

SCHEDULES.

SECOND SCHEDULE

Section 20.

TEST APPARATUS TO BE USED AND MANNER OF TESTING PETROLEUM THEREWITH SO AS TO ASCERTAIN THE TEMPERATURE AT WHICH IT WILL GIVE OFF INFLAMMABLE VAPOUR

PART I

SPECIFICATION OF THE TEST APPARATUS

General

The apparatus to be employed shall be the Abel Petroleum Testing apparatus or the Abel apparatus modified by having an oil cup provided with a stirrer. It shall be constructed to the dimensions herein specified within the limits of accuracy prescribed by the tolerances set forth below.

The Oil Cup

The oil cup consists of a cylindrical vessel open at the top and fitted on the outside with a flat circular flange projecting at right angles.

Within the cup, fixed through the wall and silver soldered or brazed in place, there is a gauge consisting of a piece of wire bent upwards and terminating in a point.

Material:—brass or gunmetal.

	Dimension.	Tolerance.
Cup, wall and bottom thickness	17 I.W.G.	—
Cup, internal diameter	2"	±0.05"
Cup, internal depth	2.2"	±0.05"
Flange, thickness	17 I.W.G.	—
Flange, width	0.5"	±0.05"
Flange, distance of upper side from top edge of cup.	0.375"	±0.05"
Gauge, thickness, not less than -	10 I.W.G.	—
Gauge, distance of point from level of upper edge of cup.	0.7"	±0.005"

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The Cover

The cup is provided with a close-fitting cover with a downward projecting rim barely reaching the flange on the cup. The downward projecting rim is made solid with the top or silver soldered or brazed in place. Upon the cover are mounted a thermometer socket, trunnions to support an oil-test lamp, a pair of guides in which a slide moves, and a white bead. The top of the cover is pierced by three rectangular holes symmetrically placed on a diameter, one in the centre and the other two as close as practicable to the inner sides of the cover-rim and opposite each other. These three holes are covered or uncovered by means of a slide moving in suitably disposed guides. The slide has two perforations, one corresponding in all particulars to the centre hole in the cover and the other to one of the holes at the side. The movement of the slide is restricted by suitable stops, and its length and the disposition of the holes are such, that at the outer extremity of the movement of the slide, the holes in the cover are simultaneously just completely opened and at the inner extremity of the movement of the slide they are completely closed.

The trunnions supporting the test lamp are fixed on the top of the guides and the lamp is mounted in the trunnions so that it is free to oscillate. The lamp is provided with a jet to contain a wick and is so arranged that when the slide is moved so as to uncover the holes, the oscillating lamp is caught by a pin fixed in the slide and tilted over the central hole in such a way that the lower edge of the cover bisects the circle formed by the bore of the jet when in the lowest position. The flame then occupies a central position within the hole in both

A suitably mounted gas-jet may be substituted for the lamp.

The thermometer socket is in the form of a split tube, mounted on a diameter at right angles to the diameter through the centres of the holes, and fitted at such an angle as to bring the bulb of the thermometer, when in place, vertically below the centre of the cover and at the correct distance from it.

A white bead, the dimensions of which represent the size of test flame to be used, is mounted in a visible position on the cover.

Materials :—all parts excepting bead :—brass or gun-metal, bead :—ivory or other suitable material.

—	Dimension.	Tolerance.
Cover, thickness	0.05"	+0.015"
Cover, central hole, length (in direction of slide).	0.5"	±0.005"
Cover, width	0.4"	±0.005"
Cover, peripheral holes length (in direction of slide).	0.2"	±0.005"
width	0.3"	±0.005"
Slide, thickness	20 I.W.G.	—
Slide, width of upper surface	0.5"	+0.01" (excess only).
Lamp, Overall length of jet	Approx. 0.6"	To suit the requirements for the position of jet when tilted.
Lamp, Bore of jet at end -	0.0625"	±0.005"
Bead. Diameter	0.15"	±0.01"

—	Dimension.	Tolerance.
Thermometer Socket:		
Internal diameter -	0.6"	±0.01"
Length of short side measured from under surface of cover.	Approx. 0.5"	—
Length of long side measured from under surface of cover.	Approx. 0.75"	—
Distance of centre of socket from centre of cover measured on the underside.	Approx. 0.7"	—
These dimensions are subject to the correct placing of the thermometer when in position.		
Vertical depth of lowest part of thermometer below centre of under-side of cover.	1.5"	±0.1"

Cover fitted with stirrer

Provision may be made in the cover for the reception of a stirrer which projects into the oil cup, for use with viscous materials only.

A bush is mounted on the cover in a position diametrically opposite the thermometer mounting and its length is such and it is set at such an angle that the stirrer rod clears the oil-level gauge and the blades operate below the level of and without fouling the thermometer bulb. The bush is placed as near as practicable to the outer edge of the cover.

The stirrer consists of a round stem having four blades or vanes silver soldered in place at one end. A collar is fixed on the stem so that when the stem is inserted into the bush from below, it is arrested at a position such that the correct length protrudes into the oil cup. The top end of the stem is reduced and screwed.

A long sleeve having an internally screwed, knurled knob soldered to its upper end, is passed over the upper end of the stem and screwed home. The length of the sleeve is such that a flat-faced collar at its lower end just comes into contact with the upper end of the bush, leaving the stirrer free to rotate without appreciable vertical play.

A flat-headed cylindrical plug is provided for insertion in the bush when the stirrer is not in use.

Material:—brass or gun-metal.

—	Dimension.	Tolerance.
Stem, length overall	4"	+0.1"
Stem, length Lower end to point of attachment of blades.	Approx. 0.1"	—

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—	Dimension.	Tolerance.
Stem, length Lower end to upper surface of collar.	1.9"	±0.1"
Stem, length Upper surface of collar to lower end of thread.	2"	±0.1"
Stem, length Diameter of stem	Approx.0.125"	—
Stem, length Diameter of collar	Approx. 0.25"	—
Stem, Thread	7 B.A.	—
Blades, Thickness	17 I.W.G.	—
Blades, Length excluding root	0.5"	+0.01"
Blades, Breadth (all corners of blades rounded).	5/16" (0.3125").	±0.01"
Blades, Blade angle	Approx. 45°	—
Sleeve. Length, to suit stem, giving free rotation with no appreciable vertical play when screwed home.	—	—
Diameter of bore	Sliding fit on stem.	—
Diameter of collar	Approx.0.25"	—

Heating Vessel

The heating vessel or bath consists of two flat-bottomed cylindrical copper vessels placed coaxially one inside the other and soldered at their tops to a flat copper ring, greater in outside diameter than the larger vessel and of smaller inside diameter than the smaller vessel. The space between the two vessels is thus totally enclosed and is used as a water jacket.

An ebonite or fibre ring of right-angle section is fitted into the hole in the centre of the flat ring forming the top of the bath and, when the apparatus is in use, the oil cup fits into, and its flange rests upon, this ebonite or fibre ring so that the oil cup is centrally disposed within the heating vessel. The ebonite or fibre ring is secured in place by means of six small screws having their heads sunk below the surface of the ring, to avoid metallic contact between the bath and the oil cup.

A split socket, similar to that on the cover of the oil cup, but set vertically, allows a thermometer to be inserted into the water-space. A funnel and overflow pipe also communicate with the water-space through the top plate and two loop handles are provided thereon.

—	Dimension.	Tolerance.
Inner vessel:		
Thickness	24 I.W.G.	—
Internal diameter	3"	±0.05"

	Dimension.	Tolerance.
Internal depth	2.5"	±0.05"
Outer vessel:		
Thickness, not less than	24 I.W.G.	—
Internal diameter	5.5"	±0.1"
Internal depth	5.75"	±0.1"
Top plate :		
Thickness, not less than	20 I.W.G.	—
Outer flange projection	0.375"	±0.1"
Diameter of central hole	To suit ebonite or fibre ring. Clearance not to exceed 0.1".	—
Ebonite or fibre ring :		
Internal diameter	Easy fit on oil cup	—
External diameter of flange	2.75"	±0.02"
Overall depth of spigot	0.25"	±0.02"
Thickness, flange and spigot	0.08"	±0.005"
Screws, C.S.	8 BA. X 0.15"	—
Thermometer socket:		
Internal diameter	0.6"	±0.01"
Height from top of plate	0.75"	±0.05"

The bath rests upon a cast-iron tripod stand, to the ring of which is attached a cylindrical copper jacket not less than 24 I.W.G. flanged inwards at the top, and of such dimensions that the bath, while resting firmly on the iron ring, just touches with its outward projecting flange the inward-turned flange of the jacket. Two handles are provided on the outer jacket.

Diameter of the outer jacket 6.5 inches + 0.1 inches.

Spirit Lamp

A spirit lamp is provided for raising the temperature of the water bath, but any other means approved by the Board of Trade may be employed for this purpose.

Thermometers

Two thermometers are provided with the apparatus, the one for ascertaining the temperature of the bath, the other for determining the flashing point.

Oil Cup Thermometer

Type	Mercury in glass, nitrogen filled, graduated on the stem, enamel back.
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Length	Approximately 9 inches.
Stem	Diameter 0.24 inches to 0.28 inches.
Bulb	Spherical: made of a normal glass approved by the Board of Trade. Diameter, 0.35 inches \pm 0.05 inches.
Range	50 degrees Fahrenheit to 150 degrees Fahrenheit with expansion chamber. Distance from the bottom of the bulb to the 50 degree line 2.75 inches to 3.15 inches. Distance from the 50 degree line to the 150 degree line not less than 4.75 inches.
Immersion	A swelling is made in the stem to ensure that the thermometer shall be fixed in its brass collar so that the distance from the top of the collar to the bottom of the bulb is 2.4 inches + 0.05 inches.
Graduation	Scale graduated in 1 degree Fahrenheit divisions. Every fifth degree and tenth degree to be indicated by longer lines. Figured at every tenth degree in full.
Marking	" Abel Oil Cup " : Identification number : " Fahrenheit " : Maker's or Vendor's name or trade mark.

Water Bath Thermometer

Type	Mercury in glass, nitrogen filled, graduated on the stem, enamel back.
Length	Approximately 9 inches.
Stem	Diameter, 0.24 inches to 0-28 inches.
Bulb	Cylindrical: made of a normal glass approved by the Board of Trade. Length approximately 0.8 inches. Diameter not to exceed the diameter of the stem.
Range	90 degrees Fahrenheit to 190 degrees Fahrenheit with expansion chamber. Distance from the bottom of the bulb to the 90 degree line 3.95 inches to 4.35 inches. Distance from the 90 degree line to the 190 degree line not less than 3-55 inches.
Immersion	A swelling is made in the stem to ensure that the thermometer shall be fixed in its brass collar so that the distance from the top of the

Graduation	collar to the bottom of the bulb is 3.5 inches + 0.1 inches. Scale graduated in 1 degree Fahrenheit divisions. Every fifth degree and tenth degree to be indicated by longer lines. Figured at every tenth degree in full.
Marking	" Abel Water Bath " : Identification number : " Fahrenheit " : Maker's or Vendor's name or trade mark.

The brass collar of the thermometer is in each case of the following dimensions :—

Outside diameter	push fit in socket.
Thickness of tube	22 I.W.G.
Thickness of flange	0.1 inches. + 0.001 inches.

Note.—A model apparatus is deposited at the Standards Department of the Board of Trade.

PART II

Manner of Testing Petroleum

- 1 For the purposes of this Act petroleum shall be tested either by means of apparatus constructed in accordance with the specification contained in Part I of this Schedule, or by means of apparatus constructed in accordance with the specification contained in the First Schedule to the Petroleum Act, 1879, and verified and stamped by the Board of Trade.
- 2 The test apparatus shall be placed for use in a position where it is not exposed to currents of air or draughts.
- 3 The heating vessel or water-bath shall be filled by pouring water into the funnel until it begins to flow out at the spout of the vessel. The temperature of the water at the beginning of the test shall be 130 degrees Fahrenheit and no heat shall be applied to the water-bath during the test. When a test has been completed and it is desired to make another test the water-bath shall be again raised to 130 degrees Fahrenheit which may conveniently be done while the petroleum cup is being emptied, cooled and refilled with a fresh sample to be tested. The next test is then proceeded with.
- 4 If an oil test-lamp is being used it shall be prepared by fitting it with a piece of flat plaited candle-wick, and filling it with colza or rape-oil up to the lower edge of the opening of the spout or wick tube. The lamp shall be trimmed so that when lighted it gives a flame of about 0.15 of an inch diameter, and this size of flame, which is represented by the projecting white bead on the cover of the oil-cup, is readily maintained by simple manipulation from time to time with a small wire trimmer. A gas test-lamp may be employed, and if so, the size of the jet of flame shall be adjusted to the size laid down above.
- 5 The bath having been raised to the proper temperature, the cup shall be placed on a level surface in a good light and the oil to be tested shall be poured into it until the level of the liquid just reaches the point of the gauge which is fixed in the cup. Before a test is begun the temperature of the oil shall be determined and shall be

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brought to approximately 60 degrees Fahrenheit. The cover, with the slide closed, shall then be put on to the cup and pressed down so that its edge rests on the rim of the cup, and the cup shall be placed into the bath or heating vessel, every care being taken to avoid wetting the sides of the cup with the oil. The thermometer in the fid of the cup has been adjusted so as to have the correct immersion when the brass collar of the thermometer is properly seated, and its position shall not in any circumstances be altered. When the cup has been placed in the proper position, the scale of the thermometer faces the operator.

- 6 The test-lamp shall then be placed in position upon the lid of the cup. When the temperature has reached 66 degrees Fahrenheit the operation of testing shall be begun, the test flame being applied once for every rise of one degree, in the following manner :—

The slide shall be slowly drawn open while a metronome, set so as to beat at the rate of 75 to 80 beats in the minute, beats three times and shall be closed during the fourth beat. A pendulum of 24 inches effective length may be used in place of the metronome, counting one beat from one extremity of the swing to the other.