May 4, 1954 W. M. HARKS 2,677,303

OIL TESTER

Filed March 21, 1950 4 Sheets-Sheet 1

Fig. 3

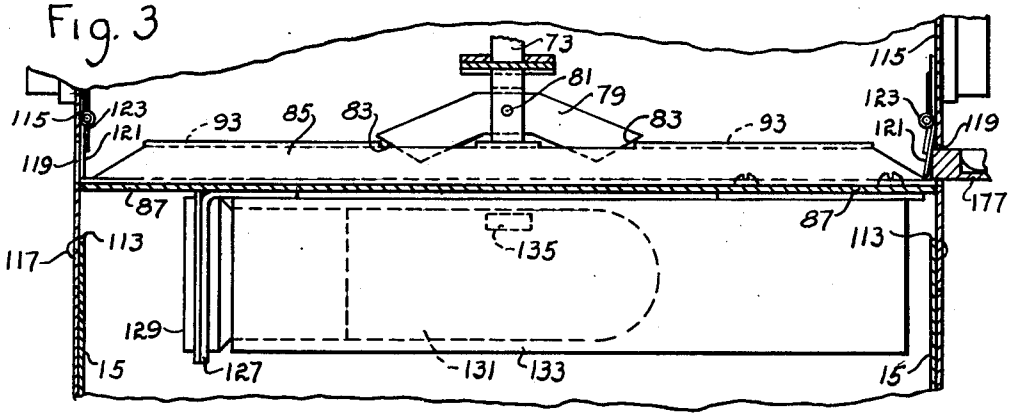
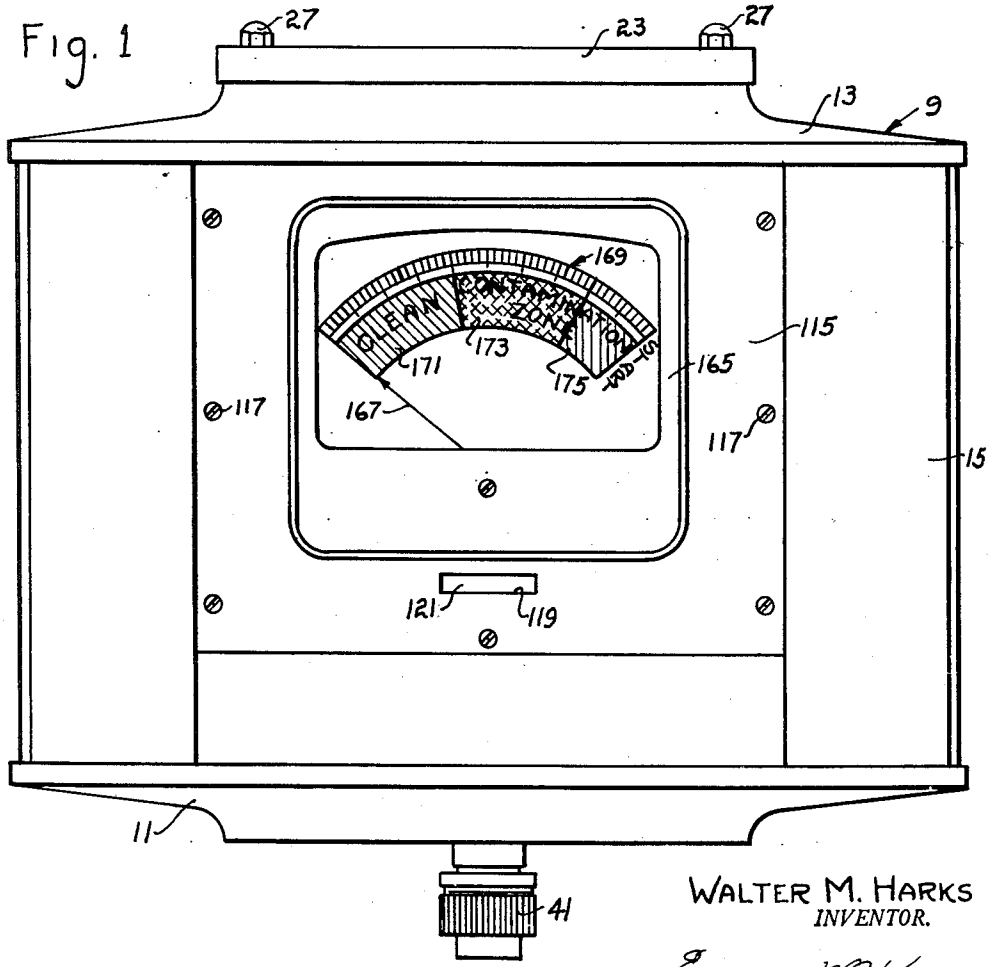


Fig. 1



WALTER M. HARKS
INVENTOR.

BY Edmund W. E. Kamm
ATTORNEY

May 4, 1954 W. M. HARKS 2,677,303

OIL TESTER

Filed March 21, 1950 4 Sheets-Sheet 2

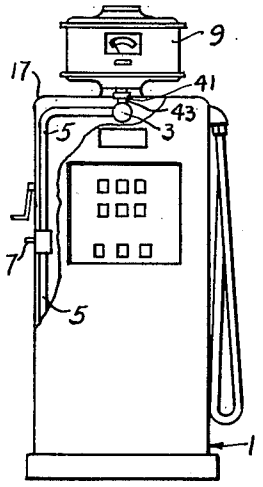
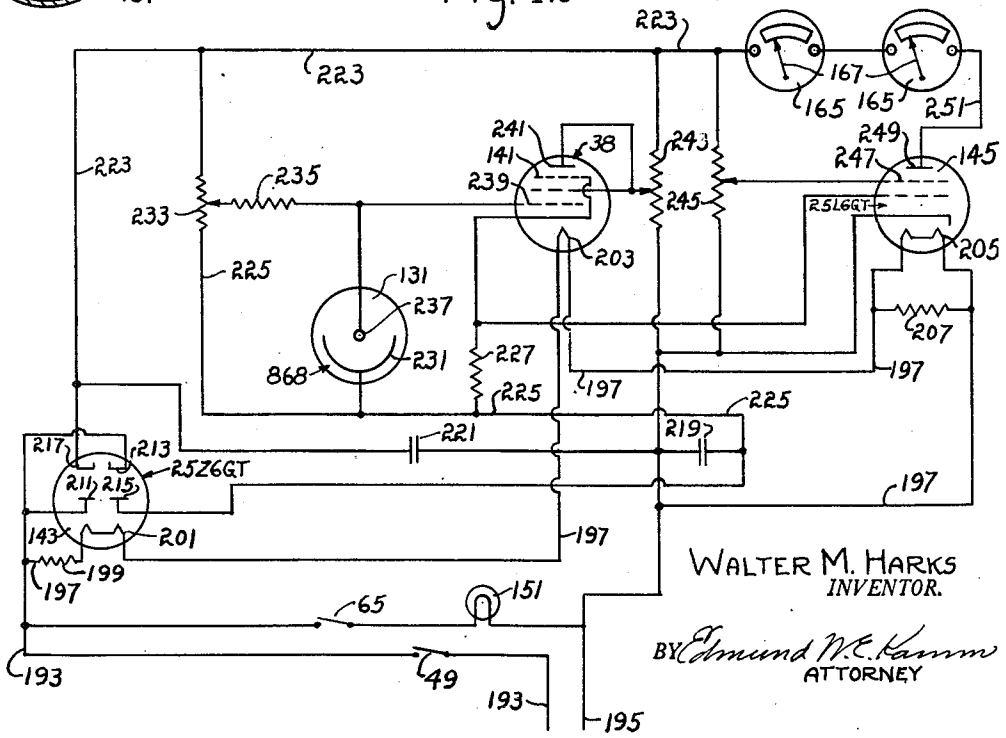


Fig. 2

Fig. 11

Fig. 12



WALTER M. HARKS
INVENTOR.

BY Edmund W. E. Kamm
ATTORNEY

May 4, 1954 W. M. HARKS 2,677,303

OIL TESTER

Filed March 21, 1950 4 Sheets-Sheet 3

Fig. 4

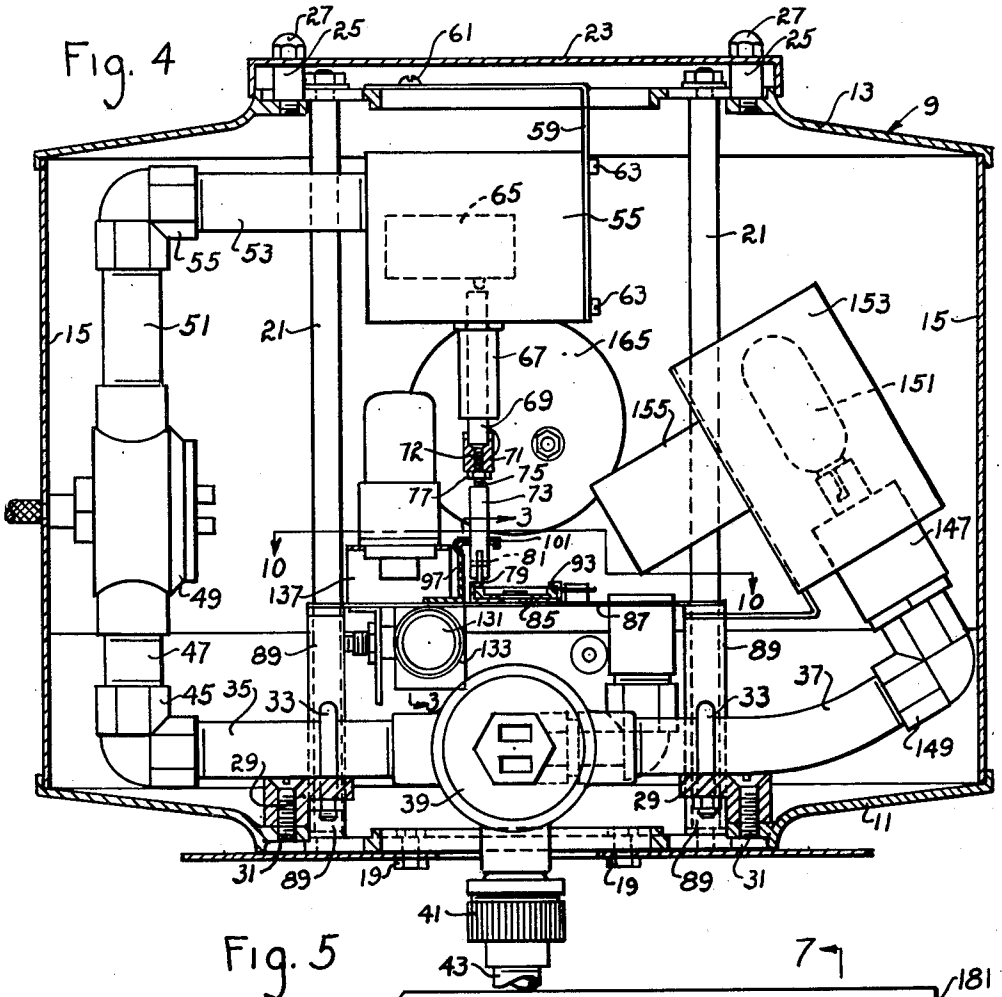


Fig. 5

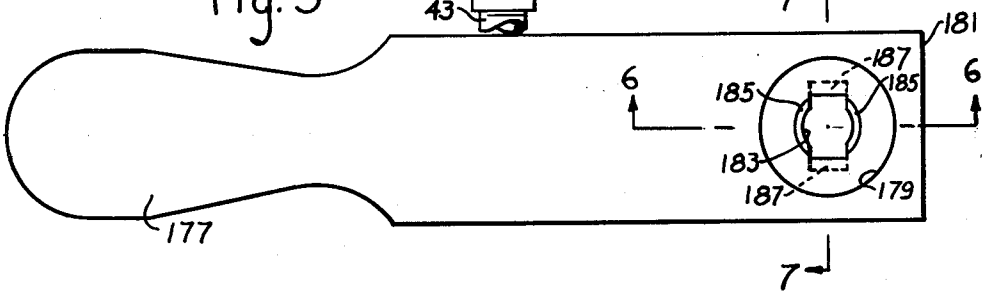


Fig. 6

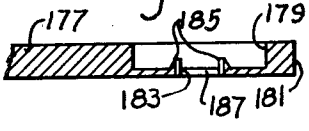
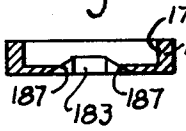


Fig. 7



WALTER M. HARKS
INVENTOR.

BY Edmund W. E. Kamm
ATTORNEY

May 4, 1954 W. M. HARKS 2,677,303

OIL TESTER

Filed March 21, 1950 4 Sheets-Sheet 4

Fig. 10

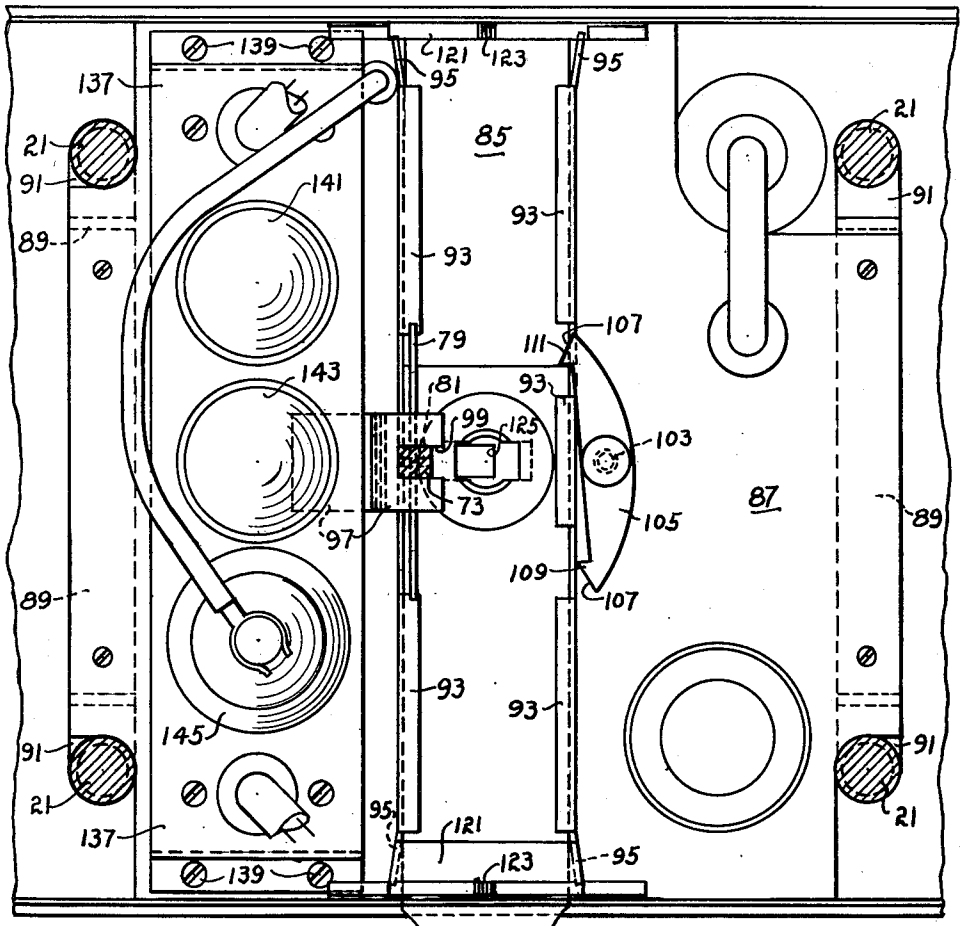
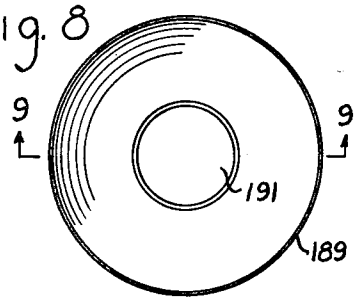


Fig. 8



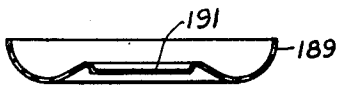


Fig. 9

WALTER M. HARKS
INVENTOR.

BY Edmund N. Kamm
ATTORNEY

Patented May 4, 1954

2,677,303

UNITED STATES PATENT OFFICE

2,677,303

OIL TESTER

Walter M. Harks, Fort Wayne, Ind., assignor to Bowser, Inc., Fort Wayne, Ind., a corporation of Indiana

Application March 21, 1950, Serial No. 150,937

4 Claims. (Cl. 88—14)

1

This invention relates to an oil tester, more specifically it relates to a device for indicating when the crankcase oil of an internal combustion engine is unfit for further use.

It is an object of the invention to provide a device which may be attached to the usual gasoline dispensing pump found in automobile service stations.

It is another object of the invention to produce a tester in which light is projected upon a sample of oil through which it passes, partly by refraction, to a photoelectric tube.

It is a further object of the invention to produce an apparatus which will be operable from either of two sides.

These and other objects will become apparent from a study of this specification and the drawings which are attached hereto and made a part hereof and in which:

Figure 1 is a front elevation of the device.

Figure 2 is a front elevation of the device mounted upon a filling station pump.

Figure 3 is an elevation showing the sample stick guiding and switch operating mechanisms taken substantially on line 3—3 of Figure 4.

Figure 4 is an elevation of the interior of the device with some parts in section to show details of the construction.

Figure 5 is a plan view of the sample stick showing the receptacle for the sample cup.

Figure 6 is a sectional view of the receptacle taken on line 6—6 of Figure 5.

Figure 7 is a sectional view of the receptacle taken on line 7—7 of Figure 5.

Figure 8 is a plan view of the sample cup.

Figure 9 is a sectional view of the cup taken on line 9—9 of Figure 8.

Figure 10 is a plan view of the sample stick stop mechanism taken substantially on line 10—10 of Figure 4.

Figure 11 is an enlarged view of the light source, sample holder and photoelectric tube showing their relative positions.

Figure 12 is a wiring diagram of the device.

Referring first to Figures 1, 2 and 4, the numeral 1 represents the usual filling station gasoline dispenser which is equipped with a junction box 3 which is connected by conduit 5 to a switch 7.

A testing device which is indicated generally by the numeral 9, comprises a base 11 and a top head 13 between which is confined a housing 15.

The base is bolted in place on the canopy 17 by bolts 19. Tie rods 21 connect the base and

2

top head (which are identical parts) to hold them together against the edges of the housing 15. A cap 23 closes the head 13 and is held in place thereon by studs 25 and nuts 27.

A pair of blocks 29 are supported on the base 11 by screws 31 and U-bolts 33 enter the blocks to support the electric conduits 35 and 37 respectively which are attached to the junction box 39. The latter is connected by a union 41 and a nipple 43 to the junction box 3 described above.

Conduit 35 is connected by an L 45 and nipple 47 to a switch 49 and by nipples 51, 53 and L 55 to the switch box 57. The free end of the box is supported by a bracket 59 which depends from and is fixed to the head 13 by screws 61 and is fixed to the box by screws 63.

A switch 65 is mounted in the box. A sleeve 67 is mounted on the lower side of the box and slidably carries a plunger 69 which is adapted to operate the switch. The lower end of the plunger is loosely fitted with a collar 71 having a small threaded hole 72. A yoke 73 has a threaded stem 75 which enters the cap and a jam nut 77 holds the yoke in adjusted position with respect to the collar.

A rocker 79 is pivotally mounted in the yoke at 81 as shown in Figure 3 and has upwardly bevelled ends 83.

A guide 85 for the sample stick or paddle is mounted on a platform 87 which is supported on brackets 89 rising from the base 11, the outwardly bent feet 91 of said brackets being pierced to pass the lower threaded ends of the tie rods so as to be held in place thereby.

The guide 85 has ears 93 bent toward each other at the top thereof and thus confines the paddle to a single course. The side walls of the guide may be flared at each end as at 95 to facilitate the entrance of the paddle.

As shown in Figures 4 and 10, a bracket 97 is mounted on the platform 87 and overhangs the paddle guide 85. The bracket is notched at 99 to receive and guide the yoke 73. A clip 101 snaps onto the bracket 97 and has a notch (not shown) which straddles the yoke 73 to hold it in the notch.

Pivotally mounted at 103 on top of the platform 87 and parallel thereto is a stop rocker 105. It is provided with bevelled ends 107 and stops 109 and 111 and is disposed in the path of one side of the paddle as it enters the guide 85.

An opening 113 is formed in the front and rear sides of housing 15 and these are covered

by the register mounting plates 115 which are held in place by suitable screws 117.

Diametrically opposed openings 119 are formed in alignment with the guide 85 and permit entrance of the paddle. A door 121 is hingedly mounted on the plate 115 above each opening and is urged to closed position thereover by a spring 123.

A square opening 125 is formed in the platform (Figures 10 and 11) on the transverse center line of the platform and slightly to the left of the center line of the guide 85 (Figure 10). A bracket 127 supports the socket 129 of the photoelectric tube 131 below the platform. A metal shield 133 for the tube is mounted on the socket and has a rectangular opening 135 therein, the radial axis of which inclines so that it passes through the left side of the opening 125 as shown in Figure 11.

A support 137 is mounted on the upper side of the platform by means of screws 139 and the sockets and other electrical parts for the electronic tubes 141, 143 and 145 are mounted thereon in any suitable manner.

A lamp base 147 (Figure 4) is connected by an L 149 to the conduit 37 and an incandescent lamp 151 is installed therein. A housing 153 is fitted over the lamp and is provided with a lateral tube 155 in which is mounted a system of lenses 157, 159 and a diaphragm 161 which is provided with a square aperture 163. The lenses preferably have a focal length of about three inches and have one convex and one plane side.

The axis B of the lens system is disposed at about 30 degrees above the horizontal platform 87 and is directed so as to pass through the opening 125 in platform 87 and through the opening 135 in shield 133. Thus when no sample is positioned in the beam, the photoelectric cell will be subjected to light of maximum intensity.

Each of the plates 115 is fitted with a register 165 which is a milliammeter. It is provided with a movable indicator 167 and fixed scale 169 which is divided into three sections 171, 173 and 175 which are preferably colored green, orange and red. The first bears the legend "Clean" and the other two bear the words "Contamination Zone." To the right of the section 175 is the legend "Start."

The paddle 177, Figures 5, 6 and 7, is formed with a circular depression 179 centered at a predetermined distance from the end 181 of the paddle. A circular hole 183 is formed at the center of the depression. This hole is bounded by a pair of opposed, upward projections 185 and is undercut laterally at 187 on each side to prevent interference with the beam of light, as will be apparent from Figure 11.

A small saucer-like disc 189 (Figures 8 and 9) of transparent plastic material is adapted to fit into the opening 179 and has a central sample cup 191 which receives a predetermined amount of the oil to be tested. Any excess runs over the rim and is retained in the outer portion of the disc.

Wiring diagram

Referring to Figure 12, it will be seen that the source of current for the operation of the device is the usual 115 volt, 60 cycle source which is available at the union in the main lines 193 and 195.

It is obvious that when the switch 49 is closed a circuit is established from 193 through 197, resistance 199, which is 200 ohms—20 watts, the heater elements 201, 203 and 205 of the vacuum tubes 143, 141 and 145 to the main 195. The elements 205 are provided with a separate shunt resistance 207 of 50 ohms—1 watt.

When switches 49 and 65 are closed, a circuit is formed from line 193 through line 209, microswitch 65 and lamp 151 to main 195. Switch 65 is closed by the insertion of the paddle into the machine.

Line 193 is also connected to the anode 211 and the cathode 213 of the 25-Z6GT tube 143 while line 195 is connected to anode 215 and cathode 217 through condensers 219 and 221 which are 10 mfd, 450 volt.

This is a voltage doubler circuit of well known construction and its output lead 223 connects cathode 217 with the milliammeters 165.

The other lead 225 is connected respectively to a resistance 227 of .56 megohm, to the cathode 229 of an 868 P. C. photoelectric tube 231 and to a voltage divider 233 of 1 megohm, the other side of the divider is connected to lead 223.

The divider 233 is connected through resistance 235 of 22 megohms to the anode 237 of the photoelectric tube and to the control grid 239 of the No. 38 tube 141. This is a "reverse circuit." The plate 241 of tube 141 is connected through voltage divider 243 of .1 megohm to the voltage divider 245 of .1 megohm and to the control grid 247 thereof. The current from the plate 249 is connected to the meters 165 by line 251.

Operation

In order to operate the device, the operator will close switch 49 (assuming that the pump lamp switch 7 is on). This will energize the voltage doubler circuit and the electron tubes but not the photoelectric cell.

While the instrument is coming to normal operating condition the operator will insert a disc 189 in the depression of the paddle 177 and place several drops of oil in the cup 191. The excess oil will overflow the edge of the cup. He then inserts the paddle from either side of the machine.

As the paddle enters the slot 119 (Figure 3), the door 121 will be opened against the action of spring 123 and the paddle will enter the guide 85. As the forward end of the paddle engages the inclined face 107 of the stop rocker 105, it will position the stop 109 or 111 at the other end of the rocker in the path of the paddle so as to position the latter with the cup in the path of the beam from lamp 151.

Also, as the paddle enters the guide, the forward end rides under the bevelled end 83 of the switch rocker 79. As the paddle passes under the other end of the rocker 79, the rod 73, 69 is raised and the switch 65 is closed to light the lamp 151.

The beam passes through the sample and is refracted more or less toward the lower side of the opening 135 in the photoelectric cell shield 133.

The density of the oil increases as it becomes less effective as a lubricant and its opacity increases as the load of foreign material in the oil increases. The density of the oil tends to shift the beam in the direction of the arrow C so that less light or in some cases, no light will enter the tube shield, as shown by the lower beam. The intensity of the light will also be decreased by the opacity of the sample.

As the intensity of the light decreases the plate 249 voltage increases because the photoelectric cell circuit is a "reverse circuit." When the switch 65 closes, the paddle is not quite at the home po-

sition determined by stop 109 or 111, therefore all light from the lamp is cut off from the photoelectric cell by the paddle and plate voltage applied to the meters is at a maximum so that the needle 167 will move all the way to the right hand position under the legend "Start." As the sample moves into position the light intensity applied to the photoelectric cell will reach the level proportionate to the density and opacity of the oil and the needle will settle back. If the oil is clean and not so dense, the amount of light entering the tube will be greater than if the oil is dense and dirty. The plate voltage will be less for the clean oil and the needle will be near the left end of the scale, in the green area 171, marked "Clean." As the opacity and density increase, the amount of light applied to the tube decreases and the plate voltage increases, deflecting the needle toward the right toward or into the "Contamination Zone" which is colored orange or red. If the needle stops in the red zone, the contamination is such that the oil should be changed.

After the meter reading has been secured, the operator will withdraw the paddle and eject the plastic disc. Usually it is advisable to also open switch 49 to deenergize the electronic circuits. The current of lamp 151 is, of course, opened as soon as the paddle is withdrawn from under rocker 79.

It is obvious that various changes may be made in the form, structure and arrangement of parts without departing from the spirit of the invention. Accordingly, applicant does not desire to be limited to the specific embodiment disclosed herein primarily for purposes of illustration; but instead, he desires protection falling fairly within the scope of the appended claims.

What I claim to be new and desire to protect by Letters Patent of the United States is:

1. In an oil tester, a photoelectric cell, a lamp, means forming the light from the lamp into a photoelectric cell actuating beam, actuatable means for energizing the lamp, means for positioning an oil sample in the path of the beam comprising a sample holder, a guide therefor which is open at both ends so as to receive the positioning means in either end, means operable in either of two directions for stopping the holder with the sample in the beam and means operable in either of two directions by the sample holder to actuate said lamp energizing means as the sample holder is positioned.

2. In an oil tester, a photoelectric cell, a lamp, means forming the light from said lamp into a photoelectric cell actuating beam, means for positioning an oil sample in the beam comprising a guide open at both ends, a sample holder adapted to enter and to move in the guide from either end, double ended control means associated with the guide having holder positioning stop means at both ends, said holder upon engagement with said positioning means at one end of the control means serving to position the stop means at the other end of the path of the holder.

3. In an oil tester, a photoelectric cell, a lamp, means forming the light from said lamp into a photoelectric cell actuating beam, a switch for energizing the lamp, means for positioning an oil sample in the beam comprising a guide open at both ends, a sample holder adapted to enter and to move in the guide from either end, double ended control means associated with the guide having holder positioning stop means at both ends, said holder upon engagement with said positioning means at one end of the control means serving to position the stop means at the other end in the path of the holder, an operator for said switch mounted in the path of said holder for operation thereby as it nears the positioned stop.

4. In an oil tester, a photoelectric cell, a lamp, means forming the light from said lamp into a photoelectric cell actuating beam, a switch for energizing the lamp, means for positioning an oil sample in the beam comprising a guide open at both ends, a sample holder adapted to enter and to move in the guide from either end, double ended control means associated with the guide having holder positioning stop means at both ends, said holder upon engagement with said positioning means at one end of the control means serving to position the stop means at the other end in the path of the holder, an operator for said switch comprising a switch rod, a double ended rocker pivotally mounted on the bottom thereof with both of its ends in the path of the holder, said rocker being formed to facilitate entry of the holder between both ends thereof and the guide, said rocker serving to actuate said switchrod to close said switch only when the holder engages both ends thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,763,544	Tokheim	June 10, 1930
1,905,251	Styer	Apr. 25, 1933
2,022,919	Logan	Dec. 3, 1935
2,056,791	Logan	Oct. 6, 1936
2,062,588	Logan et al.	Dec. 1, 1936
2,082,252	McDill	June 1, 1937
2,133,544	Kolb	Oct. 18, 1938
2,157,438	Sparks	May 9, 1939
2,253,049	Riche	Aug. 19, 1941
2,255,034	Bauer	Sept. 2, 1941
2,413,208	Barnes	Dec. 24, 1946