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J. COLE ET AL

2,669,865

APPARATUS FOR TESTING OILS FOR GUM, VARNISH, SLUDGE, AND CORROSION

Filed Jan. 26, 1950

2 Sheets-Sheet 1

Fig. 1.

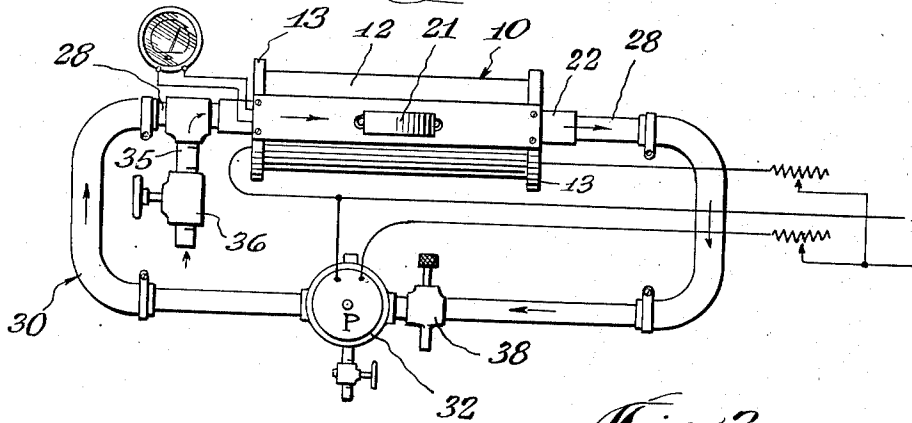


Fig. 3.

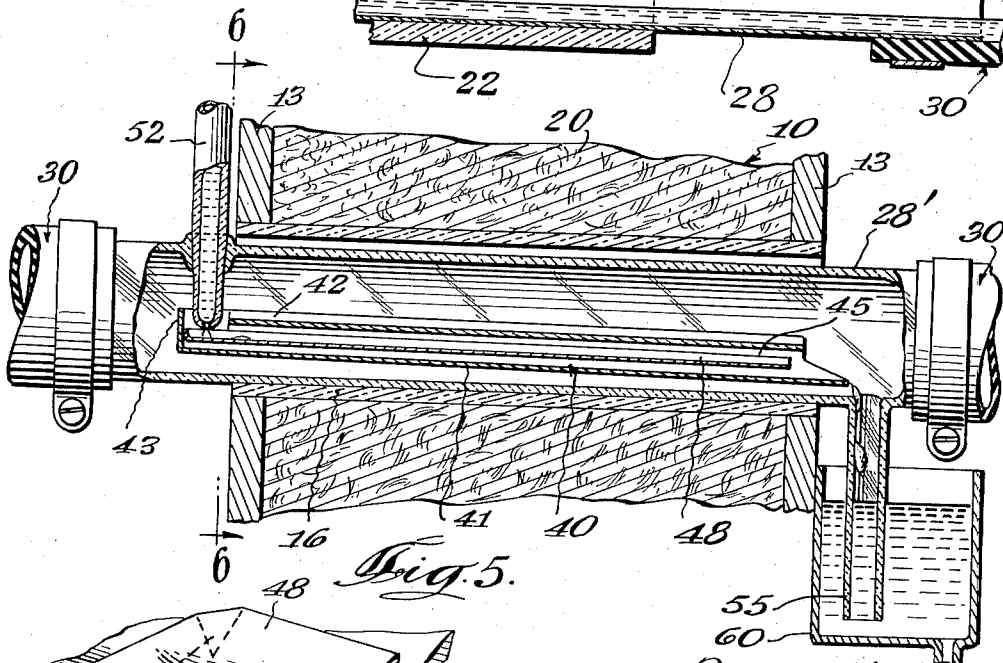
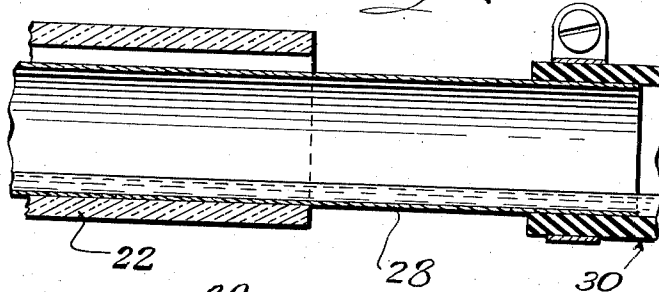


Fig. 5.

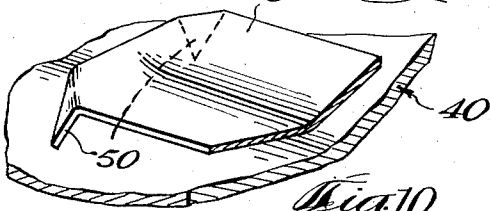


Fig. 10.

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2 Sheets-Sheet 2

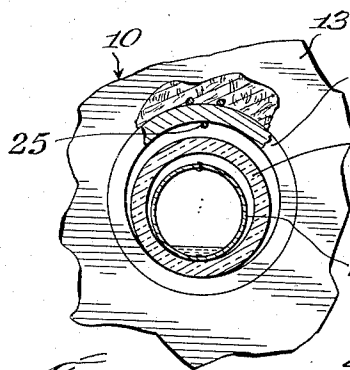
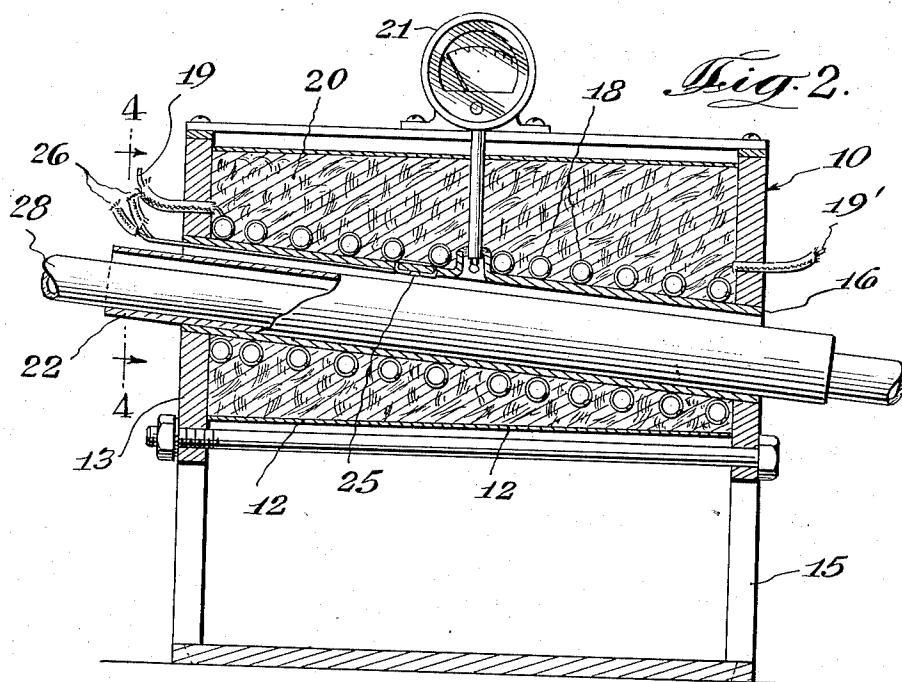


Fig. 4.

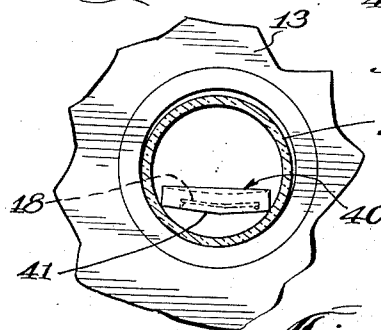


Fig. 6.

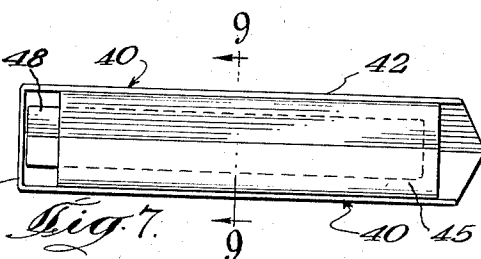


Fig. 7.

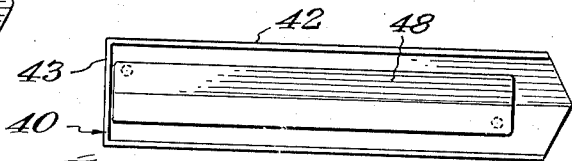


Fig. 8.

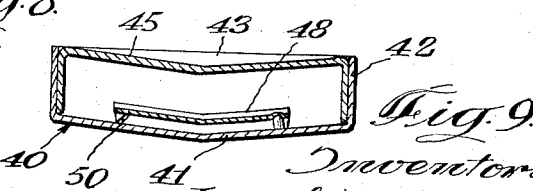


Fig. 9.

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UNITED STATES PATENT OFFICE

2,669,865

APPARATUS FOR TESTING OILS FOR GUM,
VARNISH, SLUDGE, AND CORROSIONJoseph Cole, Whiting, Ind., and John Krawetz,
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Application January 26, 1950, Serial No. 140,726

4 Claims. (Cl. 73-64)

1 Our invention relates to a laboratory apparatus for the evaluation of gum, varnish and such constituents present in or formed in lubricating oils, motor fuels, burning oils, fuel oils, work oils, transformer oils, turbine oils and the like when subjected to prescribed conditions of tests. These tests are accelerated tests based on conditions to which the aforementioned materials are subjected in actual use, such as in an engine crank case. The laboratory apparatus is also used to determine the corrosive action of the aforementioned materials when subjected to accelerated tests based on conditions under which said materials are exposed to in use, with special reference to the effect of high sulphur motor fuels. Further, the apparatus can be employed in conducting accelerated tests to determine the rust-prevention properties afforded by both temporary and permanent coating materials.

Our invention will be best understood from the appended drawings forming a part of this specification and illustrating a preferred embodiment of our invention, wherein:

Fig. 1 is a plan view of a more or less schematic arrangement illustrating a preferred form of our apparatus;

Fig. 2 is a vertical longitudinal section taken through the heater and associated parts shown in Fig. 1;

Fig. 3 is an enlarged fragmentary view of certain parts of the apparatus;

Fig. 4 is a sectional view taken substantially along the line 4-4 of Fig. 2;

Fig. 5 is a sectional view similar to Fig. 2 but showing a modified form of our invention;

Fig. 6 is a sectional view taken substantially along the line 6-6 of Fig. 5;

Fig. 7 is a plan view showing a test specimen plate and receptacle for the same, forming a part of our invention;

Fig. 8 is a plan view of the same with cover removed;

Fig. 9 is a sectional view taken substantially along the line 9-9 of Fig. 7; and

Fig. 10 is a fragmentary perspective view showing portions of a specimen holder and support constituting a feature of one embodiment of our invention.

Referring first to Figs. 1-4, the numeral 10 represents a heater in the nature of a muffle furnace, which is preferably electrically heated. Referring to Fig. 2, the heater 10 comprises a cylindrical body 12 with end closures 13 mounted on a suitable frame 15 and having a tubular element 16 therein surrounded by a heating coil 18, insu-

2 lating packing 20 being provided. The heating coil is, of course, supplied with electrical energy from an appropriate source by means of conduits 19, 19' and a thermometer indicated at 21 may be mounted on the furnace for visually indicating the temperature therein.

Within the tubular element 16 we provide an inner tube 22 of glass or other suitable material, such as a metal, within which may be disposed a removable test specimen of the character herein-after described.

It will be obvious, of course, that the furnace may be provided with a chamber of any desired shape other than cylindrical and that in lieu of the tubular element 16 a member of any other desired shape may be provided.

A thermostatic control lead is embedded in the furnace insulation as close as possible to the heating element to decrease temperature swings as measured by thermocouple leads mounted at point 25.

Removably disposable within the tube 22 is a conduit 28 for liquid to be tested, formed of glass or a suitable metal. The conduit 28 is removably connected in a piping system 30 fed by a motor driven pump 32 (Fig. 1). This pump may have an adjustable speed so that the rate of flow of oil within the system may be controlled. Obviously, the slope of elements 22 and 28 will be such that the tested liquid will flow by gravity in a thin film, and the angle of slope shown in Fig. 2 is merely suggestive or illustrative.

We contemplate that it may in some instances be desired to run tests in a controlled atmosphere, and therefore means is provided, such as a conduit 35 and valve 36, whereby air or an inert gas such as nitrogen, etc., or a contaminated gas or atmosphere may be introduced into the system. A bleeder valve 38 may be provided in the system for withdrawing air or any gas.

When it is desired to make a test run, the section 28 is, of course, weighed and if desired air or an inert gas is passed through the system under prescribed conditions of temperature, contamination, etc. A measured specimen of oil to be tested is then introduced into the system to conduit 35 and may be recirculated through the outlet valve 38, the recirculation being continued for the desired length of time and at the desired temperature. At the conclusion of the circulation, the tube 28 is removed and the deposited material may be weighed and subjected to any desired test.

In the arrangement shown in Figs. 5-9, we provide within the tube 28', which may be round

in cross section, a specially devised specimen receptacle 40. This holder consists of a rectangular shallow tray formed of metal, glass or other suitable material and having a bottom wall 41 which may be slightly dished, as seen in Fig. 9, and upstanding side walls 42 continuous with a rear wall 43, the front being open. The receptacle is provided with a cover 45 which is of shallow channel formation, the legs thereof resting on the bottom of the trough 40.

Arranged within the trough is a specimen holder 48. This holder is so designed as to eliminate the possibility of "creeping" of the liquid which flows over it in a thin film. The member 48 may be formed of any metal, such as steel, copper, lead, aluminum or alloys of these or other metals, and is preferably formed of sheet metal having a thickness of about .01 inch. As seen best in Fig. 9, the specimen holder 48 is slightly dished, being bent at the center to the extent of about 5 degrees, in order to prevent creeping. The holder 48, furthermore, may be so arranged that it will contact the bottom of the trough 40 as little as possible, and to this end it is provided with legs 50 at the corners thereof, formed by bending downwardly the edges of the plate, as seen best in Fig. 10. Thus, the warm gaseous atmosphere may circulate fully around the plate.

According to this arrangement the oil to be tested is introduced into the chamber 28' by means of a conduit 52, the parts being arranged so that the liquid falls directly onto the specimen holder 48. Obviously, the tube 28' and the parts carried thereby will be given a slight forward and downward slope so that the oil will flow in a thin film at the desired rate of speed down the plate 48. Thus, in the course of travel of the oil or other liquid, the constituents which it is desired to precipitate for test purposes will be deposited on plate 48. The oil flows off specimen plate into trough 40, escaping therefrom and from the tube 28' through conduit 55 and into a receptacle 60 from which it is recirculated. Obviously, if an inert gas is employed or the air flow is controlled, the receptacle 60, instead of being open to the atmosphere, will make a gas-tight connection with escape conduit 55.

It will be understood, of course, that the pump is so selected and calibrated that it will circulate the oil or other material to be tested at the desired rate of speed. In the testing of oils, a measuring pump having a capacity of 25 to 250 milliliters per hour is considered satisfactory.

It will be understood, furthermore, that while our apparatus is especially suitable for the testing of lubricating oils, fuel oils, burning oils, motor fuels, work oils such as transformer and tur-

bine oils, it may be useful for various other purposes.

Various changes coming within the spirit of our invention may suggest themselves to those skilled in the art. For example, if desired to run a number of tests simultaneously, the apparatus described above may comprise a battery of testing units of the character shown. Hence, we do not wish to be limited to the specific embodiments shown and described or uses mentioned but intend the same to be merely exemplary, the scope of our invention being limited only by the appended claims.

We claim:

1. In a laboratory apparatus for the evaluation of constituents of oils under test, a furnace body, an inclined conduit through which oil under test is adapted to be passed extending through said body, heating coils surrounding said conduit, a specimen holder container in said conduit, and a specimen holder in said container, said specimen holder comprising a relatively thin, elongated, dished plate deformed to provide a supporting surface of relatively small contact area whereby said plate may be positioned above its supporting surface to permit air circulation thereabout.

2. A combination as defined in claim 1, wherein said container comprises a relatively shallow conduit having a lid fitting snugly therein and adapted to overlie the specimen holder except for an opening permitting deposit on the holder of liquid to be tested.

3. A combination as defined in claim 1, said plate being bent substantially along its longitudinal center line at a slight angle, whereby a thin film will be formed by liquid flowing thereon but creeping up the sides of the plates will be inhibited.

4. In laboratory apparatus of the class described, a furnace having a passage extending therethrough, means for controlling the heat of said furnace, a removable conduit in said passage normally disposed at a slight slope and serving as a surface for deposit of a film of constituents of liquid flowed by gravity through said passage, and means for recirculating liquid undergoing test through said conduit at a predetermined rate.

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