May 13, 1947. E. RATHBUN 2,420,562

DEVICE FOR MIXING GAS AND AIR

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Fig. 1.

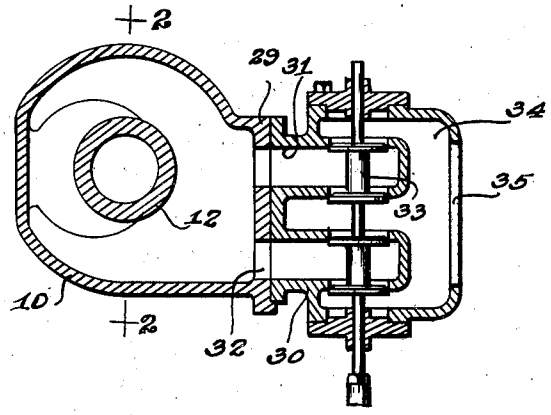
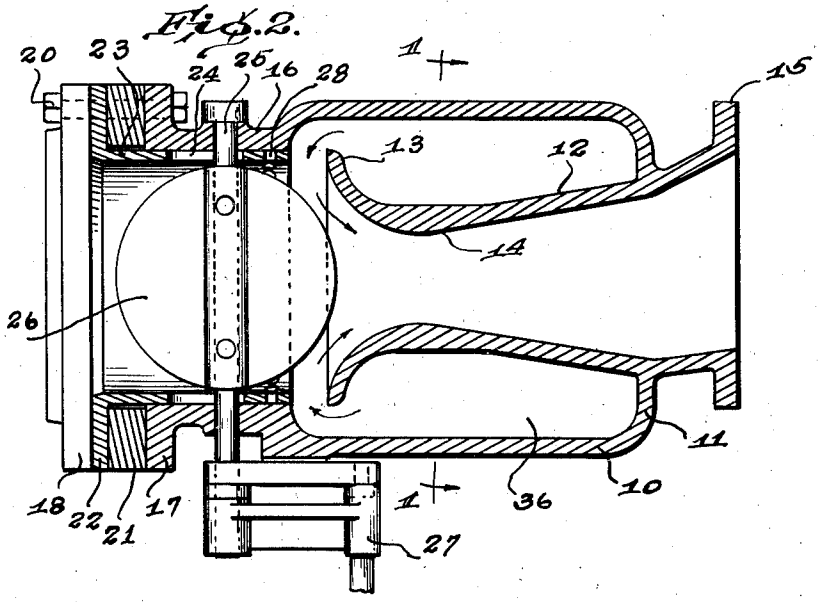


Fig. 2.



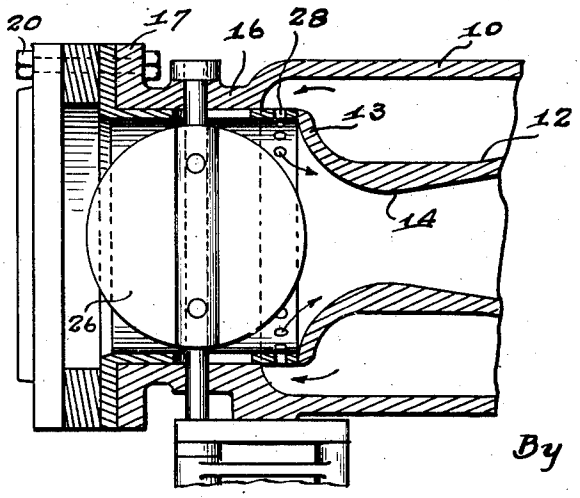


Fig. 3.

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DEVICE FOR MIXING GAS AND AIR

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6 Claims. (Cl. 48—180)

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This invention relates to Diesel engines particularly of the type utilizing a gas and oil mixture for fuel.

Diesel engines of the type employing gas or oil or a gas and oil mixture may at one time use natural gas and at another time use producer gas or a mixture of these kinds of gas. The B. t. u. content of producer and natural gas, of course, varies considerably and it is desirable that convenient adjustment be made possible to adapt the engine for the B. t. u. content of the particular gas employed at the time. It is a desideratum, therefore, to provide an oil-gas engine with a simple and convenient device by which the engine may be conveniently adapted for gases of different B. t. u. content, such, for example, as producer and natural gas.

It is an object of this invention to produce a simple and inexpensive appliance for a gas-oil engine by which the engine can be adjusted for gases of different B. t. u. content, thereby materially to enhance the efficiency of the engine operation.

An embodiment of the invention is shown by way of illustration but not of limitation on the accompanying drawings in which

Figure 1 is a transverse section on a somewhat reduced scale taken on the line 1—1 of Figure 2, illustrating a throttle box assembly for a gas-oil engine;

Figure 2 is a longitudinal section on a somewhat enlarged scale taken on the line 2—2 of Figure 1, showing particularly the adjustable sleeve which is shifted according to the B. t. u. content of the gas used and arranged in the position assumed when the engine is using gas of a relatively low B. t. u. content such as producer gas; and

Figure 3 is a fragmentary sectional view similar to Figure 2 showing the adjustable sleeve in the position assumed when the gas employed is of a relatively high B, t. u. content such, for example, as natural gas.

The illustrated embodiment of the invention comprises an elongate housing 10 having an end wall 11 with which a fuel supply tube 12 is integral, a portion of the tube projecting well inside of the housing and having a flanged mouth 13 and a constricted throat 14 providing a venturi. The portion of the tube 12 which projects outside of the housing is formed with a flange 15 for connection, either directly or indirectly, to the intake manifold of a Diesel engine (not shown).

Extending from the housing 10 and substantially in alignment with the tube mouth 13 is a tubular extension 16 which is formed with an outward flange 17 and clamped between a fitting or cap 18 and the flange 17 by bolt and nut assemblies 20 are a spacer ring 21 and a flange 22 integral with a cylindrical sleece 23 which closely fits the inside surface of the housing extension 16. The fitting or cap 18 is suitably apertured to admit air which is drawn into the venturi or fuel supply tube 12.

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The sleeve 23 is formed with a pair of diametrically opposed longitudinally elongate slots 24 to receive a pintle 25 which has bearing in the walls of the housing extension 16 and carries a butterfly valve 26. Suitable lever mechanism 27 is provided for rocking the pintle to effect the desired adjustment of the valve 26.

In the position of the parts shown on Figure 2, it will be observed that the spacer ring 21 is interposed between the flanges 17 and 22, thereby positioning the sleeve 23 outwardly with respect to the fuel supply tube 12 and so that the inner end of the tube is substantially flush with the inner end of the extension 16. For a purpose which will hereinafter be explained, the sleeve 23 is formed with an annular row of apertures 28 which are adjacent to but spaced from the inner end of the sleeve.

A portion of the housing 10 at one side of the fuel intake tube 12 is flattened as indicated at 29 and suitably secured thereto is a valve housing 30 which is formed with outlet passages 31 registering with ports 32 in the side wall 29 of the housing. A double spool valve 33 of any suitable or well-known construction controls the communication between the valve passages 31 and the interior 34 of the valve housing 30. Gas, such as natural or producer gas, may be introduced to the interior 34 of the housing through an inlet port or opening 35 and from thence, upon opening or unseating of the valve 33, a gas flows through the passages 31 and ports 32 to the inside of the housing in the region of the space indicated at 36 between the mouth 13 of the intake tube 12 and the housing wall 11 and thence passes in the direction of the arrows indicated on Figure 2, to the inside of the tube 12 and at the same time draws or aspirates air admitted through the fitting or cap 18.

In order for the engine to operate at maximum efficiency, it is important not only that the gas and air be properly mixed, but that, depending upon the quality of the gas, the flow of the latter be controlled before it reaches the Venturi or diffuser tube 12. It is desirable that relatively

free flow of gas be afforded from the space 36 to the diffuser tube 12 in the case of producer or sewer gas and for that reason, the ported sleeve 23 is disposed in the position shown in Figure 2 and when producer or sewer gas is used, it may be desirable, under some conditions, to actuate the butterfly valve 26 to close off to some extent the air supply, thereby to increase the suction drawing in the gas to the fuel tube 12.

When natural gas or gas having a higher B. t. u. content is used, the spacer ring 21 is removed and applied in the position indicated in Figure 3, thereby advancing the sleeve 23 to a position in which the inner end abuts against and closes the mouth 13 of the Venturi tube. In that event, the gas from the space 36 then passes in the direction of the arrows as shown in Figure 3, and through the annular row of apertures 28. This not only to some extent restricts the flow of gas but also directs it in such manner that it is more fully and satisfactorily mixed with the air drawn through the cover plate or cap 18. Manifestly, the gas drawn in in this manner will mix more thoroughly with the air stream thereby materially enhancing combustion. The size of the apertures 28 may be varied according to the B. t. u. content of the gas.

From the above description, it will be manifest that I have provided an extremely simple fool proof and reliable device for regulating the air-gas mixture supplied to the engine manifold in accordance with the B. t. u. content of the gas. By an extremely simple adjustment, the sleeve is positioned either for use in connection with sewer or producer gas or in the position of use in connection with natural gas. As above indicated, the size of the holes in the sleeve may be varied as desired, depending upon the B. t. u. content of the gas which, of course, is predetermined for the particular situation where the Diesel engine is to be operated.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What I claim is:

1. In a Diesel engine, means for introducing a gas and air mixture to the intake manifold of the engine, said means including a Venturi tube, and adjustable means for regulating the volume of gas delivered to said tube, said last means including a ported sleeve adapted for adjustment to either of two positions one of which affords relatively free flow of gas to the tube the other effecting abutment between the sleeve and the tube thereby to cause the gas to flow through ports in said sleeve.

2. In a Diesel engine, a device for mixing gas and air for delivery to the intake manifold, said device comprising a housing, a fuel supply Venturi tube having its mouth disposed within the housing, means for delivering air to the tube substantially coaxially of the tube mouth, means for delivering gas to the housing so that the same passes around the tube and into same around the tube mouth, and ported means adjustable in said housing and adapted to engage the tube mouth for enhancing the air-gas mixture drawn into the Venturi tube in accordance with the B. t. u. content of the gas, said ported

means comprising a sleeve slidable in the air inlet passage and movable from a position allowing free flow of gas to the Venturi tube to a position in contact with the Venturi tube whereby the gas passes to the Venturi tube through the ports in the sleeve.

3. In a Diesel engine, an air and gas mixing device as claimed in claim 2, in which the sleeve is formed with an outwardly extending flange and a spacer ring adapted to be selectively arranged on one side or the other of said flange to position the sleeve in one position of adjustment or the other.

4. In a Diesel engine, an air and gas mixing device as claimed in claim 2, in which the sleeve is formed with longitudinally elongate slots, a butterfly valve disposed within the air passage for controlling the amount of air and influencing the amount of gas drawn into the Venturi tube, a pintle for the valve having portions disposed in said slots for holding same against turning movements and guiding the sliding action thereof.

5. In a Diesel engine, a device for mixing gas and air for delivery to the intake manifold, said device comprising a housing, a fuel supply Venturi tube having its mouth disposed within said housing, means for delivering air to the tube substantially coaxially with said Venturi tube, means for delivering gas so that the same passes into said tube from about its periphery, a ported sleeve adapted for sliding movement between two positions of adjustment, one of which affords relatively free flow of gas to the tube, the other of which effects abutment between said sleeve and the flared edge of said Venturi tube to cause the gas to flow through ports, and an air control valve in said sleeve aiding the control of the air and gas ratio.

6. In a Diesel engine, a device for mixing gas and air for delivery to the intake manifold, said device comprising a housing, a fuel supply Venturi tube having an outwardly flared mouth of greater diameter than the throat disposed within said housing, said housing also defining an air passage for the delivery of air substantially coaxially with said venturi, means for delivery of gas so that the same passes into said tube from about the periphery of said flared mouth, a ported sleeve slidable to two positions of adjustment in said housing passage and adapted in one position to afford the relatively free flow of air to the tube and in the other position to abut said Venturi mouth thereby to cause the air to flow through ports, said outwardly flared mouth enhancing the mixture of the gas and air before entrance into said throat portion, and means for positively securing said adjustable sleeve in either of said positions.

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