Feb. 6, 1951 R. F. M. WAESELYNCK 2,540,970

VARIABLE OUTPUT ATOMIZER

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Fig. 1

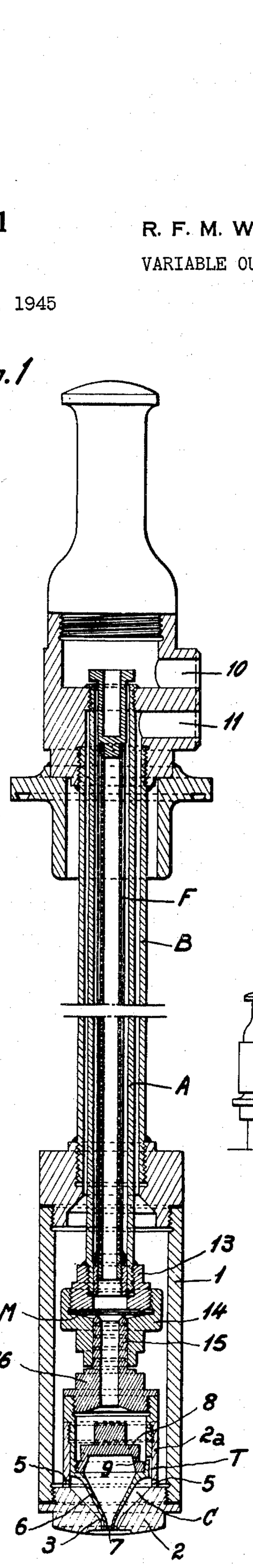

Fig. 4

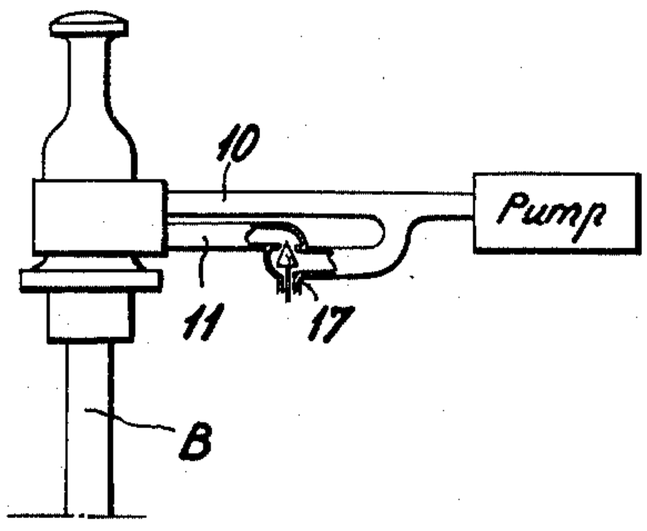

Fig. 5

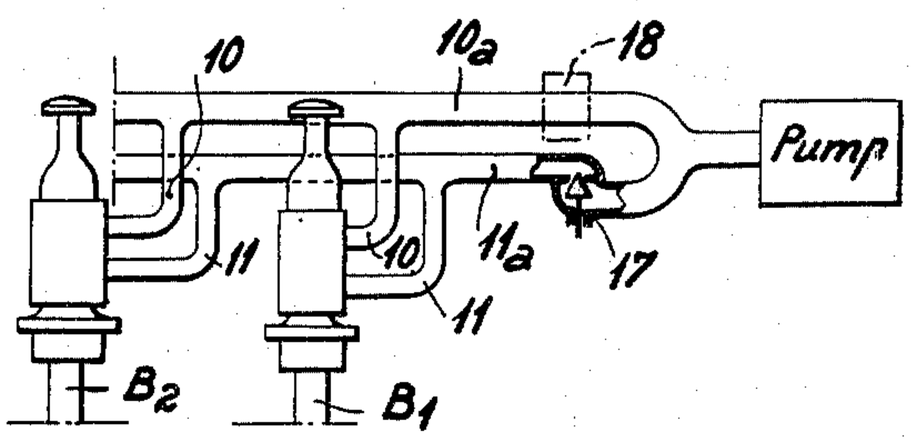

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Fig. 2

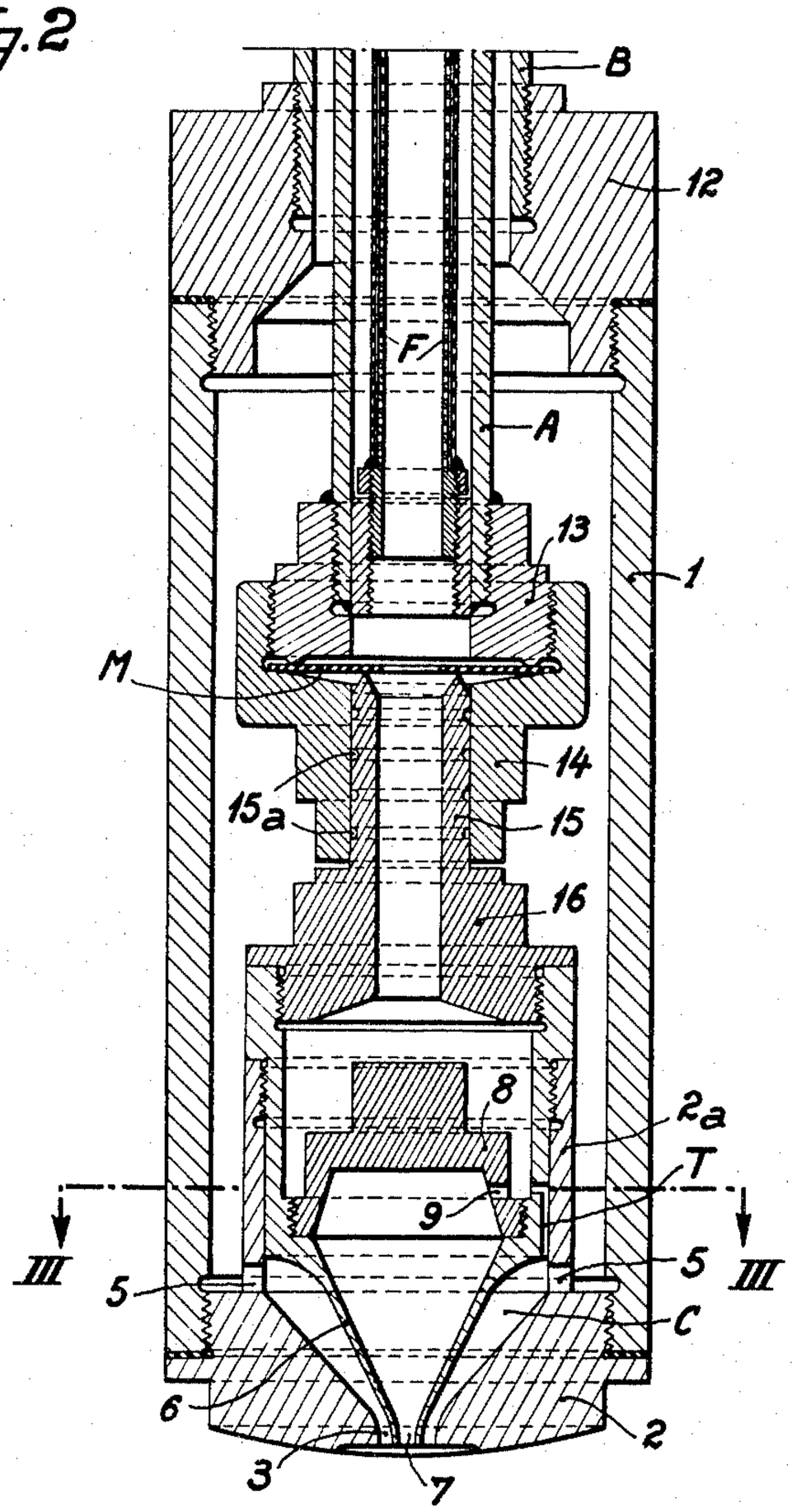
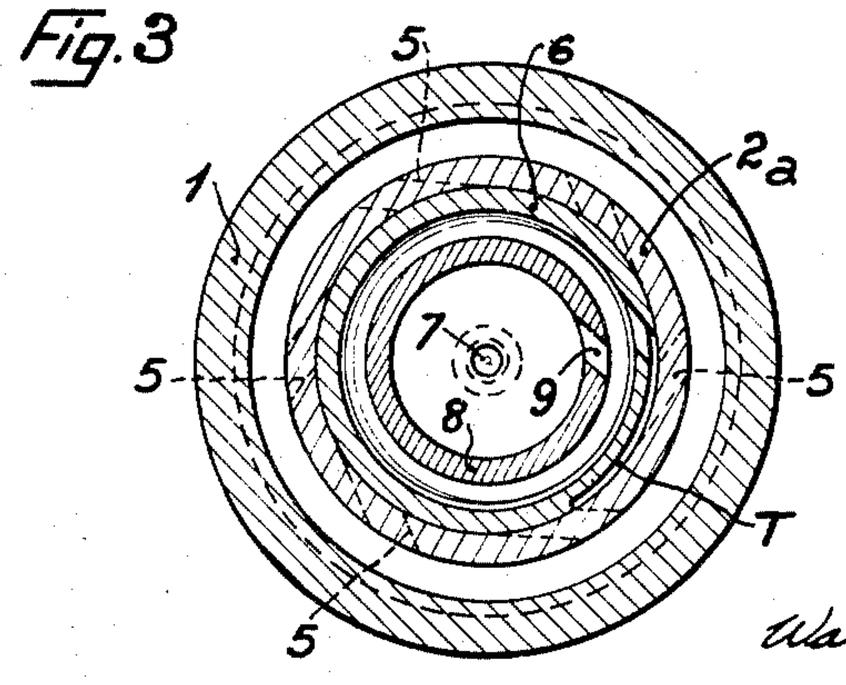


Fig. 3



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VARIABLE OUTPUT ATOMIZER

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2 Claims. (Cl. 299—115)

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The device which forms the object of the present invention is adapted to ensure the automatic atomising of any type of liquid and more particularly of liquid fuel into boiler furnaces or fireboxes, of water into steam desuperheating devices through mixture, etc.

The object of this novel device is to keep as constant as possible the atomising angle and fineness throughout an extensive range of variations in fluid flow, without it being necessary to resort to the action of a compressed auxiliary fluid different from the liquid to be atomised, and without the necessity of resorting to temperatures or pressures above those normally used in ordinary mechanical atomisers.

The novel device comprises the combination of:

(*a*) a main atomiser, the output of which is varied as desired between zero and a maximum, merely through acting on the feeding pressure, either by hand or by means of an automatically controlled device; and

(*b*) an auxiliary small output atomiser, which will be termed the pilot atomiser, the atomising sheet passing out of which serves as a carrier for the sheet passing out of the main atomiser, when the latter is fed only under a very small pressure.

The feeding pressure of the pilot atomiser remains always comparatively high and its hydraulic opening varies only but little, so that the atomising angle and fineness of the auxiliary jet remain substantially constant and ensure through their driving action the constancy of the atomising angle and fineness of the main jet, even at the lowest outputs of the latter.

The following description, referring to accompanying drawings, and given by way of example and by no means in a restrictive sense, shows how the invention may be executed, the features appearing both in the drawing and in the specification forming of course part of said invention.

Fig. 1 is a general cross-sectional axial view of an atomiser in accordance with the invention.

Fig. 2 is a similar view at a larger scale, of the atomising head.

Fig. 3 is a transversal cross-section through line III—III of Fig. 2.

Figs. 4 and 5 show diagrammatically the arrangement of a feeding pump for one atomising apparatus according to the invention, and for several apparatuses connected in parallel relation, respectively.

As apparent in the drawing, the main atomiser and the pilot atomiser are each carried out after the manner of ordinary atomisers and the atomising heads comprise each, in accordance with the

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usual arrangement, a distributor with tangential holes and an outlet cup with a central aperture.

As shown in Figs. 1 to 3, the main atomiser comprises thus a cylindrical sleeve 1 to an end of which is screwed the cup 2 provided with a central atomising aperture 3 and a distributor 2*a* with tangential holes 5.

The pilot atomiser comprises similarly a cup 6 provided with a central atomising aperture 7 and a distributor 8 provided with a tangential hole 9, said distributor 8 being constituted by a member independent with reference to the cup 6 and secured to cup 6 by being screwed into same. The pilot atomiser is mounted axially inside the main atomiser and its cup is screwed inside the distributor of said main atomiser without the interposition of any packing whereby the relative positioning of the inner cup with reference to the outer cup may be accurately determined and the replacement of the complete head may be performed easily without any special adjustment being required from the operator.

The cup 6 of the pilot atomiser is provided at its periphery with a helicoidal groove T which causes the admission of liquid into the pilot atomiser to communicate with the centrifugation chamber C of the main atomiser for a purpose to be disclosed hereinafter.

The atomisers are fed with liquid through two separate concentric channels A and B leading respectively to the two pipes 10 and 11 connected with the pump (See Fig. 4). The channel A lies inside the channel B and is welded to a member 13 screwed in its turn inside a socket 14. Inside this socket is engaged a hollow spigot 15 which forms an extension of the plug 16 which in turn closes the cup 6 of the pilot atomiser. The channel B is screwed inside the plug 12 closing the sleeve 1 at the end remote from the main atomising head 2.

The arrangement of the socket 14 and hollow spigot 15, which are simply inserted inside one another, allows the easy dismantling of the two atomising heads as a unit constituted by the elements 2—2*a*, 6, 8, 15 and 16. The dismantling is performed through mere unscrewing of the cup 2 of the main atomiser and reversely, said unit may be mounted through mere screwing down of said cup 2.

The fluid tightness in the feeding of the pilot atomiser is ensured as concerns the members 14 and 15 without any stuffing box by means of a membrane M or of a folded tube urged automatically against the end of the hollow spigot 15 by the pressure prevailing inside the pipe system

feeding the pilot atomiser, as long as the latter remains above or equal to the outer pressure. This membrane M or folded tube is held tightly between the members 13 and 14 inside a chamber the leak output of which, towards the outer atomiser, is limited, in the case of the membrane breaking, by a close fitting of the spigot 15 inside the socket 14, said spigot being machined for a tight fit. This relative fluid tightness between the two members 14 and 15 may be enhanced by providing at the outer surface of the spigot 15 a certain number of annular grooves 15*a* at different heights.

In the case of a pilot atomiser having a very low output, the corresponding openings in the distributor and in the cup are very small and it is necessary to insert a filter at the admission end; an advantageous arrangement has been illustrated which comprises a fine-meshed filter F fitted inside and extending through substantially the whole length of the admission pipe A, said filter bearing against a perforated pipe. Such a filter may also be arranged inside the admission channel leading to the main atomiser.

The most advantageous arrangement seems to consist in feeding the two pipes 10 and 11, feeding liquid to the atomisers, by means of a pump provided with regulating means and having consequently a constant delivery pressure.

The pilot atomiser operates normally under constant pressure and the liquid fed to it through the pipe or channel A passes through the hollow spigot 15, the tangential hole 9 and issues in an atomised state through the aperture 7.

The liquid fed by the channel or pipe B to the main atomiser passes through the tangential holes 5 into the atomising aperture 3. An adjusting valve 17, shown on Fig. 4, allows a modification as desired, starting from complete closing of the pressure of admission into the main atomiser. When this pressure for the feeding of the main atomiser is smaller than the pressure for the feeding of the auxiliary atomiser, part of the liquid led to the latter passes through the hole and the helicoidal groove T into the aperture 3 of the main atomiser for the purpose to be disclosed hereinafter.

Several atomising apparatus according to the invention may be connected with the same admission pipes and adjusted simultaneously by the same valve which may either be automatically or hand-controlled. The output never falls underneath a minimum corresponding to the operation of the pilot atomiser alone.

Fig. 5 shows the upper part of two apparatuses B_1 B_2 the feeding pipes 10 and 11 of which are connected in parallel relation to the pipes 10*a* and 11*a* starting from the delivering side of the common pump. The valve 17 mounted in the pipe 11*a* feeding the main atomisers allows adjustment of the output delivered to said main atomisers.

However a working at a restricted rate may be obtained by the closing of the main adjusting valve while a second valve controlling the pilot atomiser pressure is acted upon. For a burner, this corresponds to the case of operation at the moment of igniting or at a very low rate without any automatic control of the heating.

Said second valve mounted in the pipe 10*a* is shown diagrammatically in dotted lines at 18 in Fig. 5.

This complementary valve allows also during normal operation the adjustment as desired of the value of the constant pressure applied to the

pilot atomiser; i. e. of the minimum output corresponding to the closing of the main atomising circuit.

For small outputs of the main circuit, the liquid flowing out through the holes 5 of the main distributor is carried along by the rotary movement of the liquid passing with a high speed out of the helicoidal opening T and is thus finely atomised as it passes out of the main cup.

On the other hand, the suction produced by the projection of the liquid out of the inner cup is exerted on the particles produced by the main cup and holds the outer liquid sheet applied against the inner sheet.

The advantages of the invention may be summarized as follows:

1. The opening angle of the atomised sheet remains substantially constant and the fineness of atomisation remains satisfactory at all rates of operation.

2. The range of the variation in output may be considerable, for instance in the proportion of 1 to 6 with an adjustment of only the main atomising circuit and of 1 to 10 with a complementary adjustment of the pilot circuit.

3. The adjustment is executed very simply by acting on the pressure without any displacement of any mechanical member inside the atomisers. The operation in parallel of several devices is thus possible with a great accuracy while the arrangement for modifying the output lends itself remarkably well to automatic distant control operation.

4. The operation of the atomiser requires no delicate means for expanding the fluid or any regulating means the misadjustment of which would be liable to disturb to a considerable extent the characteristic data of the output. In particular, if the pump includes means for regulating the constancy as to pressure any gradual misadjustment of the latter affects only the output of the pilot atomiser, i. e. a very small fraction of the total output.

5. In the above described form of execution, the apertures in either cup are swept, under all conditions of operation, by a layer of liquid. In the case of a burner, neither cup is ever inoperative and thus rendered liable to be fouled by a deposit of coke.

6. In the case of burners with an automatic heating system, there is no risk of the burner being extinguished in the case of a sudden and momentary fall of the load of the boiler as the minimum output of fuel is defined by the minimum output of the pilot atomiser.

7. The fine-meshed filter, having a large passage area, provides means for the execution of atomisers having small diameter holes and consequently a small minimum output.

What I claim is:

1. An apparatus for the mechanical atomisation of liquid fuel and the like liquids comprising a main atomiser including an atomising aperture and adapted to produce a liquid sheet therethrough, an auxiliary pilot atomiser of small output including an atomising aperture arranged concentrically inside the atomising aperture of the main atomiser for producing a liquid sheet adapted to serve as a carrier for the sheet produced by the main atomiser when the latter is fed under low pressure, separate ducts for feeding both atomisers with the same liquid independently one of the other, means for varying the flow of the liquid feeding the main atomiser independently of the flow of the liquid feeding

the auxiliary atomiser, and means providing a liquid passage from the means feeding the pilot atomiser towards the atomising aperture of the main atomiser whereby, at small pressures in the main atomiser, a part of the liquid feeding the pilot atomiser passes into the main atomiser aperture.

2. An apparatus for the mechanical atomisation of a liquid comprising a main atomiser including an atomising aperture and adapted to produce a liquid sheet therethrough, an auxiliary pilot atomiser of small output including an atomising aperture arranged substantially in the plane of the atomising aperture of the main atomiser and inside the said aperture for producing a liquid sheet adapted to serve as a carrier for the sheet produced by the main atomiser when the latter is fed under low pressure, separate ducts for feeding both atomisers with the same liquid independently one of the other and means providing a passage between the auxiliary atomiser and the main atomiser at points preceding the atomising apertures of both atomisers, said passage being adapted for conducting only a part of the feeding output of the auxiliary atomiser to the main one when the latter is fed under low pressure.

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