force the liquid through the jacket.

I am aware that pistons have been interposed between the exhaust gases and the liquid supply for the purpose of forwarding the latter to the water jacket by means of the pulsation caused by the exhaust, as in the German Patent No. 43,554 of 1887; but said patent does not disclose the equivalent of my invention, the single piston or diaphragm acting directly against the liquid being insufficient to effect the desired circulation of water owing to the feebleness of the exhaust and the fact that the water forwarding surface is as large as that which receives the impulse of the exhausted gases.

I am also aware that in the English Patent No. 1,447, of 1891, a double piston is used; but in that case it is the direct explosive force of the gases that is used against the power piston, and not the exhaust gases, as in my invention, which latter is especially designed

to utilize the exhaust of the products of combustion after they have accomplished their full work in the cylinder and without obstructing or retarding their exit against the pressure of the atmosphere. The device in the English patent referred to would not be operative in connection with the comparatively feeble exhaust of a gas engine for the reason that the power piston thereon is of less diameter than the forcing piston, a construction practicable only where the explosive force of the gases is used to pump the cooling liquid.

The whole gist of my invention consists in rendering the exhaust available practically for forwarding the cooling liquid,—a result not heretofore attained satisfactorily or commercially,—and the feature of novelty is the use of a power piston of greater diameter than the forcing piston, so that the feebleness of the exhaust of the spent gases against atmosphere pressure is compensated for and the cooling water is positively forwarded to the water jacket under considerable pressure.

I am aware also that it is customary in steam pumps, fire engines, &c., to make the power piston larger than the water piston; but these are all devices operated by direct expansion or high pressure; whereas my device is designed to utilize only the exhaust of the products of combustion from a gas engine, and accomplishes results not heretofore attained in that direction.

What I claim as my invention, and desire to secure by Letters Patent, is—

In combination with the cooling jacket and with the exhaust passage of a gas engine, a pulsometer interposed between the exhaust and the cooling liquid supply pipes consisting of a larger chamber opening into a branch of the exhaust pipe and a smaller chamber opening into the cooling liquid supply pipe, a larger and a smaller piston situated respectively in the aforesaid chambers and connected by a rigid stem; a stationary bearing plate between the two piston heads; a spring interposed between said stationary bearing plate and the large piston; and a spring interposed between said stationary bearing plate and the smaller piston, for the purpose and substantially in the manner described.

FEODOR HIRSCH.

Witnesses:

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