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O. R. GRÖNKWIST
MEANS FOR INJECTING LIQUID FUEL AND OTHER LIQUIDS
INTO EXPLOSION MOTORS, FURNACES, AND THE LIKE
Filed June 27, 1921

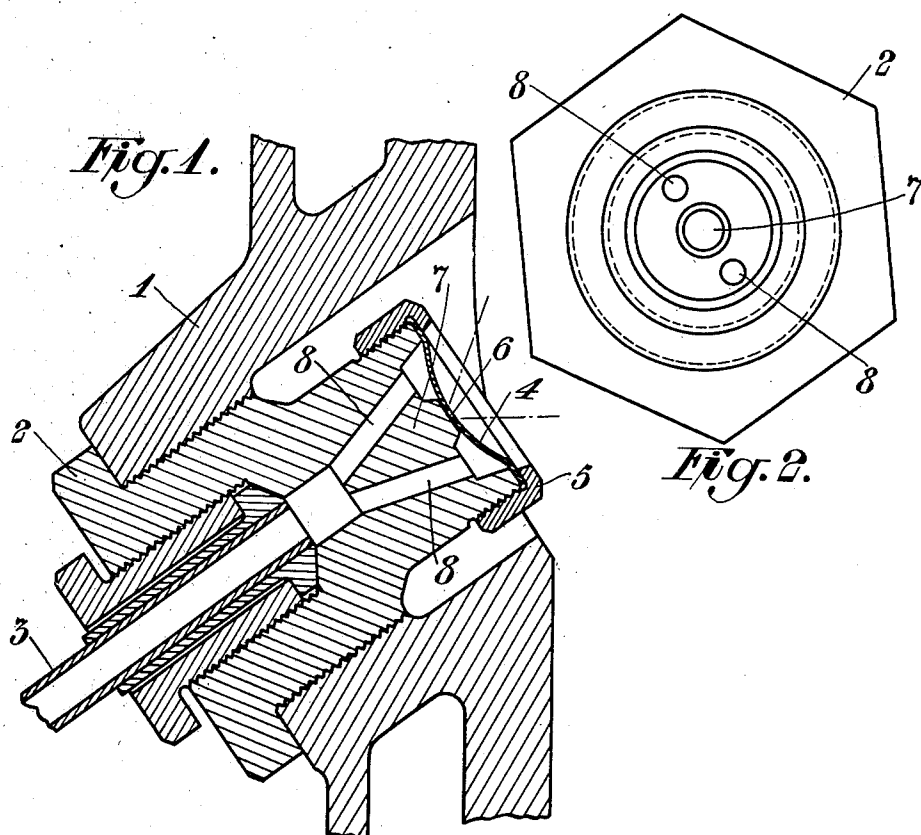
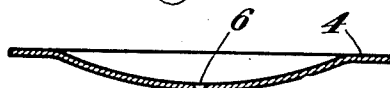


Fig. 3.



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MEANS FOR INJECTING LIQUID FUEL AND OTHER LIQUIDS INTO EXPLOSION MOTORS, FURNACES, AND THE LIKE.

Application filed June 27, 1921. Serial No. 480,799.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, OSCAR ROBERT GRÖNKWIST, a subject of the King of Sweden, residing at Stockholm, in the Kingdom of Sweden, have invented a new and useful Improvement in Means for Injecting Liquid Fuel and Other Liquids into Explosion Motors, Furnaces, and the like (for which I have filed applications in Sweden, May 7, 1915, Patent No. 42,013; in Austria, April 25, 1916, Patent No. 75,378; in Norway, April 26, 1916, Patent No. 27,796; in Germany, April 29, 1916, Patent No. 304,232; in Russia, April 30, 1916, application No. 69,239; in Great Britain, May 2, 1916, Patent No. 100,445; in Denmark, November 29, 1919, Patent No. 27,411; in Switzerland, December 2, 1919, Patent No. 87,091; in Spain, December 16, 1919, Patent No. 71,745; in France, December 15, 1919, Patent No. 507,396; in Belgium, December 15, 1919, Patent No. 283,884; in Italy, December 24, 1919, application No. 280/108; in Czechoslovakia, January 12, 1920, Patent No. 2302; and in Poland, January 22, 1920, application No. 1266/1920), of which the following is a specification.

This invention relates to means for injecting liquid fuel or other liquids into explosion motors, furnaces, and the like.

It has already been proposed to arrange a spring-actuated valve in the passage through which the liquid is to pass when injected, which valve while overcoming the resistance of the spring, becomes opened when the liquid is forced in under a sufficient high pressure. Such valves have the disadvantage, however, that on account of their comparatively great inertia they can not effect an instantaneous and complete closure when the supply of the liquid ceases. As a consequence some of the liquid will easily collect in drops at the injection opening, which is disadvantageous particularly in internal combustion engines, because these drops are gasified only with difficulty and incompletely, thus causing smoke and soot.

The object of the invention is, primarily, to avoid this difficulty. This object is attained by this, that the passage through which the liquid is to pass when injected, is normally kept closed by a resilient membrane which owing to its own elasticity is

kept bearing against a stationary member or, if desired, against another membrane, but when the liquid is forced in under pressure, is deflected and allows the liquid to pass. The resilient membrane itself thus serves as closing member and, such a membrane possessing an infinitely small inertia, it can effect a complete and instantaneous closure as soon as the pressure ceases. The quantities of liquid injected into the motor cylinder or into the furnace thus become completely and finely distributed or divided and accurately measured. Moreover, the advantage is attained that the device becomes simple and its manufacture becomes inexpensive.

In the accompanying drawing Fig. 1 shows a section of the device with a membrane provided with an injection opening and bearing against, or cooperating with a stationary member. Fig. 2 shows an end view of the member against which the membrane bears. Fig. 3 shows to a larger scale the membrane of Fig. 1.

In the drawing, 1 denotes a portion of the motor cylinder, 2 a plug inserted in the same, and 3 a tube secured to the plug for supplying the liquid fuel. 4 denotes the membrane which is secured to the plug by means of a nut 5. The nut and the membrane may, however, also be made in one piece. The membrane is provided with a central opening 6, preferably conical and with the smaller diameter at the side of the membrane bearing against the stationary member, and provided with sharp edges, as is more clearly shown in Fig. 3. The membrane is secured to the plug in such manner that the central portion of the membrane bears against the plug at 7 and that the opening 6 becomes closed by the contact thus established, especially in case there is a pressure on the outside of the membrane. 8, 8 denote one or more passages through which the fuel is admitted from the tube 3 to the back side of the membrane.

The arrangement operates in such manner that when the fuel is forced—for instance by means of a pump—into the tube 3 and when the pressure has attained a certain limit, the membrane is deflected outwards so that the contact with 7 ceases and thus the opening 6 is freed. The fuel is then forced out at high speed from the thin

layer between the membrane and the plug through the opening 6 and is distributed in the combustion chamber in a very finely divided state. To this distribution there contributes to a considerable degree the circumstance that the path of the fuel between the membrane and the stationary member (the plug) and out through the opening forms a right, or nearly right angle, owing to which the flow is subjected at one place to such a violent interruption that the fuel becomes finely divided. As soon as the forcing out of the fuel ceases, the membrane returns to closing position owing to its elasticity. In the embodiment according to Fig. 1 the closure is effected the more rapidly and securely in proportion as the pressure from the combustion chamber exerts a powerful action on the membrane and presses the same against the plug. On account of the closure being effected in this manner rapidly and securely, any portion

of the liquid is prevented in the manner stated above from being forced out through the injection opening in a state otherwise than finely divided. Moreover, the liquid back of the membrane becomes preheated to a certain extent, the thin membrane being a good conductor of heat.

I claim:

A means for injecting liquid fuel and other liquids into explosion engines, comprising a resilient diaphragm secured all around its periphery and provided with an outlet aperture in its central portion, and an abutment located entirely to one side of said diaphragm and normally engaged by said central portion of the diaphragm so as to normally close the aperture therein, the opposite side of the diaphragm inward of the periphery being entirely uncovered and directed towards the explosion chamber of the engine.

OSCAR ROBERT GRÖNKWIST.