Jan. 2, 1934. G. R. BLODGETT 1,942,323

GAS ANALYZER

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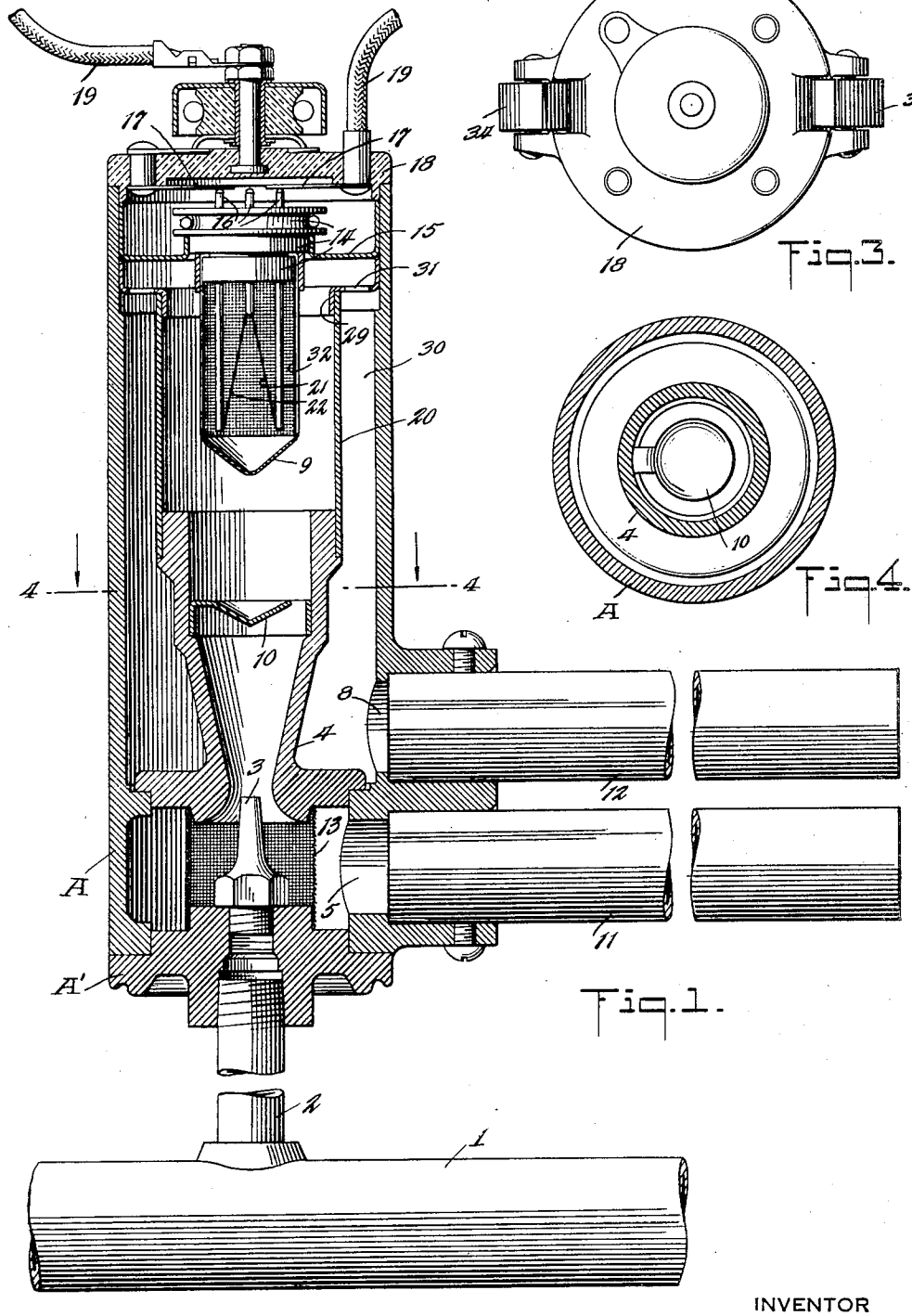


Fig. 1.

Fig. 3.

Fig. 4.

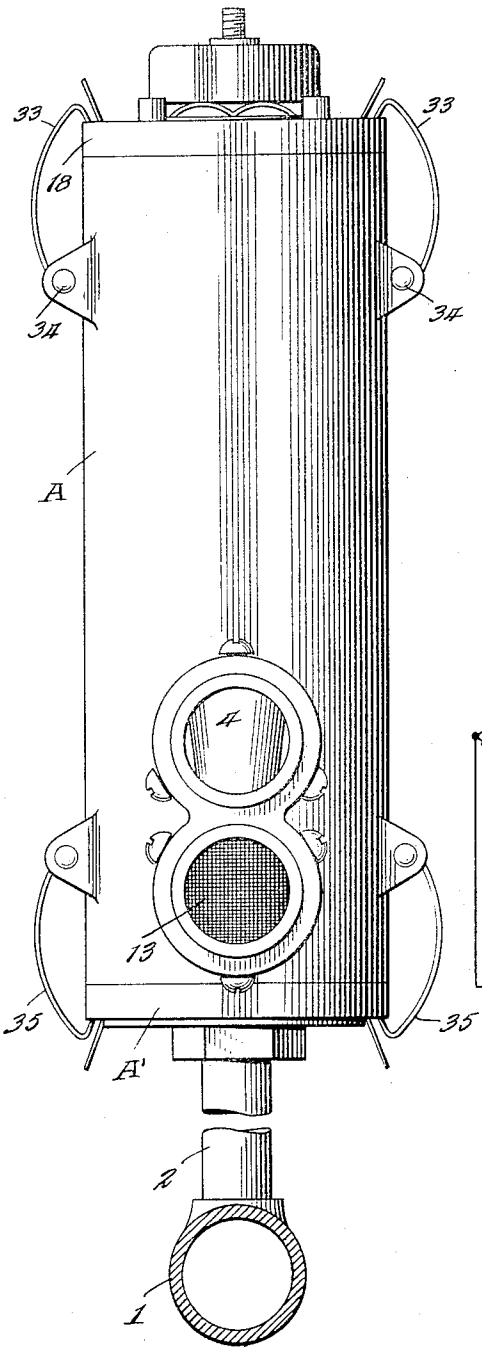
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Fig. 2.



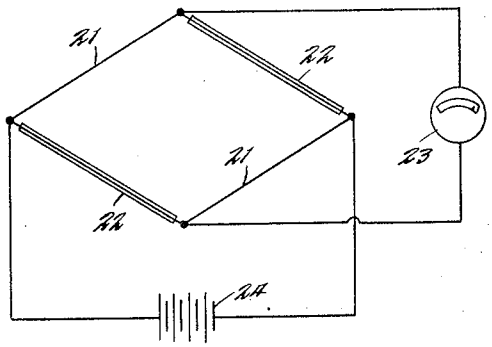


Fig. 5.

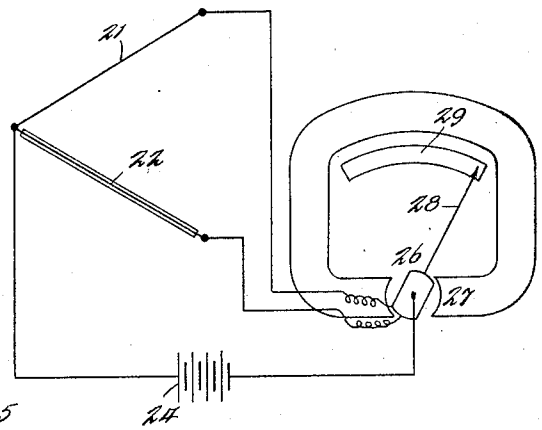


Fig. 6.

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Patented Jan. 2, 1934

1,942,323

UNITED STATES PATENT OFFICE

1,942,323

GAS ANALYZER

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Application January 9, 1931. Serial No. 507,697

2 Claims. (Cl. 23—255)

My invention consists of an improved construction of apparatus for analyzing gases, more particularly the exhaust gases of internal combustion engines according to the method which forms the subject of the Kennedy Patent No. 1,333,850 dated March 16th, 1920. The main objects of my invention are to simplify the construction and make it readily applicable for use and to secure a constant ratio of air and gas at the analyzing point notwithstanding the varying pressure and flow of the exhaust from the engine, as used in the automotive field, whether on land or water or in the air, as an aircraft.

In the accompanying drawings,

Figure 1 is a vertical section through my improved device;

Figure 2 is an elevation;

Figure 3 is an end view of the device;

Figure 4 is a face view of a baffle plate; and

Figures 5 and 6 are diagrams.

Briefly the Kennedy method of analyzing the exhaust gases of an internal combustion engine consists in drawing off continuously a test stream of such exhaust and mixing with it air or oxygen and directing this mixture over a catalytic agent, arranged in an electric circuit to control through its temperature variations an indicating apparatus such as an electric lamp or electric meter in circuit with the catalytic agent and a source of current. Conveniently the catalytic agent may be platinum wires arranged in a passage through which the mixture of exhaust gases and air or oxygen is caused to flow, and by the varying temperature of the active catalytic wires and consequent varying resistance in the electric circuit in which they are included the character of the mixture may be indicated.

In the diagram Fig. 5 I have indicated four wires arranged in the well-known form of a Wheatstone bridge, of which the wires 21—21 are active wires while the alternate wires 22 are inactive, and two of the terminals are connected up to a battery or other current source, while the other two terminals are connected up to a suitable meter 23, which may be a milliammeter.

In Fig. 6 I have shown by way of further illustration another arrangement of circuits. In this form, there are only two wires one 21 active and the other 22 inactive, connected through a battery 24 to the coils of an armature 26 free to turn between the poles 27 of an electromagnet and carrying a pointer 28 moving over a dial 29, as will be readily understood.

Turning now to my improvement illustrated in Figs. 1 to 4, the numeral 1 indicates the exhaust pipe of an internal combustion engine and from this leads a branch 2 discharging into a nozzle 3 in the bottom of the tubular casing A. The discharge end of this nozzle enters the narrowed portion of a Venturi tube 4 set within the lower part of the main casing A of the device.

Opposite the nozzle the casing has a lateral inlet 5 for the admission of air. I prefer to surround the nozzle with a suitable screen 13 to keep out dust and dirt from the interior.

In the upper part of the Venturi tube there is set a baffle plate 10, the form of which is preferably that shown in Fig. 4, such that the flow of exhaust gases and air upward through the apparatus will assume the form of a hollow column.

Centrally in the upper part of the casing I mount the catalytic and other wires 21, 22 which are carried by insulating disks 14 fixed in a transverse diaphragm 15, which forms the top of the chamber containing the wires. The wires 21, 22 are severally connected to suitable pins 16 projecting through the upper side of the insulating disks 14, and these pins may make contact with connection plates 17 carried by the insulating cover plate 18 of the casing. Any suitable connections may be provided leading to the insulating conducting wires 19, depending on the circuits decided upon.

On the wide upper end of the Venturi tube 4 is a cylindrical casing 20, and in the upper end of the latter is fitted a flanged spacing ring 29, with perforations 31, through which communication is had between the interior of the casing 20 and the circumferential space 30 between the inner casing 20 and the outer casing A. From the lower part of this space 30 leads an outlet 8 for the discharge of the mixture of air and gases.

The test wires 21, 22 are preferably surrounded by a screen 32 and in addition I find it desirable to suspend below this screen a cup-shaped or conical baffle 9 to supplement the baffle 10 in spreading and keeping the mixture of air and exhaust gases in a hollow column.

The top cap 18 for the casing may be held in place by catches 33 hinged at 34 to the outside of the casing and made of spring metal. (Fig. 2). The bottom plate A', carrying the nozzle 3 may be clamped to the casing by similar spring catches 35.

The pressure of the exhaust gases from internal combustion engines varies with the volume of the gases produced by the engine and with the load. To secure a reliable indication of the amount or percentage of the combustible content

in these exhaust gases it is necessary to maintain approximately constant the ratio of the amount of air to the amount of gas in the mixture which passes over the analyzer element.

The construction which has been above described accomplishes this. The action at the Venturi tube 4 is that the gas from the exhaust pipe of the engine draws the air in with it proportionally. This flow is equalized by the action of the baffle or diffuser 10, which with the cap 9 prevents the direct impinging of gases from the Venturi tube onto the analyzer elements 21, 22. In fact this construction induces the passage of the mixed gases and air into the presence of the analyzer elements in the form of a hollow column of uniform gaseous mixture. From the analyzing chamber the gas and air mixture passes through the openings 31 and the return passage 30 to the outlet 8.

To secure steady readings from the indicating instruments not withstanding blasts of air encountered by aircraft and automobiles, I have found that it is desirable to provide the instrument with air inlet and outlet tubes 11 and 12 of some length and of equal length and preferably to arrange them near together and parallel to each other. By this construction the effect of such air blasts are neutralized.

I claim:—

1. A gas analyzing apparatus for internal combustion engines, comprising a casing, a jet nozzle and means for supplying the exhaust gases to the nozzle in combination with an air supply inlet to the exterior of the nozzle within the casing, a Venturi tube into which the nozzle projects the mixture of air and gases, a catalytic means within a chamber to which the mixture is thus supplied and an indicator controlled by said catalytic means, and an annular return passage around the chamber containing the catalytic means.

2. A gas analyzing apparatus for internal combustion engines, comprising a casing, a jet nozzle and means for supplying the exhaust gases to the nozzle in combination with an air supply inlet to the exterior of the nozzle within the casing, a Venturi tube into which the nozzle projects the mixture of air and gases, a catalytic means within a chamber to which the mixture is thus supplied and an indicator controlled by said catalytic means, a baffle between the Venturi tube and the catalytic means and an annular return passage around the Venturi tube and the chamber containing the catalytic means.

GEORGE R. BLODGETT.