

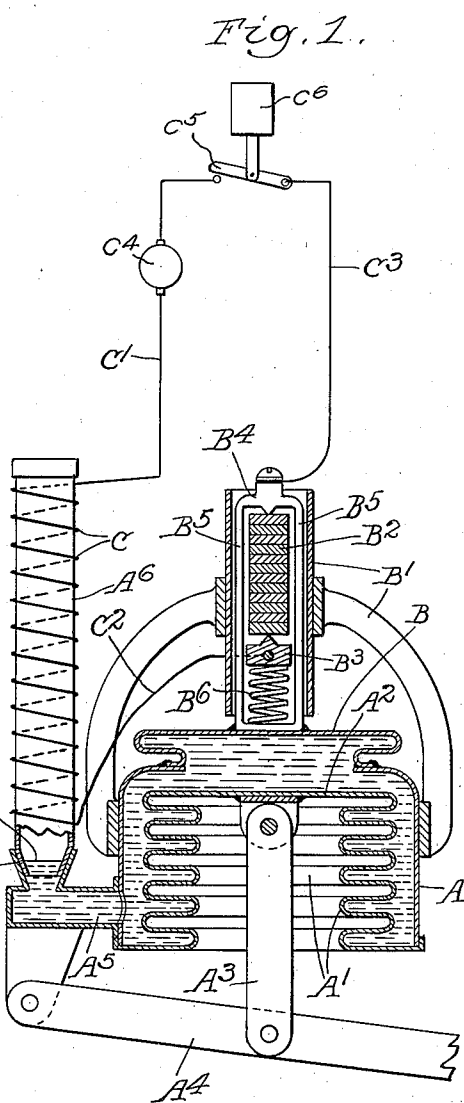
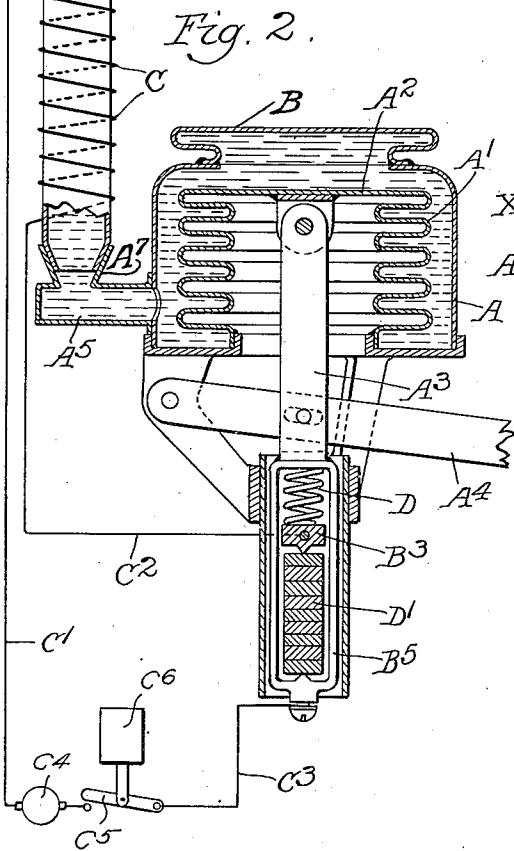
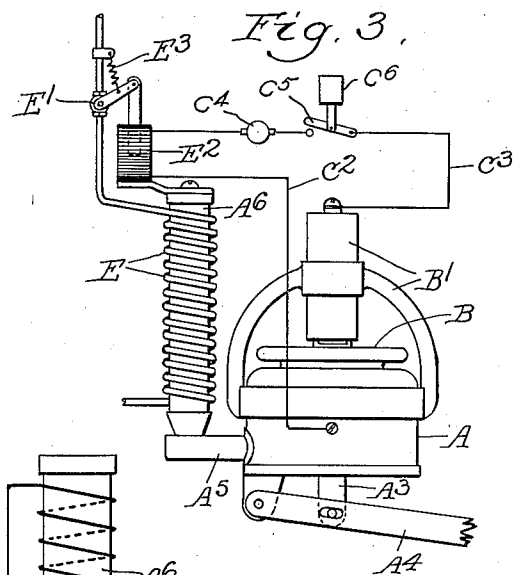
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L. M. PERSONS

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VAPOR MOTOR

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UNITED STATES PATENT OFFICE

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VAPOR MOTOR

Application filed November 23, 1928. Serial No. 321,441.

My invention relates to improvements in electrically or other heated vapor motors such as are used for operation of switches and the like responsive to temperature, pressure or other conditions. It has for one object to provide in connection with the conventional type of electrically heated vapor motor means whereby increase in pressure in the working cylinder itself may serve to limit or control the heat so that while keeping the heat on constantly during the time that the vapor is expanded, it is possible to reduce the total quantity of heat during a portion of the period, thus permitting the use of a relatively large starting heat effect and a relatively small subsequent heat effect as distinguished from the use of a fixed heat during operation smaller than the starting heat but less than the continuing heat thereby giving quicker action with less total consumption of power. Other objects of my invention will appear from time to time throughout the specification and claim.

My invention is illustrated more or less diagrammatically in the accompanying drawing, wherein

Figure 1 is a diagrammatic section through a vapor motor embodying my invention;

Figure 2 is a section through a modified form;

Figure 3 is an elevation of a form wherein the heat is applied by means other than electric means.

Like parts are indicated by like characters throughout.

A is a rigid cylindrical housing. Contained therein and extending upwardly from the lower edge thereof is a flexible metallic bellows A¹ terminating in a rigid plate A². A³ is a connecting rod pivoted on the plate A² extending downwardly generally along the axial line of the bellows and pivoted on a lever A⁴, by which a switch or other suitable mechanism may be operated. Extending outwardly from the wall of the housing A is a pipe A⁵. Extending upwardly from this pipe is a heating tube A⁶. This tube is preferably of steel, is thin and is necked down at A⁷ where it joins the pipe A⁵ so as to present a minimum area for the conduc-

tion of heat from the tube A⁶ to the pipe A⁵ and thence to the cylinder A.

B is a flexible diaphragm closing the upper end of the cylinder A. Projecting upwardly from the cylinder and out of contact with the diaphragm is a supporting bracket B¹. B² is a carbon pile mounted in the bracket B¹ between the fixed abutment B³ and a moving abutment B⁴. This moving abutment is carried by a yoke B⁵ which extends downwardly to engage the diaphragm B. A spring B⁶ presses downwardly on the diaphragm being engaged on its upper end on the underside of the abutment B⁵.

C is an electric heating coil surrounding the tube A⁶. The conductor C¹ extends out from the coil at one end to any suitable source of power. The conductor C² extends from the other end of the coil through the abutment B³ to the carbon pile. A conductor C³ extends from the carbon pile to the suitable source of power C⁴, there being in the circuit means, such as the switch C⁵ and its operating mechanism C⁶ for opening and closing it when it is desired to operate the lever A⁴. Variation in the pressure on the carbon pile B² changes the resistance interposed thereby in the circuit. The spring B⁶ pressing downwardly on the diaphragm exerts a maximum pressure on the carbon pile so as to give a minimum resistance. When the circuit is closed the heating coil C is energized, the alcohol in the tube A⁶ which fills the tube and the space between the bellows A¹, the cylinder A and the diaphragm B is heated, is vaporized and is forced downwardly into a position indicated at X at the bottom of the tube A⁶, thus exerting a pressure on the bellows causing operation of the lever. As soon as the pressure caused by this vaporization and expansion of the alcohol reaches a certain predetermined point, the diaphragm B is forced up compressing the spring B⁶ and reducing the pressure on the carbon pile, thereby interposing a resistance in the line and decreasing the heat generated by the coil C. The coil C remains heated. The vapor in the tube A⁶ remains heated and because the vapor has caused the alcohol to be forced down out of contact with the heated part of

the tube, the bellows remains in the expanded position as long as current passes through the system. The reduction in the heat caused by the decrease in pressure on the carbon pile being sufficient to prevent overheating and other expansion of the liquid. Since this makes possible the use of relatively high current and high heat effect until the carbon pile resistance is interposed very quick action of the motor results. But since the heat is on all the time no fluttering action occurs as would be the case were the flexible diaphragm set to operate a make and break switch.

In the modified form shown in Figure 2 it will be noted that the pressure on the carbon pile instead of being directly controlled by movement of a separate diaphragm is controlled by a downward extension of the link A³ which exerts a pressure in opposition to the spring D, which spring normally exerts a pressure on the carbon pile D¹ to compress the pile and reduce the resistance.

In the modified form shown in Figure 3 the tube A² is heated by a steam coil E controlled by a valve E¹ which valve E¹ is electrically controlled by means of a solenoid E², spring E³, the solenoid E² being energized by means of current passing through the carbon pile so that the resistance in the circuit changes the position of the valve so as to control the rate of steam flowing through the heating coil. Otherwise the operation is identical.

I claim:

In a vapor motor, a closed and gas-tight liquid filled system including a working chamber having wall portions movable in response to pressure changes within the system, a heating chamber in connection with the working chamber and externally positioned resistance means for continuously heating the heating chamber and thereby effecting changes in the pressure within the system, a work performing member and an operative connection between it and one movable wall portion of the working chamber, an actuating circuit for the resistance heating means and means, responsive to movement of the other movable wall portion of the working chamber, for varying the flow of current through said circuit.

Signed at Chicago, county of Cook and State of Illinois, this 17th day of November, 1928.

LAURENCE M. PERSONS.