Nov. 8, 1932. W. HELMORE ET AL 1,887,305

DEVICE FOR USE IN ASSOCIATION WITH GASES OR GAS LIQUID MIXTURES, AS A FLAME OR EXPLOSION TRAP, A MIXER, A FLOW CONTROLLER, A SILENCER, OR A COOLER

Filed Oct. 1, 1930

FIG. 1.

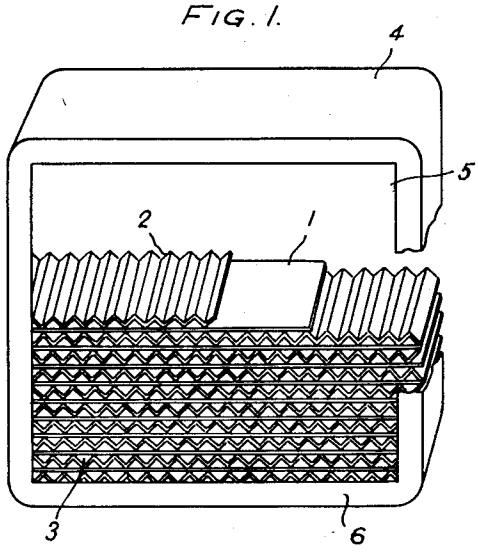


FIG. 2.

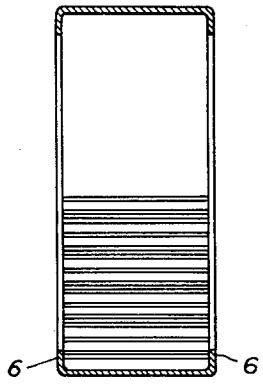
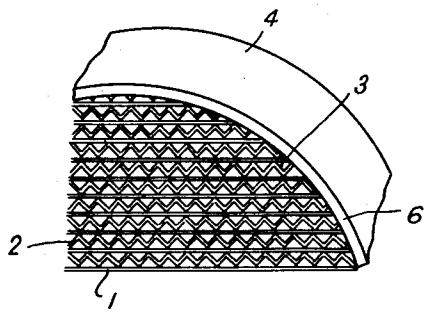


FIG. 3.



INVENTORS:
William Helmore
Andrew Swan
By James L. Norris,
Attorney.

Patented Nov. 8, 1932 1,887,305

UNITED STATES PATENT OFFICE

WILLIAM HELMORE AND ANDREW SWAN, OF SOUTH FARNBOROUGH, ENGLAND

DEVICE FOR USE IN ASSOCIATION WITH GASES OR GAS-LIQUID MIXTURES, AS A FLAME OR EXPLOSION TRAP, A MIXER, A FLOW CONTROLLER, A SILENCER, OR A COOLER

Application filed October 1, 1930, Serial No. 485,804, and in Great Britain October 1, 1929.

This invention relates to an improved device of the type having a number of narrow passages for use, in association with gases or gas-liquid mixtures, as a flame or explosion trap, a mixer, a flow controller, a silencer or a cooler. The device is applicable for example, in connection with the charge or exhaust of an internal combustion engine.

The present invention has for its chief object to provide a device for any of the above purposes, which can be inserted into a pipe line, serving to convey gas, or gas-liquid mixture (hereinafter generally referred to as gaseous mixture) and in which the walls of the passages, through which the gaseous mixture passes, can be made of thinner material than customary whereby the total cross sectional area of the passages can be increased in a given total cross section size of the device, and in which the strength of the structure to resist distortion by temperature changes, explosive or other forces can be increased.

To the end aforesaid, according to one feature of the present invention, the improved device has passages through which the gas or gas-liquid mixture can pass formed by means of zig-zag or corrugated and flat plates, the former being layered alternately with the latter, and the arrangement being such that the angles or bends of adjacent zig-zag plates are directly opposed to one another, with a flat plate therebetween. With this arrangement no bending moment is applied by the zig-zag plates to the flat plates, and the flats of the zig-zag plates between the apices or bends of the angles act as struts having rigid points of reaction at the apices or bends.

The zig-zags or corrugations may be formed with rounded or angular bends, but the angular form is preferable in order that the sides of the triangular passages formed by the combination of the zig-zag or corrugated plates and the flat plates can fulfill the function of straight struts. The adjacent zig-zag or corrugated plates are arranged with their apices or bends as near as possible at exactly opposite positions on the opposite sides of the flat intermediate plate, and are assembled in pack form or as superposed windings in a rigid housing or casing so as to form a rigid unit. The unit can be inserted into a recess or socket in a junction piece with the passages parallel to the pipe line, and can be withdrawn for inspection as required.

The invention is illustrated in the accompanying drawing, in which Fig. 1 is a general arrangement perspective view of one form of construction, parts being broken away to reveal details of construction; Fig. 2 is a longitudinal section; and Fig. 3 is a fragmentary view of another form of construction.

As shown in Figs. 1 and 2, the device may be composed of rectangular flat sheets 1 of thin metal interlayered with rectangular zig-zagged sheets 2 or corrugated sheets of thin metal so as to form a pack of sheets divided in cross section into triangular passages 3 for the fluid to be treated to pass through. The pack with the apices or bends of adjacent zig-zags disposed directly opposite one another is mounted in a rigid four-sided casing or frame 4 of rectangular cross section, so that the passages of the pack are parallel to the passage 5 through the casing or frame. The assemblage is held together in any convenient manner, so as to form a rigid unit. The casing may be made to fit into a transverse rectangular recess or socket in a junction pipe length and is secured in position therein by plates screwed or bolted to the two ends of the recess. Alternatively, one end of the recess can be permanently closed.

The sheets or pack of sheets may be located against fore and aft movement parallel to the passage by means of stops or flanges 6 on the casing, or other obstructions on the casing or in the recess or socket, and the end passages through the junction pipe length may merge from a circular cross section at the outer ends to a rectangular cross section at the inner ends where they open into the recess or socket. The outer ends of the junction pipe length may be flanged or otherwise adapted for bolting or screwing in a pipe line. With this arrangement the total cross sectional

area of the passages through the pack for the fluid may be made approximately the same as the cross sectional area of the passages through the ends of the junction pipe length without any substantial increase in cross sectional area of the device as compared with that of the pipe line.

Instead of being arranged in the form of a pack of rectangular cross section, the plates may be arranged as a pack of other cross sectional form, for example, of circular cross section in a circular casing 4 as shown in Fig. 3.

Any crushing pressure applied to the pack transverse to the passages 3 is borne by the zig-zags or corrugations acting as struts in the framework, the forces being balanced. Any tendency for the zig-zags or corrugations to flatten and expand under pressure is counteracted by the sides of the casing, against which the longitudinal edges of all the sheets abut.

In this way no distortion can occur and maximum strength is provided for resisting expansion pressure and temperature changes. There is no possibility of part of the structure being dislodged, and in the induction pipe of a petrol engine or the like no part of the device can be drawn into the engine.

The device can be applied in cases where only a short length of pipe line is available for its insertion.

Dimensions will now be given, by way of example, of a device according to the present invention suitable for use as a flame trap with petrol-air mixtures. The sheets and passages are made about 1¼" long from the front to the rear edges of, say, German silver of 0.003" thickness. The zig-zags are bent to form 90° angular apices or ridges, and the height of the triangles formed is 0.0312 inch. The number of sheets required and the size of the pack is governed by the size of the induction pipe through which the pack is fitted.

If a shorter device is required the length of the passages is decreased and the cross sectional area of each passage is decreased.

These dimensions are suitable to resist any form of explosion which may occur in a normal petrol engine but may be varied in accordance with the type of petrol engine employed and the position of the flame trap in relation to the induction pipe. In a petrol engine induction pipe where it is desired to prevent the passage of flame from the engine to the carburetter or mixture blower, this device is preferably placed as near as convenient to the engine end of the induction pipe so as to reduce the volume of mixture which could be ignited by an explosion before reaching the flame trap. In other arrangements the device is placed on the side of the carburetter remote from the engine, or is incorporated as part of the carburetter.

Where the above form of flame trap is used in connection with an engine or other device in which it is desired to secure the intimate mixture of air and gas and/or air and vapour or liquid drops the device is efficient owing to the form of the passages and any unvaporized drops of liquid break up during their passage through the structure. Such a device placed at the carburetter end of an induction manifold supplying a number of cylinders with petrol air mixture tends to negative any peculiarities of directional flow whereby any one branch pipe might receive the greater proportion of the unevaporated liquid, and serves as a flow controller by acting as a stabilizing baffle or flow straightener behind which each cylinder exerts a uniform pull on its proper proportion of fuel or air. By a flow straightener is meant a device which causes fluid to flow uniformly at all points in a plane transverse to its direction of flow.

The device may be used for cooling gases for the purpose of reducing and eliminating fire risk due to high temperature exhaust products, or other high temperature gases from other sources, by passing the gases through the device. Where such gases are emitted, as in the case of a petrol engine, with considerable violence, the device, by acting as a cooler of such gases as they pass therethrough, has further properties in producing the effect of a silencer. Its action in this respect is precisely similar to its action when used in an induction pipe, in that, by presenting a number of narrow conductive channels, it reduces the temperature and hence the volume of exhaust products or other high temperature gases, thereby decreasing the sound resulting.

The device may be provided with a cooling or heating water or other jacket or air cooling fins by arranging the jacket or fins surrounding or on the outside of the housing or casing hereinbefore referred to.

It is possible to secure, for example, in a given petrol engine, complete immunity from the fire risk resulting from the explosion, by means of an induction pipe flame trap as described above, whereby the emission of flame through the induction port towards the carburetter and air intake is precluded. Immunity from fire due to the high temperature exhaust products of the said explosion may be secured by incorporating on the exhaust side of the engine a structure which may be similar in design to that previously described but different in dimensions, whereby the exhaust gases are reduced in temperature below the temperature sufficient to ignite petrol. The exhaust gases are also silenced by these means. Owing to the nature of the structure previously described the lowest possible resistance is imposed to the outflow of the said exhaust products.

Having thus described the nature of the said invention and the best means we know of carrying the same into practical effect, we claim:—

1. A device as claimed in claim 2, wherein the plates are assembled in pack form within a rigid housing or casing so as to form a rigid unit.

2. A device of the character set forth, comprising a plurality of plates bent into zig-zag or corrugated form and a plurality of flat plates, the former plates being layered alternately with the latter plates and forming with the latter narrow passages, the angles or bends of each zig-zag or corrugated plate which are directed toward the zig-zag or corrugated plates on the opposite sides of same being directly opposed to angles or bends of the latter plates with a flat plate therebetween to prevent the application of bending moments to the flat plates and to provide rigid points of reaction for said angles or bends.

3. A device as claimed in claim 2, including a surrounding casing having portions which bear against the opposite ends of the plates and portions overlying and underlying, respectively, the upper face of the uppermost plate and the lower face of the lowermost plate and also having a flange at each of its edges overlying the longitudinal edges of said uppermost and lowermost plates and the end portions of all of the plates.

In testimony whereof we have signed our names to this specification.

WILLIAM HELMORE.
ANDREW SWAN.