

1,282,431.

W. S. JOSEPHSON.
ANTI-BACK-FIRING ECONOMIZER.
APPLICATION FILED APR. 25, 1917.

Patented Oct. 22, 1918.
3 SHEETS—SHEET 1.

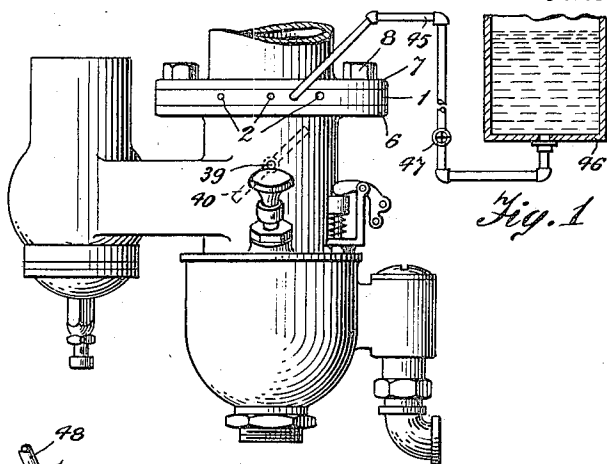


Fig. 1

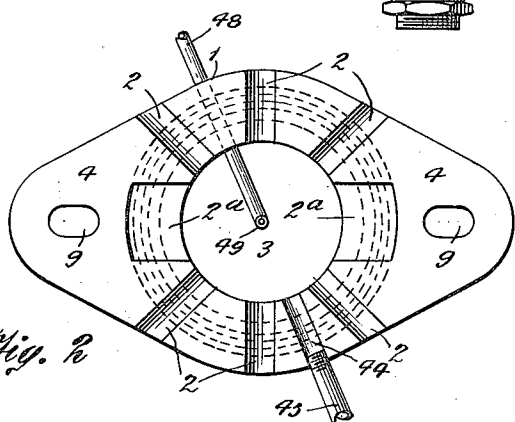


Fig. 2

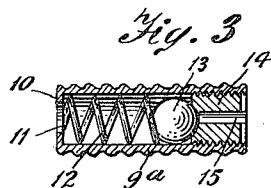


Fig. 3

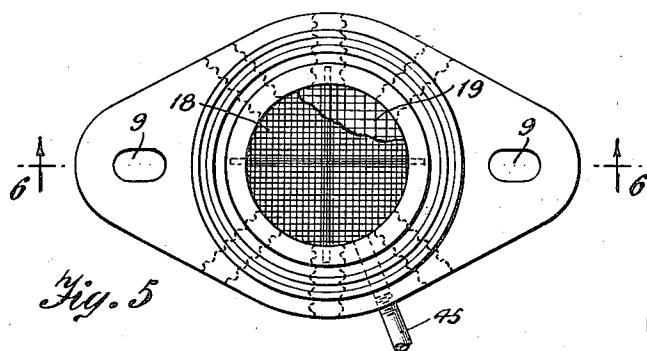


Fig. 4

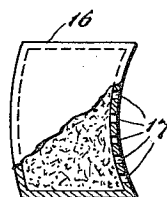


Fig. 5

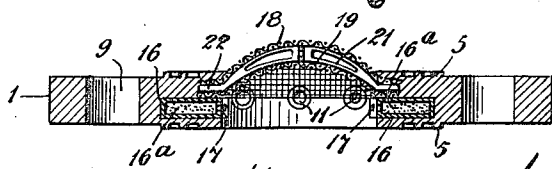


Fig. 6

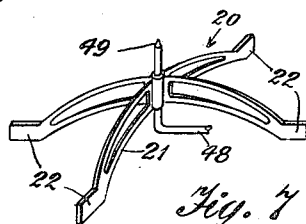


Fig. 7

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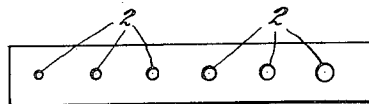


Fig. 8

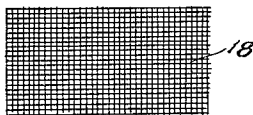


Fig. 9

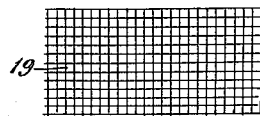


Fig. 10

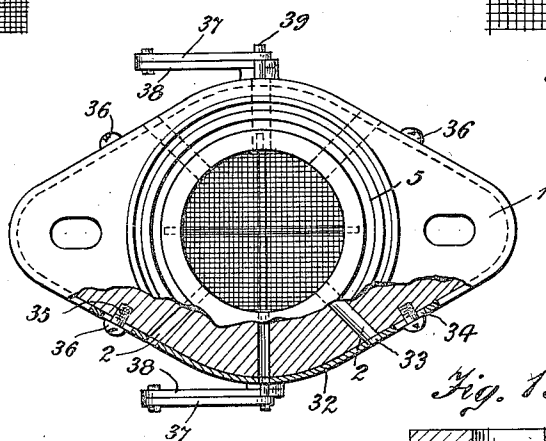


Fig. 13

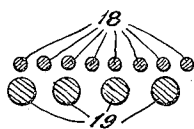


Fig. 11

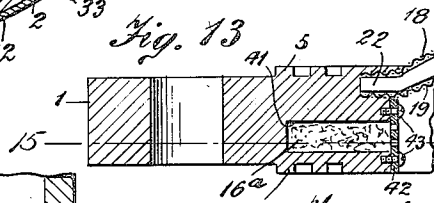


Fig. 16

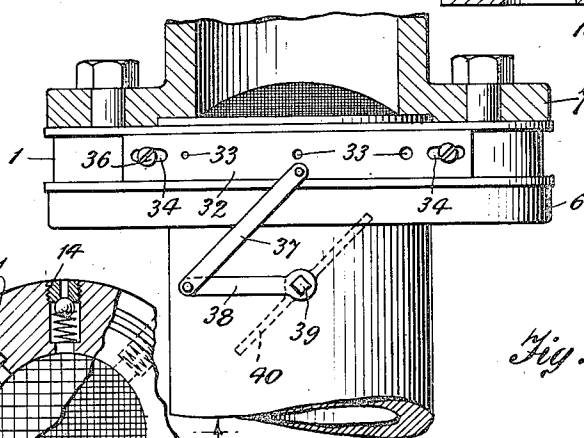


Fig. 14

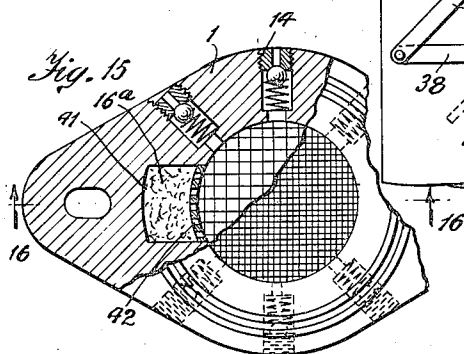


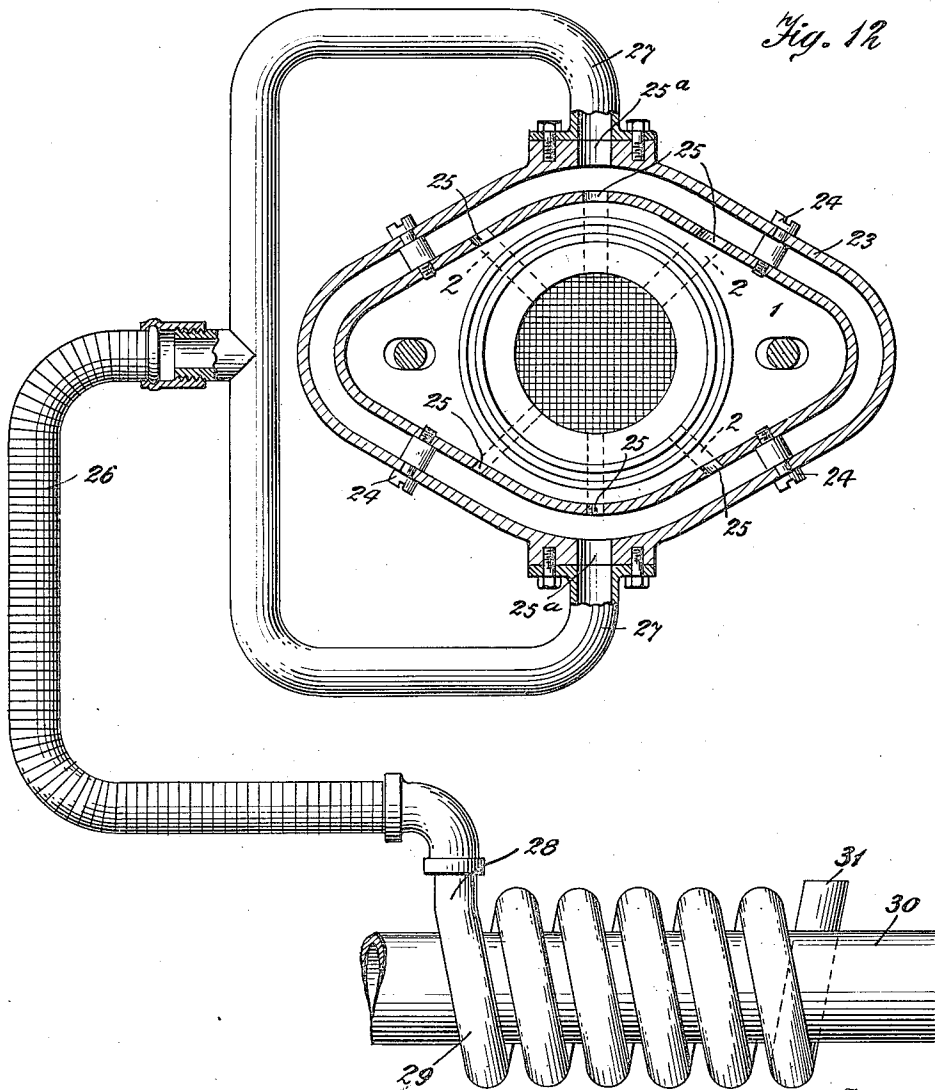
Fig. 15

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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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ANTI-BACK-FIRING ECONOMIZER.

1,282,431.

Specification of Letters Patent.

Patented Oct. 22, 1918.

Application filed April 25, 1917. Serial No. 164,349.

To all whom it may concern:

Be it known that I, WALTER S. JOSEPHSON, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Anti-Back-Firing Economizers for Internal-Combustion Engines, of which the following is a specification.

This invention is a mechanism for economizing the consumption of vaporizable fuel in internal-combustion engines, and for resistance to backfiring, and to reduce formation of carbon in the engine cylinder. The mechanism is herein illustrated in different forms and as an attachment for location between the opposed flanges of a carbureter delivery conduit and of a manifold intake conduit, but it is not an essential feature of the invention that the mechanism be made in the form of an attachment. The invention may be embodied if desired in an irremovable member of or appliance for the engine.

In the accompanying drawings forming a part hereof and illustrating the principle of my invention in the best forms now known to me,

Figure 1 is a side view of my new mechanism clamped between the opposed flanges of a carbureter discharge conduit and of a manifold intake conduit.

Fig. 2 is a top plan view of a portion of the gasket or gas-tight-joint-forming member, in process, and before completion.

Fig. 3 is a lengthwise sectional view of an air-valve constructed as an insert for one of the air-valve-receiving recesses shown in Fig. 2.

Fig. 4 is a box holding absorbent material and constructed as an insert for one of the pockets shown in Fig. 2, the inner side of the box being formed with openings for access of gaseous mixture to the contained absorbent material.

Fig. 5 is a top plan view of the completed mechanism, showing a top screen and a bottom screen spanning the central opening of the gasket and, in dotted lines, the inserted air valves and absorbent-containing boxes.

Fig. 6 is a lengthwise central section of the completed mechanism at line 6—6 of Fig. 5, the top and bottom screens and spacer therebetween.

Fig. 7 is a perspective view of the spacer removed.

Fig. 8 is a diagrammatic layout of the opposed edges of the gasket wherein are the valve-controlled air-passages, shown six in number and of gradually increasing diameters.

Fig. 9 is a plan view of the finer-mesh upper-screen material, and

Fig. 10 is a similar view of the coarser-mesh under-screen material.

Fig. 11 is a cross-sectional diagrammatic view of certain wires in the finer upper-screen and coarser under-screen material.

Fig. 12 is a view showing my new mechanism provided with a hot-air stove.

Figs. 13 and 14 are respectively plan and sectional details of another form of an embodiment of my invention.

Fig. 15 shows in section at line 15—15 of Fig. 16, a form of the invention in which the valve tubes and the inserted boxes containing the absorbent material are dispensed with.

Fig. 16 is a vertical sectional detail at line 16—16 of Fig. 15.

In Figs. 2 and 7 I show a primer conduit adapted to discharge upwardly through an upstanding jet above the upper screen. In other figures the primer jet is omitted for the sake of clearness.

In the drawings, the gasket 1 is preferably a die casting of compressible metal. It is cast progressively and when its under portion is poured the upper face thereof is provided with air-valve-receiving recesses 2 and box-receiving pockets 2^a, all of which open into the central opening 3 of the gasket that is preferably formed with wings 4, one opposite the other at each side of the central opening around which the gasket is preferably formed on both sides with an annular circumferentially corrugated shoulder 5 which is readily and uniformly compressed to form gas-tight joints at the top and bottom of the gasket when it is clamped compressively between the flange 6 of the carbureter discharge conduit and the opposed flange 7 of the manifold intake conduit by the bolts 8 through the flanges and bolt holes 9 in the gasket wings. Under such conditions the shoulders 5 are crushed into tight-fitting relations to the inequalities of the flange surfaces. The air-valve-receiving recesses 2 are each open at an outside edge of the gasket. The wings or extensions are made thinner than the annularly shouldered

portion of the gasket around the central opening.

Each air valve comprises a tube 9^a having an interior flange 10 and an air discharge port 11 at its inner end. A coiled spring 12 located in the tube has one end abutting on flange 10. A ball valve body 13 is placed opposite the outward end of the spring and held in place in the tube by a nut 14 having a central air-intake port 15. The ports 15 are all of one size, but the ports 11 are preferably varied in size, all being as large as and some being larger than the ports 15. Each valve tube port 11 preferably varies in dimension or size relatively to every other port 11, so that the ports 11 discharge varying quantities of air into the chamber of the structure, and the springs correspondingly vary in tension. The variation in areas or dimensions of the ports is desirable in order that the mechanism may automatically vary the richness or leanness of the gaseous mixture flowing from the carbureter; the variations in the engine speed automatically and synchronously making such mixture leaner as the engine speed is increased, and richer as the engine speed is decreased. And this method of operation of the present mechanism in its preferred form is accomplished by the fact that as the engine speed increases there is a corresponding increase of suction whereby the larger ports 11 and 15 are opened, the springs for the valves for the larger ports being stronger than the springs for the smaller ports; and consequently there will be a progressive unseating of the valves and opening of the ports as speed and suction increase, and a consequent increase of the air supply and resultant increase of leanness at the higher engine speeds. On the other hand, at lower speeds and less suctional force, the stronger springs may not yield to unseat the valves for the larger ports 11 and 15 and consequently there will be less air admitted at such lower speeds to the gaseous mixture with a corresponding relative increase of its richness. By the admission of outside air to the preformed mixture, my invention performs its useful function of automatically varying the richness or leanness of the mixture exploded in the engine cylinder, and this variation is effected synchronously with variations in the R. P. M. of the engine.

For the reason that it is novel and important wholly to remove the absorbent material from between the screens mentioned below, it is not an essential feature of the present invention, broadly considered, that the particular construction or even mode of operation should be availed of, but it is a very desirable and important feature of the invention for some installations.

The tubes 9^a are preferably exteriorly corrugated as shown so that the gasket metal

of the upper portion of the gasket when poured upon them will interlock therewith and keep the air valves in place.

It is a feature of this invention to provide the mechanism with a body of absorbent material 16^a such as asbestos or mineral wool, for examples, which while accessible to the gaseous mixture is not located in or opposed to the central opening of the gasket. By the present invention the absorbent material is wholly removed from the central opening of the gasket and therewith-connected conduits.

To this end boxes 16 are made for insertion in the gasket pockets, each box being filled with the absorbent material and having its inward side opening into the central opening of the gasket through the holes 17.

A pair of upper and under wire-mesh screens 18 and 19 are assembled, preferably with a thin four-armed metallic spacer 20 between them to resist any backfiring force tending to collapse the upper screen. The function of the spacer is to sustain the upper screen against a strong back-fire pressure and to keep the screens separated throughout, as a back-fire flame will penetrate a single screen but will not penetrate a double screen when properly separated throughout.

The spacer 20 may be considered as a skeletonized dome. The upper screen 18 rests on the top of the spacer. The upper side of the under screen 19 bears against the under side of the arms 21 of the spacer, the under edges of the arms being upwardly curved to the center of the under screen which like the upper screen is concavo-convex for greater strength. The number of arms 21 may be varied. Each arm terminates in an upstanding foot 22 which is located between the upper margin of the under screen and under margin of the upper screen so that these two screens are separated throughout their whole extent. The screen margins are solidly anchored in the gasket metal. The arms of the spacer are made thin and stand edgewise. About one-eighth of an inch separation of the screens is ample to prevent backfiring through the screens and they may be separated by a slightly lesser space if desired. I have found by numerous experiments that it is necessary to separate the screens properly by from three-sixteenths to four-sixteenths of an inch at and near the wall of the gasket opening spanned by the screens in order to prevent a backfire flame from passing through the screens the upper portions of which are usually separated to even a greater distance. I have also found that it is desirable for betterment of vaporization to use an under screen having holes of about one-sixteenth of an inch dimension and a slightly finer upper screen; and to arrange the upper screen with its cross wires opposed to the spaces between the cross wires of the under

screen so that the interstices of the under and upper screens are in relatively staggered relations. This arrangement certainly produces a considerably better effect than is obtainable by having the opposed interstices alined in the vertical direction.

The flat superimposed margins of the two screens are located on the upper side of the partially formed gasket which is completed by additional molten metal in the die-casting operation; whereby the inserted air-tubes, the inserted boxes containing the absorbent material, and the screen margins are all covered and firmly anchored in position; and the mechanism as a unitary attachment completed. It may of course be produced by any other practicable mode of manufacture without departure from this invention.

Two screens properly spaced apart are necessary to prevent backfiring through the device. More than two screens are undesirable as such additional screens tend unduly to interfere with the flow of the gaseous material, which flow can however be properly obtained through two screens spanning the central opening of the gasket which has a diameter of about that of the connected conduits. The described attachments are made in different sizes.

The mode of operation in relation to the vaporization effected appears to be this: A stream of gasolene coming from the carbureter strikes against the double screen of the device and fills the interstices of the screen mesh with exceedingly thin layers of gasolene. These thin layers being held in each separate interstice by capillary adhesion are therefore subject to surface tension, which induces rapid volatilization, which is still further enhanced by the action of the outside air admitted through the air ports, and consequently a very intimate gaseous mixture, in which there is no excess of liquid gasolene, enters the cylinders.

The making of the valve tubes and the boxes which hold the absorbent material as inserts is desirable when and if the invention is to be made as an attachment by die-casting operations. The metal used is soft and of lead or some suitable composition for the purpose. It is important that the gasket be made of soft compressible metal in order to resist heat and also to be deformed so as to make gas-tight joints to prevent escape of gas going from the carbureter to the manifold, and to prevent escape of gases if backfiring occurs.

As shown in Fig. 12, a mechanism embodying this invention may comprise a hot-air stove which I show in the form of a flattened conduit 23 detachably fixed by fasteners 24 to the edge of the gasket 1, and having air holes 25 which register with the air openings 2. A hot-air pipe 26 is shown with two branches 27 each connecting with the

chamber of the stove, and it is in turn connected at 28 to one end of the coil 29 located on the engine exhaust pipe 30. An end of the coil is open to form a fresh-air intake at 31 for admission of air to the stove. In the operation of this air-heating device, the hot air is sucked through the air-passages 2 and into mixture with the preformed gaseous mixture; and use of heated air through the gasket air-passages is very beneficial under many conditions.

In Figs. 13 and 14 I show a modification in which the mechanism comprises a gasket formed with the recesses 2, but here constituting air-passages, from its outward wall to the wall of its central opening; and comprising the pair of screens and spacer therefor, and also the absorbent material. But in lieu of the air-valves, the gasket is provided on each side with a flexible slidable strip of brass or other suitable metal located between upper and under projecting exterior ribs 1^a formed on the gasket. Each strip 32 is provided with a series of airholes 33 which are spaced apart one from another. In one position the imperforate portions of a strip cover the outer ends of the air-passages 2; in other positions, the airholes 33 will wholly or partially register with the air-passages 2. Each strip 32 has near each end a lengthwise-extending slot 34 through which the body of a screw 35, projecting from the gasket, extends, the screw-heads 36 overlapping the slot margins and holding the strips in place. Each strip 32 is loose-jointedly connected to one end of a link 37 the other end of which is loose-jointedly connected to a crank arm 38 fixed on the cross pintle 39 of the throttle or butterfly valve 40. When the latter is adjusted, each strip 32 is correspondingly adjusted wholly or partially to cover or uncover the air-passages 2. In this construction any mechanical adjustment of the throttle adjusts the slides.

The features of this invention may be embodied in various forms other than those shown if so desired. While I have found two screens spaced apart essential to prevent backfiring into the carbureter or source of the gaseous mixture, yet it is possible that some other form of screen may be devised for the purpose, and in any event a single screen is useful to promote the vaporization.

Fig. 15 shows a modification in which the valve tubes and the inserted boxes containing the absorbent material are dispensed with. The valves and springs are located directly in the air passages formed in the gasket, and the central hole of the gasket is formed with wall recesses 41 wherein the absorbent material is placed and covered with a perforated cover 42 held in place by screws 43 through the cover plate ends into the wall of the central opening. In all cases, if desired, the gasket may have an

opening as at 44 for example, for connection with a water pipe 45 connected with a source 46 of water supply. The suction of the engine piston pulls the water into the engine cylinders, and the water when in the cylinders is converted into steam, from which, owing to the heat generated in the explosion of the gasolene mixture, free oxygen is released, the oxygen combining with the carbon and forming carbon monoxid which is expelled through the exhaust. Pipe 45 is shown provided with an accessible control valve 47 operable from any convenient place such as the dash of a motor car for example.

There is another feature of the invention not previously referred to. I may use a primer pipe 48 from any suitable source of gaseous fuel mixture, and this pipe is indicated particularly in Figs. 2 and 7. In the latter figure the upstanding end-portion of the pipe is shown through a central aperture of the spacer 20, the pipe being provided at its upper end with a contracted jet nozzle 49 which may be forced through the central interstices of the under and upper screens and carried up to any desired height. The primer pipe 48 will in practice be connected with an accessible pump or the like (not shown).

By outside atmosphere is meant the atmosphere exterior to the device, and by inside atmosphere is meant the atmosphere within the device.

What I claim is:

1. The combination of two flanged conduits with an intermediate compressible gasket positioned flatwise between the conduit flanges, the gasket having a central conduit opening for putting the two conduits in communication; and also having an upstanding, skeleton, domed-screen supporting frame provided with a plurality of legs spaced laterally apart one from the other, and the free ends of which are anchored in the gasket; and a pair of domed screens one above and the other under said frame and each having its margins anchored

in the gasket; the body of the gasket being provided with a series of radial holes each opening exteriorly to the atmosphere and interiorly into said opening through the gasket; said radial holes varying in diameter and being severally provided with a valve, a spring therefor, and a valve seat; said valved holes being below the under screen, the gasket having elongated end portions each provided with a vertical bolt-receiving hole, and some of said radial, valved holes opening through the gasket body on one side thereof, intermediate said elongated ends, and the remainder of said radial valved holes opening through the gasket body at the other side thereof intermediate said elongated ends.

2. In the structure of claim 1, the screen-supporting frame having a tubular, pipe-holding head portion with which the upper ends of the legs join.

3. In the structure of claim 1, the edge wall of the conduits opening through the gasket being formed with a recess opening into the gasket body and a body of absorbent material in such recess; the recess being between two of said radial, valved holes.

4. In the structure of claim 1, for each radial valved hole a tubular valve casing, provided with a valve, valve seat and valve spring, the casing being fixed lengthwise in its receiving hole.

5. In the structure of claim 1, for the said recess, a casing fitted in the recess, holding a body of absorbent material and having openings whereby the conduit opening of the gasket and the chamber of the casing are in communication.

6. In the structure of claim 1, a continuous hot-air stove inclosing the peripheral edge of the gasket and having a series of openings each in communication with a radial hole of the gasket.

In testimony whereof I have hereunto set my hand this 18th day of April, 1917.

WALTER S. JOSEPHSON.