

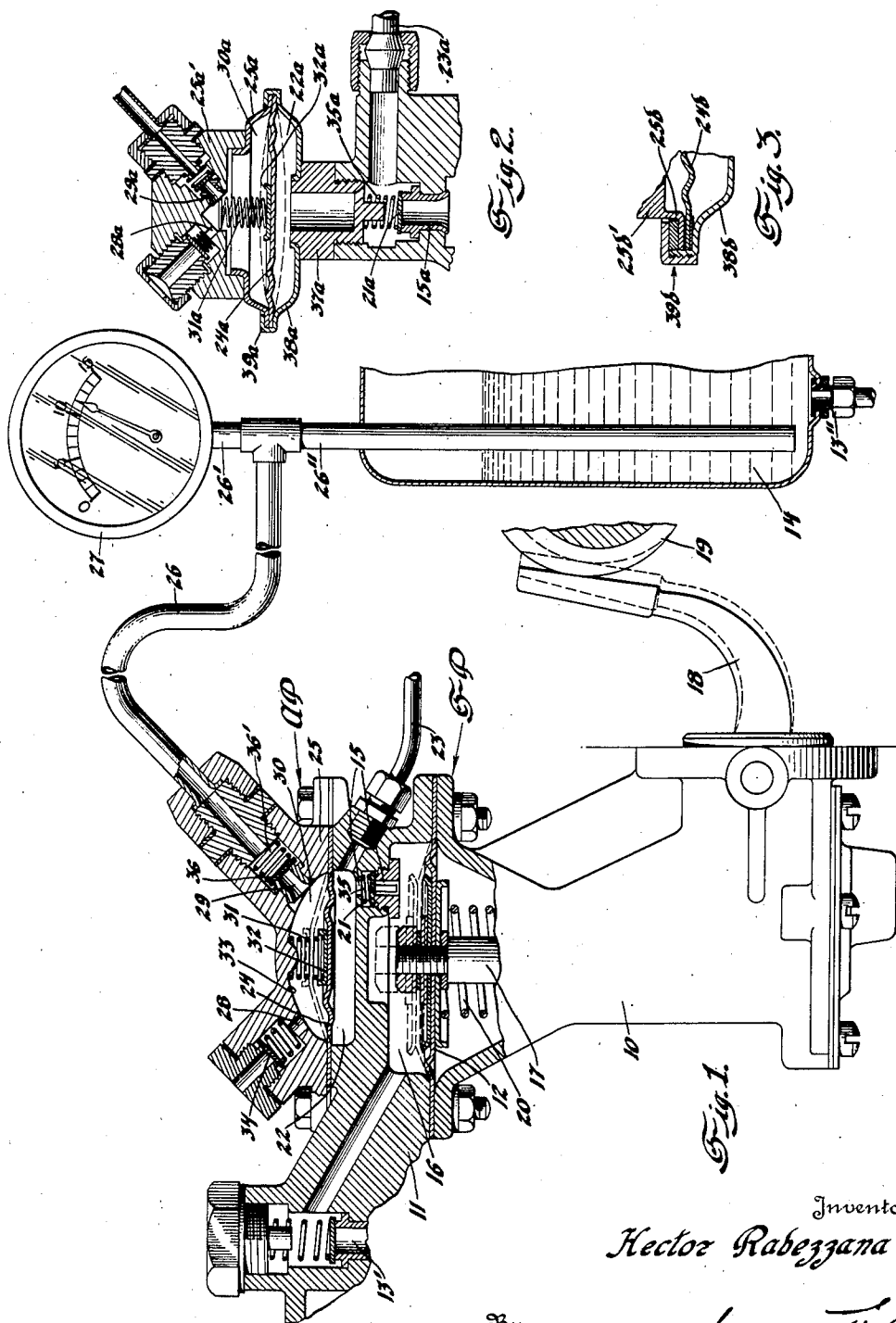
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FUEL PUMP WITH AIR PUMPING PULSATOR

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FUEL PUMP WITH AIR PUMPING PULSATOR

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Extensive use being currently made, in connection with the engines of automotive vehicles, and the like, of fuel pumps in which the effect of the expulsion strokes, accomplished by resilient means, is supplemented by the use of a so-called pulsator, placed in proximity to a valved outlet from the fuel pump and serving to maintain an advance of pumped fuel during intervals wherein an outlet valve is closed. it is an object of this invention to utilize, for an additional pumping effect, the motion which is incidentally imparted to a diaphragm comprised therein.

Fuel tanks disposed at low levels being commonly connected by air-receiving pipes with level-indicating instruments which are positioned favorably for inspection, it is an object of this invention to provide means for the replenishment of air in such pipes,—to keep the same filled with air at all times; and, in preferred embodiments of this invention, the fuel pump pulsator, whether built into the fuel pump or used in replacement of a usual valve plug or the like, may accordingly be adapted to pump air, whenever fuel is pumped, into such air-containing pipes.

Other objects of this invention, all forms of which will be seen to provide means for utilizing variations in pressure which occur within a pressure-equalizing chamber, in consequence of the operation of a reciprocatory fuel pumping element, to pump an additional fluid such as air, may be best appreciated from the following description of an illustrative embodiment of said invention taken in connection with the appended claims and the accompanying drawings.

Figure 1 is a somewhat diagrammatic elevational view, with parts broken away, showing a fuel pump of the general type referred to, as modified to include a built-in pulsator which serves not only to maintain the flow of delivered fuel, but to pump air,—the pumped air being advanced into the air-receiving pipes of a fuel-level indicating system.

Figs. 2 and 3 are fragmentary vertical sectional views suggesting modifications of a separate-unit pulsator (of the Zubaty-Babitch type—having a valve plug body) to

adapt the same to serve incidentally in the pumping of air, or the like.

Referring to details of that specific embodiment of the present invention illustrated in Fig. 1, a fuel pump FP is shown as comprising a main structural element in the form of a pump body casting 10 and subsidiary structural element 11,—these elements cooperating in the retention of a reciprocatory pumping element in the form of diaphragm 12. The subsidiary structural element 11 is shown as providing not only a valved inlet passage 13' (which may be directly or indirectly connected with an outlet 13'' from a gasoline or fuel supply tank 14) and a valved outlet passage 15 but also a fuel pump chamber 16,—the volume of the latter being variable by reciprocation of the diaphragm 12; and such reciprocation may be effected in any known or preferred manner, immaterial to this invention, or by means including a so-called diaphragm stem 17 and a lever 18, connected therewith and engaging a cam 19, or the like. These parts may serve to effect intake strokes of said diaphragm,—expulsion strokes thereof being effected by resilient means such as a calibrated compressure spring 20.

The employment of any resilient closing means in connection with an outlet valve such as is shown at 21 should be regarded as optional; but, in order to provide a pulsator in proximity to said valve (to permit or maintain the advance of pumped fuel during intervals wherein said valve remains closed) a pulsator chamber or pressure-equalizing chamber 22, shown as in open communication with a fuel delivery pipe 23 (which may lead to a carburetor float chamber or the like, not shown) may be additionally provided in the subsidiary structural element 11,—the chamber 22 being shown as provided with a yieldable wall in the form of a second diaphragm 24, peripherally secured by any suitable annularly-contacting element 25.

The mentioned parts may be regarded as comprising a complete fuel pump: but in order to render the yieldable wall or diaphragm element 24 effective as a reciprocatory pumping element of an air pump AP

for the advancement of air into, for example, air-receiving pipes 26, 26', 26'', connected with an indicator 27, and shown as extending upward from a level near the bottom of the tank 14, the mentioned element 25, or its equivalent, may be integrally or otherwise associated with parts which provide not only a valved inlet passage 28, and a valved outlet passage 29 (the latter communicating with the pipe 26) but also an air pump chamber 30,—variable in volume by each reciprocation of the diaphragm 24 in response to variations in pressure therebelow.

In preference to relying solely upon external air pressure to depress the diaphragm 24, positive means, such as a suitably calibrated but light spring 31 (shown as interposed between a cup 32, engaging diaphragm 24, and an upper wall 33 of the chamber 30) may be used to bias said diaphragm toward a simultaneous expansion of the air pump chamber 30, to effect an intake of air past an air inlet valve 34, and a corresponding diminution of the pressure-equalizing chamber 22,—to effect an advance of pumped fuel therefrom during the fuel-intake strokes of diaphragm 12, or its equivalent; and the subsequent advance of diaphragm 12, diminishing the volume and increasing the pressure thereabove sufficiently to advance fuel past valve 21, may normally cause not only an outflow through fuel delivery pipe 23, but a compression of spring 31, and an advance of air past valve 36, or its equivalent, into the air-receiving pipe 26. Valve 21 and valve 36 are shown as respectively provided with springs 35 and 36'.

To facilitate the employment of the principles underlying the present invention in the operation of fuel pumps which are not initially provided with pulsators, or which are provided with pulsators of, for example, the so-called Zubaty-Babitch type (as described and claimed in pending application S. N. 288,755, filed June 27, 1928) use may be made, if desired, of such constructions as are suggested in Figs. 2 and 3. In Fig. 2, a pulsator in the form of a separate unit, comprising a valve-plug body 37a is shown as secured above an outlet valve 21a and a spring 35a in a passage 15a leading to a fuel pump delivery pipe 23a; and said valve plug includes an upwardly concave element 38a, adapted to cooperate with a somewhat similar but downwardly concave annular element 25a in the retention of a diaphragm 24a in such manner as to provide not only a pressure-equalizing chamber 22a therebelow but also an air pump chamber 30a thereabove. The annular element 25a is shown as surmounted by a special part 25a' providing a valved inlet passage 28a and a valved outlet passage 29a and serving also to provide a stop or retaining socket for a spring

31a,—engaging a cup 32a and tending to depress diaphragm 24a.

It will be obvious that the operation of this air pumping pulsator is similar to that of the pulsator above described; and that the concave elements 22a and 25a, or their equivalents, may be held in tight engagement with the diaphragm 24a or its equivalent, either by a crimping-on operation of the general character suggested at 39a, Fig. 2, or by the use of a suitable threaded connection. A connection of the latter sort is suggested at 39b, Fig. 3, in which parts 24b and 25b, 25b' and 38b will be seen to correspond, in point of function, with parts 24a, 25a, 25a', and 38a of Fig. 2.

Although I have described but one complete fuel pump comprising a built-in pulsator which serves also as an air pump, suggesting as an alternative the use of a removable pulsator adapted incidentally to pump air into an indicator system, it should be understood not only that various features of the present invention may be independently employed but also that numerous additional modifications may easily be devised,—without involving the slightest departure from the scope of the present invention as the latter is indicated above and in the following claims.

I claim:

1. In a combined fuel pump and air pump; structural elements defining a fuel pump chamber, a pressure-equalizing chamber, and an air pump chamber; diaphragm means for varying the volume of said fuel pump chamber for a fuel pumping effect, a valved passage being provided from said fuel pump chamber into said pressure-equalizing chamber; and means rendering variations in pressure in said pressure-equalizing chamber effective to vary the volume of said air pump chamber, for an air pumping effect, said last-mentioned means comprising a yieldable diaphragm interposed between said pressure-equalizing chamber and said air-pump chamber and provided with resilient means tending simultaneously to effect an expulsion of fuel and an intake of air relative to said last-mentioned chambers respectively.

2. A combination as designed in claim 1 in which said air pump chamber is provided by an annularly-contacting element through which extend separate and oppositely inclined air intake and air outlet passages; each containing a spring-seated valve.

3. A combined fuel pump, pulsator and air pump, comprising a body element forming a chamber housing operating means, an intermediate element forming a fuel pumping chamber and a pressure-equalizing chamber, and an upper element forming an air pumping chamber, with a reciprocable flexible diaphragm interposed between said first and second chambers and connected to said

operating means, a valve between said second and third chambers, and a flexible diaphragm interposed between said third and fourth chambers.

- 5 4. In a fuel pump, a pump chamber, an outlet passage therefrom, an outlet valve in said passage, a seating spring for said valve, and a fuel pump pulsator interposed in said passage and retaining said valve spring, said
10 pulsator including a pressure equalizing chamber and an air pump chamber, a diaphragm interposed between said chambers and a spring within said air pump chamber engaging said diaphragm and biasing the
15 same towards expansion of said chamber.

In testimony whereof I affix my signature.

HECTOR RABEZZANA.

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