July 12, 1938. HANS-WOLFGANG BURSCHKIES 2,123,460

APPARATUS FOR STOPPING INTERNAL COMBUSTION ENGINES OR THE LIKE EMPLOYING OIL LUBRICATION

Original Filed March 10, 1936 2 Sheets-Sheet 1

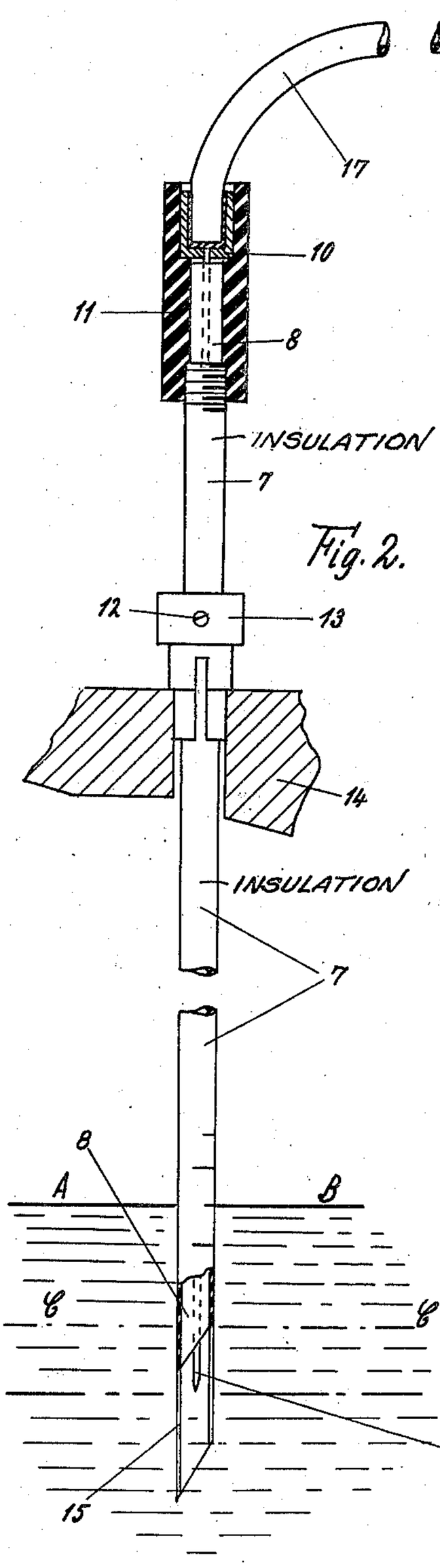
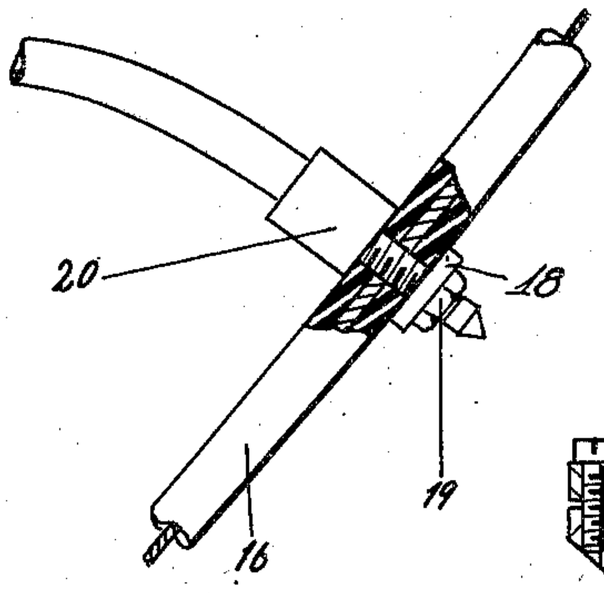


Fig. 2.



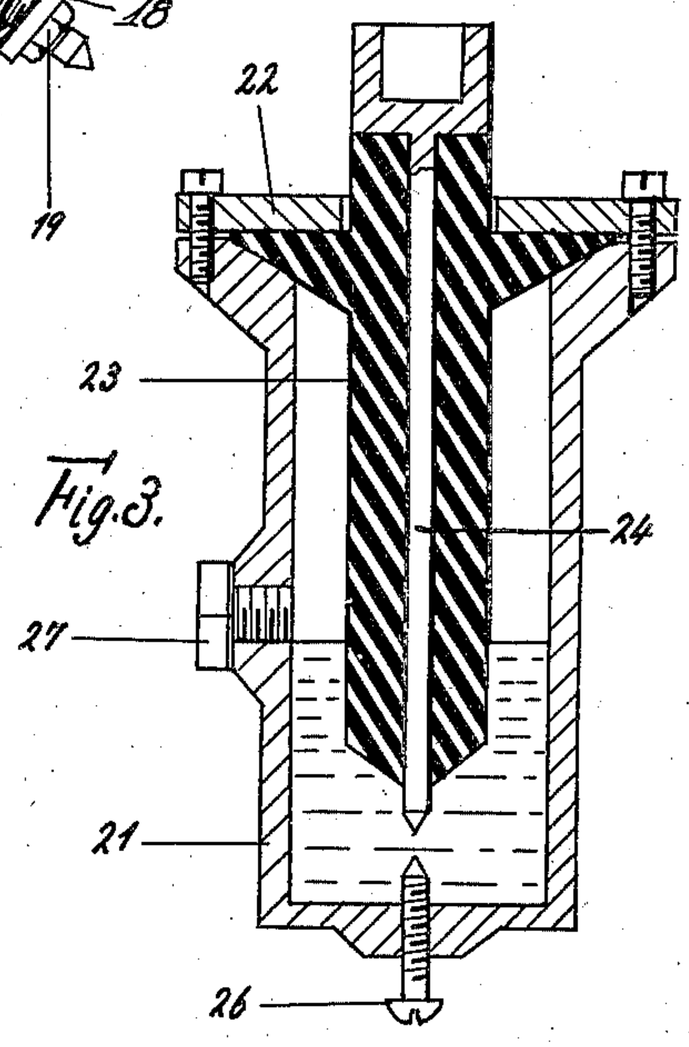


Fig. 3.

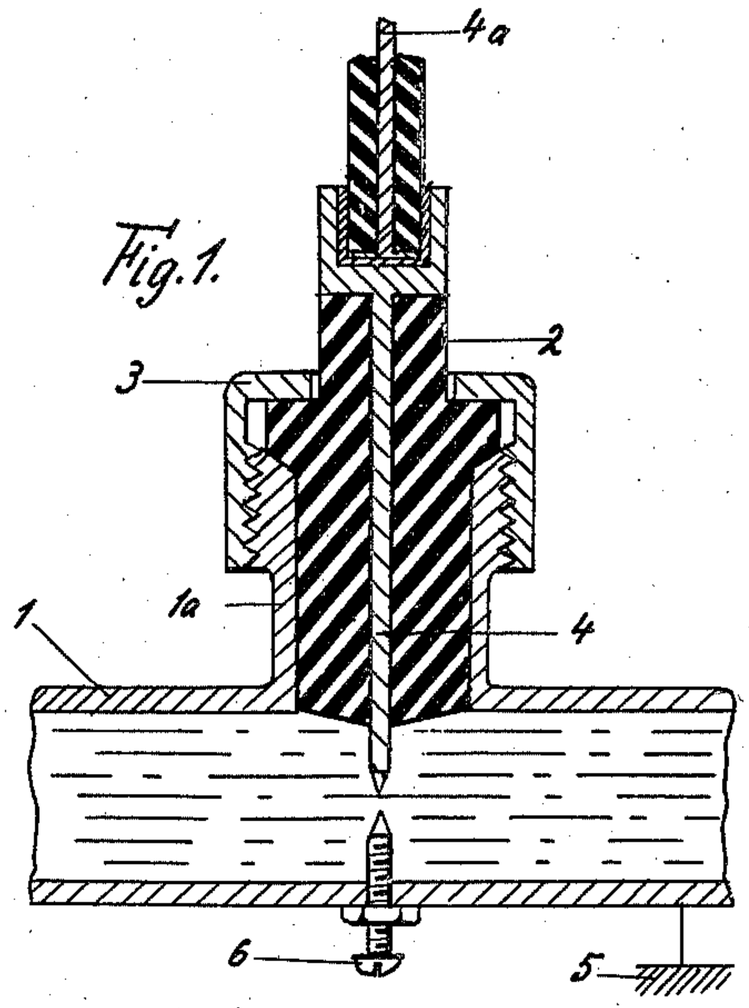


Fig. 1.

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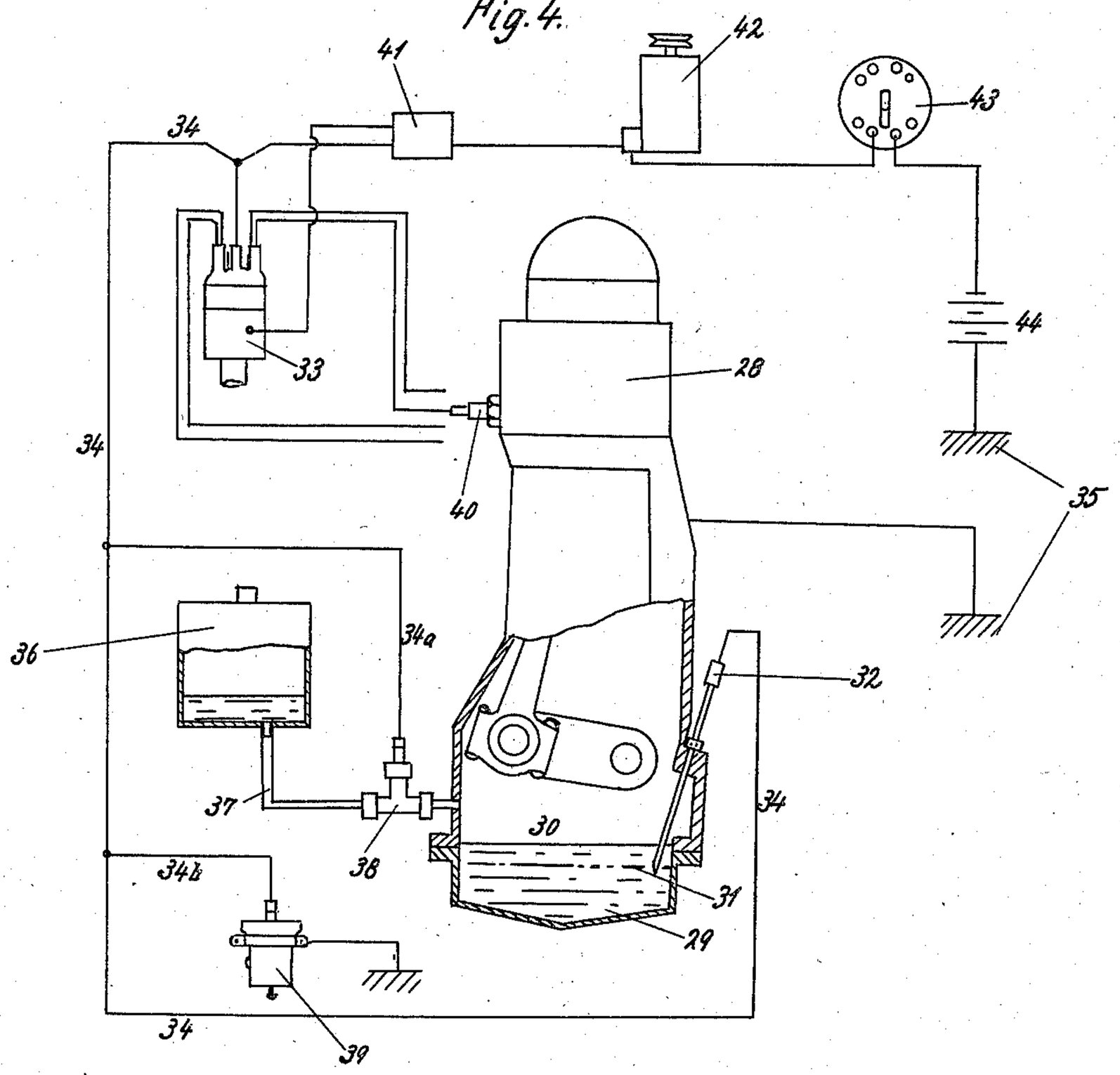
Fig. 4.



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UNITED STATES PATENT OFFICE

2,123,460

APPARATUS FOR STOPPING INTERNAL COMBUSTION ENGINES OR THE LIKE EMPLOYING OIL LUBRICATION

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4 Claims. (Cl. 123—196)

The present invention relates to an apparatus for stopping internal combustion engines or the like employing oil lubrication, should the oil supply fail or other disturbances arise.

In such engines, devices are already known in which a contact body is provided which is controlled by the oil pressure to break or short-circuit the ignition circuit when the oil pressure decreases or when the oil is at a certain minimum level, thus stopping the engine. Such contacts, however, were located outside the oil chamber or sump so that they were liable to oxidation or damage, and the controlling action therefore interfered with. Devices are also known, in which contact elements are provided, located within the oil supply conduit and comprising a contact body in the form of a ball, adapted to establish a contact under the action of the oil pressure. In this arrangement, as soon as a fault occurred in the oil supply, the ball, as a result of a change in its position, made contact between two insulated contact points thus interrupting the ignition circuit of the engine.

According to the present invention, the defects of the above arrangements are obviated by dispensing with mechanically operating contact elements, and arranging the electrodes of a spark gap connected in a short-circuit path, within the lubricating system, so that the disruptive strength of the lubricating oil itself prevents the production of a short-circuit spark as long as there is lubricating oil between the two electrodes.

The arrangement according to the present invention stops the engine, not only when the supply of lubricant fails, but even when, by reason of dilution of the oil, say by fuel residues or the like, the lubrication is likely to become inadequate. A further advantage of the arrangements according to the invention resides in the fact that the construction is so simple that it can readily be incorporated in an existing engine.

Several constructional examples of the subject of the invention are illustrated in the accompanying drawings, in which,

Fig. 1 is a sectional view through an engine stopping device which is incorporated in the oil conduit,

Fig. 2 is a side view partially in section of a rod-shaped device serving for measurement or for control,

Fig. 3 is a sectional view through a device which, by altering its position, operates to stop an internal combustion engine, and

Fig. 4 shows diagrammatically the arrangement of a number of devices according to the invention, in an ordinary four-cylinder engine.

In the arrangements shown in Fig. 1, an insulation body **2** is mounted with an oil-tight joint in a socket **1***a* attached to an oil supply conduit **1** and is locked against movement by means of an external nut **3**. Mounted in this insulating body **2** is a metal pin **4**, which at one end projects into the oil conduit **1** and, at the other end, is connected through the cable **4***a* to the ignition cable of the internal combustion engine. The conduit **1** is earthed or connected to an earthing mass **5**, and is preferably provided, at a point opposite the pin **4**, with an adjustable pin **6**, which is conductively connected to the oil conduit **1** and serves as the second electrode. The distance between the pin electrodes **4** and **6** or between the pin **4** and the inner wall of the oil conduit **1** is so chosen or is so adjusted that the quantity of oil between the pins is sufficient insulation to prevent an ignition spark jumping from one pin to the other. However, if the electrical disruptive strength of the oil is materially diminished owing to dilution of the oil, as may occur in a circulating oiling system, or if a failure occurs in the oil supply owing to the normal consumption thereof or to a fault in the oil conduit or oil pump, so that the oil level in the conduit falls to such an extent that an air-gap is formed between the electrodes **4** and **6** or, if the conduit **1** is in a horizontal position, the oil layer becomes very thin, a high tension ignition current will pass from the metal pin **4** to the inner wall of the conduit or to the pin **6** provided therein, thus causing the ignition circuit to be short-circuited and stopping the engine.

Such devices can be employed in oil-pressure brake conduits in automobiles or in all cases where supervision of an oil conduit is desired, no matter whether the oil is under pressure or not. They may also serve as control devices in all the oil conduits of a motor cycle and may also be inserted directly behind the oil tank, in order that they may operate when the latter empties.

The embodiment illustrated in Fig. 3 is also intended for stopping internal combustion engines. In this case, an insulating body **23** is fixed in a cylindrical container **21** by means of a cover **22**. In the insulating body **23** a conductive pin **24** is again mounted to serve as an electrode and is connected by a cable to the ignition cable of the internal combustion engine. The casing **21** is earthed as was the conduit shown in Fig. 1, and a second electrode **26** is adjustably mounted

with an oil-tight joint in the casing **21** at a point opposite the pin **24**. By removing the screw-threaded stopper **27**, oil can be filled into the container **21**, the quantity introduced being sufficient to cover the electrodes **24** and **26** when the container **21** is in a vertical position (Fig. 3). The container **21** is rigidly arranged on a vehicle, for instance, a motor cycle, so as to be entirely independent of the other oil conduits. If the motorcycle should fall over, the oil in container **21** will find its level and break connection between the electrodes **24** and **26** and disrupt the circuit, and as the electrode **24** is connected to the ignition of the engine, this spark gap constitutes a short-circuit and the engine is therefore stopped. Further consequences which might arise from continued running of the engine are thus avoided.

A further constructional example of the invention is illustrated in Fig. 2, which shows the short-circuiting device in the form of an oil dip stick or measuring rod. Mounted in an insulating rod **8** is a metal wire or pin **9**. The insulating rod **8** is surrounded by a metal tube **7** which is provided with a measuring scale. The upper end of the wire **9** is soldered to a bush **10**, which is prevented from sparking over to the tube **7** by an insulating bush **11**. A metal bush **13**, which is displaceable on the tube **7**, is adapted to be fixed in position by a grub screw **12**. This bush **13** serves as a stop when the measuring rod **7** is introduced into the oil-filled crank case **14**, and simultaneously earths the measuring rod **7** through the crank case. The metal pin **9** is electrically connected through the bush **10** and the cable **17** to the high-tension cable **16** which leads to the distributor, the connection being effected by means of a screw **20** on which are provided the washer **18** and the nut **19**. The line A—B marks the normal oil level, for instance, in the crank case. If the oil level falls from any cause, air penetrates into the tube **7** below the line C—C through the longitudinal slots **15** provided therein. The ignition lead **16** is thus short-circuited and the engine stopped. This embodiment of the invention may be employed in lieu of the usual dip stick or measuring rod as well as for supervising the oil in the differential gear or may be employed generally for detecting a minimum oil level in tanks of internal combustion engines or in other fields of application.

Fig. 4 shows the usual arrangement of the devices illustrated in Figs. 1 to 3, for a normal four-cylinder automobile engine. **28** is the engine, the oil sump **29** of which contains oil up to the normal level **30**. When the oil falls to the level **31**, the oil-deficiency detector **32** (corresponding to Fig. 2) functions and by means of the spark gap which is formed, short-circuits the ignition current for the distributor **33** through the cable **34**, the engine and the earth lead or the earthing mass **35**.

Should the oil tank **36** be emptied by consumption or should the oil conduit **37** be destroyed by breakage etc. so that no more oil flows through the oil-deficiency detector **38** which is of the type shown in Fig. 1, the detector **38** also short-circuits the ignition current through the leads **34***a* and **34** and the earthing mass.

In the case of a fall, for instance, as may occur with a motor cycle, the detector **39** which is of the type shown in Fig. 3, and which is rigidly connected to the vehicle, comes into operation and owing to the tilt of the motor cycle, stops the engine by short-circuiting the ignition current through the leads **34***b* and **34**.

In Fig. 4, for the sake of clarity, **40** represents the spark plugs, **41** the ignition coil, **42** the ignition dynamo, **43** the switch on the dashboard and **44** the battery.

According to the invention, the detectors illustrated in Figs. 1 to 3 may be employed severally or collectively in internal combustion engine installations.

What I claim is:—

1. A means for stopping internal combustion engines employing oil for lubrication when a fault occurs in the oil supply, comprising a unit including an electrode in wire or pin-form connected to the engine ignition lead and mounted in, but insulated from, a tube, in the form of a measuring rod which serves as a second electrode and is earthed, said tube being longitudinally slotted at the lower end up to the point where the pin electrode passes out of insulation, to provide for the access of air to said tube when the oil level falls.

2. A means for controlling the ignition circuit of an internal combustion engine having a lubricating oil supply, comprising a unit comprising a rod-like electrode in electrical connection with the ignition circuit, a tube-like electrode in electrical connection with the ground side of said circuit, an insulator section in the tube-like electrode through which insulator section the rod extends, the insulator section terminating short of the free terminals of the rod and tube to provide a spark gap, and means for supporting the unit to arrange the spark gap below the surface of and open to the body of oil providing the supply for the lubricating oil for the engine, whereby in the absence of oil bridging the spark gap such spark gap provides a short circuit path for the current of the ignition circuit.

3. A construction as defined in claim 2, wherein the unit is bodily removable with respect to the body of oil and the tube-like electrode is provided with appropriate scale marks to permit the unit to additionally serve as an oil measuring rod.

4. Device for stopping internal combustion engines employing oil lubrication when a fault occurs in the oil supply, wherein means are provided for short-circuiting the ignition current when a certain minimum level of the oil in the lubricating system is reached, including an electrode in pin-form connected to the engine ignition lead and mounted in but insulated from a tube, in the form of a measuring rod which serves as a second electrode and is earthed, said tube having means to provide for the access of air to said tube, when the oil level falls.

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