No. 835,262. PATENTED NOV. 6, 1906.

W. H. SODEAU.

MEANS FOR HEATING COMPRESSED GAS.

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Fig. 1.

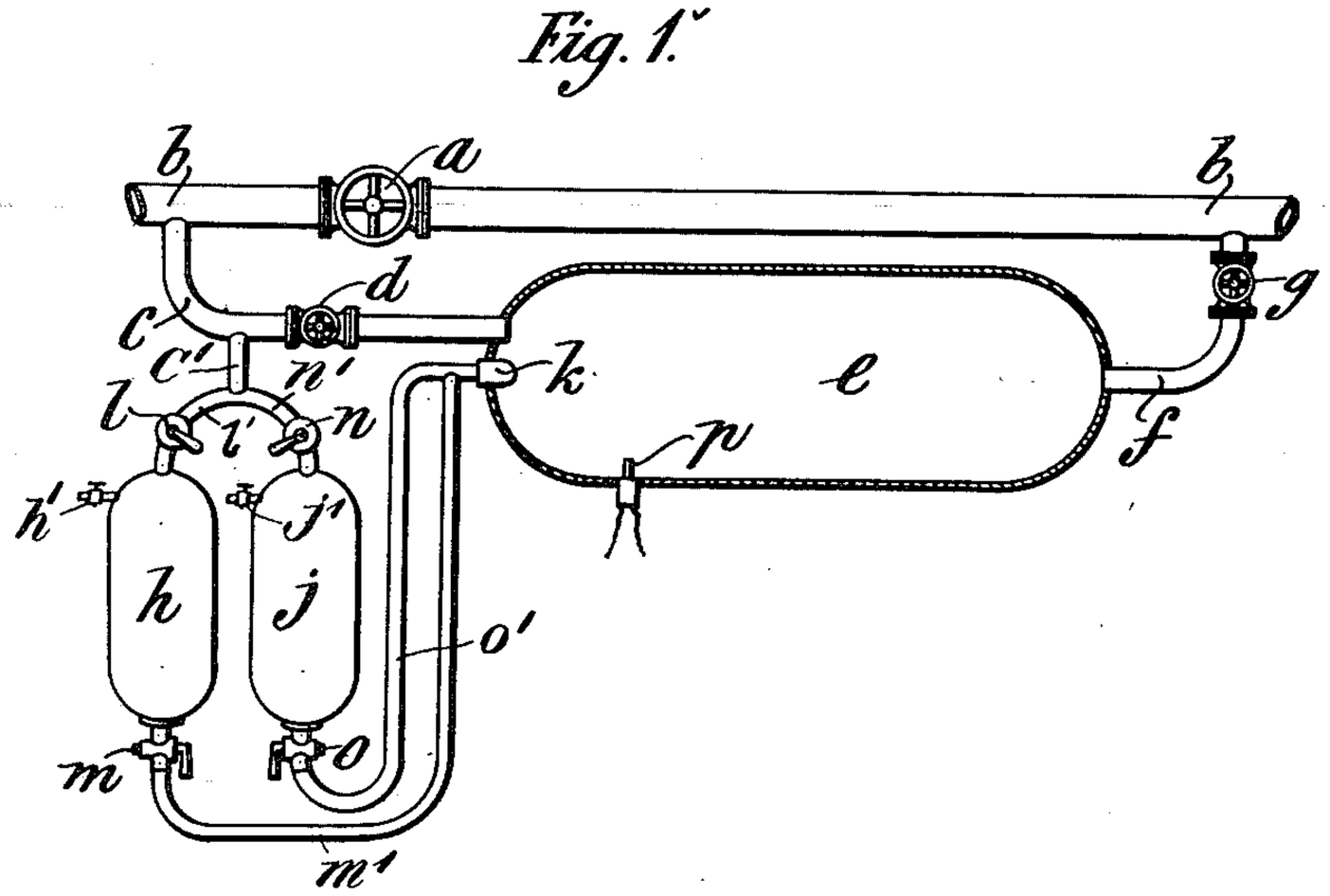
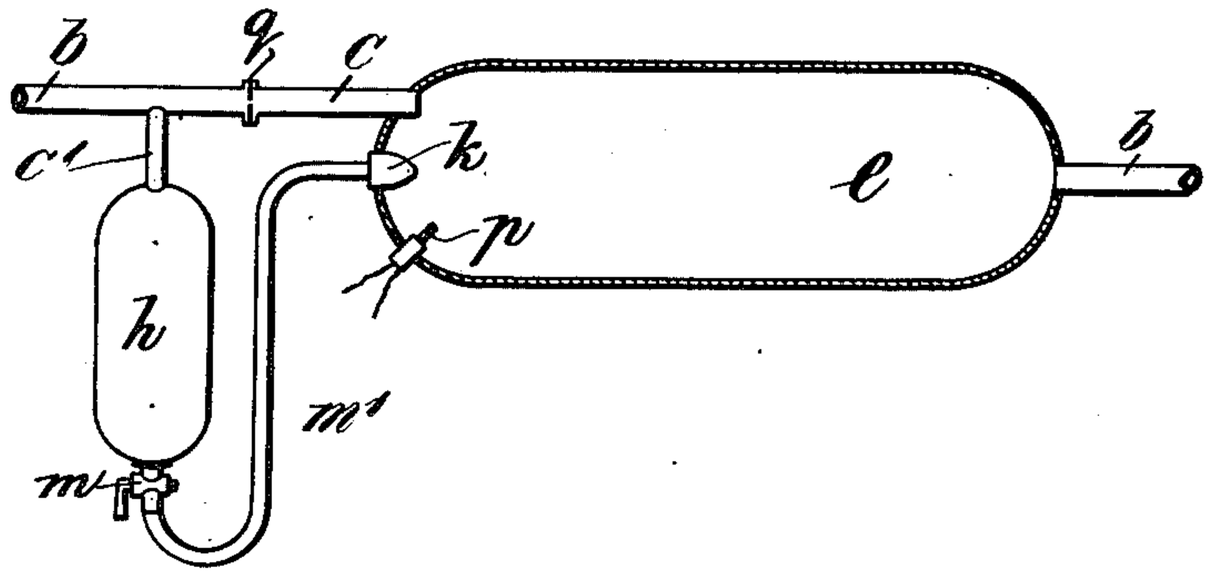


Fig. 2.



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MEANS FOR HEATING COMPRESSED GAS.

No. 835,262. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed August 21, 1905. Serial No. 275,029.

To all whom it may concern:

Be it known that I, WILLIAM HORACE SODEAU, engineering chemist, a subject of the King of Great Britain, residing at Elswick Works, Newcastle-upon-Tyne, England, have invented certain new and useful Improvements in Means for Heating Compressed Gas, of which the following is a specification.

It has before been proposed to heat compressed air or gas by means of the combustion in it of petroleum, alcohol, or other suitable combustible liquid, thereby raising the temperature of the air and consequently increasing the volume which a given weight would occupy at a given pressure. The rise of temperature has other beneficial effects, notably that it is capable of preventing the formation of ice from any water which may have been carried forward by the compressed air.

According to this invention the combustion takes place inside the pipe or passage through which the compressed air is supplied to the engine or pneumatic tool, which pipe or passage will usually be locally increased in diameter in order to provide a combustion-chamber of sufficient capacity and suitable shape, and the arrangement is such that the ratio of fuel to air can be kept practically constant or can be varied at pleasure.

The combustible liquid is contained in an appropriate vessel or fuel-reservoir communicating with the compressed-air-supply pipe at a point where the pressure is higher than in the combustion-chamber and connected to a pipe passing into the combustion-chamber, where it preferably terminates in a suitable spraying-nozzle.

In some installations there may be an already existing drop of pressure which can be utilized for feeding the combustible liquid into the combustion-chamber; but it is usually necessary to interpose a special obstacle, such as a cock or a perforated plate, in the path of the compressed air.

The amount of combustible liquid fed into the combustion-chamber per unit weight of compressed air will of course depend upon the relative densities of the two fluids and the relative resistances in the paths of each. Thus the relative proportion of a given combustible liquid may be increased by decreasing the size of the hole or holes in the perforated plate above described or by increasing the orifice through which the combustible liquid is discharged. The same effect is produced by decreasing the pressure, and consequently the density, of the compressed-air supply; but if the mean pressure is kept constant the proportion will be but little influenced by the rate at which the compressed air is passing, as the stream of combustible liquid will vary in practically the same degree. It will thus be seen that within reasonable limits any desired temperature can be obtained by altering the mean pressure or by changing the arrangement producing the drop in the air-pressure or by changing the fuel-delivery orifice.

When only a moderate rise of temperature is desired, as in the case of pneumatic hand-tools, &c., only a portion of the total air-supply need be sent through the combustion-chamber, appropriate cocks, valves, or other controlling devices being employed to obtain the desired ratio between the two air-streams which streams are, of course, subsequently reunited.

In installations which are required to run for long periods I preferably employ two or more fuel-reservoirs provided with appropriate cocks or valves so arranged that an empty reservoir may be shut off and refilled without interfering with the continuous action of the appliance. The spray may be ignited by introducing a piece of burning material into the combustion-chamber after temporarily relieving the pressure in the same (appropriate valves, cocks, doors, &c., being provided for this purpose) or while the compressed air is actually traversing the combustion-chamber by means of an ignition-tube, primer, cap, or electric ignition device.

Figure 1 is a diagrammatic sectional elevation of an apparatus suitable for use with pneumatic hand-drills and the like. Fig. 2 is is a milar view of an apparatus suitable for torpedo propulsion.

In Fig. 1 the greater part of the air passes through the cock *a* in the main supply-pipe *b*, by which it is led to the engine; but a portion takes the alternative path through the pipe *c*, which forms a connection between the air-supply pipe *b* and the combustion-chamber *e*,

and becomes heated and then rejoins the main stream through the pipe *f* and cock *g*.

Liquid fuel is contained in the fuel-reservoirs *h j*, which are connected to the air-supply pipe *b* by the pipes *c c'* and *l'* and *n'*, the pipes *l'* and *n'* being provided with cocks *l* and *n*. The reservoirs *h* and *j* are connected to the chamber *e* by the pipes *m'* and *o'*, which are provided with cocks *m* and *o*. Fuel may be supplied to the reservoirs through the valved openings *h'* and *j'*.

The drop of pressure caused by the cock *d* causes the liquid fuel to be forced through the spraying-nozzle *k* for combustion in the chamber *e*.

The proportion of fuel to air in *e* may be increased by decreasing the opening of the cock *d*, while the fuller opening of the cock *g* or the partial closing of the cock *a* will cause a larger stream to pass through the chamber *e*. These adjustments enable the desired temperature to be obtained.

When the reservoir *h* becomes empty, it may be refilled after closing the cocks *l* and *m*, the supply of fuel being meanwhile obtained from the reservoir *j*, and the latter can be similarly filled after closing the cocks *n* and *o*. The spray may be ignited by means of an appropriate electric igniter *p*.

In Fig. 2 the portion of the pipe *b* between the pipes *c* and *f*, Fig. 1, is omitted, the pipe *c* being in a line with and forming a continuation of the pipe *b*, so that the whole of the air passes through the chamber *e* and is led away by the pipe *f* of Fig. 1, which is now merged in the outgoing portion of the pipe *b*. In this case the requisite head for spraying is caused by the insertion of a perforated plate *q* in the pipe *c*, through which the whole of the compressed-air stream passes into the combustion-chamber *e*.

When the engine has made a prearranged number of revolutions, the valve *m* is opened by hand and liquid fuel is forced from the reservoir *h* through the nozzle *k* into the chamber *e*. Almost immediately the primer *p* is fired and the spray is thereby ignited. In both arrangements the ends of the pipes *m'* and *o'*, which are connected to the chamber *e*, are preferably at a higher level than the tops of the reservoirs *h* and *j*, so that fuel is only supplied to the chamber *e* when air is flowing through the pipe *b*.

What I claim is—

1. The combination of an air-supply pipe, a reservoir for liquid fuel, a combustion-chamber, connections from the pipe to the reservoir and chamber, a connection from the reservoir to the chamber, and means in the connection from the pipe to the chamber for reducing the pressure of the air-supply to the chamber as compared with that of the reservoir.

2. The combination of an air-supply pipe, a reservoir for liquid fuel, a combustion-chamber, connections from the pipe to the reservoir and chamber, a connection from the reservoir to the chamber, (the chamber end of this connection being at a higher level than the top of the reservoir,) and means in the connection from the pipe to the chamber for reducing the pressure of the air-supply to the chamber as compared with that to the reservoir.

3. The combination of an air-supply pipe, a reservoir for liquid fuel, a combustion-chamber, a connection from the pipe to the reservoir, two connections from the pipe to the chamber, a valve in the pipe between these two connections, a connection from the reservoir to the chamber, and means in one of the connections from the pipe to the chamber for reducing the pressure of the air-supply to the chamber as compared with that to the reservoir.

4. The combination of an air-supply pipe, a reservoir for liquid fuel, a combustion-chamber, a connection from the pipe to the reservoir, two connections from the pipe to the chamber, a valve in the pipe between these two connections, a connection from the reservoir to the chamber, (the chamber end of this connection being at a higher level than the top of the reservoir,) and means in one of the connections from the pipe to the chamber for reducing the pressure of the air-supply to the chamber as compared with that to the reservoir.

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Witnesses:

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