Oct. 7, 1930. F. OBERASCHER 1,777,649

DEVICE FOR EVACUATING PUMPS

Filed June 19, 1928

Fig. 1

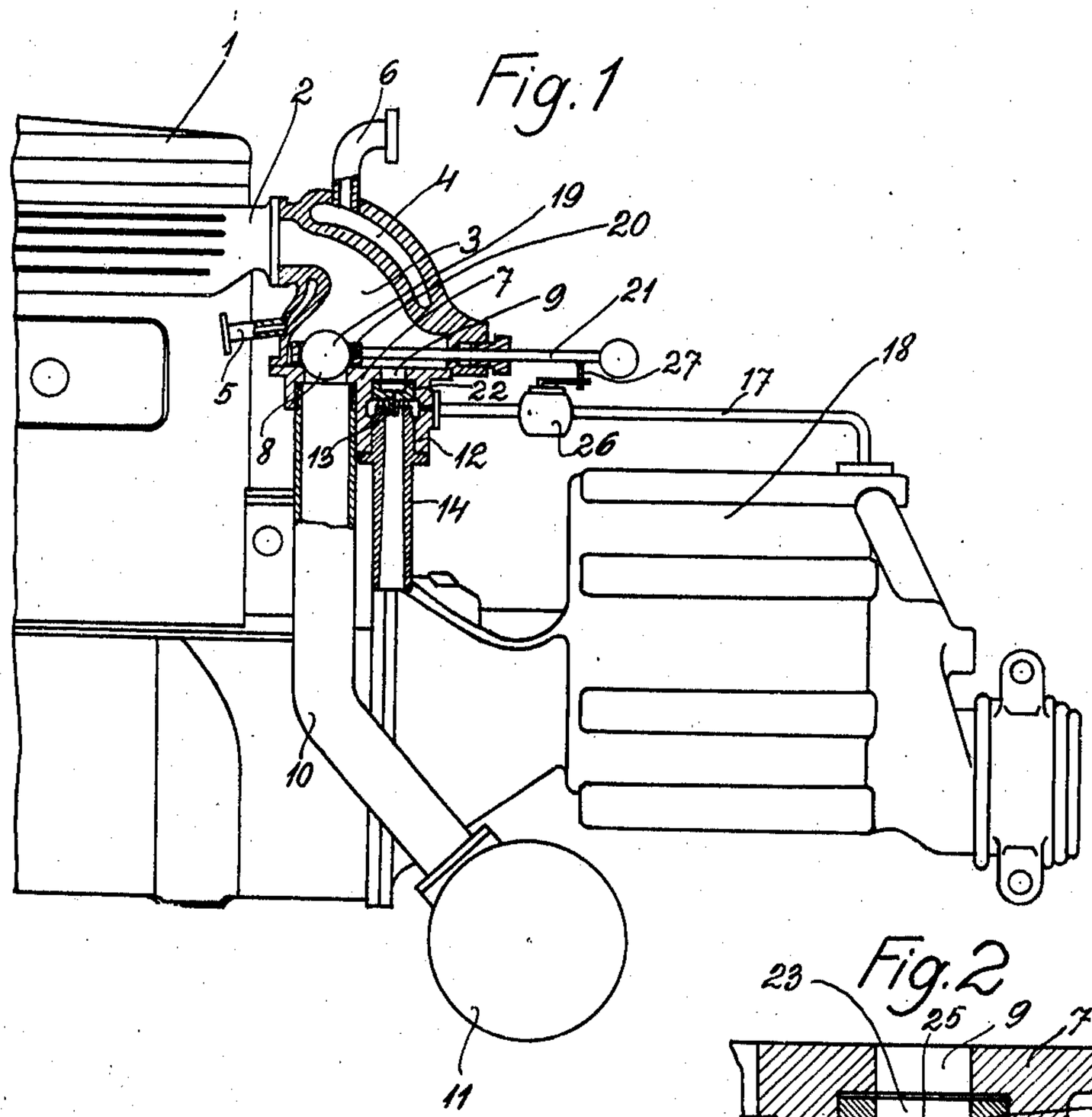
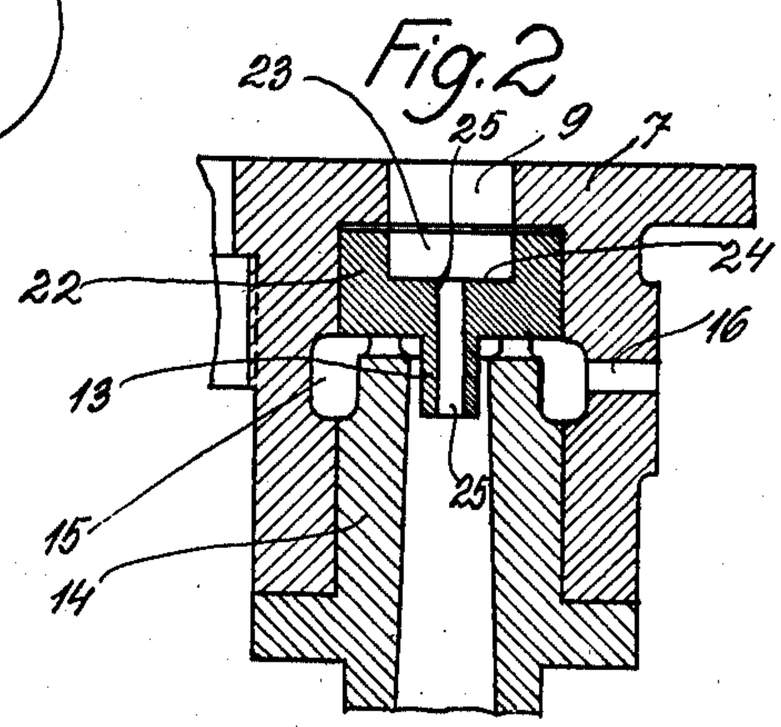


Fig. 2



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DEVICE FOR EVACUATING PUMPS

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It has already been proposed to carry out the evacuation of rotary pumps by means of an ejector, the suction effect of which would be brought about by the flow energy of a current of exhaust gases coming from an internal combustion engine and passing through the ejector. In case of a pump forming part of the firefighting outfit of a fire brigade vehicle the exhaust gases of the motor itself may be used for operating the ejector. Considering however that the pressure of the exhaust gases is not high and that in consequence the flow energy available will be relatively small, it must be reckoned with that the suction effect caused in the ejector by the exhaust gases will as a rule be insufficient and this all the more in proportion to the pressure losses occurring between the exhaust side of the internal combustion engine and the ejector.

The object of my invention is to improve the above mentioned device so that a greater suction effect is caused in the ejector by the energy of flow of the exhaust gases as could hitherto be realized; it being a further object of this invention to reduce the pressure losses of the exhaust gases before their entrance into the ejector so that in consequence—by intensifying the suction effect on the one hand and by reducing the losses of energy of the exhaust gases before their entrance into the ejector on the other hand—the total effect of the evacuating device is improved to such a degree, that a higher vacuum and accordingly a far higher pump lift is obtainable as compared with all other similar devices known.

The increase of the suction effect of the ejector is according to my invention obtained by placing shock walls directly at the entrance of the ejector jet whereby the entrance edge of this jet is preferably made as sharp as possible. The reduction of the energy losses of the exhaust gases is brought about according to my invention by locating the ejector as near as possible to the exhaust side of the internal combustion engine and even to join it directly to exhaust outlet. It is recommendable to cool down the exhaust gases leaving the internal combustion engine with a high temperature before their entrance into the ejector in order to prevent the organs of the evacuating device to be damaged by the heat of the exhaust gases.

A mode of execution of the evacuating device according to my invention is presented partly in view and partly in section in Fig. 1, whilst Fig. 2 illustrates on a larger scale a part of a section through the ejector.

1 refers to a part of an internal combustion engine, the design of which is irrelevant for the present invention. The exhaust branch 2 of the motor 1 is connected to the distribution chamber 3 which, in case the exhaust gases are to be cooled, is provided with a cooling jacket 4 fitted with the branches 5 and 6 for the admission and the outlet of the cooling medium f. i. water.

This distribution chamber 3 is closed by a plate 7 provided with two openings 8 and 9. The opening 8 leads to the exhaust line 10, which may end in a silencer 11. The opening 9 of the plate 7 is connected to the ejector 12 consisting of the nozzle 13 (see also Fig. 2) and the diffusor 14 leading into the open. Between the nozzle 13 and the diffusor a ring shaped hollow chamber 15 has been provided, whence a channel 16 leads outwards, being connected to the tube 17. This tube communicates with the suction side of the rotary pump 18, the internal design of which is of no importance with regard to the present invention.

The distribution chamber 3 contains a ball 19, which by means of the surrounding ring 20 can be moved to and fro in such a manner that it alternately closes the openings 8 and 9, the ring 20 being actuated by a rod 21 passing outwards through the chamber wall.

The result of this arrangement is that the exhaust gases entering through the branch 2 into the distribution chamber 3 are compelled to flow according to the position of the ball 19 either through the exhaust tube 10 and the silencer 11 or through the ejector 12. The ejector nozzle 13 comes out of a box shaped piece 22 containing an anteroom 23, which in the direction of the nozzle is closed by a wall placed transversely to the direction of flow, which is provided with an opening leading to the nozzle channel. The exhaust

gases entering the anteroom 23 of the box 22 through the opening 9 will for the greatest part butt against the shock wall 24, before they can reach the channel 25. When the exhaust gases flow into the chamber 23 they undergo a bottling-up action prior to their discharge through the channel 25. That is, instead of escaping from the chamber 23 at the same rate at which they are discharged into it from the exhaust conduit 2 of the engine, the gases are permitted to escape through the channel 25, which is of considerably smaller cross-section than the chamber 23. This reduction in the area of the channel results in a backing-up and building-up of the pressure of the gases in the chamber 23. Hence, as the exhaust gases must enter the anteroom 23 intermittently according to the cycle of operations of the motor 1, the butting of the exhaust gases against the wall 24 results in the pressure and accordingly also in the energy of the exhaust gases in the anteroom 23 being intermittently enhanced, so that the gases will flow out with a higher speed through the nozzle channel 25 towards the diffusor 14, producing thereby a stronger suction effect in the ring shaped chamber 15, as if these intermittent pressure rises in the anteroom 23 would not take place.

The suction effect of the ring chamber 15 propagates through the channel 16 and the tube 17 reaching thereby the suction side of the pump 18, which is rapidly evacuated.

By directly attaching the distribution chamber 3 to the exhaust branch 2 of the motor 1, the energy embodied in the exhaust gases is exploited in the ejector with the smallest possible loss.

The effect of the shock wall 24 on the entrance side of the ejector nozzle 13 is particularly high, if the edge 25 between the shock wall 24 and the nozzle channel 25 is sharp, that is when this place is not rounded off

A cock 26 may be inserted in the pipe line 17, by which the evacuating line of the pump 18 may be cut off, as soon as the pump operates regularly, whereby the exhaust gases need not flow through the ejector 12. In this case the rod 21 is drawn out and the ball is brought to bear upon the opening 9, so that the ejector 12 is shut out, whilst the exhaust 10 is opened. This cock 26 may be connected to the rod 21 by means of a coupling piece 27 so that a connection is established between the opening and the closing of the cock 26 and the displacement of the ball 19, the ejector 12 being closed by the ball 19 at the same moment as the pipe line 17 is cut off by the cock 26 and vice-versa.

It goes without saying that the evacuation device described may be designed and constructed in different manners.

What I claim is:

1. In a device for evacuating pumps the combination of a pump, an ejector having a nozzle, a diffuser and a suction room, an internal combustion engine having an exhaust branch, a connection between the outlet of said exhaust branch and the inlet of said ejector nozzle, said connection being adapted to lead the exhaust gases of said internal combustion engine from its exhaust branch into the ejector nozzle so that the ejector may be operated by said exhaust gases, a suction conduit between the suction room of said ejector and the suction side of said pump, and means for increasing the suction effect of the ejector, said means comprising a wall located around the inlet of said ejector nozzle and transversely to the flow of the exhaust gases, whereby these gases are compelled to butt against said wall.

2. In a device for evacuating pumps the combination of a pump, an ejector having a nozzle, a diffuser and a suction room, an internal combustion engine having an exhaust branch, a connection between the outlet of said exhaust branch and the inlet of said ejector nozzle, said connection being adapted to lead the exhaust gases of said internal combustion engine from its exhaust branch into the ejector nozzle so that the ejector may be operated by said exhaust gases, a suction conduit between the suction room of said ejector and the suction side of said pump, and means for increasing the suction effect of the ejector, said means comprising an anteroom before the inlet of said ejector nozzle and a wall located around the inlet of said ejector nozzle and limiting said anteroom transversely to the flow of the exhaust gases, whereby these gases are compelled to butt against said wall.

3. In a device for evacuating pumps the combination of a pump, an ejector having a suction room, an internal combustion engine having an exhaust branch directly joined to the ejector so that said ejector may be operated by the exhaust gases of said internal combustion engine, and a suction conduit between the suction room of said ejector and the suction side of said pump.

4. In a device for evacuating pumps the combination of a pump, an ejector having a nozzle and a suction room, an internal combustion engine having an exhaust branch, a distribution chamber between the outlet of said exhaust branch and the inlet of said ejector nozzle, said distribution chamber having an outlet leading to the open air, said distribution chamber further being adapted to lead the exhaust gases of said internal combustion engine from its exhaust branch into the ejector nozzle so that the ejector may be operated by said exhaust gases, a suction conduit between the suction room of said ejector and the suction side of said pump, means for increasing the suction effect of said ejector and an arrangement for alternately opening and closing the distribution chamber against the ejector and the open air.

5. In a device for evacuating pumps the combination of a pump, an ejector having a nozzle and a suction room, an internal combustion engine having an exhaust branch, a distribution chamber between the outlet of said exhaust branch and the inlet of said ejector nozzle, said distribution chamber having an outlet leading to the open air, said distribution chamber further being adapted to lead the exhaust gases of said internal combustion engine from its exhaust branch into the ejector nozzle so that the ejector may be operated by said exhaust gases, a suction conduit between the suction room of said ejector and the suction side of said pump, means for increasing the suction effect of said ejector, said means comprising a wall located around the inlet of said ejector nozzle and transversely to the flow of the exhaust gases, whereby these gases are compelled to butt against the said wall, and an arrangement for alternately opening and closing the distribution chamber against the ejector and the open air.

6. In a device for evacuating pumps according to claim 1 the feature that the ejector nozzle has a sharp edged branching off from the wall, which is placed around the nozzle inlet transversely to the flow direction of the exhaust gases.

7. In a device for evacuating pumps according to claim 2 the feature that the ejector nozzle has a sharp edged branching off from the wall, which is placed around the nozzle inlet transversely to the flow direction of the exhaust gases.

8. In a device for evacuating pumps according to claim 5 the feature that the ejector nozzle has a sharp edged branching off from the wall, which is placed around the nozzle inlet transversely to the flow direction of the exhaust gases.

9. In a device for evacuating pumps the combination of a pump, an ejector having a suction room, an internal combustion engine having an exhaust branch joined to the ejector so that said ejector may be operated by the exhaust gases of said internal combustion engine, a suction conduit between the suction room of said ejector and the suction side of said pump, and a cooling device for cooling the exhaust gases prior to their entrance into the ejector.

10. In a device for evacuating pumps the combination of a pump, an ejector having a nozzle, a diffusor and a suction room, an internal combustion engine having an exhaust branch, a connection between the outlet of said exhaust branch and the inlet of said ejector nozzle, said connection being adapted to lead the exhaust gases of said internal combustion engine from its exhaust branch into the ejector nozzle so that the ejector may be operated by said exhaust gases, a suction conduit between the suction room of said ejector and the suction side of said pump, means for increasing the suction effect of the ejector, said means comprising a wall located around the inlet of said ejector nozzle and transversely to the flow of the exhaust gases, whereby these gases are compelled to butt against said wall.

11. The combination of a device for evacuating pumps according to claim 2 and a cooling device for cooling the exhaust gases prior to their entrance into the ejector.

12. The combination of a device for evacuating pumps according to claim 4 and a cooling device for cooling the exhaust gases prior to their entrance into the ejector.

13. The combination of a device for evacuating pumps according to claim 4 and a cooling device for cooling the exhaust gases prior to their entrance into the ejector, said cooling device consisting of a cooling jacket surrounding the distribution chamber and adapted to permit the circulation of a cooling medium therethrough.

14. In a device for evacuating pumps the combination of a pump, an ejector having a nozzle and a suction room, an internal combustion engine having an exhaust branch, a distribution chamber between the outlet of said exhaust branch and the inlet of said ejector nozzle, said distribution chamber having an outlet leading to the open air, said distribution chamber further being adapted to lead the exhaust gases of said internal combustion engine from its exhaust branch into the ejector nozzle so that the ejector may be operated by said exhaust gases, said distribution chamber finally being provided with a cooling jacket through which a cooling medium may circulate, a suction conduit between the suction room of said ejector and the suction side of said pump, means for increasing the suction effect of said ejector, said means comprising a wall located around the inlet of said ejector nozzle and transversely to the flow of the exhaust gases, whereby these gases are compelled to butt against the said wall, and an arrangement for alternately opening and closing the distribution chamber against the ejector and the open air.

15. The combination of a device for evacuating pumps according to claim 1, characterized by the provision of a cooling device for cooling the exhaust gases prior to their entrance into the ejector, and an ejector nozzle having a sharp edge branching off from the wall, which is placed around the nozzle inlet transversely to the direction of flow of the exhaust gases.

16. The combination of a device for evacuating pumps according to claim 2, characterized by the provision of a cooling device for cooling the exhaust gases prior to their entrance into the ejector, and an ejector nozzle having a sharp edge branching off from the wall, which is placed around the nozzle inlet

transversely to the direction of flow of the exhaust gases.

17. The combination of a device for evacuating pumps according to claim 5, characterized by the provision of a cooling device for cooling the exhaust gases prior to their entrance into the ejector, and an ejector nozzle having a sharp edge branching off from the wall, which is placed around the nozzle inlet transversely to the direction of flow of the exhaust gases.

18. A device for evacuating pumps comprising a pump, an ejector provided with a nozzle, a diffusor and a suction room, an internal combustion engine provided with an exhaust branch, a connecting distribution chamber between the outlet of said exhaust branch and the inlet of said ejector, said distribution chamber being provided with an outlet leading to the open air, a second outlet leading to the inlet of the ejector nozzle, a cooling jacket through which a cooling medium circulates, and an arrangement for alternately opening and closing the distribution chamber against the open air and the ejector, a suction conduit between the suction room of said ejector and the suction side of said pump, and means for increasing the suction effect of the ejector, said means comprising a wall located around the inlet of said ejector nozzle transversely to the flow of the exhaust gases, whereby these gases are compelled to butt against said wall, said nozzle inlet branching off with a sharp edge from said wall, and an anteroom before the inlet of said ejector nozzle, said anteroom being limited at one side by said wall.

In testimony whereof I affix my signature.

FRANZ OBERASCHER.