March 16, 1937. H. W. EDEN 2,074,083

DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 16, 1936 2 Sheets-Sheet 1

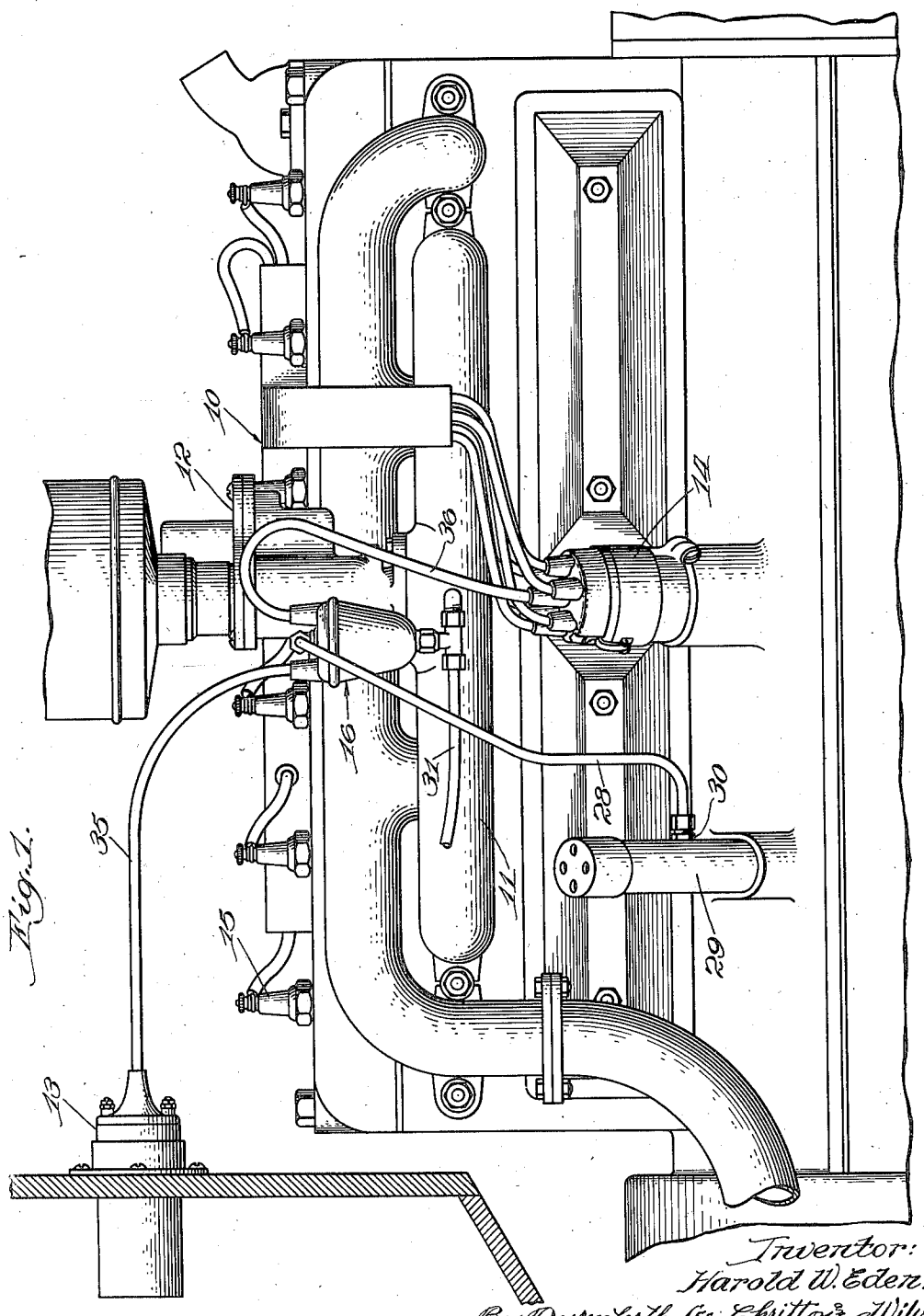

Fig. 1.

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Fig. 2.

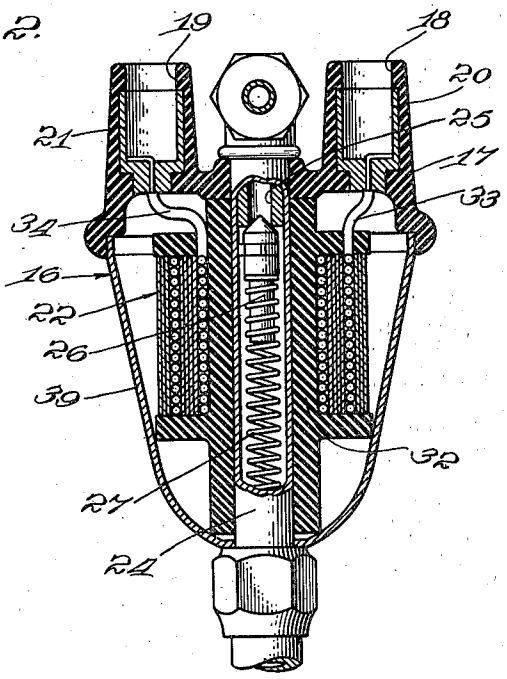
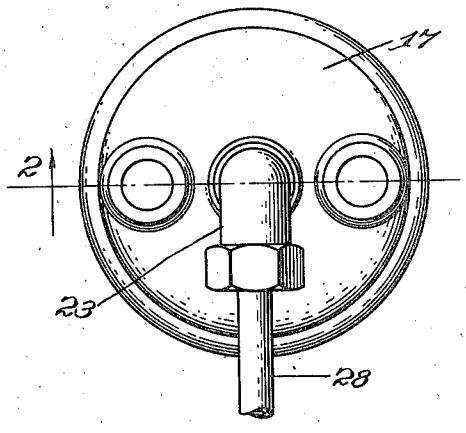


Fig. 3.



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DEVICE FOR INTERNAL COMBUSTION ENGINES

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7 Claims. (Cl. 123—119)

This invention relates to a device for internal combustion engine, and more particularly to means for improving the combustion and power thereof.

One feature of this invention is that it improves the combustion of the charge fired in the cylinders of an internal combustion engine; another feature of this invention is that it improves the power of said engine; yet another feature is that it improves the smoothness of operation of an engine to which it is applied; a further feature is that it eliminates, or substantially eliminates, carbon monoxide from the exhaust of said engine; a still further feature is that it improves the mileage per gallon of gasoline when used in connection with an engine on a vehicle, for example; other features and advantages of this invention will be apparent from the following specification, and the drawings, in which:

Fig. 1 is a side elevation of an engine and a combustion improving device thereon; Fig. 2 is a detailed view, principally in section, of the device, along line 2 of Fig. 3; and Fig. 3 is a top plan view of the device.

Many difficulties are encountered at present in attempting to secure higher efficiencies from an internal combustion engine, particularly of that type usually found in automobiles. Such engines frequently do not secure the desired amount of power from each gallon of gasoline, run with noticeable roughness, and even with carburetors well adjusted, pour large quantities of carbon monoxide out of their exhaust pipes. The development of more power per gallon of gasoline and smoothing out of engine operation, are, of course, of importance to the operator of an individual vehicle. In addition, the elimination, or substantial elimination, of carbon monoxide from the exhaust of said engine is of great importance not only to the operator but to the public in general.

It has been found that by providing an auxiliary intake to the manifold, additional to the usual intake through the carburetor, through which air and preferably oil vapors are drawn when the vacuum in the manifold exceeds a predetermined amount, and by exposing the gases entering through this additional intake to the influence of the field of a coil energized by high-tension current, that the above mentioned desired results are obtained.

In the particular embodiment of this invention illustrated herewith, a six cylinder internal combustion engine of the conventional type found in present automobiles is indicated in general by the reference numeral **10**. The engine is provided with an intake manifold **11** through which a charge of air and gasoline is drawn to the cylinders from the carburetor **12**, in accordance with conventional practice. The charge is fired in the cylinders by a high-tension electrical system comprising an induction or spark coil **13**, a distributor **14**, and spark plugs **15**. The spark coil, and consequently the entire ignition system, is energized in the usual manner by a battery circuit completed through breaker points in the distributor; this is not illustrated here, since it forms no part of the present invention.

The specific combustion improving device illustrated herewith is indicated in general by the reference numeral **16**. This device includes a top portion **17** preferably formed of some plastic dielectric material, and a body portion **39**. The top **17** has therein two sockets **18** and **19** having therein contact elements **20** and **21** forming the connections for the two ends of a coil **22**. The top has in the center thereof an elbow **23** supporting a pipe **24** passing downwardly therefrom. The upper end of this pipe or tube has therein a reduced portion **25** here shown as having an internal diameter of three-sixteenths of an inch, although for passenger car operation the diameter of this passage would normally be one-eighth of an inch. The tube **24** also contains a valve member **26** spring pressed against the reduced portion **25** by a spring **27** adjustable as to tension by means not here illustrated. The tube **24** is connected through the elbow **23** to a pipe **28** opening into the oil breather pipe **29** near the engine by being tapped into the side thereof, as at **30**. The breather pipe, according to conventional practice, opens into the crank case of the engine **10**, and thus any air and vapors, whether they be of oil, gasoline, water, or otherwise in the space above the oil in the crank case, may be drawn through the pipe **28** and the tube **24** when the valve **26** is open. The spring **27** is preferably so adjusted that the valve will open and permit the flow of gases through the tube **24** when the vacuum present in the manifold **11** exceeds about eight inches of mercury. The lower end of the tube **24** is connected, through appropriate means, to an opening in the intake manifold **11**. This means is here shown as a T coupling inserted in the vacuum line **31** leading in the usual manner to the driving motor of a windshield wiper.

The coil **22** is here disclosed as comprising 30 turns of No. 16 B. & S. gage wire wound on a seven-eighths inch spool or form **32** of dielectric

material. The coil comprises two layers of 15 turns each, the second layer being separated from the first or inner layer by about one-eighth inch of insulating material, such as paper, mica, or the like. The two ends of the coil are connected by the leads **33** and **34** to the contacts **20** and **21**, respectively. Referring more particularly to Fig. 1, it will be seen that one of these contacts is connected to the high-tension portion of the spark coil **13** by the wire **35**, and the other contact is connected to the central terminal of the distributor **14** by the wire **36**. Thus the coil **22** is in series in the high-tension ignition system between the spark coil **13** and the distributor **14**, and is energized by the high tension current delivered by the spark coil. That is, each spark furnished to one of the plugs **15** causes a high tension current to flow through the coil **22**, which sets up a field in and about that coil. It will be seen, from the construction described, that any gases flowing through the tube **24** will be exposed to the field existing in this coil, since the tube **24** is of non-magnetic material, such as brass.

It has been found that the admission of additional gases to the intake manifold which are drawn into it when the vacuum therein exceeds a predetermined amount have a beneficial effect on the operation of the motor; it has also been found that the insertion of a coil in the high-tension ignition system of an engine between the spark coil and the distributor has an improving effect upon the operation of the motor. Placing the coil about the tube through which the gases are admitted, however, has an additional beneficial effect which exceeds the mere use of each of these factors independently on the engine. In other words, the particular arrangement disclosed and claimed herewith produces a combination effect which improves the combustion, smoothness, carbon monoxide content of the exhaust, and overall efficiency of an internal combustion engine of conventional type beyond the mere presence of each of the two factors independently on the same engine.

The predetermined amount of vacuum at which the valve **26** opens to admit gases to the intake manifold, can, of course, be varied, but it has been found that the preferred point is at, or substantially near, to a vacuum equivalent to about 8 inches of mercury. The number of turns on the coil **22** can also be varied, but it has been found that about 15 turns of the size wire defined on this size spool is about the minimum for improved operation; and that 60 turns is about the maximum, that is, the inductance of the coil **22** should lie in a range between that equivalent to a 15 turn coil of No. 16 wire on a seven-eighths inch core, as a minimum, and 60 turns of No. 16 wire on a seven-eighths inch core as a maximum.

The presence of the coil appears to have a beneficial effect because of at least two reasons. One of these is that the coil improves the length of discharge or "hotness" of the spark jumping the plugs **15**; and the other is, that the exposure of the gases passing through the tube **24** to the field of the core seems to develop a condition in such gases which improves the combustion, with a consequent decrease in carbon monoxide and increase in power. Whatever the reasons for the improved operation resulting from the use of this device, however, experiment has clearly proven that a device built upon the lines disclosed will have the desired results. Probably the most important result, at least with respect to the public in general, accomplished by the device is the reduction of carbon monoxide in the exhaust gases from the engine. In a typical test, made with a six cylinder car of well known make, the exhaust gases contained 1.18% of carbon monoxide when the engine was idling, 3.5% during "stop and go" driving, and 5.7% at a sustained speed of 35 miles per hour. With the device disclosed herein added to the engine, and all other conditions remaining exactly the same, the carbon monoxide content of the exhaust gases was only .1% when the engine was idling, .3% during "stop and go" driving, and .1% at a speed of 35 miles per hour. It will be noted with an idling speed, the condition usually existing where carbon monoxide is the most troublesome, as in a garage or in very tight traffic, the monoxide content of the exhaust gases is reduced to a point that eliminates danger; and that under all conditions it is practically eliminated. Tests on the above car and on many others, gave savings up to five miles per gallon of gasoline combined with smoother and better engine performance at all speeds. In all cases it was found that oil consumption was slightly increased by the withdrawal of vapors from the crank case, but this increase in no case amounted to more than one-half pint per 100 miles. The withdrawal of the gases in the crank case, combining air, oil vapors, gasoline vapors, etc., has several desirable effects. First, it provides overhead lubrication for the engine; second, it makes use of unburned gasoline vapors existing in the crank case which would be normally wasted; and, thirdly, it withdraws gasoline, water, and anything else which might tend to dilute the oil.

When the word "gases" is used herein, and particularly in the claims, it is intended to define gases which consist mostly of air, but which may also have incorporated therewith vapors of oil, gasoline, or the like. It is to be understood that the means for admitting air to the intake manifold through which gases are drawn into said manifold when the vacuum existing therein exceeds a predetermined amount is additional and supplementary to the normal or conventional intake through the air passages associated with the carburetor.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as possible in view of the prior art.

What I regard as new and desire to secure by Letters Patent, is:

1. A combustion improving device for an internal combustion engine having a high tension ignition system energized by a spark coil, including: means whereby air and vapors from the crank case are drawn into the intake manifold of said engine when the vacuum therein exceeds a predetermined amount; and a coil in series with the high-tension portion of said spark coil, said coil being so constructed and arranged that said air and vapors pass through the field thereof before entering said manifold.

2. A combustion improving device for an internal combustion engine having a high-tension ignition system energized by a spark coil, including: means whereby air and vapors from the crank case are drawn into the intake manifold of said engine when the vacuum therein exceeds

a predetermined amount, said means including a tube; and a coil around said tube, said coil being in series with the high-tension portion of said spark coil.

3. Apparatus of the character claimed in claim 2 wherein the coil around said tube has an inductance within the range between that equivalent to 15 turns of No. 16 wire on a seven-eighths inch dielectric core and that of a 60 turn coil of No. 16 wire on a seven-eighths inch dielectric core.

4. Apparatus of the character claimed in claim 2, wherein the coil around said tube comprises about 30 turns of No. 16 wire on a seven-eighths inch dielectric core.

5. A combustion improving device for an internal combustion engine having a high-tension ignition system energized by a spark coil, including: means whereby air and vapors from the crank case are drawn into the intake manifold of said engine when the vacuum therein exceeds a predetermined amount, said means including a tube having a valve therein opening when the vacuum in said intake exceeds about 8 inches of mercury; and a coil around said tube, said coil being in series with the high-tension portion of said spark coil.

6. Apparatus of the character claimed in claim 5, wherein the coil around said tube has an inductance within the range between that equivalent to 15 turns of No. 16 wire on a seven-eighths inch dielectric core and that of a 60 turn coil of No. 16 wire on a seven-eighths inch dielectric core.

7. Apparatus of the character claimed in claim 5, wherein the coil around said tube comprises about 30 turns of No. 16 wire on a seven-eighths inch dielectric core.

HAROLD W. EDEN.